



ADDIS ABABA UNIVERSITY
COLLEGE OF DEVELOPMENT STUDIES
CENTER FOR ENVIRONMENT AND DEVELOPMENT

INSTITUTIONAL COLLABORATION TOWARDS
SUSTAINABILITY OF SURFACE WATER QUALITY:
THE CASE OF AKAKI RIVER, ADDIS ABABA, ETHIOPIA

By
Kidus Workineh

**A thesis submitted to the Center for Environment and Development Studies in Partial
Fulfillment of the Degree of Master of Arts in Development Studies
(Environment and Sustainable Development)**

Thesis Advisor: Ermias Teferi (Ph.D.)

February, 2020
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DECLARATION

Kidus Workineh, do hereby declare that this thesis is my original work and that it has not been submitted partially or fully by another person for an award of a degree in any other university.

Name of participant: Kidus Workineh Tebikew

Signature_____

Date_____

As a thesis research advisor, I hereby certify that I have read and evaluated the thesis prepared by Kidus Workineh under my guidance, which is entitled “Institutional Collaboration towards Sustainability of Surface Water Quality, Case Study of Akaki River, Addis Ababa, Ethiopia”. I recommend that the thesis be submitted as it fulfills the requirements for the award of a Master’s Degree in Environment and Sustainable Development.

Name of Advisor: Ermias Teferi (Ph.D.)

Signature _____

Date_____

APPROVAL

As members of the Board of Examiners of the M.A thesis open defense Examination, I certify that, I have read and evaluated the thesis entitled “Institutional Collaboration towards Sustainable Surface Water Quality, The Case of Akaki River, Addis Ababa, Ethiopia” prepared by Kidus Workineh and examined the candidate. I recommend that the thesis be accepted as it fulfills the requirements for the Master’s Degree in Environment and Sustainable Development

Signed by the Examining Committee:

Thesis Advisor _____ Signature _____ Date _____

Internal Examiner _____ Signature _____ Date _____

External Examiner _____ Signature _____ Date _____

Chair of the Department of Graduate Program Coordinator

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List of Abbreviations and Acronyms

AAEPGDC	Addis Ababa Environmental Protection and Green Development Commission
AASWAA	Addis Ababa Solid Waste Administration Agency
AWBA	Awash Basin Authority
BDA	Basin Development Authority
EPA	Environmental Protection Agency
EFCCC	Environment Forest and Climate Change Commission
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPE	Environmental Policy of Ethiopia
EPHI	Ethiopian Public Health Institute
FDRE	Federal Democratic Republic of Ethiopia
IWRM	Integrated Water Resource Management
MoA	Ministry of Agriculture
MoH	Ministry of Health
MoWIE	Ministry of Water, Irrigation, and Energy
MoTIn	Ministry of Trade and Industry
PPP	Polluter Pays Principle
SD	Sustainable Development
UNCED	United Nations Conference on Environment and Development
UNEP	United Nations Environment Program
WHO	World Health Organization
WRM	Water Resource Management

Abstract

The problem of rivers particularly in the context of governance and management is one of the preeminent problems in the contemporary era. The causes of the urban river resource crisis emerge from different factors. The current river crisis has been mainly caused not just by a lack of technology but also by a failure in the governance structures. In the same way, the problem of weak cross-sectoral collaboration for the governance of rivers is one of the concerns in Addis Ababa. Akaki River is facing serious deterioration due to many factors. It is the most polluted river due to it surrounded by industries. The main objective of this thesis was to assess the existing practice of responsible institutions' collaboration towards sustainable water quality of Akaki River and to investigate challenges affecting the successful collaboration of responsible government institutions. A mixed type of research method with a descriptive case study approach was employed. Both primary and secondary data were used for this research and data were collected through questionnaires, key informant interviews, and document analysis. The research assessed the existing policy and regulatory frameworks for surface water quality management and existing practices of responsible governmental institutions towards the water quality of Akaki River. Based on the findings the existing collaboration among responsible institutions is very problematic. Lack of regular communication among institutions, lack of integrated planning, lack of shared governance and joint decision making practice, lack of clear understanding of roles and responsibilities, lack of adequate human and financial resources and lack of trust between collaborators institutions were the main problems that were identified. The challenges affecting their collaborative effort for the management of Akaki River are the situation-specific, institutional, process-related, and social context. Therefore, a collaborative effort of all responsible institutions is highly needed to minimize and control the water quality problem of the Akaki River. Follow-up and monitoring of the water quality of the river is of utmost importance. Such regular follow-up is also required for the sources that discharge into it. In relation to this, institutional capacity in laboratory facilities and technical workforce are areas that need focus. Together with supportive legislation for protecting water quality, capacity building in these aspects will ultimately bring about improvement of the water quality of Akaki River. There is a need for the city of Addis Ababa to plan for and manage its water resources holistically and also different sectors in government have to work together to protect river systems. The government should fill the gap in policy and legal frameworks in order to address the water pollution problem effectively. It should also define clear roles and responsibilities to each institution with a consistent and clear organizational structure.

Keywords: *Collaboration, Water Quality, Pollution, Environmental Management, Institutions*

CHAPTER ONE

INTRODUCTION

1.1. Background of the Study

Collaborative environmental management has been considered by various studies. It is an instrument for effective environmental management that can be applied to understand the roles and practices of stakeholders while exploring their cultural, political, and economic interests. Collaborative environmental management provides the drivers that facilitate avenues for collaborative responsibility in managing environmental issues (Makuochukwu & Zhao, 2015).

Since the development of 1992 Agenda 21 of the United Nations Conference on Environment and Development (UNCED), which advocates that stakeholders should be conscious of a sustainable environment, the need for effective collaborative roles and practices becomes inevitable in managing environmental issues (Harold et. al., 2015). The concept of environmental management is the administrative and operational activities with the objective of obtaining a sustainable environment. This task of managing the environment, sometimes considered impossible, is a collective responsibility, which demands an understanding of stakeholders that affect and that are affected by the environment.

The problem of rivers particularly in the context of governance and management is one of the preeminent problems in the contemporary era (Olsson & Head 2015). The causes of the urban river resource crisis emerge from different factors. According to Chan (2009), the current river crisis has been mainly caused not just by a lack of technology but also by a failure in the governance structures. Particularly, urban river problems arise, in addition to pollution, illegal dumping of wastes, scarcity, and others, mainly from another context: weak cross-sectoral collaboration in the governance of rivers. Though urban rivers are providing various life-supporting services, urbanization, pollution, and uncontrolled waste dumping have affected rivers, and thus a collaborative framework that pools resources and legitimacy from different sectors have to be practiced (Olsson & Head 2015).

To address this global concern, new theoretical frameworks are emerging. Collaborative governance has become a mechanism to address river problems. Addressing river problems through the involvement of various sectors has gained recognition in different countries (Salman and Daniel 2006). Collaborative river governance is very important to effectively deal with urban

river problems. Although there is no precise definition, the term collaborative governance is increasingly used to refer to policy approaches that encompass some or all of the following characteristics: collaboration, participation, integration, learning, adaptation, and region-based decision-making (Cameron 2017).

Summarizing seven kinds of literature on urban river collaborative governance, Olsson and Head (2015) explained that the problem of rivers in cities needs to take environmental, legal, and social concerns into account; and in addressing this river problem, collaborative governance approaches are needed. Though cross-sectoral collaborative governance has emerged as a mechanism to deal with river problems, little is known about how such processes of collaboration in decision-making, mutual learning, and implementation are going on (Holt et al. 2012). Thus, cross-sectoral collaboration in the governance of urban river resources has been emphasized in different kinds of literature as an important subject to be deeply investigated (Franzen et al. 2014).

In Addis Ababa City, the Akaki River, specifically the Little Akaki River is facing a great problem in that the level of pollution is very worrisome, and the level of attention given by different sectors and all other responsible stakeholders is very limited. It is facing a multitude of problems (Aschale et al. 2016)

In their study Worku and Giweta (2018) concluded that, the problem of Akaki River water quality is posing serious impacts on the environmental, social, and economical aspects of the city. The problem is highly increasing from time to time, due to a very weak inspection of the mandated regulatory institutions, low enforcement of environmental policies, lack of institutional capacity, and poor cooperation among the environmental regulatory bodies and other stakeholders.

Meanwhile, institutional collaboration is a vital for environmental resources management (Makuochukwu & Zhao, 2015). The coordination and partnership of different institutions increase efficiency facilitate the possibility of sharing risks and benefits and creates enabling conditions to evaluate the condition of City Rivers (Woldesenbet, 2018). Coordinating and collaborating activities regarding river pollution with different relevant agencies at all levels will help to promote synergy and assure effective delivery. Coordination with and among stakeholders, allow for articulation of country Priorities, avoid duplication of efforts and unnecessary overburdening of activities. Coordination is about synchronizing relationships and it is vital for reducing point and non-point sources of pollution. Integrate water resource management brings

coordination and collaboration among the individual sectors, plus a fostering of stakeholder participation, transparency and cost-effective local management (GWP, 2005). It involves the coordinated planning and management of land, water and other environmental resources for their equitable, efficient and sustainable use (Calder, 1999).

Hamere and Eyasu (2018), highly recommended that all stakeholders, including the federal and city administration and the local community, should participate in the formulation of policies, standards, guidelines as well as other activities, which help to mitigate the pollution of the Addis Ababa City Rivers.

Therefore, all of the scholars indicated that Akaki River is under high pressure of pollution and causing various types of waterborne diseases. Based on different studies made on Akaki river pollution status in Addis Ababa City, the main sources of the river pollution are discharges of wastewater from industries, domestic wastes, and agricultural activities. Therefore, the study was focused on how the responsible institutions, powered by the government to protect the environment, manage the water quality of rivers, conserve the rivers and riversides and ensure the environmental safety are collectively and collaboratively working to minimize and control the impacts of the Akaki river pollution. The main objective of the study was to assess the institutional collaboration of different institutions towards the sustainability of the water quality of Akaki River.

1.2. Statement of the Problem

Akaki River has been the subject of several types of research and project works from different fields. Most of them, which are from the natural science fields, dealing with the technical, chemical, and engineering aspect of the Rivers.

Using physicochemical parameters, Solomon et al. (2011) assessed human impacts on the Akaki River and concluded that factors affecting Akaki River are different: industrial, residential, and hospital wastes.

Another research by Agajie (2007) on the suitability assessment of Akaki River revealed that the Akaki River is at a high risk of bacteriological pollution, and thus the river is not usable as such. Another research by Chali (2015), using engineering software, on Gefersa water supply tells a similar story. Tamiru (2003) also noted that Rivers in Addis Ababa are deteriorating.

EPHI Technical Report (2017) also noted that the Akaki River was found to be under high impact and is impaired. On the other hand, the river water is used for a variety of purposes such as

irrigation, cattle drinking, and domestic purposes without prior treatment. For sustainable management of this water resource, environmental protection agencies at different levels and other concerned administrative and/or nongovernmental bodies should take strict as well as technical measures. Enforcement of law and propagating environmental education to the community with special targets to those contributors to the present degradation could be one solution.

Hamere and Eyasu (2017) concluded that the Akaki River is highly polluted because of the increasing human population, uncontrolled urbanization, and inadequate sanitation infrastructure and system. The main cause of this pollution is domestic waste, industrial as well as hospital wastes from a point and non-point sources.

Little Akaki flows through the western part of the city, rises north-west of Addis Ababa on the flanks of Wechacha Mountain and flows for 40 km before it reaches the Aba Samuel Reservoir (Belachew, 2006). It among other rivers is the most polluted river due to it surrounded by industries and the largest market of the country as well as east Africa (Merekato). Little Akaki River is more polluted than the Big Akaki River (Tamiru, 2001). Comparison between the Great and Little Akaki reveals that the Little Akaki is more polluted. This is most probably a result of a large number of industries that are situated along the river. Most of these industries discharge their wastes directly into the river. Waste from the densely populated area also enters streams that ultimately join the Little Akaki (UNEP, 2005).

Little Akaki river serves as natural sewerage lines for domestic and industrial wastes, hence making them known for their offensive odor. The eutrophication process in the streams is a result of water pollution (Belachew, 2006).

In Addis Ababa, indiscriminate waste disposal from domestic, industrial, and commercial sources affect the water quality of the Akaki River. Moreover, this situation is limiting the usability of the River. Consequently, in many studies, the River is regarded as one of the most polluted Rivers in Ethiopia (Mulugeta, 2019). The Akaki River is affected by many of the city's industries established alongside the river and its tributaries (Malin and Jonathan, 2019). The Little Akaki River in Addis Ababa, due to deteriorating water quality conditions, has not found services that are worth mentioning except urban irrigation. Even this service has raised public concern because of health hazards from vegetables irrigated with polluted water (Aschale 2015).

The current state of the river has socio-economic, health and ecological impacts. Repeated floods affecting households and farmlands along the river erode not only the soil but also the resilience of the inhabitants. With all its contaminants, the Akaki's water cannot support aquatic organisms. Yet, the same water along with its heavy metals is used to grow vegetables consumed in the city. The long-term health impacts are particularly harmful to young children. 40% of the city's population either does not have access to potable water or is limited to intermittent access. In the past eleven years alone, the city has seen at least four outbreaks of acute watery diarrhea and Cholera, which have been linked to poor hygiene, access to water and consuming vegetables grown in the city (Milha, 2020).

The sources of Akaki River pollution are manifold, including industrial and agricultural effluents, sewage, and solid waste from households and industry. Each of these sources of pollution can be attributed to a breakdown in the governance system of basic services provision and regulation enforcement. Looking at the solid waste collection system of the city, 65% is collected, and out of this only 5% is expected to be recycled, 5% is composted and the remainder is disposed of in landfills; while the uncollected 35% is dumped in unauthorized areas, usually rivers (HRI, 2020).

Many of them found out that Akaki River is facing serious deterioration due to many factors. They recommended that strict policy implementation should take place in different industrial effluents to avoid the contamination of the rivers, and there should be collaboration among the organization who involve in pollution control and rehabilitation of polluted rivers and riversides, to avoid repetition of efforts.

The collaborator sectors that are concerned with pollution prevention and control and water resources management are from environment, health, water, agriculture and industry sectors which are currently found both at federal and city administration level are mainly EFCCC, MoWIE, MoA, MoH, MoTIn, EPHI, BDA, AAEPGDC, AAWSA, and AASWAA. These institutions have been mandated by the government to study, manage and protect the river system from any type of pollution.

The problem of weak cross-sectoral collaboration for the governance of rivers is one of the concerns in Addis Ababa City. Explaining how rivers in Addis Ababa City are deteriorating from a different context, a river assessment that was conducted by Meklit et al. (2016) emphasizes that the collaboration of different sectors for the governance of rivers is weak. Though different sectors are responsible to manage the rivers, there is a weak collaboration among different sectors to

govern such river problems. Cross-sectoral collaboration for the governance of rivers in Addis Ababa is weak, and it has to be well investigated to understand the depth of the problem (Berisso et al. 2016).

However, though many research works were conducted to investigate the river crisis from different dimensions, none of them dealt with the governance problems and cross-sectoral collaboration aspects of rivers. They suggested that water and environmental agencies should work for the protection and development of the rivers. Even though there have been many workshops and governmental meetings in which the necessity of cross-sectoral collaboration has been understood to be significant, there is no research work that investigated the nature of collaborations among sectors in governing rivers in Addis Ababa City. Therefore, the problem of weak cross-sectoral collaboration for the governance of rivers is one of the central issues in Addis Ababa City and it has to be investigated.

Therefore, it is because of this specific gap that the study was conducted to make an assessment and fill the gap in knowledge concerning cross-sectoral collaboration among responsible government institutions for the sustainability of water quality of Akaki River. The cross-sectoral collaboration to manage the river water, the existing practice of institutions to prevent river pollution and the constraining factors of collaboration for the sustainability of water quality of Akaki River worth researching. In light of this, critical investigation of collaboration among sectors largely complements in properly addressing water quality problems of Akaki River.

1.3. Objective of the Thesis

1.3.1. General Objective of the Thesis

The general objective of this study was to assess the institutional collaboration of responsible governmental sectors towards the sustainability of the water quality of Akaki River.

1.3.2. Specific Objectives of the Thesis

Specific objectives were to:

- Review the existing legal and regulatory framework concerning surface water quality management in Ethiopia.
- Identify the existing collaborator institutions relevant to address the water quality problem on the Akaki River.

- Assess the existing roles and responsibilities of institutions and practices of collaboration among responsible government institutions towards the water quality of Akaki River.
- Identify the challenges of cross-sectoral collaboration in collectively addressing the water quality problems on Akaki River.

1.4. Research Questions

The study answers the following questions

- What are the existing policy and regulatory frameworks concerning surface water quality? What are the weakness and strength of the framework?
- How does the existing practice of institutions towards sustainability of water quality of Akaki River look like?
- What challenges are hindering the selected institutions in collaboratively address the pollution load on Akaki River?

1.5. Scope of the Study

The study was conducted in Addis Ababa city, concerning the institutional collaboration towards the water quality of Akaki River. The study was focused on the institutional collaboration among the major governmental sectors that have a significant role in monitoring and controlling river water pollution and undertaking conservation of rivers and riversides related activities, towards the sustainability of the water quality of Akaki River in Addis Ababa city. Therefore, the study was taken place in Addis Ababa City and data was collected from the various sectors from federal to city administration level that are stationed in Addis Ababa City.

1.6. Limitations of the Study

The major limitation of case studies is normally the fact that even though they can only describe insights gained from one specific studied case, there is a temptation for generalizing these results. Like most case study researchers, the author of this research is aware that it is not possible to generalize the findings from the case to a broader conceptual set of principles. Still, there is often a desire to present some general principles, which allow the underlying case study findings to have broader implications. This is possible, as good case study research can without doubt teach important lessons (Smith, 2010).

The current COVID 19 incidence was the biggest challenge in getting respondents in person at their office and getting the relevant data from the concerned institutions. In addition, a shortage of time and money was forced the researcher to focus on the major government institutions, which are in charge of regulatory activities against polluters and water management activities to address the river pollution problems of the Akaki River.

Though, the researcher to get the relevant data for the research it undertaken most of the interviews with the key informants through telephone and email as the COVID 19 limits a close social interreaction.

1.7. Significance of the Study

The existence of a variety of institutions for environmental protection and management, and the growing impacts of river water pollution from time to time, demands apparent research to understand the extent to which these institutions are collaboratively working to address the problem. Researches have not been done on this particular concept. The research can therefore contribute to the area in many ways: first, the research highlighted issues that need to be taken into account by institutions and other concerned bodies. Second, by identifying entry points that bring increased performance through collaborative working towards the sustainability of water quality of the Akaki River. Finally, the research suggested some areas where further action is required.

1.8. Organization of the Thesis Paper

This research paper is organized into five main chapters, which are structured as follows: The first chapter deals with the introduction: background of the study, statement of the problem, the objective of the study, research questions, significance of the study, the scope of the study, and limitation of the study. The second chapter provides a review of related literature and the conceptual framework of the study. The third chapter focuses on the research methodology: description of the study area, research design, and data collection techniques and procedures of data analysis. The fourth chapter deals with results and discussions and the final chapter is about conclusion and recommendation.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1. Concepts and Definitions

One of the problems in studying institutional collaboration is, understanding the variety of terms used to identify relationships. Three relationship processes identified in the literature on institutional relationships: cooperation, coordination, and collaboration. In practice, the term collaboration is commonly interchangeable with cooperation and coordination. For instance, a dictionary definition of collaboration is cooperating, coordinating, or working in conjunction with others. It generally understood vaguely as meaning to work together to produce something. Each word, however, carries a different meaning and exhibits a different level of formality and structure (Mattessich et al., 2001; Hord, 1986).

2.1.1. Cooperation

It refers to a simple verbal agreement between institutions to take some kind of unified action to make their autonomous programs more successful (Hord, 1986). Each cooperating institution remains very independent, takes no risk, and retains total authority (Mattessich et al., 2001). Cooperation, therefore, is the most informal inter-organizational relationship lacking any common mission, structure, or joint planning (Mattessich et al. 2001).

2.1.2. Coordination

It is slightly more formal than cooperation because the coordinating parties determine that their missions are compatible and that they can work together to advance their separate, yet compatible, missions (Mattessich et al.; Hord, 1986). Coordination involves a low level of joint planning, sharing of resources, defining compatible roles, and interdependent communication channels (Mattessich et al., 2001). Some risks are experienced as the parties coordinate efforts that may or may not be successful for both parties (Mattessich et al, 2001). Each organization retains its autonomy and individual authority (Mattessich et al., 2001).

2.1.3. Collaboration

It is the most formal institutional relationship involving shared authority and responsibility for planning, implementation, and evaluation of a joint effort (Hord, 1986). In their literature on successful collaboration, Mattessich et al. (2001) define collaboration as "... a mutually beneficial and well-defined relationship entered into by two or more organizations to achieve common goals". It brings autonomous organizations together to fulfill a common mission that requires comprehensive planning and communication on many levels (Mattessich et al., 2001). Besides,

the risk to each collaborating organization is greater because each member contributes its resources and reputation (Mattessich et al, 2001). Gray (1989) defines collaboration as a process that “... occurs when a group of autonomous stakeholders of a problem domain engages in an interactive process, using shared rules, norms, and structures, to act or decide on issues related to that domain”. It is increasingly recognized that collaboration should not mean sub-contracting, but a genuine partnership between organizations based on mutual respect, and acceptance of the independence of the collaborating organizations concerning their vision and approaches.

2.1. Assessing Institutional Collaboration

Six categories were used as a framework for measuring successful institutional collaboration in their research in Mattessich et al. (2001). It has been noted that these six collaboration factor categories are synthesized from various works of literature; and they are most likely to influence the success of institutional collaborations.

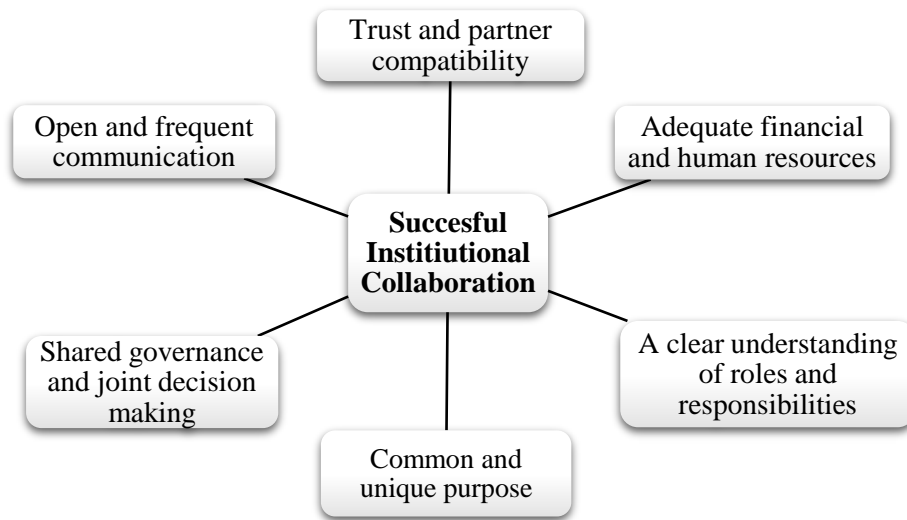


Figure 2. 1 Frameworks for measuring successful institutional collaboration (Source: Mattessich et al. (2001))

These six successful collaboration factor categories fall into three stages of collaboration identified in Gray’s (1989) seminal work on a collaboration. These three stages of collaboration include: (1) the precondition stage where collaborators come together to form the relationship; (2) the process stage where collaborators interact and make decisions; and (3) the outcomes stage where collaborators assess the effectiveness of their efforts and adapt to change (Gray, 1989). During the precondition stage, the parties come together to begin the partnership.

Collaboration success factors found in the literature that relates to the formation stages fall into the preconditioned state. These factors include determining the reasons for partnering, reviewing partner compatibility, defining the criteria for partner selection, and developing a common purpose, goals, and objectives. Relationship factors are most critical at this stage with trust being the major relationship factor. Finally, sufficient human resources must be allocated before moving to the process stage (Mattessich et al. 2001).

At the process stage partners must clearly identify their roles and responsibilities, create joint decision-making and governance processes, set up methods for open and frequent communications, and select a skilled convener (Mattessich et al · 2001). Fostering interdependence at this stage is critical. Installing shared governance or a joint decision-making process at this stage fosters interdependence. Joint decision-making provides ownership of the collaboration by bringing partners together to develop plans to carry out the partnership agreement and identify organizational or systems changes that are needed to meet the goals of the partnership (Kanter, 1994). At the same time, the group must remain open to a variety of ways to organize to accomplish tasks and adjust the process if it is not moving the collaboration toward the goal. The commitment of sufficient human resources also fosters interdependence during the process stage. Partners must assign key people interested in the success of the collaboration to lead the project (Mattessich & Monsey, 1992). Finally, a formative evaluation should be completed at this stage (Gray & Wood, 1991). At the outcomes stage, collaboration success is measured by assessing whether the expected outcomes defined at the precondition stage were met. The accuracy of the identified problem domain should also be assessed to determine if the needs of the target group were met and how effectively these needs were addressed. If additional needs or problems were identified, how these needs can be addressed must be evaluated. Summative program evaluation methods should be implemented at this stage to include whether and how the collaboration itself may have been transformed during the process stage (Gray & Wood, 1991). Summative evaluation feedback loops should be established to determine whether the collaboration should continue, be restructured, or ended.

2.2. Challenges Impeding Institutional Collaboration

The challenges that impede collaboration that is identified in many pieces of literature including Steven et al. (1997) appear to fall into four main categories. These include those that are situation-

specific; those that are process-related; those that arise from the societal context; and those that arise from the institutional context.

a) Situation-specific challenges

Several challenges that are specific to particular situations may constrain effective collaboration. These factors include power imbalances; lack of communication; technical and scientific issues; public opposition; and fundamental differences that separate the stakeholder institutions.

As far as power imbalance is concerned, Steven et al. (1997) noted that institutions would be understandably reluctant to collaborate if they are at disadvantage in adequately represent their interest or if they believe that their interest will be deemed secondary to more powerful ones. On the other hand, the stronger one often sees little need to compromise or otherwise involve the weaker party, which lacks the power to influence the course of events on its own. Kanter (1994) (cited in *ibid*), further notes that to make collaboration work, more communication than anyone anticipated is necessary, and thus, difficulties with communication or a lack of trust can make successful collaboration hard to achieve.

Technical challenges inherent in collecting and sharing data can have stymied multi-party efforts; meaning that, differences in data collection methods and analytical techniques can make it difficult for groups to combine the information in a useful way. Oppositions by the public to goals or methods of a collaborative project can pose barriers that make it difficult for a collaborative effort to succeed. Fundamental differences between stakeholder institutions are presented in Steven et al. (1997) as a significant barrier to collaborative problem solving, as they might have basic ideological differences, and historical antagonisms.

b) Process-related challenges

Given the importance of collaboration, ineffectively running, or structuring a collaborative process greatly reduces its chances for success. The process-related challenges, which impede collaboration discussed in Steven et al. (1997), include a lack of focus on process; a lack of process management or interpersonal skills; resistance to collaborative management styles; and difficulty securing the involvement of all relevant stakeholders.

A failure to appreciate the importance of process-related questions and to spend enough time on process-related discussions is an important barrier to collaboration, as Gray (1989) noted

conveners and negotiators frequently underestimate the critical role of the technical planning process in ensuring successful collaboration. The complexity of collaborative effort further suggests the need for effective process management and interpersonal skill, where its lack seriously hampered it. Many leaders may also be resistant to adopt new roles and skills required to manage a collaborative process successfully as it may threaten the leaders' traditional views of their previous roles. Difficulties in identifying and involving all relevant stakeholders can lead to opposition from parties who feel excluded from the process, and this often prevents collaborative efforts from succeeding.

c) Social Context

The societal context within which policy decisions are made can present significant barriers to collaboration. These include attitudes held by individuals, groups, and agencies that often push institutions apart, rather than foster collaboration. Societal barriers to collaboration discussed in Steven et al. (1997) include cultural norms; stereotypes and intergroup attitudes; polarization arising from traditional decision-making processes; opposition by public interest groups; and politics.

For instance, the individualistic cultural norm can be an obstacle to the collaborative process; exaggerated or false intergroup attitudes can also constrain effective communication that is a starting point for building the game. Traditional forms of decision-making reinforce group differences and make it more difficult for them to work collaboratively. Adversarial decision-making processes promote strategic polarization in the ways that groups define themselves, emphasizing their differences.

d) Institutional Context Barriers

Besides with societal barriers, several institutional barriers constrain collaboration. Institutional barriers to collaboration identified in Steven et al. (1997) include conflicting agency goals and missions; problematic organizational norms and culture; lack of top-level support for collaboration; resource constraints; and problematic government policies and procedures.

Institutions do have real differences between their goals and missions as defined by statute, tradition and political realities, and collaborative efforts highlight conflicts between these goals. These conflicting missions might lead to differences in assessing priorities for various activities. Informal norms, values and traditions might make it difficult for groups to collaborate. In some

cases, even if local institutions pushed cooperative approaches forward, a lack of support for such efforts from the upper level of management hampered their efforts. Resource constraints such as lack of time, money, and skilled personnel have been noted as obstacles to collaboration.

Another scholar (Warner, 2006) noted that cross-sectorial collaborations are newly introduced partnerships among sectors that have unique complementary strengths, resources, ideas, principles, authorities, and skills collectively address common matters. Such collaborative frameworks are systems that bring various sectors' views and enhance their collaboration for interdependence in solving common resources through collective decision-making and the adoption of common strategies and plans.

2.3. Concepts in Surface Water Quality

2.3.1. Surface water

Which include streams, rivers, lakes, estuaries, wetlands, and oceans, which are intrinsic to both the functioning of Earth's chemical and biological systems and to human culture and economics. As sources of food and drinking water to humans, many surface waters are also closely associated with human health (Harold et al., 2015).

2.3.2. Surface Water Quality

It is a term most identified by society to describe the physical, chemical, and biological characteristics and conditions of water and aquatic ecosystems, which influence the ability of water to support the uses designated for it. Water quality is measured with a wide range of physical, chemical, and biological variables, parameters, indicators, and measurements. The chemical and physical characteristics of water and sediment influence aquatic biota and the ecosystems in which they reside. Biological measures are viewed as more integrative, while the typical physical-chemical results from water samples show a "snapshot" of conditions at the moment of sampling (CCME, 2006).

Good water quality is essential for human well-being, for use in agriculture, aquaculture, and industry, and to support freshwater ecosystems and the services they provide. Improving water quality is a critical element of the 2030 Sustainable Development Goals, fulfilling an essential role in reducing poverty and disease and promoting sustainable growth (OECD, 2018).

2.3.3. Surface Water Quality Standards

It means a determination of quality by identifying the requirements and permissible quality standards regarding physical, chemical, microbiological and radiological parameters of water (WRM proclamation, 2000).

2.3.4. Surface Water Pollution

It means harm caused as a result of the pollution of water by using organic or inorganic matter or as a result of a change in the temperature of the water (WRM proclamation, 2000). Water pollution occurs when pollutants are discharged directly or indirectly into water bodies without adequate treatment to remove harmful compounds. Water pollution affects plants and organisms living in these bodies of water; and, in almost all cases, the effect is damaging not only to individual species and populations but also to the natural biological communities (Asha, 2016).

Anthropogenic activities related to extensive urbanization, agricultural practices, industrialization, and population expansion have led to water quality deterioration in many parts of the world. Also, deficient water resources have increasingly restrained water pollution control and water quality improvement (Asha, 2016). The industrialization of a country leads to a shift in the pattern of water use from rural and agricultural to urban and industrial and the growth of large cities has been accompanied by increasing stress on the aquatic environment leading to a reduction in the quality of the water (McDonald et al., 2011). Poorer water quality means water pollution.

Pollution sources that affect surface water are usually separated into two categories:

1. Point sources
2. Non-point sources or diffuse pollution

Point sources of pollution: are those, which have a direct identifiable source. An example includes pipe attached to a factory, oil spill from a tanker, effluents coming out from industries. Point sources include sewage treatment plants, industrial discharges, or any other type of discharge from a specific location (commonly a pipe) into a stream (Chapman et al, 2013). Point sources of pollution include wastewater effluent (both municipal and industrial) and storm sewer discharge and affect mostly the area near it.

Non-point sources of pollution: pollution sources that are diffused and without a single point of origin or not introduced into a receiving stream from a specific outlet. The pollutants are generally carried off the land by storm water runoff. The commonly used categories for non-point sources are agriculture, forestry, urban areas, mining, construction, dams and channels, land disposal and saltwater intrusion (OECD, 2001). Water pollutants may be organic and inorganic water pollutants.

2.3.5. Effects of Water Pollution

Water pollution has various effects on both human health and the aquatic ecosystem. Water pollution may pose a serious threat to the environment as well as lives. Pollutant effects may vary depending on their types and source. For instance, while heavy metals, dyes, and some other

organic pollutants have been identified as carcinogens, hormones, pharmaceuticals, and cosmetics and personal care product wastes are known as endocrine disruptive chemicals (Oluyori P. and Oreofe A, 2018)

The waterborne disease continues to be a huge public health problem in many regions of the world today (Harold F, 2015). Microorganisms play a major role in water quality and the microorganisms that are concerned with waterborne diseases are *Salmonella* sp., *Shigella* sp., *Escherichia coli* and *Vibrio cholera* (Adetunde and Glover, 2010). All these cause typhoid fever, diarrhea, dysentery, gastroenteritis and cholera. The most dangerous form of water pollution occurs when feces enter the water supply. The fecal-oral route of transmission in which the pathogens are shed only in human feces (Adetunde and Glover, 2010) perpetuates many diseases. The presence of fecal coliforms of *E. coli* is used as an indicator for the presence of any of these waterborne pathogens (Adetunde and Glover, 2010).

Effluents from industries contain various organic and inorganic waste products. Fly ash form thick floating cover over the water thereby reducing the penetration of light into deeper layers of water bodies. Fly ash increases the alkalinity of the water and causes reduced uptake of essential bases leading to death of aquatic plants. Liquid organic effluents change the pH of water and the specific toxicity effects on the aquatic plants vary depending on their chemical composition. There may be synergistic, additive or antagonistic interactions between metals with respect to their effects on plants however; these effects are reduced in hard and buffered freshwater bodies (Asha, 2016).

2.3.6. Surface Water Quality monitoring

Water quality monitoring is an integrated activity for evaluating the physical, chemical, and biological characteristics of water in relation to human health, ecological conditions, and designated water uses (ITFM, 1995). It is the programmed process of sampling, measurement and subsequent recording or signaling, or both of various water characteristics, often intending to assess conformity to specified objectives (ISO, 2011). Ongoing water quality monitoring and good data are the cornerstones of effective efforts to improve water quality. Water and sanitation managers, governments and communities need to know what pollutants are in the water, how they entered the waterway or aquifer, and what are effective approaches for improving water quality? (UN-Water, 2011). The Environmental Protection Agency of the U.S. (USEPA, 2008), defines five major monitoring purposes:

- 1 Characterize waters and identify changes or trends in water quality over time.

- 2 Identify specific existing or emerging water quality problems.
- 3 Gather information to design specific pollution prevention or remediation programs.
- 4 Determine whether program goals, such as compliance with pollution regulations or implementation of effective pollution control actions are being met
- 5 Respond to emergencies, such as spills and floods.

The European Union (EU, 2012) describe three types of monitoring for surface waters: surveillance, operational and investigative monitoring.

Cavanagh et al. (1998) who classify the purposes of the monitoring programs into four broad categories give another classification: compliance, trend, impact assessment, and survey. Each monitoring program involves a series of water quality measurements intended to detect short or long-term variability of the water body studied.

Compliance monitoring is a type of monitoring done to ensure the meeting of immediate statutory requirements, the control of long-term water quality, the quality of receiving waters as determined by testing effluents, or the maintenance of standards during and after the construction of a project.

Trend monitoring is used to detect subtle changes over time that may result from a potentially long-term problem. Measurements are made at regular time intervals to determine if long-term trends are occurring for a particular variable. Trend monitoring is a commitment that extends over a long period (i.e., usually 10 years or more) to ensure that true trends are detected.

Impact assessment monitoring measures the effects on the water quality of a particular project (anthropogenic) or event (natural). Projects, in this case, refer to anything associated with industrial activities, resource extractive activities, impoundments (dams), agricultural activities, and urban or recreational developments.

Survey monitoring is used to characterize existing water quality conditions over a specified geographic area. As such, it is more of an inventory rather than a true monitoring process because it does not address changes over time. It is often conducted within watersheds that have not been previously sampled and which are so remote that there exists little or no direct anthropogenic activity. It is generally carried out in a limited manner (once or twice per lake or river) unless the resulting data promote the cause for concern. Consequently, this type of inventory occasionally serves as the first step towards establishing one of the above, more extensive monitoring programs.

The National Water Quality Monitoring Council of the US. (2003) proposed a framework for water quality monitoring programs composed of six phases considered critical to the establishment of a reliable water quality-monitoring program: develop monitoring objectives; design monitoring program; collect field and lab data; compile and manage data; assess and interpret data; convey results and findings. In addition, the framework contains 3C's: collaborate, communicate, and coordinate; which are an integral part of each of the elements of the framework

In general, water quality monitoring is performed to answer a question that is linked, in one way or another, to a management concern (e.g. policy formulation, environmental protection, compliance, development concerns). Therefore, one of the main objectives of a water quality-monitoring endeavor is to provide the necessary information to answer specific questions in decision-making. To achieve this objective, a systematic process must be followed to address the monitoring program and there must be a collaboration, coordination and communication among various authorities.

2.5.7. Guiding Principles for Water Quality Management and Pollution Control

Water pollution control is one of the most critical challenges in the world (EPA, 2010). Without urgent and properly directed action, developing countries face mounting problems of disease, environmental degradation and economic stagnation, as precious water resources become more and more contaminated. At the Earth Summit in Rio de Janeiro in June 1992, world leaders recognized the crucial importance of protecting freshwater resources. Chapter 18 of Agenda 21 sees "effective water pollution prevention and control programmes" as key elements of national sustainable development plans (UNEP, 1997).

Water quality problem is usually specifically addressed in connection with the establishment of different environmental legislation and strategic action plans, but also within the framework of water resources management planning. Moreover, studies and documents related to public health aspects should also consider water pollution. These three interacting areas are often administered in different line ministries typically the Environment, Water and Health institutions of a certain country (UNEP & WHO, 1997).

The United Nation Environment Program (UNEP) and the World Health Organization (WHO) together with various international organizations have prepared a framework to control water quality problems and pollution control strategies countries should follow and implement. The

following guiding principles provide a suitable basis for the effective management of water pollution.

Prevent pollution rather than treating symptoms of pollution; remedial actions to the mitigation of polluted sites and water bodies are generally much more costly than applying measures to prevent pollution from occurring. Although wastewater treatment facilities have been installed and improved over the years in many countries, water pollution remains a problem, including in industrialized countries. The most logical approach is to prevent the production of wastes that require treatment. Thus, approaches to water quality management and control that focus on wastewater deduction, in-plant refinement of raw materials and production processes, recycling of waste products should be given priority over traditional end-of-pipe treatments (UNEP, 1997).

Use the precautionary principle; there are many examples of the application and discharge of hazardous substances into the aquatic environment, even when such substances are suspected of having detrimental effects on the environment. Until now, the use of any substance and its release to the environment has been widely accepted, unless scientific research has proved unambiguously a causal link between the substance and a well-defined environmental impact. However, in most cases, it takes a very long time to establish such causal links, even where early investigations suggest clear indications of such links. When, eventually, the necessary documentation is provided and action can be taken to abandon the use of the substance, substantial environmental damage may already have occurred. Examples of such situations include several pesticides that are now being abandoned because contamination of groundwater resources has been demonstrated. The examples clearly show that action to avoid potential environmental damage by hazardous substances should not be postponed because scientific research has not proved fully a causal link between the substance and the potential damage (UNECE, 1994).

Apply the polluter-pays-principle; the polluter-pays-principle, where the costs of pollution prevention, control and reduction measures are borne by the polluter. The principle is an economic instrument that is aimed at affecting behavior, i.e. by encouraging and inducing behavior that puts less strain on the environment. Examples of attempts to apply this principle include financial charges for industrial wastewater discharges and special taxes on pesticides (Warford, 1994).

The Environmental Policy of Ethiopia has given due emphasis to the control of hazardous materials and pollution from industrial wastes, and adopted the "polluter pays" principle while endorsing the precautionary principle.

Apply realistic standards and regulations; an important element in a water pollution control strategy is the formulation of realistic standards and regulations. However, the standards must be achievable and the regulations enforceable. Unrealistic standards and non-enforceable regulations may do more harm than having no standards and regulations, because they create an attitude of indifference towards rules and regulations in general, among both polluters and administrators (UNEP &WHO, 1997).

The government of Ethiopia has passed various laws to control pollution, such as the EIA, and pollution control laws including the Council of Minister's regulation to prevent industrial pollution in 2008. Ambient water quality and effluent standards have also been developed.

Balance economic and regulatory instruments, Compared with economic instruments, the advantages of the regulatory approach to water pollution control is that it offers a reasonable degree of predictability about the reduction of pollution (Bartone *et al.*, 1994). A main disadvantage of the regulatory approach is its economic inefficiency. Economic instruments have the importance of giving incentives to polluters to modify their behavior in support of pollution control and of providing revenue to finance pollution control activities.

Against this background, it seems appropriate, therefore, for most countries to apply a mixture of regulatory and economic instruments for controlling water pollution. In developing countries, where financial assets and institutional capacity are too low, the most important criteria for making balance the economic and regulatory instruments should be cost-effectiveness (those that achieve the objectives at the least cost) and administrative feasibility (UNEP &WHO, 1997).

Apply water pollution control at the lowest appropriate level, the appropriate level may be defined as the level at which significant impacts are experienced. The important point is that decisions or actions concerning water pollution control should be taken as close as possible to those affected, and that higher administrative levels should enable lower levels to carry out decentralized management. Thus, this guiding principle intends to initiate a process of decentralization of water pollution control functions that is adapted to administrative and technical feasibility.

Establish mechanisms for cross-sectoral integration, in order to ensure the co-ordination of water pollution control efforts within water-related sectors, such as health and agriculture, formal mechanisms and means of co-operation and information exchange need to be established.

Encourage participatory approach with involvement of all relevant stakeholders; the participatory approach involves raising awareness of the importance of water pollution control among policy-makers and the general public. Decisions should be taken with full public consultation and with the involvement of groups affected by the planning and implementation of water pollution control activities.

Give open access to information on water pollution, this principle is directly related to the principle of involvement of the general public in the decision-making process, because a precondition for participation is free access to information held by public authorities. Open access to information helps to stimulate understanding, discussions and suggestions for solutions of water quality problems. In many countries, notably the countries in economic transition and the developing countries, there is no tradition of open access to environmental information. Unfortunately, this attitude may seriously jeopardize the outcome of any international co-operation that is required.

2.6. Water Quality Problem in the Akaki River

The main threat to the water quality of Akaki River is environmental pollution derived from domestic and industrial activities. Due to the inadequacy of controlled waste management strategies and waste treatment plants people are forced to discharge wastes both on an open surface and within water bodies. Uncontrolled waste disposal has deteriorated the quality of surface water by changing the chemical, physical and organoleptic properties of water (Tmiru, 2001).

The main sources of pollution that enter Akaki River are industries, municipal solid waste and oily wastes from garages and fuel stations. There are over 2,000 registered industries in Addis Ababa (65 % of all industries in the country) most of them located along the riverbanks. According to the Addis Ababa Environmental Protection Authority (2007, unpublished), 90% of all industries lack facilities for some degree of the onsite treatment plant and subsequently

The water quality of the Little Akaki River has been classified as a very badly polluted river, and the pollution level of the river exceeds the standard values defined by the Environmental Protection Authority. The discharging wastes into surface water bodies by a large margin, especially the values for biochemical oxygen demand (BOD), phosphate, suspended solids (SS), ammonia (NH₃), total coliform bacteria and metallic content of the wastewater (EPA, 2003).

In particular, the little Akaki River is more polluted than the big Akaki River and has a characteristics greenish-dark color, pitch-dark sediment and a peculiar pungent odor, which is

associated with the industrial and domestic waste discharged to the system. Most of the industries are established along the course of the Little Akaki River and its major tributaries. These include textiles, tanneries, breweries, wineries, distilleries, pharmaceutical and national alcohol liquor factories. According to Aschale et al. 2017), Toxic trace elements in Little Akaki River exceed the permissible limits of WHO (World Health Organization), European Community and the Ethiopian Standards of drinking water, irrigation and other uses and the river further degraded in quality as compared to the previous study.

2.7. The Need for Collaboration and Coordination for River Water Quality Management

Coordination is about synchronizing relationships and it is vital for reducing point and non-point sources of pollution. Integrate Water Resource Management brings coordination and collaboration among the individual sectors, plus a fostering of stakeholder participation, transparency and cost-effective local management (GWP, 2005). It involves the coordinated planning and management of land, water and other environmental resources for their equitable, efficient and sustainable use (Calder, 1999). The process depends on collaboration and partnerships at all levels, from individual citizens to international organizations, based on a political commitment to, and wider societal awareness of the need for water security and the sustainable management of water resources (UN-ESCWA, 2004). IWRM expresses the idea that water resources should be managed holistically, coordinating and integrating all aspects and functions of water extraction, water control and water-related service delivery to bring sustainable and equitable benefit to those entirely dependent on the resource (EC, 1998).

The coordination and partnership of city increase efficiency facilitate the possibility of sharing risks and benefits and creates enabling conditions to evaluate the condition of City Rivers. Coordinating and collaborating activities regarding river pollution with different relevant agencies at all levels will help to promote synergy and assure effective delivery. Coordination with and among stakeholders, allow for articulation of country Priorities, avoid duplication of efforts and unnecessary overburdening of activities.

2.8. Theoretical Literature Review

Much of the literature on collaboration identifies typical themes in institutional collaboration such as diversity, coordination and decision-making, information flow and exchange, shared

understanding, and trust and support (Rodriguez et al., 2003; Guimera et al., 2005; Engestrom et al., 1995).

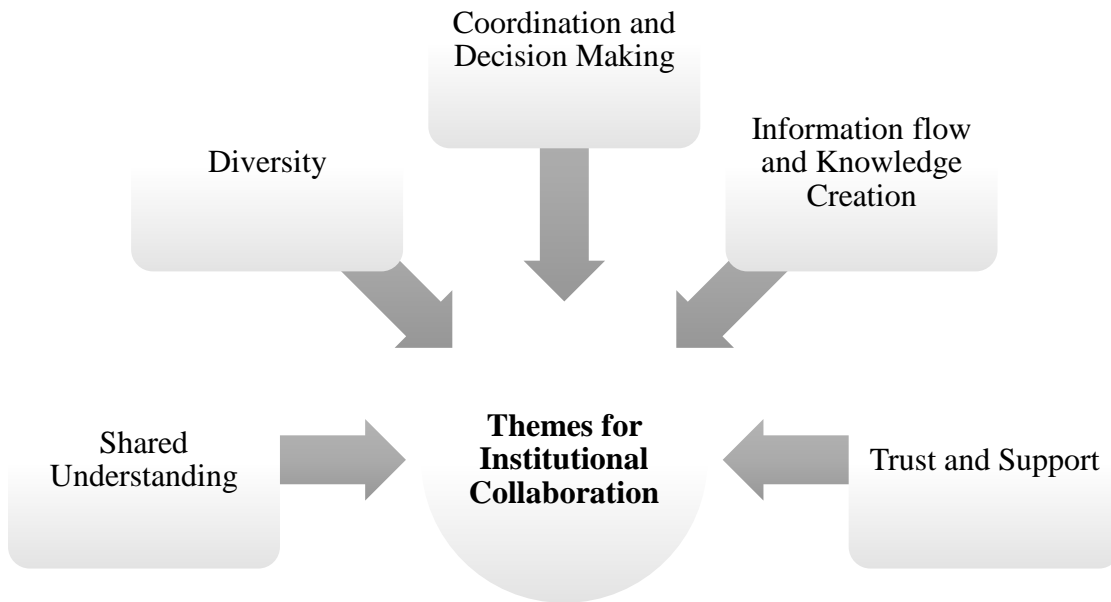


Figure 2. 2 Themes in institutional Collaboration (Source: (Rodriguez et al., 2003; Guimera et al., 2005; Engestrom et al., 1995))

a) *Diversity*

Diversity is integral to collaboration amongst institutions. This is because participants in institutional collaboration are often from different histories, experiences, practices, and perspectives. There are contradictory views on the impact that diversity has on the effectiveness of the collaboration.

On the one hand, differences amongst institutions are said to increase difficulties in the interaction amongst. For example, conflict may face in addressing different organizational and administrative practices, and the interpretation and response to strategic problems (Rodriguez et al., 2003). Others, on the other hand, pointed that, differences across institutions are considered valuable as experience across organizations exposes the actor to a variety of operational methods, values, and cultures (Guimera et al., 2005). Experience in working with others develops skills in working with diversity such as developing civic responsibility, listening to different perspectives, and participating effectively. This provides skills of cooperation as well as a sense of shared responsibility for collective endeavors with diverse goals and members (Engestrom et al., 1995).

b) Coordination and Decision Making

Coordination is necessary for decision making in collaborative arrangements. As stated in Engestrom et al. (1995), coordination is more than networks of common interest in collaborative activity. It involves multiple subjects from different institutions or activity systems; that collaboration meets a need or motive; and that subjects or individuals from different activity systems come together to coordinate care across different institutions within a system. O'Neil Chung and Brown (1997) stated that the more coordinated a group or team is, the better the decision-making processes and vice versa.

c) Information Flow and Knowledge Creation

It is already identified that coordination is critical to enable information exchange and sharing. It is just one aspect of information flow and knowledge creation, i.e. the meaning and interpretation given to information, influence what information is passed on, how it is passed on, and what knowledge may be created as a result (Gulati, 1999). Therefore, information flow and knowledge creation are important features of collaborative activity, influenced amongst other things by the distribution of power and the goals of each organization taking part. Knowledge creation is a dynamic process of interpretation, a discourse, a tool of power and control. Factors that assist information flow and knowledge creation in an area include the number of institutions and the extent of interaction between them (Ibid)

d) Shared Understandings

Common or shared understandings can include shared mental models (conception of a system), common language and concepts, common problem-posing and problem-solving heuristics, a group's culture in which there are commonly held values, beliefs, and goals (Lorenz, 1992). A range of strategies required to develop shared understanding includes behaviors such as: asking relevant and thought-provoking questions, sharing observations, seeking alternative perspectives, assertively challenging a particular opinion, seeking clarification, and sharing information through processes of consulting and collaborating (Owen, 2001).

The common concept across different kinds of literature is that collaboration involves shared purposes. For example, firms work together to meet their need, to be innovative, competitive, and profitable (Lorenz, 1992). Through collaboration, they reduce uncertainties, increase opportunities

for internationalization, expand their range of expertise, and develop specialist products, achieving a range of corporate objectives.

e) Trust and Support

Trust assists good information flow, open dialogue, facilitating collaboration and innovation, and quick decision-making. In discussing trust within industrial districts, Lorenz (1992) suggests that the beliefs of those involved are important. He argues that although norms of tradeoff may develop and are evident within many industrial districts, the maintenance of mutuality is dependent on the beliefs of actors. For instance, the belief that there is again to be made for the actors. Over time, common bonds and social identities are shared and there are developing trust and an exchange of reciprocal services. Trust, good information flow and open dialogue, formal or informal, facilitate collaboration, and potentially innovative outcomes. Trust is important in enabling members of a network to make quick decisions and process more complex information (Lorenz, 1992).

In the social capital literature, trust is typically described as the lubricant for diverse groups to work together (Flora, 1998). Actors need to trust each other to offer exchanges of information, to develop norms of reciprocity and an ability to listen to different perspectives to participate effectively.

To summarize up on all the features, the collaborative activity involves working across different practices and histories; it is a process of working at the boundary, which is a site of tension, and potential learning. Shared understanding in this site is achieved through the development of boundary tools through which dialogue, story-telling, knowledge construction, argumentation and differentiation take place. Experience in diverse collaborative activity increases skills of collaboration, the diversity of networks, access to resources and perspectives not otherwise available. Coordination and decision making requires good communication skills and the interpreting and exchange of information. These processes are assisted by trust and informal arrangements for the exchange. Interpretation of information is influenced by the goals of each participant or organization taking part in the collaboration, and by the asymmetrical distribution of power. Information exchange is core to the development of shared understandings and the development of mental models, just as the shared purpose is intrinsic to collective activity. These in turn require trust and support.

2.9. Conceptual Framework of the Study

In this paper, following Agrewal et al., (2009), the analytical focus is on the broad domains of institutions; particularly the public/government to address the water pollution problem particularly to Akaki River water quality problem.

In collaboration, however, each type of institution may be able to overcome the weaknesses of its partners in responding to Akaki river pollution in Addis Ababa City. Hence, whether or how collaboration the institutions are, in terms of collective actions, information and resources sharing, division of tasks, and joint planning and implementations is another focus of the study. It has been noted that factors such as Trust and partner compatibility; common and unique purpose; shared governance and joint decision making; a clear understanding of roles and responsibilities; open and frequent communication; and adequate financial and human resources are most likely to impact the success of institutional collaborations.

To sum up, as indicated in the figure 2.3, the framework looks in to the means of surface water pollution control, objectives of pollution prevention and the end outcome of pollution minimization and control. A special emphasis has been given to frameworks for successful institutional collaboration and various challenges to successful institutional collaboration.

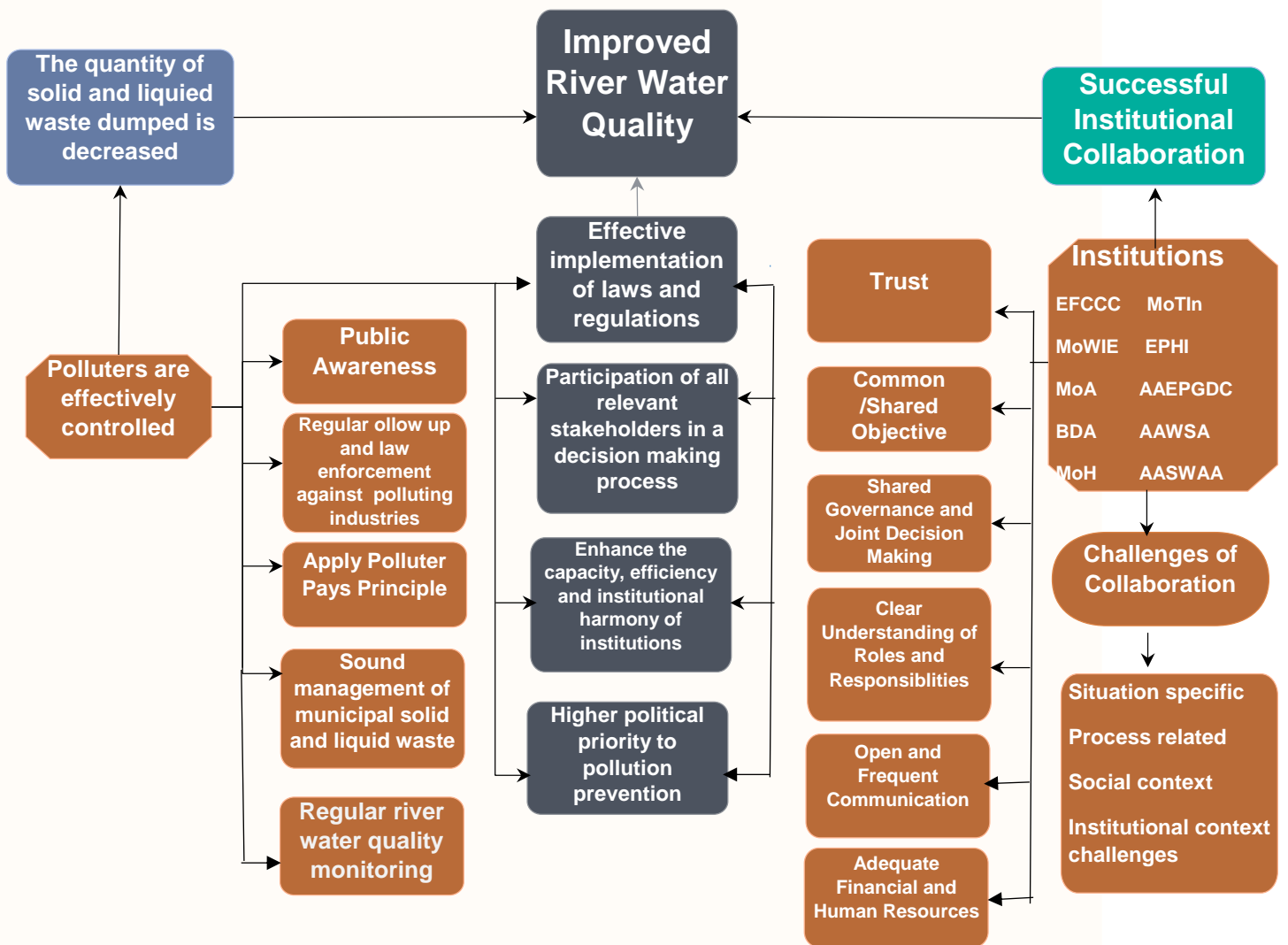


Figure 2. 3 Conceptual framework of the study

(Source: Compiled by the researcher based on the literature review (UNEP & WHO (1997), Mattessich et al. (2001), Steven et al. (1997), Guimera et al. (2005))

CHAPTER THREE

MATERIALS AND METHODS

3.1. Description of the Study Area

Ethiopia is located in the Horn of Africa and shares borders with Eritrea to the North, Sudan, and South Sudan to the West, Kenya to the South and Somalia and Djibouti to the East. It covers a total area of 1.13 million square kilometers (Km²) with a topography of massive highlands, rugged terrain and low plains. The elevation ranges between the two extremes that are from 125 m below mean sea level at Danakil depression to 4,620 meters above mean sea level at Ras-Dashen peak (Berhanu et al. 2014; Hailemariam, 2017).

Addis Ababa city is the capital of Ethiopia, having a population number of around 6 million (UN, 2017). Administratively, the City, with an area of 540 km², is subdivided into 11 sub-cities namely: Gulele, Yeka, Addis-Ketema, Arada, Kolfe-Keranio, Lideta, Kirkos, Bole, Nefas silk-Lafto, and Akaki-Kality and 116 districts (FDREMT, 2011; Mulugeta, 2019).

Addis Ababa is found at the central part of the country and it is located at the geographical coordinate of 9°0'19.4436" and 38°45'48.9996" E, covering a total area of over 51,000 hectares and lies between 2200 and 2600 meters above sea levels on a well-watered plateau surrounded by hills and mountains (Ferezer, 2012).

The city is growing fast due to urbanization and it is in the process of huge infrastructure development. Addis Ababa is home to more than 2,000 industries, ranging from potable water, cement, textile, beverage and alcohol, tobacco, leather, tannery, plastic, and food factories. The metropole serves as the country's industrial, cultural, administrative, commercial, and modern hub (Aschale, 2016). It is also one of the central hubs in Africa, with its many international organizations and institutions. It is home to the African Union, United Nations Economic Commission for Africa, and more than a hundred embassies. It is said to be Africa's diplomatic capital and a beacon of humanitarian progress nowadays on the African continent (Malin and Jonathan, 2019).

The lowest and the highest annual average values of temperature are between 10 and 25°C. April and May are the driest months. The main rainy season, which is characterized by intense rainfall

of short duration, is responsible for 70% of the annual average rainfall of 1400 mm (Belachew, 2006).

The capital city is endowed with many natural resources, and water is one of all. Fresh surface and groundwater are used as potable water, irrigation for crops, and coolant agent in industrial sectors, sanitation and recreational purposes (Ferezer, 2012).

Addis Ababa is located in the central parts of Ethiopia with the Entotto mountain ridge on the northern side. The city lies in the highland with an altitude ranging from 2,200 to 2,500 m above sea level. The river network within Addis Ababa can be divided into two catchments, the Great Akaki catchment (900 km²) and the Little Akaki catchment (540 km²) (Aschale et al., 2017), which both drain to the lake Aba Samuel.

A critical assessment of secondary sources indicated the presence of seven major and six medium rivers in Addis Ababa although the classifying parameters and the list of the rivers remained unclear (Berisso et al. 2016). Nearly 75 small streams and tributaries feed these major and medium-sized rivers of the city. According to Berisso et al. (2016), all the rivers in the city fall under two major sub-basins or watersheds, namely,

- a. The Big Akaki River Basin (The Eastern Sub-catchment) and
- b. The Little Akaki River (The Western sub-catchment)

The tributaries of the Akaki River include Kebena, BancheYeketu, Kortame, Bulbula, Lequ Soramba and kotebe and Fincha rivers. Akaki river consists of two main branches, the confluence of which at the Aba-Samuel reservoir. Little Akaki flows through the western part of the city, rises north-west of Addis Ababa on the flanks of Wechacha Mountain and flows for 40 km before it reaches the reservoir and the Big Akaki river flows through the eastern part of the city which rises from north-east part of Addis Ababa (Entoto Kidane Miheret) area and flows into Aba-Samuel reservoir after 53 km. The main water resources that provide the city by man-made water reservoirs in the Awash basin, namely Legedadi, Gefersa, Dire and Aba Samuel. With the exception of Aba Samuel, all reservoirs supply domestic and industrial water.

Big Akaki river, while the streams, medium and smaller streams include Ginfile, Buhe, Korsu, Bole, Kotebe, Harbu, Beshale. Buhe, Jemo, and Tafo (Abraham 2012).

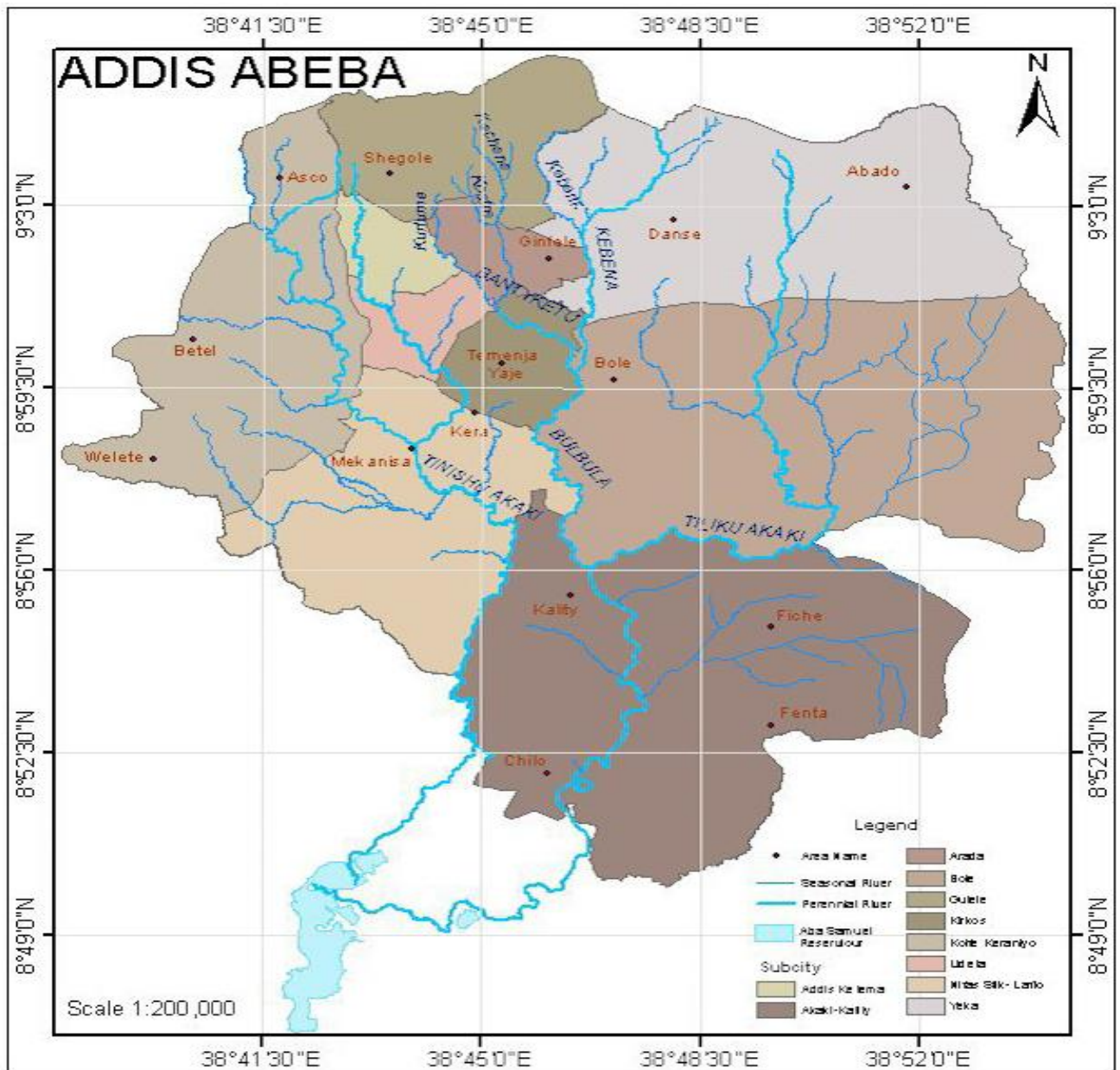


Figure 3. 1 Akaki River (Source: Ethio-Gis)

Akaki River today is facing a great problem in that the level of pollution is very worrisome, and the level of attention given by different sectors and all other responsible stakeholders is very limited (Meklit et al. 2016). Particularly Little Akaki River is facing a multitude of problems, including but not limited to an increasing level of pollution, the health and other related consequence of river problems, the lack of appropriate measures that have taken by the government and non-governmental organizations, and lack of awareness and responsibility of the community.

Little Akaki is occupied by few medium and large industries (Addis Ababa and Dire Tanneries, Addis Ababa glass factory, Ethio-Marble Factory, Tikur Ababy shoe Factory, Dil oil and Gulele soap factories) than Great Akaki streams (Tegegn, 2012). In addition, commercial activities are very common in this catchment, especially around Kolfe sub city.

3.2. Research Methods

This part deals with the research design, sampling procedure and unit, source of data, sampling technique, method of data collection, and method of data analysis.

3.2.1. Research Design

The researcher employed a qualitative research approach. The descriptive Case study design has been used for this research paper since it described the working conditions of institutions. A descriptive case study design was adopted to carry out an in-depth examination, inquiry, and review by describing the nature of a group situation (Yin, 2003) on the collaborative efforts of institutions in responding to surface water quality problems in Ethiopia. A case study is important to investigate a certain group of institutions: how they interact with each other in addressing the problem of rivers, the process of discussions and decision-making activities, the process of exchanging feedbacks, making supervisions and evaluations. Thus, all these activities are complex ones that could be understood through the case study approach, which enables investigation of the depth of social circumstances (Yin 2009).

Institutions at the federal level were selected based on their mandate concerning the management of river water quality issued by the federal government. Institutions at the city level were selected based on the powers and responsibilities given by the city administration regarding the protection of rivers, the management of solid and liquid wastes, and the management of polluted rivers.

1) Federal Environment, Forest and Climate Change Commission (EFCCC), 2) Ministry of Water, Irrigation and Energy (MoWIE), 3) Ministry of Health (MoH), 4) Ministry of Agriculture, 5) Ministry of Industry 6) Ethiopian Public Health Institute, 7) Basin Development Authority, 8) Addis Ababa City Environmental Protection and Green Development Commission (AAEPGDC), 9) Addis Ababa City Solid Waste Administration Agency (AASWAA) and, 10) Addis Ababa Solid Waste Administration Agency are selected institutions that have significant roles and responsibilities in the management of river water quality.

The underlying reason for selecting these case institutions is that based on different studies the main sources of contamination of the Akaki River in Addis Ababa are due to industrial wastes, municipal and domestic wastes, hospital wastes and agricultural activities. Addis Ababa is home to more than 2,000 industries, which comprises 65% of all industries in the country and most of them located along the riverbanks, which are mostly, found in the western and southern parts of the city and discharge these effluents directly to the river. 90% of these industries do not have any kind of treatment plant and discharge their solid, liquid and gaseous wastes untreated into the environment (Hamere and Eyasu (2017). Domestic and municipal wastes, which are generated from day to day practices, are the major source of water pollution in Addis Ababa city (Worku Y. & Giweta M, 2018).

3.2.2. Data Collection Instruments and Procedures

The researcher can use one or more of the several research methods under the case study method depending upon the prevalent circumstances. In other words, the use of different methods such as interviews, questionnaires, documents, study reports of individuals, letters, and the like is possible under the case study method (C.R Kothari, 2004)

The study has relied on both primary and secondary data sources. The primary source of data was collected through key informant interviews and the secondary source of data was collected from systematic documents like policies, strategies, programs, proclamations, reports, proceedings, published and unpublished materials, manuals, web pages, institutions publication, and magazines.

3.2.2.1 Key Informant Interview

According to Russell and Hershberger (2003), key informant interviews were carried out with the intention of capturing more firsthand data. It was aimed to facilitate open interaction between the key informants that can yield vital, broad, and detailed information and the researcher through inviting key figures in the institution relevant to the issue under discussion to participate in open dialogue. For this research, semi-structured interviews were conducted because this method allows the researcher to ask a series of open-ended questions based on the topic areas the researcher wants to cover and it gave a researcher the freedom to probe the interviewee to elaborate or to follow a new line of inquiry introduced by what the interviewee is saying. Semi-structured interview questions help to dig out detailed information about a certain underlying phenomenon (Kothari, 2004). It enabled the researcher to ask questions flexibly that are pertinent to understand

the issue from different perspectives. For this study, 18 key informants have been selected from concerned institutions. These key informants were General Directors, Directors, Team leaders, and Senior Experts from concerned institutions who have high experience and knowledge regarding surface water quality management.

3.2.2.2.Document review

Writers such as (Mouton and Marais, 1990) espoused on the methodological significance of archival or documentary analysis. These authors associated archival research with “the extensive collections of records, documents, library collections or mass media materials that have been a massed,” data from demographic profiles, personal documents (such as dairies, autobiographic and letters) as well as materials collected from media prints are all genres of archival sources. Systematic documents like policies, strategies, programs, proclamations, reports, minutes, published and unpublished materials, manuals, web pages, institutions publication and magazines are used. For this study, Ethiopian environment, water and public health policies, laws, regulations and standards have been reviewed. 10 year reports of each selected institutions have also been reviewed.

3.2.3. Sampling Techniques

The case study method can be used only in a limited sphere; it is not possible to use it in the case of a big society. Sampling is also not possible under a case study method (Kothari 2004).

However, the sampling technique that the researcher used for the research to select target interviewees is non-probability. Non-probability sampling enables the researcher to identify the most relevant targets, to select some group of samples that represent the whole, and to identify the most favorable and potential sources of information to the study (Kothari 2004). Thus, the researcher used a purposive sampling technique to select the well-experienced managers and experts that can provide broad and deep information and have direct intervention in the issue of surface water quality. By using this sampling technique, the researcher selected 18 key informants from selected institutions and made an interview to get the needed data.

3.2.4. Data Analysis

As indicated in Yin (2003), qualitative data analysis is an integrated part of the data collection, where the researcher might analyze as the research progresses, continually refining and reorganizing in light of the emerging results. In this research, the data collected through key informant interviews, and documents helped the researcher to harness diverse ideas about the issue. Consequently, it will assist in crosschecking the results, increased the validity of the findings, and eased analysis of the data thematically.

Therefore, the data analysis method used for this research is narrative analysis and content analysis. The collected data were analyzed through the following stages. Familiarizing the data through review, reading, and listening, transcription of recorded material, organization and indexing of data, coding and identification of themes, developing of theory and incorporation of existing knowledge, testing theory against the data and, report writing

CHAPTER FOUR

RESULTS AND DISCUSSIONS

This chapter includes the presentation, analysis and interpretation part of the data collected from both primary and secondary sources. The main objective of this study was to assess the institutional collaboration towards the water quality management of Akaki River in Addis Ababa City. Herby to fulfill the intended objectives of the study, the researcher collected data through interviews and document reviews from the organization in the study area.

The result and discussion section contain four major areas. In the first place, the report contains review of policy and regulatory frameworks concerning surface water quality. Second, it contains descriptions of the institutional set up regarding river water quality. Third, the study shows the analysis of whether and how collaboration the institutions are in responding to the problem of water quality of Akaki River in Addis Ababa city. The final section has descriptions of challenges that hampered sectoral collaboration in the study area.

4.1. Review of Policy and Regulatory Frameworks concerning Surface Water Quality Management

Clean, safe and adequate freshwater is vital to the survival of all living organisms and smooth functioning of ecosystems, communities and economics. Declining water quality has become a global issue of concern as human populations grow, industrial and agricultural activities expand, and climate change threatens to cause major alterations to the hydrological cycle. Water quality is complex and diverse and is deserving of urgent global attention and action (UN Water, 2011).

In Ethiopia, due to high population growth, rapid urban expansion and industrial development, the surface water quality in urban areas is under high pressure. In order to address this problem, the government of Ethiopia adopted various policies and regulations.

The most relevant policies and regulatory frameworks concerning the management of surface water are the following. Environmental Policy (1997), Water Resources Management Policy (1999), Public Health Policy (1993), Water Sector Strategy, Environmental Pollution Control Proclamation 300/2002, Water Resource Management Proclamation, Environmental Impact Assessment Proclamation 299/2002, Public Health Proclamation 200/2000, Solid Waste Management Proclamation 513/2007, Prevention of Industrial Pollution Regulation 159/2008, Water Resource Management Regulation 115/2005, and different environmental Standards.

The environment Policy of Ethiopia was approved by the Council of Ministers of the FDRE on April 2, 1997. The goal of this policy is to improve and enhance the health and life quality of all the people in the country and to promote sustainable social and economic development, without compromising the ability of the future generations to meet their own needs. The policy contains provisions to prevent industrial pollution. The key provisions, among others, are, the operating industries should minimize or prevent discharges of substances, biological materials from industrial plants. It also adopts the polluter pays principle to make the polluting enterprises pay for their pollutants. The policy prohibits all acts causing environmental degradation, environmental pollution or environmental incidents and river water pollution. The policy, in general terms, regulates the responsibilities of industries and requires proper management of waste, which affects surface water quality. It also deals with a penalty schedule for breaking the law and adopts the Polluter Pays Principle (PPP), whereby the organization responsible for pollution or degradation of the environment must financially compensate for the damage. This financial punishment has the potential to discourage the polluting industries from further pollution if it is properly implemented and proportional to the extent of the pollution.

The Ethiopian Water Resources Management Policy was issued in 1999. The primary goal of the policy is to promote all efforts towards efficient, equitable and optimum utilization of the available water resources. The overall objective of the policy is to enhance the well-being and productivity of the people through sustainable development of water resources for equitable social and economic benefits. The Water Resources Management Policy includes components addressing all aspects of water resources development and management. It also treats several cross-cutting issues. The Water Policy has considered sustainability, integration and water usage efficiency as well as overall environmental conservation and protection of water resources including the aquatic environment on a sustainable basis. Many issues of environmental concerns are addressed by the national water resources management policy. Water abstraction limit control, water quality control and water pollution control mechanisms are clearly addressed in the policy. Some of the environmental aspects of water policy such as control level of abstraction and quality might be an area of specific concerns. Pollution control is an urgent IWRM issue. Most pollution has resulted from industry effluents, wastes generated from household uses, wastes from latrines, wastes from farmlands discharged into rivers and lakes. The water and environmental policies are consistent with the concept of IWRM.

The Water Sector Strategy which was finalized in 2002 is a vehicle for translating the water policy into action. It is therefore anticipated to provide guidance to stakeholders in implementing the principles, guidelines and issues outlined in the national Water resource Management policy with the aim of translating the Water Policy into action. The environmental aspect of the strategy document:

- Limits the maximum abstraction to be equal to the sustainable yield of aquifers for groundwater users;
- Indicates the importance of developing a water quality standard;
- Prevents indiscriminate discharge but states the requirement of adequate treatment in case of industrial effluents, asks for the establishment of safe limits for sanitary fill lactation, and assumes that the developments of standards on limits in the future;
- Recommends developing a strategic mechanism for sustainable developments; and
- Recognizes the integration and the need to address the same in unison.

The Public Health Proclamation No 200/2000 addressed various aspects of public health issues including water quality control, waste handling, and disposal, availability of toilet facilities and others. This proclamation critically prohibits discharging untreated liquid waste generated from septic tanks, seepage pits, and industries into water bodies, or water convergences.

The Environmental Pollution Control Proclamation No 300/2002 was enacted to help realize the effective implementation of the environmental Objectives and goals incorporated in the Environmental Policy. In addition, the Proclamation was enacted because of the need to protect the environment in general and particularly safeguard human health and well-being, preserve the biota in the river and maintain an untainted aesthetics and to prevent or minimize the undesirable pollution resulting from economic development through appropriate measures. The proclamation also grants, EFCCC and Regional environmental agencies are empowered to take administrative or legal measures against persons that release any pollutant in violation of laws provided regarding the control of environmental pollution. Moreover, development activities that likely cause pollution or other environmental hazards shall have an obligation to install sound technologies or adopt practices that avoid or minimize the generation of waste and to promote the re-use or recycling of effluents, discharges and wastes in general.

The Ethiopian Water Resources Management Proclamation (No. 197/2000) is one of the legislation documents prepared by MoWIE in 2000. The objective of the WRM proclamation is i)

to ensure that the water resources of the country are protected and deployed for the highest social and economic benefits of the people of Ethiopia. ii) To follow up and supervise that they are duly conserved. iii) To ensure that the harmful effects of water are prevented and that the management of water resources is carried out properly.

As per this Proclamation, MoWIE is given almost exclusive powers of decision-making in the management and utilization of the water resources of the country. The supervising body has been given broad regulatory powers under the proclamation, which include the establishment of an inventory of water resources and registry of actions; issuing permits of professional competence as well as for water use and construction; allocation of water resources; establishing required standards for the design and construction of waterworks and monitoring same; issue guidelines and directives for the prevention of pollution of water resources as well as for water quality and health standards in consultation with other concerned public bodies.

A major aspect of the water resources proclamation is that most water resource uses and construction works are to be based on a permit system. However, there are certain water uses and activities, which are exempted from this rule. The proclamation has several provisions regarding the application, issuance, duration, suspension and revocation of permits. It also provides for the payment of fees and water charges for use to the Supervising body. The amount and criteria for determining fees are left to subsequent regulations. The establishment of water users associations in a voluntary manner is also envisaged by the proclamation. Details of their establishment and organization will also be specified in the regulations. There are also provisions relating to the settlement of disputes and adjudication the procedures of which are to be specified in subsequent regulations.

Following the provisions of the environment policy, the Ethiopian government enacted the Environmental Impact Assessment Proclamation (Proclamation № 299 of 2002). The primary aim of the Proclamation is to make EIA mandatory for specified categories of activities undertaken either by the public or private sectors and possibly the extension of EIA to projects. The Proclamation has made EIA be a mandatory legal prerequisite for the implementation of major development projects. Concerning development projects, the proclamation stipulates that no person shall commence implementation of a proposed project identified by directive as requiring EIA without first passing through the environmental impact assessment process and obtaining authorization from the competent environmental agency (Art. 3(1)).

Solid Waste Management Proclamation No. 513/2007 aims to promote community participation to prevent adverse effects and enhance benefits resulting from solid waste. It provides for the preparation of solid waste management action plans by urban local governments. Therefore, Solid Waste Management Proclamation No. 513/2007 states that Urban Administrations shall ensure the participation of the lowest administrative levels and their respective local communities in designing and implementing their respective solid waste management plans. In Article 5.1, each Region or urban administration shall set its own schedule and, based on that, prepare its solid waste management plan and report of implementation. According to this proclamation, any person shall collect waste in an especially designated place and in a manner, which does not affect the health of the society and no person shall dispose of solid, liquid, or any other waste in a manner which contaminate the environment or affects the health of the society.

According to Proclamation 300/2002, the Prevention of Industrial Pollution Regulation to prevent industrial pollution was formulated by the EFCCC and endorsed by the Council of Ministers to ensure the compatibility of industrial development with environmental conservation. It not exceeding the environmental standards. The regulation also obliges industrial operators to handle its equipment, inputs and products in a manner that prevents damage to the environment and human health. Moreover, the regulations urge industrial operators to prepare and implement an emergency response system of their own. On the other hand, industrial operators are required to prepare and implement internal environmental monitoring systems and keep written records of the pollutants generated and the disposal mechanisms used to get rid of the pollutants. In relation to it, factories are required by the regulation to submit annual compliance reports with the provision of the regulations.

The Water Resource Management Regulation is issued by the Council of Ministers with the objective of providing detailed regulations for the implementation of the provisions of the Water Resources Management Proclamation. The main components of the regulation are the following,

Regulation on Permits

The regulation provides a detailed list of responsibilities of the supervising body and the applicant. The responsibilities of the supervising body are to issue, renew, terminate, suspend or reject water use and waste discharge permits following the indicated regulations and authorize, terminate, or suspend construction of waterworks, fix the validity period of the construction work, and extend if required. Moreover, the tasks of the applicant are to satisfy regulatory requirements for obtaining

and renewing water use permits and obligations of the user and for obtaining and extending waterworks permits and obligations of the permit holder.

Regulation on Water Quality Control

Except for municipal effluents, the supervising body is authorized to fix the quality of any effluent matter into surface water or groundwater and control its implementation and the regulation provides guidelines on the sitting of water supply boreholes, required laboratory tests, sealing boreholes, reasons not to complete wells and reporting obligations of well drillers.

Regulations on Fees and Charges

The supervising body is authorized to collect application fees for permits and others and charges for use of water, for the discharge of wastes into water sources, and the use of water from government projects. It also contains regulations on the frequency and duration of payment and penalties for failure to comply with the regulations.

Different guidelines and standards have been formulated since the adoption of the environmental policy of Ethiopia. Ethiopia prepared ambient environmental standards and standard is also formulated for each particular industry for the amount of its discharges. National Environmental Council has endorsed certain effluent standards for specified industrial sectors. The endorsed effluent standards for the specified 12 industrial sectors are posted on the official website of the EFCCC.

In addition to policies and legislation adopted by the federal government, Addis Ababa City government has issued different regulations and guidelines at the city administration level. A regulation on pollution control (Regulation No 25/2007) on May 4, 2006, with an aim to facilitate the smooth implementation of pollution control proclamation issued by the federal Environment, Forest and Climate Change Commission. Article 4 of this regulation narrates some of its main objectives as follows:

- To safeguard or protect the environment from any pollution;
- To design a system as to how a polluting firm shall reinstate the polluted environment to its original position and made him responsible for the damage caused as a result of pollution; and,

- Keep and encourage the adoption of technologies and creativities to eliminate pollution. Moreover, the regulation explicitly states the power and duties given to environmental inspectors.

4.1.1. Strengths of Existing Policies & Regulatory Frameworks

After a critical assessment of different documents through desk review and analysis, the following points are considered as a strength of existing policies and legislative frameworks.

- The environment, water and health policies and laws hitherto developed in Ethiopia are said to reflect global policy changes or the widespread adoption of international policy principles and principles of sustainable development goals.
- The environmental policy of Ethiopia is a good benchmark for applying international multilateral environmental agreements. Most of the principles are taken from Rio Declaration.
- Water and Environment Policies considered socio-economic development while ensuring participatory and sustainable development.
- They incorporated sectoral and cross-sectoral policy frameworks and implementation strategies to be followed.
- They promote sectoral and institutional collaboration and the participation of relevant stakeholders in decision making process as a pillar to a better and effective environmental management.
- All of the policies and legislative frameworks highly focus on minimizing degrading and polluting impacts and adopting a precautionary principle in decision-making.
- Environmental and water policies and legislations articulate a permit system as a mechanism to avoid dissipation and degradation of water resources.

4.1.2. Weakness of Existing Policies and Regulatory Frameworks

- The environmental policy of Ethiopia is too general, not systematically formulated and missed strategies for rigorous implementation, monitoring, or evaluation.
- While the EIA proclamation has made environmental assessment a mandatory legal prerequisite for the implementation of major development projects, programs and plans it has the following weakness,
 - It doesn't specify an expiry date for the EIA clearance which is given for a particular project or industry.

- The EIA proclamation doesn't specified dates for undertaking environmental audit for industries that have taken ESIA clearance and entered into operation.
- Compensation for displaced parties doesn't consider livelihood restoration, and there is no resettlement action plan guideline. World Bank Policies have been used as a guideline so far.
- Although the EIA Proclamation was made years ago there is no enforcement mechanisms in place in order to specifically determine the liability of proponents to undertake EIA before licensed with an investment permit, as the proclamation strictly prohibits the commencement of any projects requiring EIA before appropriate assessment is made.
- Even though EIA proclamation underlines environmental audit as a crosscheck mechanism for the implementation of the EIA plan, no environmental audit guideline is not prepared yet.
- Even though the issue of EMP for pre-started projects without EIA clearance has been mentioned in the EIA proclamation, no implementing guideline is prepared.
- Also the issue of public consultation is mentioned in the EIA proclamation however, procedural guidelines for implementation is not prepared yet.
- Implementing guidelines hasn't also been prepared for most of the issues mentioned in the Pollution Control Proclamation 300/2002.
- No implementing guideline is prepared for liquid waste management.
- The Environmental Pollution Proclamation 300/2000 doesn't consider the actual cost of the damaged environment. Under Art 16 of the proclamation states that, A natural person commits an offence if he discharges any pollutant contrary to the provisions of this Proclamation or regulations issued hereunder and is liable, on conviction, to a fine of not less than one thousand Birr and not more than five thousand Birr or to an imprisonment of not less than one year and not more than ten years or both and, in the case of a juridical person, to a fine of not less than five thousand Birr and not more than twenty five thousand Birr and an imprisonment of the officer in charge for a term of not less than five years and not more than ten years, or a fine of not less than five thousand Birr and not more than ten thousand Birr or both. Any industry is obliged by the law to install secondary and tertiary treatment plant to treat its wastewater discharges. These treatment plants currently costs more than 2 million Ethiopian birr, which means if a juridical person doesn't install a treatment plant and discharges any pollutant to the environment it pays only 25,000

Ethiopian Birr, which is promoting industries to discharge their wastewater directly to the river without any treatment. It is contradicting to the industrial pollution prevention regulation.

- The environmental standard is outdated. Some of the parameters presented in the environmental standard document of Ethiopia doesn't go along with the WHO and other standards and it doesn't consider the current environmental issues. It needs to be updated.
- There is no municipal wastewater discharge standard developed in the country. The absence of municipal wastewater discharge standard is a big challenge to effectively monitor and control wastewater discharged from households and municipalities which can lead to the deterioration of water quality of rivers.

4.1.3. Perception and opinions of respondents on the existing policy and regulatory frameworks

Based on the key informant interview which was aimed to know the adequacy of the existing policy and regulatory framework for the management of river water quality

One interviewee from BDA explained about the existing legal frameworks

Most of the existing policies address the issue of protection of river water quality. Moreover, these policies promote that sectoral and cross-sectoral collaboration is the pillar in the management of river water quality. The problem is the weak implementation of these policies and regulations. The implementation of these policies is weak due to many reasons. The political commitment of the government is not strong for the implementation. Industries are discharging their wastes directly to the river without any treatment. This is mainly due to the problem of lack of accountability of industries and weak law enforcement. The collaboration of different responsible sectors is too weak and they are functioning in a fragmented way.

Another interviewee from MoWIE expressed that

The formulation of policies and regulations are good if they are implemented effectively. Regulations are prepared to provide solutions for the problem of river water quality deterioration. In my understanding, there is enough legal framework to address the issue of water quality of rivers. Akaki river has been an open dumping site for domestic and industrial wastes. The intervention of responsible sectors to collaboratively address the problem and the enforcement of the law is very weak.

An interviewee from MoWIE has expressed his views on the existing policy and legal frameworks regarding surface water quality as follows.

In Ethiopia, various policies, laws, and regulations incorporated the issue of protection of surface water. Both the Ethiopian water resource policy and Environmental policy of Ethiopia clearly underlines the protection of surface waters. These policies also encourage the collaborative and cross-sectoral management of surface water resources. There are also different laws and regulations to implement the issues raised in the policies. The IWRM is also an ideal tool for the collaborative management of water resources in the country. Therefore, I think there is no problem in the policy and legal frameworks side for the collaborative management of surface water.

To conclude, even though the some of the existing legal and regulatory frameworks have weakness, it is possible to control and minimize the current pollution problem by using the existing legal frameworks. The biggest problem is weak enforcement of the law and low level of commitment of the government to implement those policies effectively.

4.2. Institutional Setup, Roles, and Responsibilities regarding Surface Water Quality Management

By reviewing, some documents from secondary data sources (mainly from legislative documents to provide for the definition of powers and duties of the executive organs of the federal democratic republic of Ethiopia and Addis Ababa City Administration), the institutions that have a critical role concerning the river water quality have been identified by the researcher. These institutions are organized from federal to city administration levels having different roles but with a common goal towards sustainable river water quality.

4.2.1. At Federal Level

4.2.1.1. Environment, Forest and Climate Change Commission/EFCCC/
EFCCC was first established in 1995 with the title Environmental Protection Agency (EPA) by proclamation number 9/1995 to coordinate and regulate environmental management activities mentioned under the constitution. It was again re-established in 2002, under Environmental Organs Establishment Proclamation No. 295/2002. The proclamation repealed the earlier proclamation for the establishment of Environmental Protection Agency No. 9/1995. The Environmental Organs Establishment Proclamation entered into force on 31 October 2002 in an initiative to revise the then structure of environmental protection and to redefine the responsibilities of environmental actors. The main objective of this proclamation is ascribing responsibilities to separate

organizations for environmental development and protection, regulation and monitoring, avoiding possible conflicts of interests and duplication of efforts. It was established for the third time named Ministry of Environment, Forest and Climate Change by Proclamation No. 916/2008, responsible for the council of ministers. The commission recently established for the fourth time as Environment, Forest and Climate Change Commission and being out of the council of ministers and directly responsible to the prime minister.

EFCCC is a federal institution established mainly with the mandate to coordinate measures to ensure that the environmental objectives provided under the constitution and basic principles set out in the environmental policy of Ethiopia are realized. The commission is also mandated for

- Establishing a system and follow up implementation for environmental and social impact assessment,
- Preparing a mechanism that promotes social, economic and environmental justice,
- Coordinating the activities to mainstream climate-resilient green economy (CRGE) strategy in different sectors and regions,
- Follow up the multilateral environmental agreements ratified by the country,
- Formulating environmental safety policies and laws on the production, importation, management and utilization of hazardous substances or wastes and genetically modified organisms,
- Leading the negotiations of international environmental and climate change agreements,
- Formulating policies, strategies, laws, guidelines, standards and programs on environmental issues,
- Establishing a national environmental information system, promoting and providing environmental awareness,
- Establishing a system for development, utilization and protection of forest resources, and establishing a system to rehabilitate the degraded environment and ensure its economic and environmental benefit.

EFCCC has three core departments named, environment sector, forest sector and climate change sector. There are different divisions, subdivisions and departments under every three sectors. The researcher focused on the admin setup of the environment sector as the issue of river water quality lay down under the environment sector. Under the environment sector, there are three divisions named

1. Environmental and Social Impact Assessment and Licensing General Directorate
2. Environmental Compliance Monitoring General Directorate
3. State of the Environment General Directorate

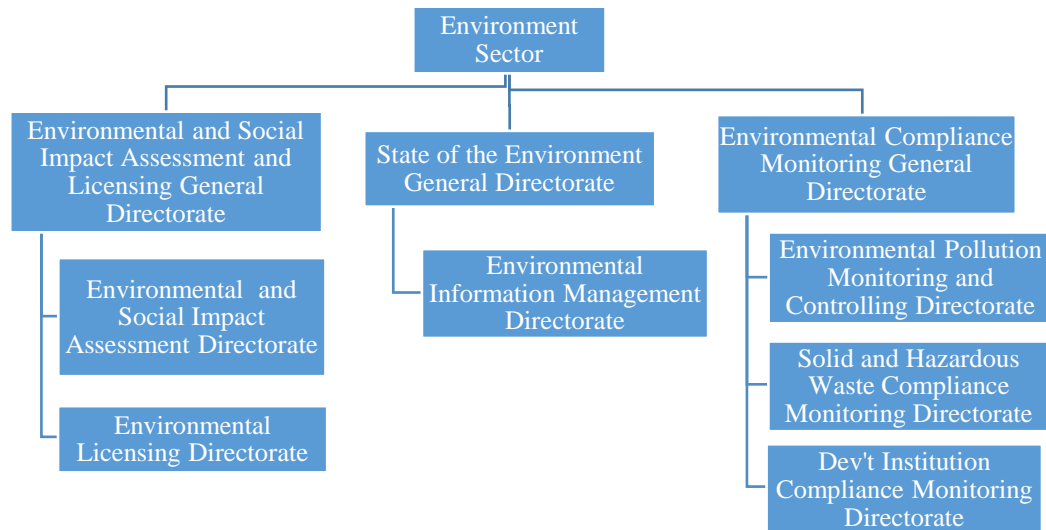


Figure 4. 1 Admin set up in the EFCCC (Source: <https://www.efccc.gov.et/about-the-commission/organizational-structure.html>)

Environmental compliance monitoring general directorate is a responsible body for water quality issues and a highly concerned body for compliance and monitoring of different industries. This general directorate consists three directorates that undertakes surface water quality monitoring, industrial pollution compliance monitoring and law enforcement and solid and hazardous waste management activities.

4.2.1.2. Ministry of Water, Irrigation, and Energy (MoWIE)

MoWIE was established in August 1995 by Proclamation No. 4/95 as a federal institution. It issued a water resource management policy, proclamations, and regulations for the best use of the country's water resources. The proclamation 1097/2018 defined the powers and duties of the Executive Organs of the state. The powers and duties of the MoWIE include:

- To undertake basin studies and determine the country's ground and surface water resources potential;
- To determine equitable allocation and utilization of water bodies;
- To undertake studies and negotiations of trans-in-boundary and trans boundary water bodies;
- To promote the expansion of medium and large-scale irrigation dams;

- To issue permits and regulate the construction and operation of waterworks; and
- To administer dams and hydraulic structures, among others (Reta, 2018).

MoWIE undertakes basin studies and verify the country's ground and surface water resource potential in terms of volume and quality, and facilitate the utilization of the same; in cooperation with the appropriate organs, prescribe quality standards for waters to be used for various purposes; promote the development of water resources.

The Ministry of Water, Irrigation and Electricity of Ethiopia is a federal organization established to undertake the management of water resources, water supply and sanitation, large and medium scale irrigation and electricity. The Ministry is a regulatory body, which involves the planning, development and management of water resources, preparation, and implementation of guidelines, strategies, policies, programs, and sectoral laws and regulations. It also conducts study and research activities, provides technical support to regional water and energy bureaus. In the case of transboundary water resources and regional developments pertinent to the sector, it engages in the negotiation and the signing of international agreements.

Core areas of MoWIE services include: river basin study, trans-boundary water affairs, groundwater study and development, water quality and hydrology, water use permit and licensing, and water sector research and development based on the values of innovation and creativity, fairness and equity, quality first, endurance and aspiration, environment and sustainable development, continues learning, teamwork and detest corruption (MoWIE website).

MoWIE is the executive organization responsible for planning, allocation and apportionments of water to all regional states regardless of the sources and location. It is also responsible for the preparation of laws related to the protection, utilization of water resources, issuances permit to construct and operate waterworks, conducting water tariff studies, preparation of plans for proper utilization of water for development and supervision of its implementation, prescription of quality standards required for the utilization of water for various purposes (MoWR, 2000).

A Minister and three State Ministers head the Ministry. The State Ministers are managing Water Supply and Sanitation Sector, Irrigation and Drainage Sector and Electricity Sector. MoWIE is among the six other institutions that is delegated by the federal government and EFCCC to evaluate ESIA studies of projects which are related to water and electricity and issue ESIA clearance and

undertake follow up implementation of project based on the license given. Therefore it has an environmental unit named Environment and Climate change coordinating directorate with one director and multi-deciplinary experts.

4.2.1.3. Basin Development Authority

The Basin Development Authority was established in 2018, by Regulation No. 441/2018 with the overall objective to implement sustainable and integrated development, administration and utilization of the water resources at a basin level in an equitable and participatory manner.

It undertakes policy studies, surveys, and researches needed to create a conducive environment for the implementation of an integrated water resource management within basins; and follow-up implementation upon approval by the relevant body. It is also a responsible body to ensure continuous collaboration with regional government organs and other relevant bodies by setting up a forum for effective networking.

The Authority is also mandated to study, generate policy ideas, follow-up the implementations of the equitable and sustainable utilization and management of the trans-boundary and boundary rivers, lakes and aquifers. The Authority is directly responsible to the Ministry of Water, Irrigation and Energy. It gives advice and technical support to the Ministry of Water, Irrigation and Energy on dispute resolution in relation to the allocation and use of water resources of the basins

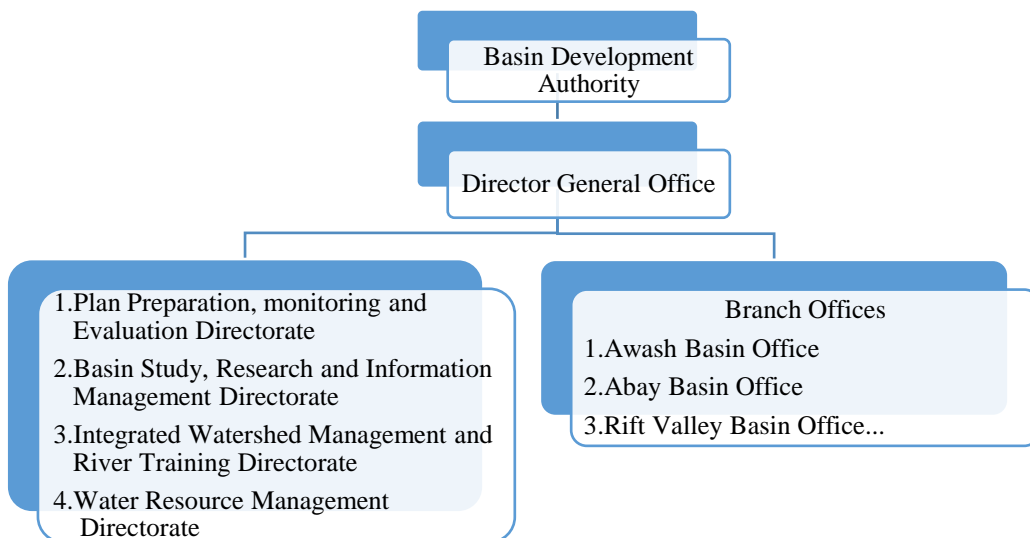


Figure 4. 2 Basin Development Authority institutional setup (Source:

<https://chilot.me/2020/04/definition-of-power-duty-and-organization-of-the-basin-development-authority-regulation-no-441-2018/>)

4.2.1.4. Ministry of Health

The ministry of health is a federal organization established to formulate the country's health sector program, follow up and evaluate the implementation, provide appropriate support to promote research activities intended to provide solutions for the country's health problems and for improving health service delivery, support the expansion of health services coverage, take preventive measures against events that threaten the public health; in the events of an emergency situation coordinate measures of other stakeholders to expeditiously and effectively tackle the problem, coordinate and follow up the implementation of the country's health information system, devise and follow up the implementation of strategies for the prevention of epidemic and communicable diseases, provide appropriate support to promote research activities intended to provide solutions for the country's health problems and for improving health service delivery (Proclamation No.1097/2018).

The Ministry of Health is involved in the monitoring and management of water-borne diseases throughout the country. It is also responsible for developing measures to ensure environmental sanitation and hygiene at the community level.

4.2.1.5. Ethiopian Public Health Institute

The Ethiopian Public Health Institute was established by the Council of Ministers Regulation No 301/2013 with the powers and duties to prepare national research agenda on public health and nutrition, conduct research as per the said agenda, submit policy briefs based on the research result, disseminate research findings and evaluate their impact; conduct public health research on environmental and occupational safety and health; undertake national surveys and surveillances on communicable and non-communicable diseases, nutritional problems, environmental health, health system and other health-related issues; conduct surveillance, analysis and disseminate current information on selected public health risks, epidemic-prone diseases, and nutritional and environmental problems

4.2.1.6. Ministry of Agriculture

The Ministry of Agriculture (MoA) is the Ethiopian government ministry which oversees the agricultural and rural development policies of Ethiopia on a Federal level. The powers and

duties of the MoA include: conservation of natural resources, food security, water use and small-scale irrigation, monitoring events affecting agricultural development and early warning system, promoting agricultural development, and establishing and providing agriculture and rural technology training.

It has environmental and climate change coordinating directorate under supporting service sector. MoA is responsible for the management and control of pesticides and insecticides which have a significant impact on environment and human health.

4.2.1.7. Ministry of Trade and Industry .

Its main responsibility is to promoting the expansion of domestic trade and foreign trade relations and take appropriate measures to maintain lawful trade practices. It is also mandated to promote industrial development through attracting investors from around the world. It is responsible to register, issue license, and follow up different industries.

The Ministry is organized under one minister, implementing departments, five support services, one Civil Service Reform office and trade branch office that enable the ministry to effectively perform its duties and responsibilities vested with it.

It is among institutions that has been delegated by EFCCC to review ESIA documents of industrial projects and issue ESIA clearance and to do follow up and monitoring activities. It has 1 environmental unit named industrial environment and climate change directorate under meal, chemical and construction materials industry development state minister, that is incharge of ESIA clearance and CRGE strategy implementation.

4.2.2. At Addis Ababa City Administration Level

4.2.2.1. Addis Ababa Environmental Protection and Green Development Commission
Established by the Proclamation number 15/2001 to establish Addis Ababa city administration implementers and reform municipality service. Its mission is to create pollution-free and green Addis Ababa and syndicate development with environmental works that are researched, evaluated and monitored with the collaborative efforts of the community to ensure the right of the society to live in a clean and healthy environment with sustainable development and wise use of natural resources.

In Addis Ababa city administration, Addis Ababa City Environmental Protection and Green Development Commission is a mandated regulatory body on all systems of waste management,

and it formulated and organized wonderful polices guidelines, and standards, which enable control of the pollution of Addis Ababa Rivers and riversides. This organization has a research division, which is focusing on environmental pollution. Accordingly, many researchers are involved in studies, which are focusing on the pollution status of the rivers such as the Akaki River, and the number of effluents that are discharging directly to the rivers.

Addis Ababa City Environmental Protection and Green Development Commission (AAEPGDC) has also a powerful division, which is called Environmental pollution control and supervision, and it follows and controls the pollutant status of industries and their products with a set of policies, rules, and standards. When industries are not in line with policies of waste management systems, AAEPGDC is mandated to warn, penalize, and close the industries. However, usually, most industries within and around Addis Ababa city are not abide to the existing rules and policies of waste management, and they discharge their waste to the nearby rivers without any treatments. In line with this, mentioned that AAEPGDC focuses on awareness creation and working together with the industries and other stakeholders to improve their production and waste management system.

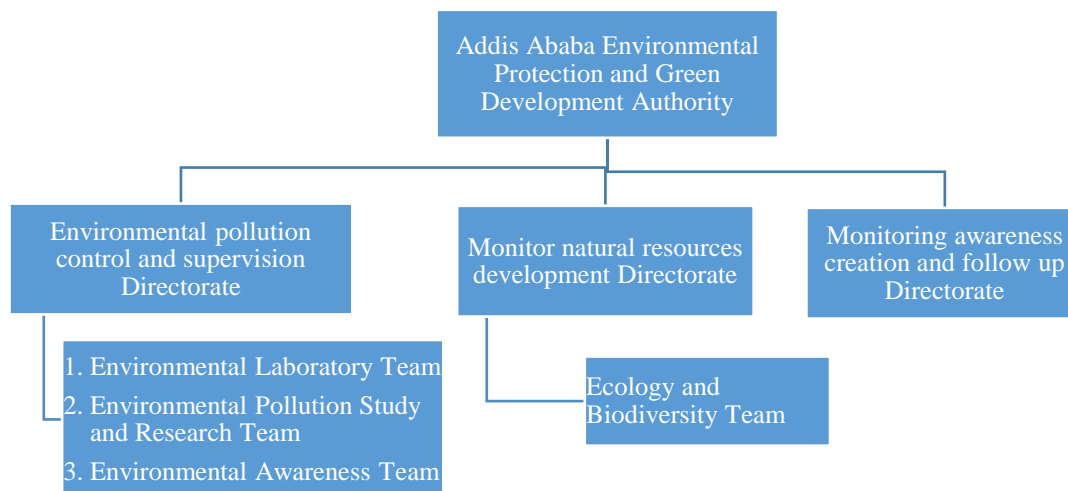


Figure 4. 3 Addis Ababa Environmental Protection and Green Development Commission institutional setup (Source: <http://www.addisababa.gov.et/hu/web/guest/environment-protection-authority>)

4.2.2.2. Addis Ababa Water and Sewage Authority

AAWSA was established for the first time in 1970 with proclamation No 68/1963 and reestablished in 1994 by Proclamation No 10/94. Since the time AAWSA was established by

Proclamation No 10/94, it has been engaged in providing water and sewerage services to the public and by using water resources and building sewerage discharging systems working together with various stakeholders, and by opening 8 sub-branches in the city AAWSA has been providing clean drinking water and modern sewerage system services which is compatible with the fast-growing development of the city to the public.

AAWSA is responsible for constant follow-up and monitoring of the quality of the drinking water quality supplied to the city of Addis Ababa through a centralized piped network. The Authority is also responsible for monitoring sewage and sewerage treatment facilities in the city. Laboratory facility and technical expertise are also available for carrying out the analysis of water samples. Currently, the Authority provides water quality analysis services to many institutions requiring its services. At the present, the monitoring program at the Authority mainly focuses on the quality of drinking water supplied to the population of Addis Ababa and has only limited monitoring of streams, rivers, springs and other natural water bodies.

The Addis Ababa Water and Sewage Authority is responsible for providing adequate and safe water supply, provision of wastewater facilities, wastewater treatment and emptying of septic tanks and pit latrines. As sewage type discharge is a major source of pollution of the Akaki Rivers technical assistance from the AAWSA in these aspects will be essential.

Addis Ababa Water and Sewerage Authority is responsible for studying water sources, preparing water master plan, develop water supply and sewerage management projects, and administer water supply.

AAWSA is organized into four main departments and eight district branch offices. Among the four main departments, the Sewerage sector is a responsible department for the collection, treatment and disposal of wastewater of the city. Under the sewerage sector, there are three sub-departments namely, Wastewater Treatment, Recycle and Disposal Sub Department, Wastewater Collection Sub Department and Condominium Houses and Others Sewage Lines Service Providing Sub Department.

4.2.2.3. Addis Ababa Solid Waste Administration Agency

Addis Ababa Solid Waste Administration Agency is a mandated body to ensure the collection, transportation and safe disposal of municipal wastes in an integrated way and coordinate different institutions that are working on solid waste management at sub-city, and woreda level.

The main solid waste management system of Addis Ababa city is open dumping, which is a very poor management system and the main sources of river pollution. The city has one open dumping area (traditionally call ‘Koshe’), which was established in the 1950s and located 13 km away from Addis Ababa. Due to the expansion of the city, ‘Koshe’ is currently in the center of the city, and is still surrounded by many residences and institutions of the city. Surprisingly still now the site serves in the form of an open dumping system, which affects the surrounding environment. However, considering these problems, the city’s administration has built a new sanitary landfill facility at Sendafa, Oromia Regional State, Ethiopia, though it is not still operational due to various reasons. When it became fully functional, this new landfill is expected to process solid wastes for the coming 30 years generated from the City, and it is expected to contribute to the solid waste management of the city (Worku Y* and Giweta M, 2018)

Table 4. 1 Description of sectors role and responsibility concerning river water quality

No	Name of the Institution	Core responsibilities regarding river water quality
01	Environment, Forest and Climate Change Commission(EFCCC)	<ul style="list-style-type: none"> • Formulating water pollution control policies, laws, regulations, guidelines, standards, programs, and action plans and follow up on their implementation. • Monitoring and enforcing the protection of the water resources of the country • Enacting legislation that would enable the monitoring/protection of the water resources of the country. • Setting up an environmental information system and overlooking the dissemination of the information • Coordinating the activities of the Regional and City Administration Environmental Protection Organs. • Ensure the effective implementation of ESIA over any project or program that has a significant impact on water bodies. • Undertake environmental inspection on industries and take administrative and legal measurements over industries that violate the law. • Awareness creation water pollution for the general public, water users and industries.
02	Ministry of Water, Irrigation and Energy(MoWIE)	<ul style="list-style-type: none"> • Developing water resource management policies, strategies, sectoral laws and regulations, programs and standards and follow up their implementation. • Monitoring and enforcing the protection of the water resources in Ethiopia • Setting up quality and quantity standards for the sustainable utilization of the water resources of the country.

		<ul style="list-style-type: none"> • Setting up an information system and overlooking the dissemination of information. • Manages surface water and groundwater quantity and quality. • Authorizes and controls withdrawals and discharges from different sources to the river, and works modifying river flows and ecosystems. • Undertakes strategic water assessments and water quality monitoring to determine water resource usage. • Builds and operates water supply, sewerage, wastewater treatment plants, drainage, and irrigation systems. • Issuing water use permit and licensing. • Planning, research, and development of river basin • Provides technical advice and assistance to regions and city administrations. • Create awareness of water resources management and promote public participation.
03	Ministry of Agriculture	<ul style="list-style-type: none"> • Pesticides and insecticides management • Management of harmful agro-chemicals.
04	Basin Development Authority	<ul style="list-style-type: none"> • undertake policy studies, surveys and researches needed to create a conducive environment for the implementation of an integrated water resource management within basins • facilitate and undertake activities necessary for the implementation of integrated water resources management in basins • develop plans for protection and sustainable uses of basins • Identify measures that should be taken against pollution and damage to basins; implement same in collaboration with relevant organs • Issuing permit licences for users and discharge permits • measure, collect, compile, analyze and disseminate information for proper planning, administration and steering of water resources in the basin • Conserve, protect and manage water bodies and related ecosystem • ensure continuous collaboration with different stakeholders
05	Ministry of Health	<ul style="list-style-type: none"> • Developing water quality standards for safe consumption by the population • Performing researches on the different public health issues of the country • Supporting the management of Occupational Health and Safety • Undertaking activities of sanitation to prevent and control the occurrence of diseases
06	Ministry of Trade and Industry	<ul style="list-style-type: none"> • Registration, issuing licences and follow up different industries, • ESIA Clearance for industries, follow up and monitoring

		<ul style="list-style-type: none"> • Management of different harmful chemicals
07	Ethiopian Public Health Institute	<ul style="list-style-type: none"> • Conducting researches on the different public health issues including river water quality • Disseminating information to the public based on research findings • Provide technical and scientifically approved public health issues to decision-makers
08	Addis Ababa Environmental Protection and Green Development Commission	<ul style="list-style-type: none"> • Develop water pollution control proclamation, regulation and action plan at the city administration level. • Provide ESIA clearance for projects and follow up on its implementation. • Undertake environmental inspection on industries and take administrative and legal measurements over industries that violate the law. • River water quality monitoring and assessment on a regular basis at the city administration level • Create societal awareness on waste management and environmental protection.
09	Addis Ababa City Water and Sewerage Authority	<ul style="list-style-type: none"> • Providing clean water supply to the city of Addis Ababa • Monitoring of the potable water supply to the city of Addis Ababa • Developing a sewerage system for the city of Addis Ababa • Collecting and managing sewage and • Performing researches on the different water resource issues in the city • Responsible for the overall management of domestic and municipal wastewater in the city.
10	Addis Ababa City Solid Waste Administration Agency	<ul style="list-style-type: none"> • Responsible for the overall collection, transportation, and disposal of solid waste in the city • Manage solid waste enterprises that are in charge of collection, transportation and disposal of solid waste in the city

(Source: from secondary data source compiled by the researcher, 2020)

Based on the above table that reflects roles and responsibilities of various institutions concerning surface water, we can understand that those institutions have a shared objective both directly or indirectly. Their objective is to create a clean and healthy environment for citizens and through protection and development of water resources to improve the water quality and quantity. Therefore, these institutions have to work together to achieve their goals. The following chart indicates how these institutions are supposed to collaborate to improve the water quality of river systems, particularly for Akaki river management in Addis Ababa city.

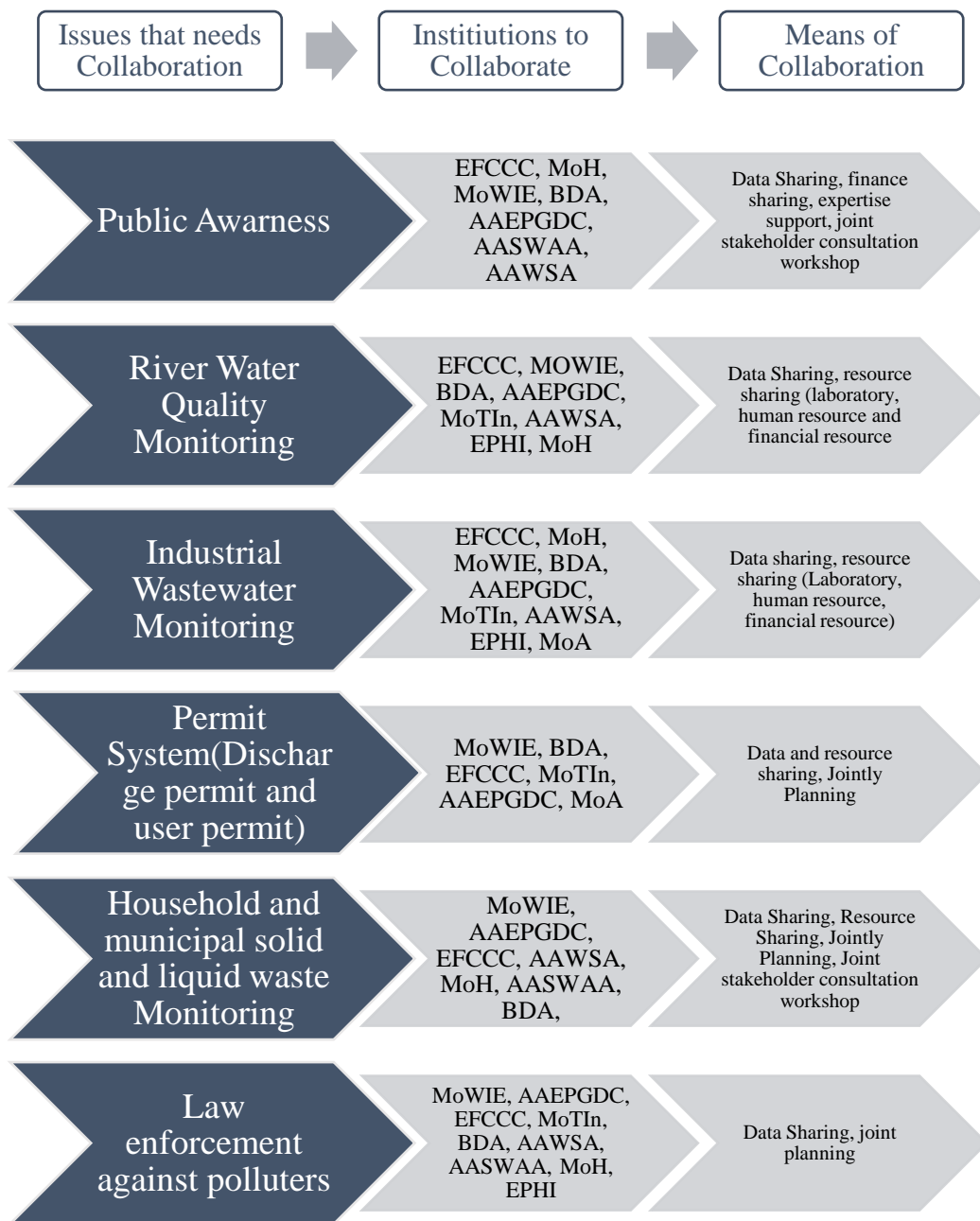


Figure 4. 4 Collaborative process of institutions (Source: developed by the researcher from document review and interviews)

4.3. Existing Practices of Institutions towards Sustainable Surface Water Quality

Different works of the literature indicated that in Ethiopia the problem of water quality is a major threat to the ecosystem, especially in the urban environment. The government of Ethiopia has adopted different policies, laws, and regulations for the sustainable management of river water. It has also established different institutions from the federal to district (woreda) level.

EFCCC is the responsible body for the overall environmental management of the country and it is a mandated body to ensure the implementation of environmental policies and laws in a comprehensive, well-coordinated, and with the framework of a holistic approach. It also has a responsibility to mainstream the climate-resilient green economy strategy in each sector and follows up on the implementation of the strategy. EFCCC has a great role in facilitating and coordinating sectors for the effective implementation of environmental laws.

Regarding river water quality monitoring, EFCCC for the past ten years has been undertaking water quality monitoring activities over tributaries of the Awash River. EFCCC have selected 15 permanent sampling sites including Big Akaki River at Bole, Little Akaki River and Aba Samuel Reservoir. The monitoring activity was undertaken twice up to four times a year. The monitoring objective was mainly for trend analysis and compliance and law enforcement purposes. The Environment and Forest Research Institute using 15 water quality parameters analyze samples taken from different sampling sites. Recently the commission has got mobile laboratory equipments from donor agencies which can measure more than 12 parameters onsite. According to the information found from the 10-year report of EFCCC, the findings from the laboratory result found out that the water quality of Awash River is above the Ambient Environmental Standard in all of the parameters and it is highly polluted river due to many reasons. Therefore EFCCC have learned that the Akaki River is the worst polluted river in the basin.

To assess capacities and gaps a survey of the major environment, health, research, and water sector institutions in Ethiopia was carried out in this study. This was carried out through interviews based on a questionnaire that was developed by the researcher. In all cases, the interviews were made with high placed and responsible officials and experienced experts in each institution. The outcome is summarized below.

Environment, Forest, and Climate Change Commission (EFCCC) is the major institution for environmental protection in Ethiopia. The commission has a mobile laboratory facility with the capacity to measure a variety of pollutants including, heavy metals and physical parameters. The

commission also works with the Environment and Forest Research Institute and Addis Ababa Environmental Protection and Green Development Commission in the analysis of samples. A technical team in the Pollution Control Department undertakes regular monitoring of the water quality of the rivers in the Awash Basin. The output of this survey will be a seasonal report on the water quality of the surface water bodies in the Awash River Basin.

EFCCC together with AAEPGDC has closed 11 textile and tannery industries in Addis Ababa city that have no any treatment plant and discharge their waste directly to the river system. But due to low attention given to environmental issues and high attention for industrial development and foreign currency industries has been reopened with a 6 monthes grace period given.

Ministry of Water Resources, Irrigation and Energy (MoWIE) has developed integrated water resources management master plans for almost all major river basins in Ethiopia. At the Ministry, water quality analysis is performed through the laboratory facilities of the Basin Development Authority (BDA). Currently, the laboratory of BDA has the facility to measure several pollutants, mainly trace elements and eutrophication indicators. Kits are also available for rapid/efficient in situ measurement of samples. Under the BDA there are two technical teams, i.e. the Water Resources Quality Control and the Permit and License Execution teams which undertake surface and groundwater quality monitoring. The Permit and License Execution Team has the responsibility to implement the water use oriented permit system the Ministry has currently introduced. Both teams require capacity building and technical assistance to undertake their tasks efficiently.

Ministry of Health (MoH) - As a primary health sector institution, the MoH has been actively involved in water quality monitoring (drinking) and solid waste management issues of the country. The Ministry makes use of the laboratory facilities available at the Ethiopian Public Health Institute (EPHI) and the Quality and Standards Authority of Ethiopia to determine the quality of drinking water. In-situ measurement kits are also available for use in the surveys the Ministry undertakes. A working team '*Water Quality and Waste Management Control Team*' is currently active in assessing the quality of drinking water at the national level. Thus, the Ministry, in collaboration with the respective regional health bureaus, undertakes routine sanitation surveys to monitor the waste that is generated from many sources including hospitals, hotels, and research facilities are properly disposed of.

Addis Ababa Water and Sewage Authority (AAWSA) is responsible for constant follow-up and monitoring of the quality of the drinking water quality supplied to the city of Addis Ababa through a centralized piped network. The Authority is also responsible for monitoring sewage and sewerage treatment facilities in the city. Laboratory facility and technical expertise are also available for carrying out the analysis of water samples. Currently, the Authority provides water quality analysis services to many institutions requiring its services. At the present, the monitoring program at the Authority mainly focuses on the quality of drinking water supplied to the population of Addis Ababa and has only limited monitoring of streams, rivers, springs, and other natural water bodies.

Even though Addis Ababa is the only city with sewer networks, it has a very limited sewer network coverage that accounts for 7.5% of the built-up areas. Since only parts of the older sections of the city are connected to the central sewer system, both residential and business premises use septic tanks. Currently, there are efforts to control and treat the river in Addis Ababa by city administration including the recent huge river and riverside development project and few private sectors. But these efforts are very limited and not address the whole pollution problem in the city (Hamere and Elias, 2017).

According to an interviewee from AAWSA expert, currently, the organization treats or sewer less than 10 percent of the city's liquid waste. This figure is similar to AAWSA, report and the remaining are pit latrines are used that dispose of their wastewater in the storm water drainage network. He also mentioned that they use a hybrid waste treatment method, i.e., a combination of centralized and decentralized wastewater treatment. Centralized wastewater treatment means handling wastewater treatment residuals and industrial process by-products that come from other industries. When waste management services are not provided or accessible in unplanned areas through conventional means, the responsibility to manage solid waste becomes the responsibility of individuals. A decentralized waste management system becomes an option. This is approach is based on the concept of integrating decentralized peri-urban systems within urban planning initiatives and centralized waste concepts. Thus, he explained that it is important to combine these approaches based on different situations. He continues to explain, currently, the centralized system used in three sites namely, Kality treatment plant, Akaki treatment plant, and Eastern treatment plant (Kotebe) having a capacity of 7,600 m³/day (currently work above its capacity of about 10,000 m³/day); 12,500 m³/day and 80,000m³/ day (only plan), respectively. The Eastern treatment plant not functional except serve as a drying bed then changed to a stabilizing pond and receives

only sludge from vacuum trucks that empty septic tanks. The main treatment method here is secondary treatment.

Basin Development Authority (BDA) is established as an autonomous public agency to administer the available water resources of different basins in the country and regulate the flow of water in the rivers. The Authority has a General Manager that is appointed by the Minister of the Ministry of Water Resources. Among the responsibilities of BDA, its mandate to monitor the water quality of rivers. It is also mandated to issue user permit licences and wastewater discharge permits. Currently, the Authority undertakes regular monitoring of the water quality of rivers in different basins.

Ethiopian Public Health Institute has laboratories that can be used for measuring a wide range of pollutants. Currently, these institutions provide such laboratory services at a national level. Furthermore, unlike most other organizations, the laboratories in these institutions have the capacity to measure pollutants in a variety of environmental matrices including sediments, water, and living organisms.

Different institutions in Ethiopia have different roles and responsibilities towards the management of surface water quality. These institutions range from federal to district level. Their functions are different based on their interest. Some are regulatory bodies, the others are working towards the development of water resources and the rest are service providers.

Key informant interview have been made to know the adequacy and efficiency of these institutions for the management of surface water quality. The result is presented in the following table.

Interviews were made regarding the existing institutional set up to surface water quality management. One interviewee from MoWIE expressed that,

“The existing institutional arrangement for the management of river water quality can be seen as good though these institutions lack resources like a modern laboratory for water quality monitoring and skilled manpower. There are some conflicting roles between some institutions but it is not that much a big problem”.

Another interviewee from Addis Ababa Environmental Protection and Green Development Commission responded that,

“At Addis Ababa City level different institutions have been arranged to address the problem of surface water pollution. These institutions have different roles, responsibilities, and interests on river water quality management. Based on my experience these institutions lack skilled human power, financial resources and laboratory facilities to address the existing problem of river water quality, but if they can come up together and share resources they can be effective”.

An interviewee from EFCCC also raised the issue of a high turnover of leaders and experts in the responsible sectors. He concluded that,

For the last few years, the head of institutions has been replacing very frequently. This problem leads to a lack of experienced leaders for the effective management of the sector. Besides, well-experienced professionals have been going to other institutions that have better relief. Because of these government sectors are losing the capacity to manage and address the complex problems of the environment.

From the above key informants interview, one can understand that the existing institutional arrangement for surface water management is very good, though there are constraining challenges affecting the performance of the existing institutions. Lack of financial resources, lack of laboratory facilities for regular water quality monitoring, high turnover of experienced leaders, and experts in the concerned institutions are the main problems that are facing the existing water institutions. The current reform is a big opportunity for these institutions that it can support to build a strong institutional collaboration for a better outcome.

4.4. Sectoral Collaboration towards Water Quality of Akaki River

Strategic collaboration and partnerships with other organizations can be vital to the success of one organization's goals and initiatives. Partnerships with other organizations have the potential to concentrate the community's focus on a particular problem, create alliances among organizations that might not normally work together, and keep the community's approach to issues consistent (JSI, 2012). Collaboration can help organizations achieve their goals more effectively and with fewer resources. The researcher has tried to assess the perception of key informant interviewees on the importance of sectoral collaboration for the management of surface water.

One interviewee from EFCCC concluded his views on the need for collaboration between sectors that,

“To control the Akaki River pollution, different concerned sectors should come up together and have integrated plan and programs over the problem. The collaboration of sectors involved in a particular issue can result in a more cohesive and comprehensive interventions Collaboration between responsible sectors can minimize duplication of efforts, to identify the point and non-point sources of pollution through effective information and data sharing and creates a better and conducive environment for joint decision making against the problem. ”

An interviewee from MoH expressed that,

Coordination, collaboration and partnership of sectors are necessary for the more effective and efficient delivery of programs and eliminating unnecessary duplication of efforts. It is vital for addressing the pollution load happening on Akaki River. Sectors have been investing their effort to alleviate the pollution problem of rivers, but not collectively and collaboratively. Effective collaboration and coordination among responsible sectors enable them to build a strong system to overcome a particular problem.

It has been discussed broadly in chapter three that the water quality of Akaki River is deteriorating and degrading due to some reasons mainly from point source pollution. The river is under high pressure of high risk to public health. At the same time, various government institutions are in charge of different roles and responsibilities concerning the management of surface water quality. The major responsibilities of these institutions include creating awareness to the general public about surface water pollution, solid and liquid waste management, monitoring the river water quality regularly, protecting the river from the point and non-point sources of pollution, and do the law enforcement activities over non-complaints, and developing rehabilitation plans for the polluted river.

The researcher interviewed the key informants about the existing practices of sector collaboration in addressing the problem of water quality of Akaki River. An interviewee from EFCCC explained that

The collaborative practice that has been exercised by responsible sectors concerning the issue of surface water quality management is weak. There were no regular, open, and frequent communication among sectors, no data sharing experience, no trust between sectors, no experience of shared governance, and decision-making practices so far. Each

sector has been functioning independently. I don't even know what some sectors are doing activities towards the water quality of the Akaki River. I also do not know the plan of each concerned sector over Akaki River. We have had a relationship only with the Basin Development Authority and MoWIE, a partnership called "towards a water management program on the Awash River Basin", a program initiated by the international organization named Center for Science and Environment based in India. The program was aimed at strengthening the monitoring program on Awash River Basin and develop a strategy for the water quality monitoring activity. The monitoring strategy was developed but not applied on the ground yet. Though the monitoring strategy is developed, no communication and data sharing was done with BDA and MOWIE yet.

Another interviewee from EPHI also responded by mentioning EPHI is involved in conducting public health studies and research that,

The EPHI has conducted different studies and research at different times on the pollution level of the Akaki River. The research findings showed that the Akaki River is under a highly polluted category based on different water quality standards. We have tried to made a panel discussion with different stakeholders and disseminate information to the public and also to sectors that do regulatory activities to take appropriate action on polluting industries. However, no progress has been seen so far. The sectoral integration is also weak, that is why the problem of water pollution on Akaki River is increasing from time to time. There is no trend of regular communication between sectors, lack of data-based joint decision making, and a clear understanding of roles and responsibilities.

In general, based on the findings of the data the sectoral collaboration towards the water quality of Akaki River is weak. There is no trend of regular meetings on a particular problem, weak open and frequent communication, a problem of clear understanding of roles and responsibilities, weak data-based joint decision-making trend, lack of data sharing experience among responsible sectors have been identified problems.

4.5. Challenges constraining to successful sectoral collaboration towards the water quality of Akaki River

It has been widely discussed in chapter two about factors affecting the successful collaboration of institutions towards addressing social, environmental, and economic problems. These factors fall into four main categories. These include situation-specific, process-related, societal context, and

institutional context factors. Based on these factors, a survey was conducted on purposively selected respondents that which specific factors are facing institutions in addressing the water quality problem of Little Akaki River collectively and collaboratively. Each specific factor has been discussed below.

4.5.1. Situation Specific Challenges

Situation specific factors include power imbalances among collaborators, lack of regular communication between institutions, technical and scientific issues, public issues, and the fundamental differences that separate the stakeholder institutions.

Based on the data acquired from key informants, regular communications among stakeholder institutions is very low. It is because of the regular communication between responsible sectors is very low, the collaboration among them is too low. An interviewee from Ministry of Health expressed that,

“The culture of regular communication among all responsible sectors regarding surface water quality and its impacts on human and environmental health is very weak. Since the Akaki river is a highly polluted river in Ethiopia, it needs the intervention of different sectors, non governmental organizations, civil societies and the general public. But the ground truth indicates that no proper attention and consideration has given to the problem and communication between different stakeholder institutions is at insignificant level.”

On the other hand, for the collaboration of different stakeholders towards the the appropriate management of the problem, it has been identified that lack of procedural and technical guidelines. Though there are different policies, strategies, and regulations about sectoral collaboration, there is lack of implementing guidelines and technical documents on issues like who are collaborators, how to collaborate and when to collaborate to manage surface water quality problems.

Therefore, the data acquired from key informants confirmed that situation specific challenges affecting successful institutional collaboration to manage the Akaki River Pollution are low regular communication between stakeholder institutions and lack of technical and scientific procedures for collaboration are the main challenges affecting the collaboration of responsible institutions for the water quality management of Akaki river.

4.5.2. Process Related Challenges

Process-related challenges as mentioned in Steven et.al, (1997) are lack of focus on process; a lack of process management or interpersonal skills; resistance to collaborative management styles; and difficulty securing the involvement of all relevant stakeholders.

Based on the key informant findings, the level of focus on process and process management or interpersonal skills are very low. A process is serious of actions, operations, or motions involved in the accomplishment of a proposed action or project. It is a course of action intended to achieve a certain result. An interviewee from AAWSA expressed that,

“The weak technical planning process in ensuring successful collaboration for surface water quality management is one of the biggest challenge for successful collaboration among stakeholder institutions. Difficulty in securing and participating all stakeholders having a critical role in addressing the river water quality problem is one of the prominent problems in the case of Akaki River. The attention given to process management, desire to collaborative management styles, and focus on process is too weak in the case of Akaki River water quality management.”

High resistance to collaborative management styles and difficulty securing the involvement of all relevant stakeholder institutions have also been identified as challenges to successful collaboration of different sectors. An interviewee from AAEPGDC expressed that,

“The involvement of all stakeholders in addressing the water quality problem on Akaki River is weak. The concerned bodies are too weak to secure the the participation of all stakeholders towards the management of the River. There is a resistance of different sectors and head of sectors for collaboration. These are the challenges that we have faced so far.”

To summarize based on the findings process-related challenges affecting the collaboration of responsible institutions in addressing the water quality problem of Akaki River are lack of focus on process, low process management, resistance to collaborative management styles, and difficulty in securing the involvement of all relevant stakeholder institutions.

4.5.3. Social Context Challenges

Individualistic cultural norms can be an obstacle to the collaborative process; exaggerated or false intergroup attitudes can also constrain effective communication that is a starting point for building

the game. Traditional forms of decision-making reinforce group differences and make it more difficult for them to work collaboratively. Adversarial decision-making processes promote strategic polarization in the ways that groups define themselves, emphasizing their differences.

Based on the interview data acquired from key informants, it has been identified that there is high polarization arising from the traditional decision-making process on river water quality management decisions. Respondents had no views on other social context challenges such as cultural norms, stereotypes and intergroup attitudes, and opposition by public interest groups and politics.

4.5.4. Institutional Context Challenges

The institutional context challenges discussed in Steven et al, (1997) are conflicting agency goals and missions; problematic organizational norms and culture; lack of top-level support for collaboration; resource constraints; and problematic government policies and procedures.

An interviewee from EFCCC responded that,

There is a problematic organizational structure in different water and environment institutions. There is no consistent structure from federal to city level. Also the structure is frequently changed. Within the last 5 years the structure of EFCCC has been changed four times. This is a biggest challenge for collaborative management of environmental resources.

On the other hand, there are a number of mandate overlaps in the national and state efforts to develop, use and manage water resources due to the inherent nature of water. First, water is everybody's concern and it cuts across many sectors and frontiers directly or indirectly. Second, the efforts to proactively make policies and regulations/laws adaptive are limited: some policies and regulation, at least in part, are overtaken by changes in the institutional arrangement on ground.

An interviewee from EFCCC expressed that,

“Environment, Forestry, and Climate Change (EFCCC) is an organization which is charged to address policy and regulation issues related to the environment, forest and climate change. Regional states are also following the federal structure and are establishing environment bureaus. Setting standards, developing pollution prevention, etc... are in EFCCC portfolio. On the other hand, MoWIE has a Hydrology and Water Quality Directorate, which is responsible to evaluate the fitness of water bodies for a given

purpose upon request. Although this is a contested mandate, neither of them are effective in preventing pollution. Hence, both are expected to come together and agree on duties and share responsibilities. Further, catchment (forest) management is another area that both ministries are required to align roles and share responsibilities. Greening the dry lowlands while deforesting uplands has no logic. In this regard, there are also plenty of complementarities any catchment management plan should accommodate the interest of both ministries.”

Surprisingly there is also a mandate overlap in between two directorates of EFCCC named Pollution monitoring and controlling directorate and Compliance monitoring directorate. Both of the directorates are functioning under EFCCC having almost the same role which are interdependent and interconnected. But there is a mandate overlap and a well defined activity on ambient and industrial pollution monitoring and controlling. Both of the the directorates currently are working dependently. The interconnection and correlation between the two directorate is weak and there is no data sharing and collaborative pollution control experience between them so far.

Also another interviewee from MoWIE explained that,

“There is a mandate overlap Issues between Ministry of Agriculture and MOWIE. It revolve around (1) catchment management, (2) small scale irrigation development, and (3) the permit, use and disposal systems of pesticides and herbicides. Ministry of Agriculture undertakes watershed management to enhance agricultural productivity, the co-benefit of which is erosion and sedimentation reduction, retention of nutrient and pesticides/herbicides in farmlands. The Basin Administration Directorate of MoWIE carry out watershed development activity, particularly in areas where reservoirs are vulnerable to erosion the co-benefit of which is improving agricultural productivity. Although the priorities in the intervention may differ, the activity could be harmonized to address both concerns.”

Irrigation is another area of contention. Small scale irrigation (<200 ha) is the responsibility of Ministry of Agriculture, while schemes larger than 200 ha fall under MoWIE mandate. There are, however, schemes which are large but still managed by individual smallholder farmers for which the role of Ministry of Agriculture is critical. For instance, Koga dam, which irrigates close to 7000 ha, is managed by farmers. But the dam is managed by Abay Basin Authority delegated by

MOWIE. The total irrigated area developed and managed by Regions is much larger than that developed by MoWIE (NIWRMP, 2018).

Also another interviewee from MoA explained about permit system for herbicides and pesticides that,

“Permit for herbicide and pesticide control is provided by Ministry of Agriculture. Many of these chemicals ended up in water bodies, making standing water bodies such as rivers, lakes and wetlands vulnerable. The capacity to monitor the impact of these chemicals on the aquatic systems at all levels is very low.”

Additionally, the federal government together with EFCCC has delegated MoTIn, MoA, MoT, MoH, and MoMP to review EIA documents of different projects which are related to each sector, and issue ESIA clearance and undertake follow up. These seems to be have a conflict of interest between EFCCC and the delegated sectors. The delegated sectors are basically intended to implement their objectives based on their interest. Here we can understand that the main objective of the delegated sectors is not environmental sustainability (it could be one of the principle but not the main objective). Therefore these mandate should be given back to EFCCC as its primary mandate is to efectively implement and follow up the implementation of different environmental laws and regulations.

To sum up the institutional factors affecting the successful institutional collaboration are, problematic organizational structure norms, and culture in the mandated sectors, top-level support for collaboration, resource constraints, and mandate overlaps between institutions. Based on the findings there is a mandate overlap regarding water quality management between EFCCC and MoWIE, MoWIE and Ministry of Agriculture. Also there is a mandate which can cause a conflict of interest between EFCCC and different institutions.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1. Conclusion

As stated in Agenda 21 and adopted by the United Nation's Conference on Environment and Development, Rio de Janeiro, 1992, "Integrated water resources management is based on the perception of water as an integral part of the ecosystem, a natural resource and a social and economic good, whose quantity and quality determine the nature of its utilization. To this end, water resources have to be protected, taking into account the functioning of aquatic ecosystems and the availability of the resource, to satisfy and reconcile needs for water in human activities. It brings coordination and collaboration among the individual sectors, plus a fostering of stakeholder participation, transparency, and cost-effective local management.

The research was aimed at assessing the existing practice of responsible institutions' collaboration towards sustainable water quality of Akaki River and investigating challenges affecting the successful collaboration of responsible institutions concerning Akaki River water quality management. The researcher employed a qualitative research method with a descriptive case study approach. Both primary and secondary data were used for this research and data were collected through key informant interviews, and document analysis. The collected data were analyzed through narrative and content analysis techniques and the data were presented in tables, and statements.

In Ethiopia, the policy and regulatory frameworks concerning the management of surface water quality look very good though there are different problems in implementing these regulations. The Akaki River is severely polluted in Addis Ababa city, due to directly discharged industrial wastes and domestic and urban solid and liquid wastes. Different institutions are mandated from the federal to city administration level to manage the river water quality. Based on their mandate these institutions are supposed to make productive activities regarding the river water quality in a coordinated and collaborative way. The researcher has tried to assess the perception of respondents about the necessity of institutional collaboration for addressing the problem of water quality in the Akaki River. It has been discussed in chapter four that institutional collaboration is a must and critical way to address the problem of Akaki River Pollution.

The existing practice of sectoral collaboration among responsible institutions towards the water quality of Akaki River is weak. It has been identified that weak information sharing, no formal communication between responsible sectors, weak level of shared governance and decision-making practice, weak resource sharing practice, lack of integrated institutional plans and practices, and the level of trust between responsible institutions is weak towards the management of water resources of Akaki River.

The barriers to successful collaboration of institutions towards the water quality of Rivers, particularly in the case of Akaki River have been identified. These challenges are institutional, situation-specific, social context, and process-related.

The institutional challenges affecting sectoral collaboration that have been identified by the research are lack of top-level support for collaborative management of rivers, human and financial resource constraints, mandate overlap between sectors and a problematic organizational culture which is business as usual and not supportive and encouraging for collaborative management

Lack of regular communication between mandated sectors has been identified as a major challenge constraining successful collaboration for surface water quality management. The culture of sectors in interchanging thoughts, opinions, and data on a shared responsibilities is identified as weak. Lack of technical and scientific procedures that can help sectors to come up together and discuss shared responsibilities has also been identified as a big problem in the collaborative management of Akaki River.

A process is serious of actions, operations, or motions involved in the accomplishment of a proposed action or project. It is a course of action intended to achieve a certain result. The weak technical planning process in ensuring successful collaboration for surface water quality management has been identified as a factor for successful collaboration between stakeholder institutions. Difficulty in securing and participating all stakeholders having a critical role in addressing the river water quality problem is one of the prominent problems in the case of Akaki River. The attention given to process management, desire to collaborative management styles, and focus on process is too weak in the case of Akaki River water quality management.

The societal context within which policy decisions are made can prevent significant barriers to collaboration. These include attitudes held by individuals, groups, and agencies that often push

institutions apart, rather than foster collaboration. In the case of Akaki River water quality management, the results showed that the traditional decision-making process is very high.

5.2. Recommendation

Collaboration is one of the keys to unlocking sustainability. No single organization or sector has the knowledge or resources to go it alone. Leaders from all sectors of society agree that solving sustainability challenges will require unparalleled cooperation.

When considering the Akaki River the main issue of concern is the deterioration of its water quality. Hence, as a prerequisite for implementing mitigation measures the routine follow-up and monitoring of the water quality of the river is of utmost importance. Such regular follow-up is also required for the sources that discharge into it. Concerning this, institutional capacity in laboratory facilities and technical workforce are areas that need focus. Together with supportive legislation for protecting water quality, capacity building in these aspects will ultimately bring about improvement of the water quality of the Akaki River.

Based on the results obtained from the study the following points are recommended.

At the federal level

- ❖ MoWIE and EFCCC are the major institutions for the development and protection of water resources across the country and also leading institutions for coordinating and facilitating different sectors from federal to district level. These institutions should ensure the effective implementation of policies and laws and coordinate different sectors in government to work together to protect river systems.
- ❖ EFCCC and MoWIE should amend and update legislative frameworks regarding river water quality which needs amendment. They should also develop implementing guidelines and standards for surface water quality management.
- ❖ They should build the capacity of basin authorities, regions, city administrations and water, health and environment bureaus on water pollution monitoring and controlling.
- ❖ BDA should develop an effective basin wide surface water quality information system that is reliable, relevant, and accessible to all.
- ❖ The federal government should ensure that water quality management planning is jointly submitted between all responsible institutions at federal level and the city administration concerned offices with clear roles and responsibilities in the implementation.
- ❖ The federal government should allocate adequate financial and human resources for the responsible sectors. Successful collaboration needs considerable support and sufficient resourcing that it is useful to have someone with the responsibility for identifying problems

relating to collaboration, contributing to communication between participating organizations, and supporting staff to work in new environments. Also, it should ensure that effective governance arrangements, clear leadership roles, and transparent lines of accountability in place for collaboration to be a success.

- ❖ The federal government should fix the problem of mandate overlap between institutions at the federal level, specifically between EFCCC and MoWIE, MoWIE and MoA. It should also work to make clear understanding of the roles and responsibilities of different responsible government sectors concerning surface water quality management.
- ❖ There should be technical and procedural guidelines for collaboration of responsible institutions both at federal and city administration level. Some of the regulatory frameworks should be updated and different implementing guidelines should be prepared.
- ❖ There should be should be open and frequent communication among responsible institutions at federal and city administration level and other relevant stakeholders at all level concerning the water quality issue of Akaki River in Addis Ababa.
- ❖ All responsible institutions should create trust to assist good information flow, open dialogue, facilitating collaboration and innovation, and quick decision-making in river water management.
- ❖ There should be shared governance and joint decision-making experience among responsible government sectors and other relevant stakeholders on water quality management.
- ❖ Responsible institutions should focus on process, effective process management, and open for collaborative management styles for collaboration.
- ❖ There should be a clear organizational structure in each institution for the management of surface water quality.

The Addis Ababa City Government

- ❖ Should ensure that there is a holistic planning towards the management of the river and riversides. There is a need for the city of Addis Ababa to plan for and manage its water resources holistically.
- ❖ Should support responsible sectors in the city for collaborative management of Akaki River.

- ❖ Addis Ababa Environmental Protection and Green Development Authority should take the responsibility of coordinating different sectors and stakeholders for holistic management of the Akaki River raise public awareness on water pollution cause, levels, and impacts.
- ❖ AAEPGDC should also undertake regular follow up and bring to the law polluting industries that discharge wastewater and solid waste to the river systems.
- ❖ The City administration should support AAWSA and AACSWAA to come with systems for safe disposal of urban liquid and solid waste management.

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APPENDICES

Annex One Key Informant Interview

Key Informants – Head of the Institution/Director Generals or Directors or Senior Experts/

Name of the Interviewee _____

Interviewee's Position _____

Age _____

Sex _____

Responsibility _____

Total work experience _____

Work experience for the current position _____

Number of staff members under his/her supervision _____

Date of the Interview _____

1. Tell me about this institution: How long has it been operating, how and why it started, its purpose, its history, its structure.
2. Since its beginning, what sort of activities has the institution been involved with or initiated?
3. Tell me the role of your institution towards the water quality of Akaki River in Addis Ababa City?
4. Does your institution undertake activities for counteracting the effects of river pollution in Addis Ababa City?
5. What tools (e.g. strategies, problem-solving approaches, means of communication, etc.) are used?
6. Does your organization have further plans to improve the water quality of Akaki River in Addis Ababa City?
7. What is your institution's understanding of collaboration with other institutions in improving the water quality of Akaki River in Addis Ababa City?
8. Does your institution have collaboration with other institutions regarding the pollution of the Akaki River? With whom? And on what?
9. Do you think this is an issue for the institution? Why?
10. Tell me the trends of the institutional collaboration of responsible sectors situation regarding the river pollution in Addis Ababa city?
11. Tell me what activities are undertaking by stakeholder institutions to improve the water quality of Akaki River in Addis Ababa city? By which institutions?

12. Tell me the list of government offices, agencies, NGO's and others (if any) which have relevance to river water pollution specifically on Akaki River?
13. Tell me if there are protocols, formal or informal rules that intend collaboration of institutions or bureaus in addressing the river pollution problem in Addis Ababa city?
14. What collaboration mechanisms and processes currently exist? Amongst responsible institutions? In what areas?
15. How effective are they? Why?
16. Tell me if there are barriers that limit the collaboration of stakeholder institutions?
17. What do you think about their causes?
18. Does your institution have collaboration with other institutions? With whom? And on what?
19. Tell me about the institution's experiences and discussions that had (if) about how the institution would work collaboratively with other institutions.
20. Are there institutions (formal or informal) countering with your institutions' objective?
21. What would your institution do differently next time?
22. Tell me if there are challenges that limit institutional collaboration?

Annex Two Summary of Plagiarism Report

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W	URL: https://www.researchgate.net/publication/346321864_An_overview_of_water_pollution_... Fetched: 1/15/2021 10:29:00 PM	88	1

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W	URL: https://www.unwater.org/publications/un-water-policy-brief-water-quality/ Fetched: 1/15/2021 10:29:00 PM	88 1
W	URL: https://www.mdpi.com/2073-4441/10/2/98/pdf Fetched: 5/2/2020 5:56:37 AM	88 1
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