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**Establishing Efficient Monitoring, Evaluation and Learning Framework of
Transboundary Water Governance and Management, the Case of
Tanganyika Lake Basin**

Defended on 23/09/2020 before the Following Committee

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A research study submitted to the Pan African University Institute of Water and Energy Science, including climate change department of Water Science in partial fulfilment for the requirements of the Degree of Master of Science in Water Policy

DECLARATION

I, **William NDIHOKUBWAYO**, hereby declare that this thesis represents my original work, realized to the best of my knowledge. I also declare that all information, material and results from other works presented here, have been fully cited and referenced in accordance with the PAUs academic rules and ethics. The work has never been submitted to any other institution for academic purposes.

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DEDICATION

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

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ABBREVIATIONS AND ACRONYMS

AfDB	African Development Bank
AIDA	International Association for Water Law
AU	African Union
DGREA	General Direction of water resources management and sanitation
DRC	Democratic Republic of Congo
DSS	Decision Support System
EIA	Environmental Impact Assessment
FGDs	Focus group discussions
GEF	Global Environmental Facility
GIS	Geographical Information System
HDI	Human Development Index
ILBMS	Integrated Lake Basin Management System
IRBM	Integrated river basin management
ISARM	International Shared Aquifer Resource Management
IUCN	International Union for Conservation of Nature
IWRM	Integrated water resource management
LATAWAMA	Lake Tanganyika water management
LTA	Lake Tanganyika Authority
LTBP	Lake Tanganyika Biodiversity Project
LTRP	Lake Tanganyika Research Project
M&E	Monitoring and Evaluation
MEL	Monitoring, Evaluation and Learning
NAPA/CC	National adaptation plan of action to climate change (NAPA/CC)
NDF	Nordic Development Fund
NGOs	Non-government organisations
NSAPB	National Strategy and Action Plan for Biodiversity
OECD	Organisation for Economic Cooperation Development
PAU	Pan African University
PAUWES	Pan African University Institute of water and energy sciences (including climate change)
PRODAP	Project to support the Lake Tanganyika integrated regional development programme
REGIDESO	National Company for Electricity and water Distribution, Burundi
SADC	Southern Africa Development Community

SAP	Strategic Action Programme
SPSS	Statistical package for social sciences
TDA	Transboundary Diagnosis Analysis
ToC	Theory of change
UN	United Nations
UNDP	United Nations Development Program
UNEC	United Nations Economic Commission
WHO	World Health Organisation

TABLE OF CONTENTS

DECLARATION	II
BIOGRAPHICAL SKETCH.....	III
DEDICATION	IV
ACKNOWLEDGEMENTS	IV
ABBREVIATIONS AND ACRONYMS	V
TABLE OF CONTENTS	VII
LIST OF FIGURES.....	XI
LIST OF APPENDICES	XI
KEY TERMINOLOGIES	XII
ABSTRACT	XIII
CHAPTER 1 INTRODUCTION.....	15
1.1. Background.....	15
1.2. Problem statement.....	16
1.3. Research Questions.....	17
1.4. Research Objectives.....	17
1.5. Significance of the study.....	18
1.6. Conceptual Framework.....	18
1.7. Theoretical concerns	21
1.8. Chapter outline.....	21
1.9. Scope of the Study	21
1.10. Definitions of the terms	22
1.11. Components of the MEL Tools.....	22
CHAPTER 2 LITERATURE REVIEW	24
2.1. Transboundary Water Governance and Management.....	24
2.2. Challenges of Tanganyika Transboundary Lake Basin	26
2.2.1. Socio-political management challenges	27
2.2.2. Challenges in environmental management	27
2.2.3. Institutional and governance challenges.....	28
2.2.4. Financing challenges	29
2.3. Integrated Lake Basin Management System (ILBMS).....	29
2.4. Monitoring Transboundary Basins	31
2.5. Evaluation of Transboundary Basins	32
2.6. The MEL framework	34
2.6.1. Framework Development process.....	34

2.6.2. MEL Framework indicators	35
CHAPTER 3 MATERIAL AND METHOD.....	36
3.1. Description of the study area and population of the study.....	36
3.2. Research Methodology	38
3.3. Research Design.....	40
3.4. Sampling techniques	40
3.5. Targeted Sample size	40
3.6. Data collection instruments.....	41
3.7. Documents review	41
3.8. Study Administration and ethical considerations	42
3.9. Data collection, management and analysis	42
3.9.1. Survey Tools and Pilot	42
3.9.2. Data Collection Procedures	42
3.9.3. Management of Fieldwork	42
3.10. Development of monitoring, evaluation and learning framework.....	43
3.10.1. Programme design/formulation.....	43
3.10.2. Results framework (Develop Logic Model/Indicators).....	43
3.10.2.1. Logic model development.....	43
3.10.3.2. Programme theory of change underlying PRODAP (2007) adapted from (ORGANISATIONAL RESEARCH SERVICES, 2004).....	44
3.10.4. Learning and evaluation questions & actionable measurement framework.....	45
3.10.5. Measurements options.....	46
3.10.5.1. Measurement parameters	46
3.13.5.2. Monitoring, Evaluation and Learning plan and implementation.....	46
CHAPTER 4: PRESENTATION OF RESULTS.....	47
4.1. Respondent's information background	47
4.2. Water use and management	47
4.3. Respondent's position.....	48
4.4. Data analysis of the key indicators	50
4.5. Challenges.....	58
4.5.1. Challenges to governance and management of Tanganyika Lake	58
4.5.2. Main challenges to sustainability of the Lake	59
4.5.3. Observation of Tanganyika Water Level and the reason	60
4.5.4. Existing opportunities to improve the governance and management of Lake Tanganyika.....	60

4.5.5. Field observation images	61
4.6. Reliability.....	63
CHAPTER 5: ANALYSIS AND DISCUSSIONS.....	64
5.1. Identification of area of success.....	64
5.2. Identification of areas for program improvement.....	65
5.3. Prioritization of actions.....	66
5.4. MEL Framework Design in Tanganyika Transboundary water governance and management.....	67
CHAPTER 6: CONCLUSION AND RECOMMENDATION	68
6.1. Preamble	68
6.2. Findings of the study.....	68
6.3. Recommendation and lessons	69
6.4. Limitations and delimitation of the study	70
6.5. Future research directions	71
SUMMARY.....	72
REFERENCES	73
APPENDICES	82

LIST OF TABLES

Table 1: Population size and growth in the riparian countries (United Nations, 2016)	27
Table 2: Data Collection Method and corresponding objectives	38
Table 3: MEL components and methodology for data collection	39
Table 3: Summary of the approaches adopted in this study.	Erreur ! Signet non défini.
Table 5: Theory of Change underlying PRODAD and its impacts adapted from (ORGANISATIONAL RESEARCH SERVICES, 2004)	45
Table 6: Gender distribution of respondents	47
Table 7: Age distribution of the respondents	47
Table 8: Sector distribution of the respondents.....	47
Table 9: Channel use Distribution to know Lake Tanganyika Authority	48
Table 10: Percentage distribution of responses for Monitoring and Evaluation on a Likert scale of 1 to 5	51
Table 11: Percentage distribution of responses for communication and reporting on Likert scale.....	52
Table 12: Institutional effectiveness and water cooperation factors	53
Table 13: Water cooperation and governance indicators	54
Table 14: Percentage distribution of the public awareness	55
Table 15: Percentage distribution of Sustainability factors.....	56
Table 16: Percentage distribution of community participation indicators	57
Table 17: Challenges to governance and management of Tanganyika Lake	58
Table 18: Challenges to sustainability of Lake Tanganyika	59
Table 19: Field observation on the change of Tanganyika water level and reason.....	60
Table 20: Internal consistency of the groups of indicators	63

LIST OF FIGURES

Figure 1: A Framework to understand MEL process ((Shaw et al., 2003)	19
Figure 2 : Framework application to good water governance principles (OECD, 2018).	20
Figure 4: Deforestation within Tanganyika watershed (Britton et al.,2019).....	28
Figure 5 : Map of Tanganyika Lake Basin (<i>Lake Tanganyika / AGLI</i> , s. d.).....	36
Figure 6 : Geographic map of Lake Tanganyika (Naithani et al., 2011)	37
Figure 7: Sampling localisation (Rumonge, Bujumbura urban, and Bujumbura rural)	37
Figure 8: Breakdown of the respondent's position in the study.....	49
Figure 9: Level of satisfaction of the governance and management of Tanganyika waters. ...	49
Figure 10: Fishing materials in Tanganyika Lake (Kabezi, Rumonge province)	61
Figure 11: Raising water level in Tanganyika (Kabondo, Bujumbura urban)	62

LIST OF APPENDICES

Appendix 1: Objectives, achievements and lesson/recommendation matrix	82
Appendix 2: Identification of indicators	83
Appendix 3: Sampling guideline	91
Appendix 4: Questionnaire design	92
Appendix 5: Introductory Letter for data collection	100
Appendix 6: Monitoring, Evaluation and Learning framework monthly work plan	101
Appendix 7: The Research Budget.....	104

KEY TERMINOLOGIES

Decision Support System	Decision support systems are sub-collection of information management systems that help planners, analysers and managers in decision-making process (Khodashahri & Sarabi, 2013).
Evaluation	Evaluation is the judgement of the status/condition or performance of some aspects of management against predetermined criteria (Hockings et al., 2006).
Framework	A framework is a composition of a relevant list of categories that are developed from initial research that should be a part of every new project.
Ground water	Ground water is that portion of the atmospheric precipitation, mostly rainfall, which has percolated into the earth to form underground deposits called aquifers (Edmund G. & J.N., 1959).
Hydro politics	Hydro politics is a systematic investigation of the interaction between states, non-state actors and a host of other participants like individuals within and outside the state, regarding the authoritative allocation and/or use of international and national resources (Meissner, 2001).
Hydro-economics	Hydro economics is the discipline of understanding the current and the potential economic value of water, using hydrologic, economic and social perspectives (Brouwer & Hofkes, 2008).
Institutions	Institutions are entities defined by a configuration of legal, policy, and organisational rules, conventions, and practices that are structurally linked and operationally embedded within a well-specified environment (Saleth & International Water Management Institute, 2004)
Monitoring	Monitoring is the on-going process by which stakeholders obtain regular feedback on the progress being made towards achieving their goals and objectives (UNDP, 2009).
Surface water	Surface water is water originates mostly from rainfall and is the mixture of surface run-off and groundwater. It includes larges rivers, ponds and lakes, and the small upland streams which may originates from springs, and collect the run-off from the watersheds (Edmund G. & J.N., 1959).
Transboundary waters	Transboundary waters are water resources that are shared by two or more sovereign states, and include international freshwater, international groundwater and international large Marine Ecosystems (K. Paisley & Henshaw, 2013)
Water governance	Governance is a “range of political, institutional and administrative rules, practices and processes through which decisions are taken and implemented, stakeholders can articulate their interests and have their concerns considered, and decision makers are held accountable for water management”(OECD, 2018)

ABSTRACT

As water is in complex circulation, the consideration of the interactions between all types of waters — surface water, groundwater and return waters — is important for the management and protection of these shared resources. Appropriate transboundary water indicators were selected as guidelines to use for assessing joint management practices and enhancing the sustainability of the Lake based on literature review and the Lake Tanganyika Authority program documents. The study focuses on establishing efficient monitoring, evaluation and learning (MEL) system of transboundary water governance and management based on case studies targeted to the sustainability of the Lake Basin. The finding of the study indicates that sustainability of governance and management over shared water resources in the lake basin can be achieved in advancing collaborative and adaptive learning and research activities emerged from MEL tools. The MEL framework was achieved using a participatory and non-participatory approach and a semi-structured survey interviews through appropriate indicators, data, analysis, reporting models and continues assessments supported by the stakeholders and partner institutions in the basin. The study was conducted in Burundi where the Lake Tanganyika Authority, a program of the riparian countries was implemented with the function of coordinating all the activities related to Lake Tanganyika. Data was collected using a pre-designed questionnaire and analysed using Statistical Package for the Social Sciences (SPSS). A total of 27 respondents participated in the survey and seven experts in water management were interviewed. Three main study areas in the basin were selected for the survey: Bujumbura urban province, Bujumbura rural province and Rumonge province. The data analysis of the findings of the research shows the past and on-going projects on Tanganyika Lake have not achieved their level of sustainability due to problems associated with poor system of transboundary water cooperation and governance, inadequate public awareness and least emphases given to community participation in projects that affect the livelihood of the people. The study highlights the status of the need of improving communication and reporting (35% neither satisfactory nor dissatisfactory), program monitoring and evaluation process (46 % neither satisfactory nor dissatisfactory) and institutional effectiveness (35 % good). Most interviewees highlighted the environmental pollution issues and non-protection of the upstream catchments as the main challenges to sustainability, whereas the weakness of implementing policies and laws on fisheries and water management, the ineffective institution & legislation, and the non-respect of the legal instruments were mentioned as the main challenges on Tanganyika Water governance and management. The existence of Lake Tanganyika Authority and the legislation regarding water governance and management were seen as the unexplored potential opportunities to improve the Lake Tanganyika water governance and management. Efficient implementation of the MEL framework leads to regional stability development, management of the shared water resources requires appropriate multilateral stakeholders relationships, and it stands on diversification of risks and sustainable development of the invaluable water resources.

Keywords: Monitoring, Evaluation, Framework, Transboundary Water Governance, Tanganyika Lake Basin, Sustainable Development

ABSTRACT

L'eau étant en complexe circulation, la prise en compte des interactions entre tous les types d'eaux - eaux de surface, eaux souterraines et « eaux de retour » - est importante pour la gestion et la protection de ces ressources partagées. Des indicateurs appropriés des eaux transfrontières ont été sélectionnés comme lignes directrices à utiliser pour évaluer les pratiques conjointes de gestion et améliorer la durabilité du lac sur la base d'une revue de la littérature et des documents de programme de l'Autorité du lac Tanganyika. L'étude se concentre sur la mise en place d'un système efficace de suivi, d'évaluation et d'apprentissage (MEL) de la gouvernance et de la gestion des eaux transfrontières, basé sur des études de cas ciblées sur la durabilité du bassin du lac. Les conclusions de l'étude indiquent que la durabilité de la gouvernance et de la gestion des ressources en eau partagées dans le bassin du lac peut être atteinte en faisant progresser l'apprentissage collaboratif et adaptatif et les activités de recherche issues des outils MEL. Le cadre MEL a été réalisé en utilisant une approche participative et non participative et des entretiens d'enquête semi-structurés à travers des indicateurs appropriés, des données, des analyses, des modèles de rapports et des évaluations continues soutenues par les parties prenantes et les institutions partenaires du bassin. L'étude a été menée au Burundi où l'Autorité du lac Tanganyika, un programme des pays riverains a été mis en œuvre avec la fonction de coordonner toutes les activités liées au Lac Tanganyika. Les données ont été collectées à l'aide d'un questionnaire préconçu et analysées à l'aide du progiciel statistique pour les sciences sociales (SPSS). Au total, 27 répondants ont participé à l'enquête et 7 experts en gestion de l'eau ont été interrogés. Trois zones d'étude principales du bassin ont été sélectionnées pour l'enquête : la province urbaine de Bujumbura, la province rurale de Bujumbura et la province de Rumonge. L'analyse des données des résultats de la recherche montre que les projets passés et en cours sur le lac Tanganyika n'ont pas atteint leur niveau de durabilité en raison de problèmes associés à un système médiocre de coopération et de gouvernance dans le domaine des eaux transfrontières, à une sensibilisation insuffisante du public et à une moindre emphase accordée à la participation des communautés à des projets qui affectent les moyens de subsistance des populations. L'étude met en évidence la nécessité d'améliorer la communication et le reporting (35% ni satisfaisant ni insatisfaisant), le processus de suivi et d'évaluation du programme (46% ni satisfaisant ni insatisfaisant) et l'efficacité institutionnelle (35% bonne). La majorité des personnes interrogées ont souligné les problèmes de pollution de l'environnement et la non-protection des bassins versants en amont comme les principaux défis à la durabilité, tandis que la faiblesse de la mise en œuvre des politiques et des lois sur la pêche et la gestion de l'eau, l'institution et la législation inefficaces, et le non-respect de la législation ont été mentionnés comme les principaux défis de la gouvernance et de la gestion de l'eau au Tanganyika. L'existence de l'Autorité du lac Tanganyika et la législation concernant la gouvernance et la gestion de l'eau ont été considérées comme des opportunités potentielles inexploitées pour améliorer la gouvernance et la gestion de l'eau du lac Tanganyika. La mise en œuvre efficace du cadre de la MEL conduit au développement de la stabilité régionale, la gestion des ressources en eau partagées nécessite des relations multilatérales appropriées entre les parties prenantes et repose sur la diversification des risques et le développement durable des précieuses ressources en eau.

Mots clés : Suivi, Evaluation, Cadre, Gouvernance des Eaux Transfrontalières, Bassin du Lac Tanganyika, Développement durable

CHAPTER 1 INTRODUCTION

1.1. Background

Lake Tanganyika is the richest freshwater ecosystem in the world, with more than 1,500 species of plants and animals where more than 600 of these species are endemic to the Lake Tanganyika Basin including 245 cichlid species and 44 non-cichlid fish species (Marijnissen et al., 2009). However, unsustainable development patterns endangers this Lake; it has a direct impact on biodiversity (Kmentová et al., 2020) and water quality (Niyoyitungiye et al., 2019). The Governments of Burundi, Tanzania, Democratic Republic of Congo and Zambia established Lake Tanganyika Authority in 2007 (Article 23 of the convention on the sustainable management of Lake Tanganyika) to manage, monitor and ensure the sustainability of the Basin. LTA along with other micro and macro projects, are trying to address the basins' problems. One of the activities is to collect information and manage all activities that may be harmful to the Lake's ecosystem (Article 4 on cooperation). In addition to the above challenges, there are few studies focusing on Tanganyika water governance and management.

This research introduces and adapts a better MEL system that improves water governance and management of the shared water resources of the basin. In this study, MEL framework is a tool that uses indicators and corresponding data and information to improve effectively human decision-making in order to enhance program impacts for the sustainability of Lake Tanganyika. In this context, MEL framework used two important components; a component that strengthens Monitoring, Reporting and Evaluation Function, and a component that builds a Collaborating, Learning and Adapting Institutional Practice.

To assess the strategies and joint management that have been undertaken on Tanganyika Lake sustainability, and also introduce the MEL, the sub-indicators such as the public awareness, the community participation, the sustainability factors, water cooperation and management, institutional effectiveness, monitoring and evaluation and communication & reporting were used.

The area chosen is Transboundary Tanganyika Lake Basin, an area managed and governed by Republic of Burundi, DRC, United Republic of Tanzania and Zambia through Lake Tanganyika Authority. This study suggests useful way of dealing with the existing problems by recommending a better MEL system application of scientific knowledge that optimizes the basin water supply management and security.

1.2. Problem statement

Lake Tanganyika drainage basin is a region that is experiencing a fast population growth with the average growth rate estimated between 2 – 3.1 % per year (Niyoyitungiye et al., 2019). The region is very fragile in terms of security. Eastern DRC has been in conflicts with armed groups for many years as well as Burundi. Therefore, the region witnessed a high internal and external population displacements and repercussions on society due to wars (Stearns & Vogel, 2017). This driving force creates pressures on the environment ecosystem, overuse of natural resources, habitat degradation and water quality deterioration (Yu et al., 2018). Over the years, different types of pollutants from intensive agriculture and pastoral activities have been discharged and accumulated into the Lake. This is the case of sediments (Soreghan, 2016), pesticides (Mahugija et al., 2018), nutrients (Niyoyitungiye et al., 2019). Johnson (2018) noted the increase of sewage dumping from cities such as Kalemie, Uvira (DRC), Bujumbura (Burundi), and Kigoma (Tanzania) around Lake Tanganyika shoreline. The urbanisation in the region is very fast which creates another form of threat to the Lake (Plisnier et al., 2018). Although the pollution is the major threat to the Lake and its biodiversity; Climate has led to the reduction in fishes stock and species disparities due to the rising of temperature of Lake waters ($0.129 \pm 0.023^{\circ}\text{C decade}^{-1}$ over the period 1912–2013 at the water surface and at all depths from 0 – 100 m)(Kraemer et al., 2015). According (Cohen et al., 2016), overfishing coupled with climate warming are affecting the disparities of living species in the lake (the case of sardines). This has led to the reduction of the fishing yields estimated at 200,000 tons per year.

While this Lake is continuing to face severe threats regarding its environment ecosystem (Nkotagu, 2008), the impact is not simply easy to see, water is remaining relatively good. However, the existing activities that are happening in bordering countries like deforestation, increasing in fishing and water pollution exacerbated by climate change impacts will increase the deterioration of Lake Tanganyika waters and make its management significantly difficult. The growing scarcity of fish resources will bring conflicts in communities around the Lake especially those who rely on fishing activities (Johnson, 2018).

According to (Onditi et al., 2019), no major conflicts were seen over Tanganyika waters between countries entities have yet occurred since the establishment of LTA in 2008, however, conflicts sometimes happen opposing fishermen and disputes between Tanzania and DRC have

occurred over the exploration of oil in the Lake. The most frequent conflicts regarding shared waters in the Eastern African region are between states and their citizens. On Lake Tanganyika, the riparian countries have anticipated any conflicts by installing the institutions to manage Tanganyika water for economic efficiency and environmental services goals. Transboundary water management is focused upon management related to institutional approach towards water resources, both in enhancing cooperation and establishing frameworks for negotiation between countries.

In addition to the economic and environmental problems, lack of adequately regulations and policies to enforce measures taken is attributed to most of the issues. Institutions in charge of Lake Tanganyika governance and management have taken different measures (LTA, 2003) but there is a need of increasing awareness through sharing of information and best practices among the actors and promoting community participation in implementation of best practices to manage resources. According to (Plisnier et al., 2018), continuous long- term monitoring program will help to improve the best management of Lake Tanganyika.

1.3. Research Questions

This Research is structured on four Questions:

1. What are the constraints that affect the strengthening of effective joint management of Tanganyika Lake waters and what could delay this process?
2. Can the MEL framework be applied to Lake Tanganyika Basin for strengthening its governance system and sustainable Lake management?
3. How and to what extent MEL Tools can be applied to the existing program and projects for effective sustainability and cooperation.
4. Can an efficient MEL system supported by DSS help to address and improve human decision-making effectiveness in order to meet sustainability goals at national and regional level?

1.4. Research Objectives

The purpose of this research is to identify useful instruments that would help in establishing an efficient monitoring, evaluation and learning framework for sustainability of transboundary water governance and management system of Lake Tanganyika Basin.

Specific Objectives:

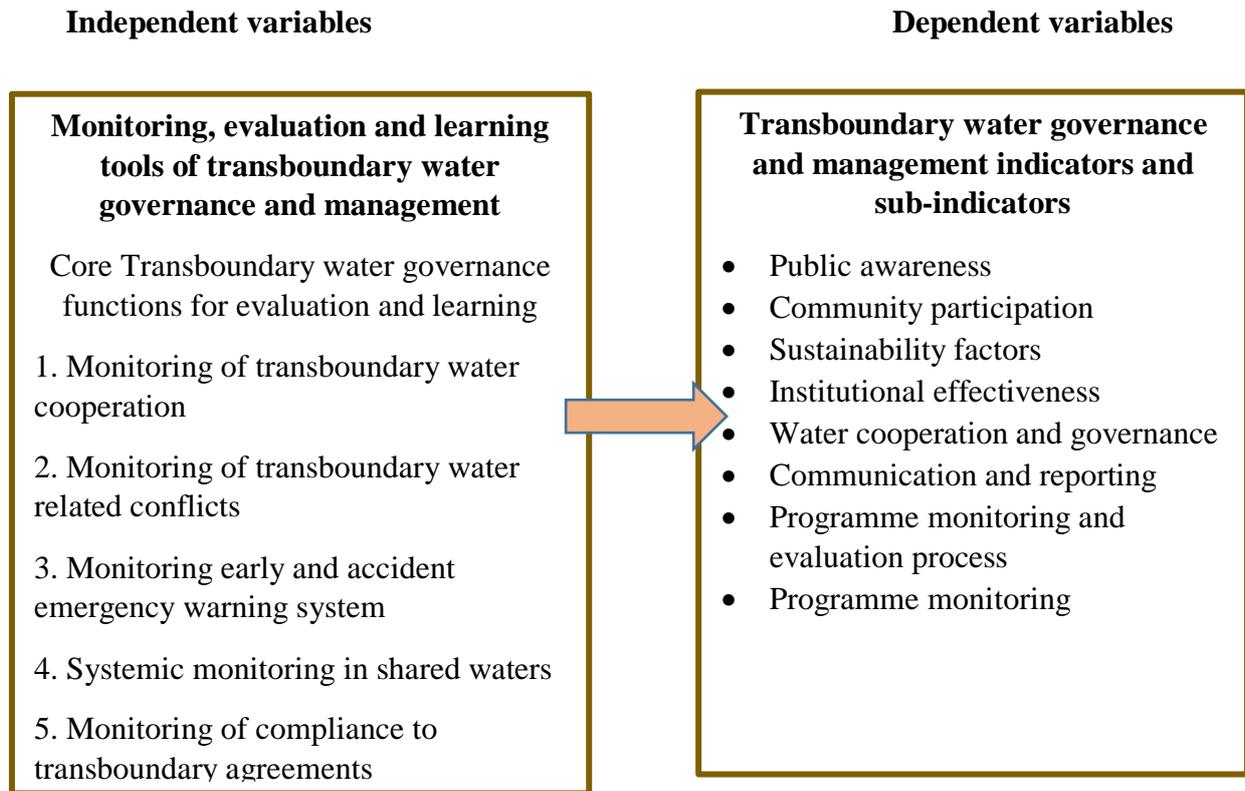
1. To assess the joint management practices and strategies within Tanganyika Lake Basin,
2. To enhance sustainability of the shared lake water resources,
3. To introduce better MEL system that improves water governance and management of the shared water resources of the basin,
4. To improve collaborative work, interconnectivity, economic development and integration among the Lake Tanganyika basin countries.

1.5. Significance of the study

This study contributes to science by identifying any challenges/gaps on Lake Tanganyika water governance and management. It also contributes to a better practice by addressing sustainability issues on Transboundary water governance and management through Learning, one component of Monitoring, Evaluation and Learning framework. The study intends to add a value on Tanganyika Lake policies by suggesting different recommendations to Lake Tanganyika Authority on improving the MEL of transboundary water cooperation, interconnectivity, economic development and integration among the Lake Tanganyika basin countries.

1.6. Conceptual Framework

The conceptual framework tries to show the implementation and relationship between programs or projects 'inputs, outputs, outcomes and impacts on Lake Tanganyika Governance and management. Monitoring, Evaluation and Learning tools are independent variables and Transboundary water governance and management indicators and sub-indicators is the dependent variables.



The MEL framework in this study has six steps (Shaw et al., 2003).

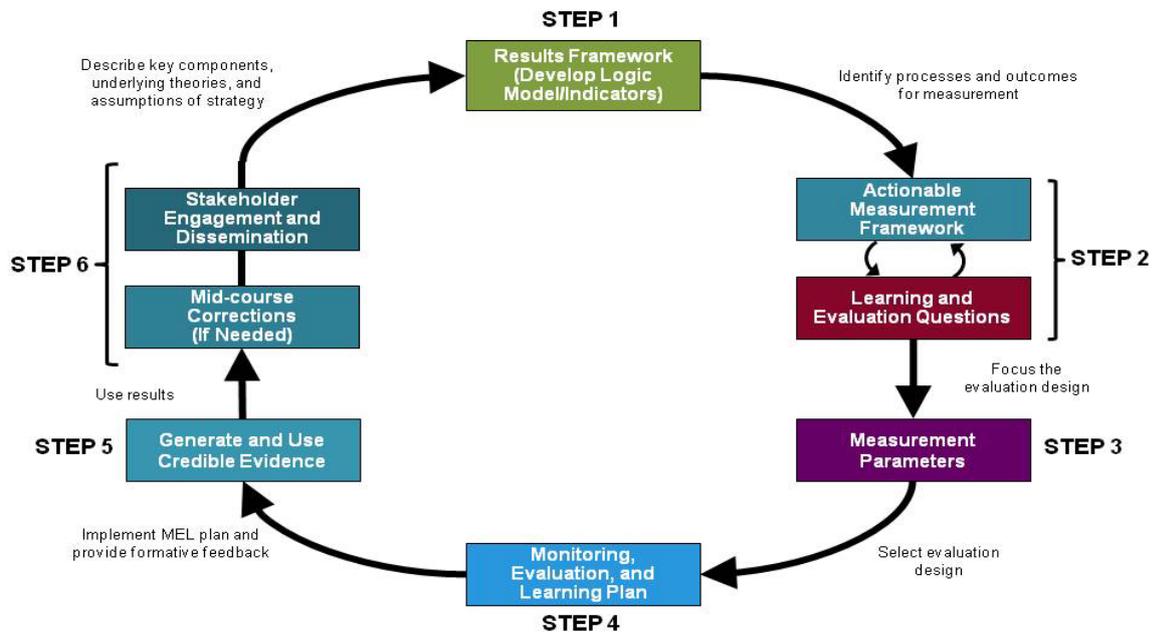


Figure 1: A Framework to understand MEL process ((Shaw et al., 2003)

According to (Rangarajan et al., 2011), the development of the MEL framework starts with results framework (step 1) used to identify key processes and outcomes for measurement. The second step (Step 2) involves using a measurement framework to guide the identification and prioritization of key learning and evaluation questions to the purposes of measurement. The step 3 is to identify broad evaluation approaches to answering each question. This step 3 provides a start-point of step 4, which is the development of a detailed evaluation design and forms the basis of the MEL plan. The next is to document the implementation and effectiveness of the strategy (Step 5) and the last step gives the information to the internal and external stakeholders for various decision-making purposes (Step 6).

There are many frameworks that use indicators in water resources management (Bertule & Forenedes Nationers Miljøprogram, 2017; Hooper & Ward, 2006; Timmerman et al., 2011). For instance, Bertule & Forenedes Nationers Miljøprogram (2017) propose six conceptual frameworks and among these examples, one can be used in water governance, which is the governance and institutional performance framework that focus on the principles of good governance (OECD, 2018). Indicators in this context are used to track the performance of institutions (river basin organisations, water authorities, etc); they also measure the progress towards implementing principles of IWRM.



Figure 2 : Framework application to good water governance principles (OECD, 2018).

1.7. Theoretical concerns

Several studies have been done on Lake Tanganyika but most of them are directed to economic importance of aquatic and fisheries farming (Van der Knaap, Katonda, & De Graaf, 2014) , water quality (Niyoyitungiye et al., 2019), and climate change effects monitoring (Plisnier et al., 2018) but it is difficult to find studies on Lake Tanganyika water governance and management.

1.8. Chapter outline

The thesis is organised in 6 (six) chapters. The first section introduce the study by identifying gaps/challenges to Tanganyika Lake basin, shows what the researcher intends to do, conceptualize the research and select the key components of the research. The second section details the key components such as monitoring transboundary waters, evaluation of transboundary waters, MEL framework and transboundary water governance and management in the literature review; this section also identifies some of the indicators of transboundary water governance and management. The third section shows the methods and material that are used in the research, details of the Tanganyika Basin, population and sampling, procedures and data analysis & reporting. The fourth and fifth section are the parts of results and analysis & discussion. The results are obtained through the proposed methodologies and the data analysis is processed using SPSS software and MS-EXCEL. The final section provides recommendations to improve the identified gaps to policies and provide conclusion.

1.9. Scope of the Study

This research focuses on identifying useful instruments that would help in establishing efficient monitoring, evaluation and learning (MEL) system of transboundary water governance and management based on case studies targeted to the sustainability of the Lake Tanganyika Basin. According to this study, there are three main components namely Monitoring, Evaluation and Learning. MEL system as a transboundary water governance and management tool for Lake Tanganyika Basin for it sustainability. These three components are interdependent and interconnected.

1.10. Definitions of the terms

Some of the core terminologies used in conducting this study related to transboundary water governance & management includes transboundary waters, Lake Tanganyika basin, Water Governance, sustainability, monitoring, evaluation, learning and some of them have several meanings.

There are many definition of Water Governance. According to (OECD, 2018), governance is a “range of political, institutional and administrative rules, practices and processes through which decisions are taken and implemented, stakeholders can articulate their interests and have their concerns considered, and decision makers are held accountable for water management”. The stakeholders are the subjects, individuals or groups, public or private, directly or indirectly involved in the planning process and/or in the implementation phases of the plan.

By transboundary waters, the researcher understands water resources that are shared by two or more sovereign states, and include international freshwater, international groundwater and international large Marine Ecosystems (K. Paisley & Henshaw, 2013). In this context, these are shared water resources within Tanganyika Lake Basin, which is a geographic land area draining into the Lake; also referred to drainage basin. Sustainability of the Lake refers to the avoidance of depleting the natural resources in order to maintain a balance between social, economic and environmental sectors.

MEL is a combination of Monitoring, Evaluation and Learning. Monitoring refers to the routine monitoring of project resources, activities and results, and analysis of the information to guide project implementation whereas Evaluation refers to the periodic (mid-term, final) assessment and analysis of an on-going or completed project. Learning is the process through which information generated from M&E is reflected upon and intentionally used to continuously improve a project’s ability to achieve results (UNDP, 2009).

1.11. Components of the MEL Tools

MEL framework is a tool that has three components. The first is to monitor comprehensively, where the information for learning is collected (Guijt, 2008); the second component is to evaluate selectively as it is difficult to evaluate every specific components. It is better to select those that produce the most value for learning. The third component is learning continuously, as learning can take place during monitoring, evaluation or both M&E (Regeer et al., 2016).

The Learning component can be divided into two subsets such as Learning and reflection and knowledge management.

MEL components and MEL tools components aim to strengthen Monitoring, Reporting and Evaluation Function and build a Collaborating, Learning and Adapting Institutional Practice (Archibald et al., 2018, p.8 ; UNDP, 2009 ; Holley, 2010, p.144).

CHAPTER 2 LITERATURE REVIEW

2.1. Transboundary Water Governance and Management

Transboundary water resources that covers both surface and ground waters and other transboundary resources are the challenging natural resources that require integrated management and governance systems (Gerlak, 2004 ; Akamani & Wilson, 2011). Shared water resources does not follow administrative borders set by human beings (Kibaroglu, 2019). Water crosses borders and boundaries with impunity. Therefore, shared waters become a source of political issues and conflicts (Uitto & Duda, 2002) .What flows from upstream may be harmful in watershed downstream, for example pollution. Scholars have mentioned three ways that emphasize the state of transboundary water resources governance and management based on state-centric approach at geographical scale (Kibaroglu, 2019; Akamani & Wilson, 2011). First, Kibaroglu (2019) notes that most of the literature on transboundary water management in the twentieth century has taken for granted that the governments of nation states are responsible for building institutions of governance for transboundary water resources (p.441). Second, the existence of geographical borders as lines of demarcation for political community which structure problems definitions, management's options and potential solutions. Third, the international law; where transboundary freshwater bodies are governed , at one and the same time by international water law and by the domestic water law of the concerned nations (International Association for Water Law (AIDA) & Burchi, 2019). Therefore, political system has a great impact on the outcome of Transboundary water governance and management as their responsibility is to protect the countries' sovereignty and national rights.

Specific water sharing arrangements and actions as well as principles and practices have been developed at international level to promote awareness in order to overcome the challenges around shared waters (Puri & Aureli, 2005; Kibaroglu, 2019). However, the important task is more attached to surface water than groundwater. Transboundary Water must be shared within and between jurisdictions; which include the right of riparian states to use water without compromising the ecosystem (Jay et al., 2016). International law recognizes that states sharing a basin have an inherent right to a fair share of the joint resource; hence, there is a limited territorial sovereignty over shared water resources (Rahaman, 2009). Several principles, conventions and treaties support the theory on limited territorial sovereignty such as the four principles of the Dublin conference in 1992 namely institutional/management and governance principles, social principles, economic and financial principles and environmental principles

(The Dublin Statement on Water and Sustainable Development - UN Documents: Gathering a body of global agreements, s. d.) (Solanes & González-Villarreal, 1999).

According to (Uitto & Duda, 2002), governance of transboundary waters has often been weak, capacity inadequate and a sense of commitment lacking in Africa. To date, most of the African countries have established the Africa water vision for 2025 with a shared vision “An Africa where there is an equitable and sustainable use and management of water resources for poverty alleviation, socioeconomic development, regional cooperation, and the environment.” Through the vision, there is a call for implementing IWRM and policies. One of the three strategic priorities is to promote good water governance and transboundary water cooperation and improve monitoring, evaluation and knowledge management systems as the crosscutting priorities and actions (United Nations Economic Commission (ECA), African Union (AU) & African Development Bank (AfDB), 2003).

Unlike transboundary surface waters, much emphasis was not given to transboundary groundwater and aquifers by policy and decision-makers. However, programs related to the International Shared Aquifer Resource Management ISARM in different parts of the world have been established such as in Africa, Latin America and Arab States. In Africa, a workshop was organised in Cape Town, in 2000 to set up a network in the SADC to enhance the study and assessment of the southern African regional aquifers. In 2002, a workshop was organised and held by General Water Authority of Libya in Tripoli with the aim to improve the existing knowledge on African shared aquifer systems and prepare an inventory of case studies (Puri & Aureli, 2005).

Transboundary Water governance and management is entirely linked with hydro-politics and hydro-economics. While Elhance (1997) defines hydro-politics as a systematic analysis of interstate conflicts and cooperation regarding international water resources, Meisser (2001) defines it as a systematic investigation of the interaction between states, non-state actors and a host of other participants like individuals within and outside the state, regarding the authoritative allocation and/or use of international and national resources. Hydro economics is the discipline of understanding the current and the potential economic value of water, using hydrologic, economic and social perspectives (Brouwer & Hofkes, 2008). Turton & Henwood, (2002) divided the concepts of hydro-politics in four main groups such as water and conflicts, water and security, water and environment and water, society and culture. Therefore, hydro-

politics become a complex issue since it covers all the dairy life of people. According to Jankielsohn (2012), the management of water is central to politics and future political conflicts.

Lake Tanganyika is presently governed by riparian countries through the Lake Tanganyika Authority LTA established under article 23 of the convention on sustainable management of Lake Tanganyika. Under UNDP assistance and Global Environmental Facility (GEF), riparian countries have agreed to establish common programs on fisheries, biodiversity, pollution control, catchment degradation, economic issues, education and development of joint GIS and management of data (Manikowski & Gündling, 2001; Uitto & Duda, 2002). The objective is to produce an effective and sustainable system for managing and conserving the biodiversity of the lake (University, 2005). Lake Tanganyika Convention on the sustainable management (2003) for example is a framework for improving public participation (Article 17 of the convention) within the context of shared waters management (Milanés Murcia, 2019). Its objective is to ensure the protection and the conservation of the biological diversity and the sustainable use of the natural resources of Lake Tanganyika and its basin by contracting states based on integrated and cooperative management (Article 2 of the convention). More legal instruments (Manikowski & Gündling, 2001) have been put in place to manage Lake Tanganyika waters at national and international level. Global Environment Facility (2010) highlights the need for greater focus on institutional issues (national governance and international relations) to ensure the effective water resources management. The implementation of the joint interstates protocols, agreements among riparian countries embraces the will of establishing sustainability, justice and equity in the utilisation of the shared resources (Onditi et al., 2019).

Although the instruments have been put in place, the effective implementation and enforcement is still a problem as Plisnier, Nshombo, Mgana, & Ntakimazi (2018) recommend a political commitment support for Tanganyika Lake.

2.2. Challenges of Tanganyika Transboundary Lake Basin

Tanganyika Transboundary Lake Basin has many challenges classified in two main categories such as socio-political management and environmental management challenges including governance challenges, changing mind-sets and behaviours of individuals and industrial companies, economic challenges, sedimentation, fisheries management, water resources, planning, development and assessment (Nkotagu, 2008; Van der Knaap, 2018).

2.2.1. Socio-political management challenges

According to (Ogutu-Ohwayo & Balirwa, 2006), the catchment area of Lake Tanganyika is shared by poorest countries in the world with high population densities (Table 1). These countries have the lowest human development index; Burundi (0.417), Tanzania 50.538), DRC (0.457) and Zambia (0.588) (« Human Development Index (HDI) | Human Development Reports », 2019). Within the drainage basin, the expansion of population is high with the rate of population growth estimated to 2 – 3.2 % per year (LTA Secretariat, 2012).

Table1: Population size and growth in the riparian countries (United Nations, 2016)

Countries	Mid-year population (Thousands)		Annual growth (%)	Population densities
	1980	2015	1980-2015	2015
Burundi	4,127	11,179	2.8	435.3
DRC	26,357	77,267	3.1	34.1
United Republic of Tanzania	18,685	53,470	3.0	60.4
Zambia	5,929	16,212	2.9	21.8

2.2.2. Challenges in environmental management

Lake Tanganyika is among the African Great Lakes that are sensitive to climatic and physico-chemical changes (Ogutu-Ohwayo & Balirwa, 2006). Studies have shown that there is a significant correlation between population growth and increasing pollution (Cohen et al., 2005); Michel et al., 2003). According to different studies (Conaway et al., 2012; Niyoyitungiye et al., 2019), the anthropogenic and atmospheric watershed impacts such as climate change, deforestation, agricultural activities, discharge of wastewater from domestic and industrial point sources contribute to the global rise in eutrophication, mercury contamination and so on. There is an increase in fishing activities over the lake (Cirhuza et al., 2015). Therefore, the pressure from human activities has reduced species biodiversity in the Lake. Overexploitation affect mainly fishes and others species (Dudgeon et al., 2006).

The most important consequence resulting from anthropogenic activities is the water quality deterioration. Industrial activities and dumping sites are discharging non-treated water and solid waste into the lake. Therefore, there is a continuous change in physical, chemical and biological

properties of water due to human activities exacerbated by climate change effects and global warming (Schwefel et al., 2019, Naithani et al., 2011). The lake provides fresh water for the surrounding bordering countries. The change in water quality affects economically people and water service providers.

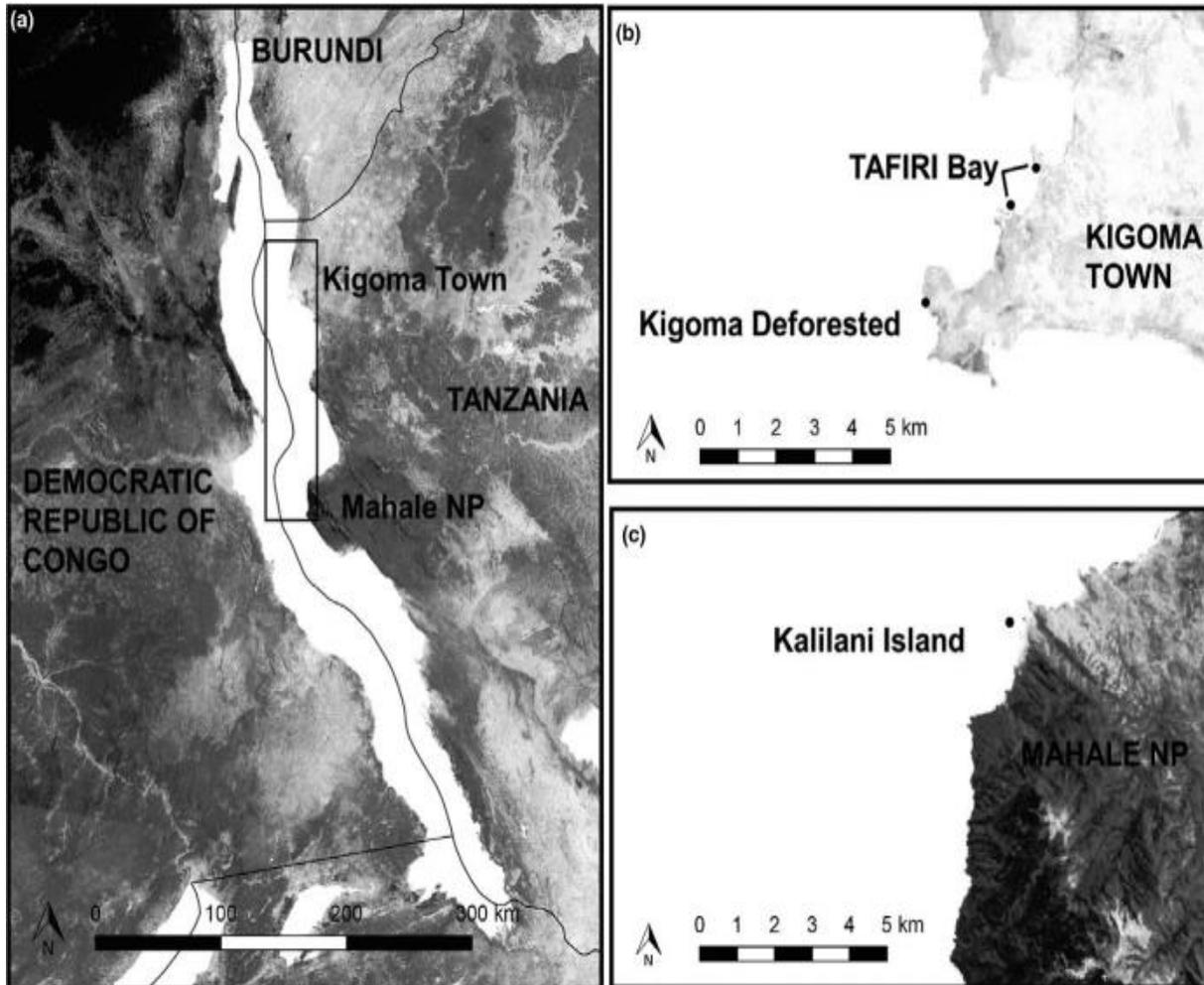


Figure 4: Deforestation within Tanganyika watershed (Britton et al., 2019)

(a) Map of Lake Tanganyika (b) TAFIRI Bay and Kigoma Deforested sites from the northern basin. (c) Kililani site from the central basin. The background of all three maps represents tree cover from 0 % white -100% black (Hansen et al., 2013) in (Britton et al., 2019).

2.2.3. Institutional and governance challenges

Dealing with socio-political and environmental management challenges require adequate and strong institutions and an effective governance system. Despite the lack of studies on

Governance of Tanganyika Transboundary Lake Basin, the riparian countries have signed joint regional programs / projects such as Lake Tanganyika Research Project LTRP (Mölsä et al., 1999), Lake Tanganyika Authority LTA (Van der Knaap et al., 2014) and LTBP (West, 2001). Unfortunately, specific legislation does not exist or lack full implementation. Amongst the problems, lack of resources, poor enforcement of existing regulations, inadequate institutions and institutional mechanisms, governance including stakeholder's commitment and participation and unsustainable funding mechanisms are prevailing for the effective management of Lake Tanganyika (Ogutu-Ohwayo & Balirwa, 2006).

2.2.4. Financing challenges

Lake Tanganyika is among the largest freshwater Lake in the world. Its value depends on how it is managed and protected. Lake waters and ecosystem have an economic value (Reynaud & Lanzanova, 2017). Riparian countries and other stakeholders including water utilities, local governments, NGOs share the common interest and therefore need to avoid or minimize harmful activities and higher cost through nature based and investment. Yet, all the Tanganyika bordering countries are the least developed in the World. With the limited budget allocated to Lake Tanganyika water management, condition uncertainties due to climate change and competing demand, maximize water's value for current and future use become very difficult and complicated. Hence, hydro-economic models are required for sustainable water management (Yildiz, Yildiz, & Yildiz, 2016 ; Yang, Wi, Ray, Brown, & Khalil, 2016). The Lake is the source of wealth for the riparian states and their people; the annual value in on fishery is USD 700 million (Tortell, 2013) plus other socio-economic activities including transportation, water supply, etc. For instance, Bujumbura is using the Lake for its water security in drinking water supply and food security for all the riparian countries (PRODAP, 2007). Most of the people in Bujumbura are dependent upon treated water from Lake Tanganyika for their domestic activities including drinking, socio-economic activities and industries, which means that in case of pollution in Tanganyika waters, it will cost lots of money to water utilities to produce safe drinking water. The impact in either way would be detrimental for the whole economies and quality of life of the people around Lake Tanganyika.

2.3. Integrated Lake Basin Management System (ILBMS)

Integrated Lake Basin Management system (ILBMS) is a new approach developed in 2000 during the world Water forum and ministerial conference in Hague (Hooper, 2003) with the

objective of achieving sustainable development of the Lakes/ivers as well as improve basin governance (Lin et al., 2013). The ILBMS is a subset of IWRM promoted as a means of more realistically managing water resources, based on a participatory approach (Jaspers, 2003). The concept of ILBMS is used to manage, protect and improve efficiently water treatments, rehabilitate of degraded waters in a river or Lake and deal with climatic variabilities (Sharip & Jusoh, 2010).

On Lake Tanganyika rising issues; the Lake Tanganyika Regional integrated management programme (LTIMP), the TDA, the convention on sustainable management of the Lake Tanganyika that established the Lake Tanganyika Authority in 2008 are the examples of ILBMS that have been put in place for the sustainability of the Lake. The ILBMS needs also to be supported by organisational models as (Mostert, 1999) identified 3 models such as hydrological model, administrative model and coordination model. The ILBMS encompasses six essential governance themes or pillars as supporters of ILBMS: Institutions, policies, participation, technologies, information and finance (Shailendra & Masahisa, 2010). Lake Tanganyika Basin involves many stakeholders competing for effective participation in decision making (Mölsä et al., 2002). Interacting with the institutional factors within ILBMS is very complicated. On one hand, we have inter-sectoral competition coupled with interstates aspects. All the stakeholders need to participate in decision-making process. On the other hand, the investment in skill and knowledge is affected by multiple factors related to organisational decision (Rodriguez Perez Jesus, 2003). However, financial mechanism can help to improve ecosystem services at watershed scale (Wegner, 2016).

In terms of Tanganyika Basin conservation and sustainability, a range of policies, strategies and programs has been signed. In 2003, riparian countries signed a joint convention on sustainable management of Lake Tanganyika that is concerning sustainable fisheries management, prevention of sedimentation and environmental impact assessment (Milanés Murcia, 2019). In 2009, the four riparian countries developed a SAP (to be updated regularly) for protection of diversity and sustainable management of natural resources in the Lake and its basins with six priorities:

1. Adaption and resilience to climate change impacts,
2. Sustainable fisheries,
3. Sustainable land management,

4. Protection, restoration and management of critical habitats,
5. Control and prevention of biological invasions,
6. Reduced pollution and improved water quality.

The SAP is strengthened by the environmental and social principles that underlie the convention on Biodiversity, agenda 21 and Dublin principles (Hodgson, 2000). According to the final evaluation executed in 2013, the process of project implementation was appropriate but more time and financial means to be allocated to the in-country review of national legislation was recommended (Manikowski & Gündling, 2013).

2.4. Monitoring Transboundary Basins

According to UNDP (2009), monitoring is defined as the on-going process by which stakeholders obtain regular feedback on the progress being made towards achieving their goals and objectives. Monitoring systems help to support good basin governance and provide basic management information to improve decision –making process. Monitoring seeks to answer the questions related to the pre-identified outputs and efficiency of the results. It responds to the questions about issues, risks and challenges being faced or that may be foreseen to ensure the achievement of results. Monitoring leads to the decisions needed for any changes in the planned work. It checks the continuous relevance of the outputs the activities in order to achieve the envisioned outcomes; it also checks the relevance and effectiveness of the outcomes for achieving the overall goals and impacts. Finally, monitoring provide lessons to the managers (Archibald et al., 2018).

Monitoring transboundary Basins involves agreements and other arrangements between riparian states to ensure long-term sustainable cooperation (Hussein et al., 2018). Monitoring transboundary Basins follows certain indicators that promote operational arrangements for water cooperation in transboundary basin. The operational arrangement needs to meet the following criteria (« Step-by-Step Methodology for Monitoring Transboundary Cooperation (6.5.2) », s. d.) :

- there is a joint body, joint mechanism, or commission (for example, a river organization) for transboundary cooperation;
- there are regular (at least once per year) formal communications between riparian countries in the form of meetings (either at the political or technical level);

- there is a joint or coordinated water-management plan(s), or joint objectives have been set;
- There is a regular exchange (at least once per year) of data and information.

However, Hussein, Menga and Greco (2018) note that the four criteria are not enough to a positive and equitable operational arrangement to reduce conflictive and increase cooperative hydro political relations. Hence, there is a lack of power asymmetries among riparian countries (Hussein & Grandi, 2017). For instance, the case of Nile basin.

Monitoring has four levels: Monitoring of intermediate outcomes, interventions (=outputs), activities and inputs. A set of processes guides the monitoring activities:

- Identifying a set of activity, intervention/output, and intermediate outcome indicators specific to the intervention;
- Identifying sources for quantitative and qualitative information on these indicators
- Data collection, analysis, and reporting.
- Monitoring of inputs at the organizational level.

Within Tanganyika Transboundary Basins with all its challenges, monitoring transboundary waters needs transboundary cooperation to prevent negative impacts (Bergesen et al., 2018). Therefore, Water Convention provides a sound framework for transboundary cooperation in the context of adaptation to climate change.

Many Technical skills such as GIS, modelling, remote sensing (Chowdary et al., 2001; Skoulikaris et al., 2018) can be used to monitor Transboundary Lake basin. On Tanganyika Transboundary Lake Basin, Plisnier, Nshombo, Mgana, & Ntakimazi (2018) have proposed remote sensing to monitor various surface parameters to reduce the cost of regular monitoring activities as well as the collaboration with international partners. Joint monitoring efforts serve to build trust and confidence among nations and partners (Gerlak, 2004).

2.5. Evaluation of Transboundary Basins

Hockings, Stolton, & Leverington (2006) defines evaluation as the judgement of the status/condition or performance of some aspects of management against predetermined criteria. Evaluation complements monitoring by providing independent and in-depth assessment of

what worked and what did not work and why; it involves guiding principles, norms, policy, standards and processes (UNDP, 2009).

According to GEF, the international organisation in charge of Environmental management including transboundary waters, evaluating transboundary waters projects should focus on how well projects are fulfilling:

- Governmental concern around international water issues by creating, collecting and disseminating scientific knowledge and building linkages to other issues beyond water quality and quantity, such as trade and biodiversity, land degradation, tourism, fisheries, poverty alleviation concerns, urbanisation, population growth, migration, etc.;
- Contractual environment by creating and strengthening international conventions and agreements and enhancing regional collaborating governing bodies.
- National capacity by transferring knowledge and technical capacity to boost bureaucratic power and creating forums for the stakeholder collaboration for effective change.

One of the important steps that has been done within Tanganyika Basin is the Transboundary Diagnosis Analysis TDA (West, 2001) and a strategic action Program SAP for Lake Tanganyika (2012). The TDA provides an analysis of the major threats within a basin. It is also the basis for a SAP of actions to address the priorities identified from the TDA. The two approaches are at the heart of creating and disseminating scientific knowledge and enhancing contractual environment as well as promoting IWRM (Gerlak, 2004). All the two frameworks require budget.

Evaluating financial resources allocated to water resources refers to hydro-economic analysis of water-related activities and scenarios within transboundary waters such as basin development decision, human development, climate change and so on (Yang et al., 2016; Kahil et al., 2018). Hydro economic solutions are based on the DSS tools developed to evaluate economic trade-offs and optimize the management of water and other natural resources. They connect human and natural systems and analyse the value of water resources and aquatic ecosystem to the society (Brown et al., 2015). Hydro economic models are solution-oriented tools for

discovering new strategies to advance efficiency and transparency in water use (Harou et al., 2009).

2.6. The MEL framework

According to (Jiménez et al., 2020), Monitoring, evaluation and learning for Transboundary Water Governance and management is among the core governance functions that refers to five important points namely monitoring of transboundary technical cooperation, monitoring of water related conflict, early and accident emergency warning systems, systematic monitoring in shared waters and monitoring compliance to transboundary agreements. Studies on transboundary water cooperation in the context of Sustainable Development Goal Indicator 6.5.2 methodology (Hussein et al., 2018; McCracken & Meyer, 2018) involves assessing the operational cooperation; cooperative arrangement; joint body, mechanism or commission, regular meetings; joint management plan and regular exchange of data and information. Water related issues in transboundary waters management create interstates tensions that hamper significantly economic development, security and integration at national and regional level (Battistello Espíndola & Ribeiro, 2020; Zeitoun & Mirumachi, 2008).

The MEL approach is used to guide efforts to monitor progress, make adjustments or mid-course corrections and evaluate outcomes of any program (Shaw et al., 2003). The framework seeks to contribute to sustainability of projects through advancing collaborative and adaptive learning and research activities (Weber et al., 2018). According to Shaw, Sloan, Sridharan, & Thomas (2003) , MEL framework consists of the program logic model as well as key learning questions to be addressed in the evaluation process. MEL framework is taken as an integral part of successful and thoughtful development interventions (Claire & Banerjee, 2019).

2.6.1. Framework Development process

The development of MEL framework involves a theory of change and logic model (ORGANISATIONAL RESEARCH SERVICES, 2004 ; Child et al., 2015). The ToC is based on core capacities as the inputs that are used to carry out impact, leverage and influence strategies towards community change. Core capacities may be collective vision and results framework, governance structure, communication plan structure, support collaborative learning and accountability to results, etc. According to UN (2015) in (*Water and Climate Change Adaptation in Transboundary Basins*, 2015), monitoring and evaluation tools should include

performance indicators, the logical framework, theory of change evaluation, formal surveys, rapid appraisal methods, participatory methods, public expenditure surveys, cost-benefit analysis and impact evaluation.

2.6.2. MEL Framework indicators

Practitioners, basin managers and water resources managers have used indicators for different purposes in many studies. For instance, SDGs is a framework that uses indicators to fulfil certain targets including water and sanitation. According to (Hooper & Ward, 2006), within IWRM, there are 115 indicators of best practices. Indicator is defined as any quantitative or qualitative measure used to assess the state or a process, system or entity or its performance relative to a benchmark. In this context, qualitative transboundary water governance and management indicators are considered for MEL framework (OECD, 2018).

CHAPTER 3 MATERIAL AND METHOD

3.1. Description of the study area and population of the study

Lake Tanganyika, the first deepest lake in Africa and the second deepest lake in the world located at 6°30'S 29°50'E is shared by four riparian countries: Burundi, Tanzania, DRC and Zambia. All the four countries are on the shoreline of 1,828 km with different proportions: DRC (43%), Tanzania (37%), Zambia (11%) and Burundi (9%). Tanganyika is located at an elevation of about 772 m above mean sea level in the Western part of the Great Rift Valley. The overall surface area of Lake Tanganyika is approximatively 33000km² with an average depth of 600 m and the total volume of water is estimated to 19,000 km³ (Hodgson, 2000).

Lake Tanganyika is facing many problems that are affecting different group of people at all levels. Many projects are trying to address some of these problems selectively but with the same objective of sustainability of the Lake. The population of this study is all the stakeholders from projects, institutions, government officials and public. However, there are no major studies conducted on stakeholder's activities by group and gender.

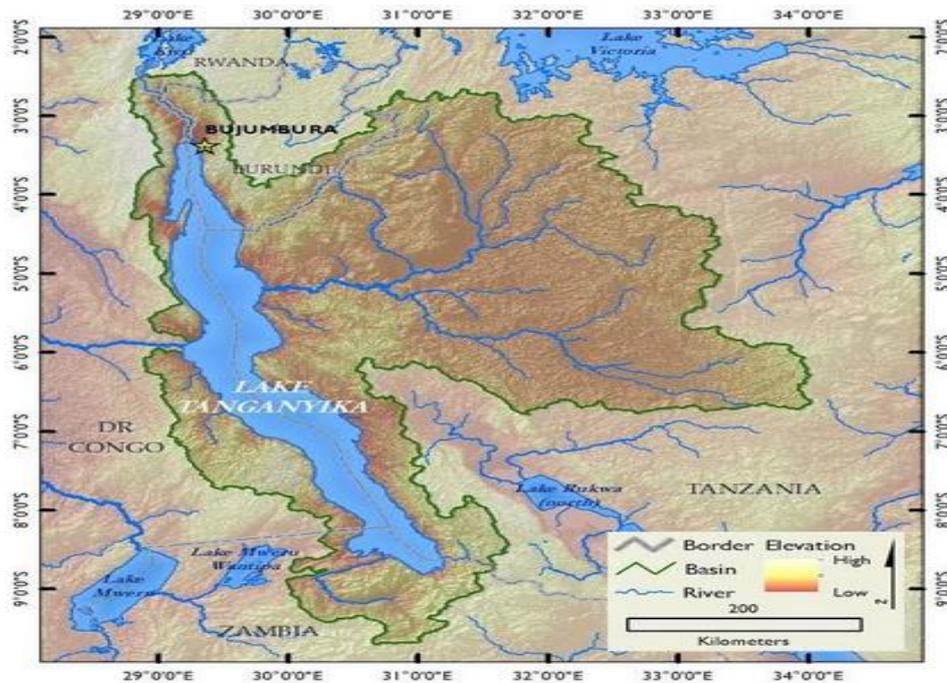


Figure 5 : Map of Tanganyika Lake Basin (Lake Tanganyika / AGLI, s. d.)

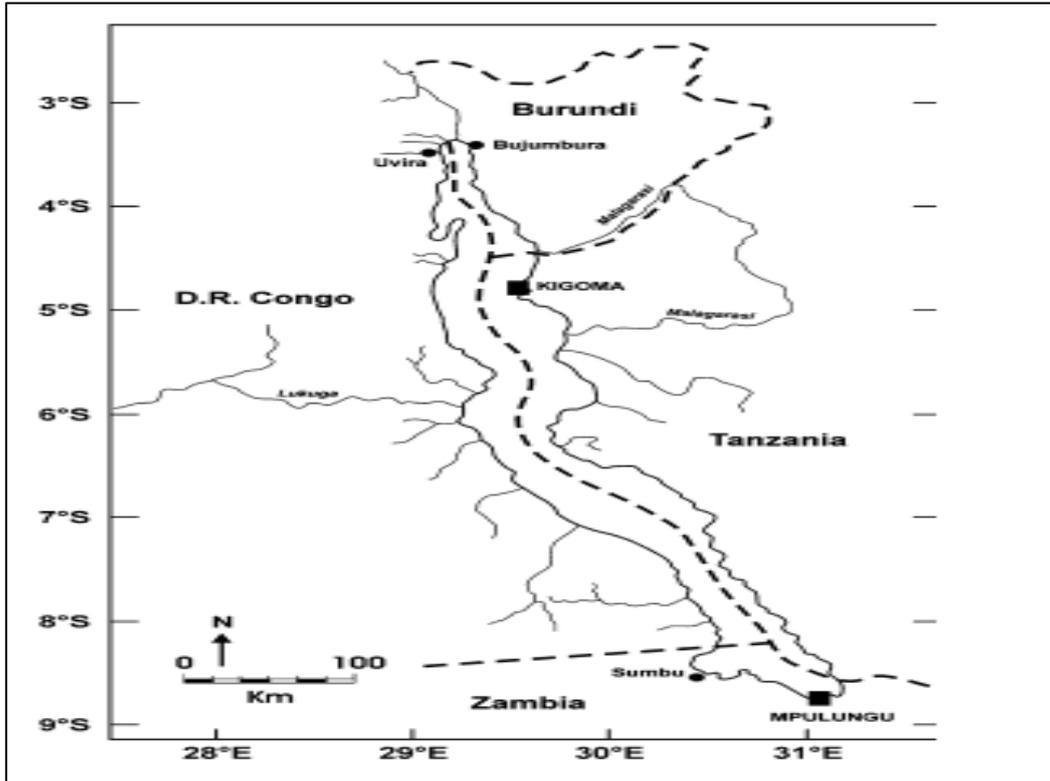


Figure 6 : Geographic map of Lake Tanganyika (Naithani et al., 2011)



Figure 7: Sampling localisation (Rumonge, Bujumbura urban, and Bujumbura rural)

3.2. Research Methodology

This study analysed the concept of MEL tools both at organisational and programme level to provide information needed for decision-making, planning and operational transboundary water Governance and management within the existing programme taking into consideration different stakeholders at different levels; national and local. This included the identification of populations who were evaluated (institutions, NGOs, etc.) and map all actors involved in Tanganyika water management. Four important subsets of monitoring and evaluation were considered namely legislation and commitments, institution arrangements, project management and public participation and awareness.

The researcher's findings and results was based on both qualitative and quantitative methods to gather data. The researcher conducted a qualitative analysis via both semi-structured and structured interviews through a designed questionnaire as the primary data.

All the range of data collected was organised and archived in an objective way and dynamic, to allow the institutions to update, modify, extract and analyse them. Statistical methods using SPSS and MS-EXCEL helped in data processing and construct the researcher's final recommendations. Interviews and observation were transcribed or recorded. A combination of data (qualitative and quantitative) determined or highlighted the criticalities and relations between them, identified causes of problems and finally guided the researcher to the design of the MEL framework that can be undertaken towards sustainable management of Lake Tanganyika.

Table 2: Data Collection Method and corresponding objectives

Objectives	Types of Data	Approach		Sources of Data
		Participatory	Non participatory	Primary &Secondary
Assess the joint management practices and strategies within Tanganyika Lake Basin	Qualitative	-Individual interviews (closed and open-ended)	Direct observation without discussion -Semi-structured	-LTA documents -Universities -Fieldwork -Surveys Interview...

Objectives	Types of Data	Approach		Sources of Data
		Participatory	Non participatory	Primary &Secondary
Enhance sustainability of the shared lake water resources,	Qualitative	-Individual interviews	-Structured surveys	-Fieldwork
	Quantitative	-Scoring -Ranking		-Government documents -Survey reports -LTA documents
Introduce better MEL system that improves water governance and management of the shared water resources of the basin,	Qualitative	Individual interviews	Structured surveys	- Government documents
	Quantitative	-Scoring		-Interviews -Survey reports,-Etc.
Improve collaborative work, interconnectivity, economic development and integration among the Lake Tanganyika basin countries.	Qualitative	-Individual interviews	-Structured surveys	-Government documents
	Quantitative	-Scoring		-LTA documents -Survey reports

Table 3: MEL components and methodology for data collection

MEL components	Data collection
Monitoring components	Quantitative data -Surveys
	Qualitative data (narrative) -Interviews -Surveys - Observations (Tanganyika water level rising) -Completion reports
Evaluation components	-PRODAP evaluation reports -Annual reports -SAP (2012) Question to answer during evaluation: why and how things work?
Learning components	-Programme planning and design -Implementation of findings

MEL components	Data collection
MEL for Transboundary water governance and management	-Theory of change - Learning questions -MEL plan Questions : - Who is intended to learn? - When and how learning will appear.

3.3. Research Design

This research is both a qualitative and quantitative study. The qualitative approach of this study focuses on human behaviour, understandings, experiences and observations. The aim of this method is to understand and interpret the meaning from the counterpart interviews, research already done, Universities, institutions etc. The qualitative approach is appropriate for this study because the data collected and used focuses on the participants ‘understanding and experiences. The research attempts to disclose which means involved stakeholders of the Lake Tanganyika governance and management programs assign to a learning perspective within the monitoring and evaluation systems. Some information collected were interpreted quantitatively.

3.4. Sampling techniques

A non-probability sampling method was used to select the study population. A number of participants who could affect (be affected by) the Lake management was prioritized. Therefore, government officials, NGOs, fishermen were selected at the first time. However, additional people were added such as scholars. The goal of this survey is to be representative in collecting data with participative methods of data collection. The researcher together with the supervisor has identified different people (self-selection sampling) who were contacted in order to complete the research. The sampling strategy was based on the individual role/activity, Institutional aspect that the person is likely to influence / affect the management and governance of Lake Tanganyika. All the respondents were from the same geographical area.

3.5. Targeted Sample size

Within this study, participants were selected based on the relevance of their projects either to affect Lake Tanganyika management or to be affected. The target was to conduct interviews with the people who work in the projects or institutions related to Lake Tanganyika management. About 27 participants (83 % men and 17 % women) among them seven experts

from government, NGOs and private sector, academicians and the public responded to the survey.

3.6. Data collection instruments

The study used two types of questions; open-ended and close-ended questions. A qualitative data transcribed from interviews and analysis of documents was used and interpreted to extract key findings. The interviews started with the preparation and introduction to the participants.

Survey questionnaire was produced in English, which was translated in French and Kirundi (the local language) for the people who do not have the ability to understand French. During data collection and M& E process, materials such as recorder, pen, papers (questionnaire), and field plan were used. The audience was asked to fill the checklist as per their observation and perceptions. In some cases, phone communications were used to contact officials in order to allow the researcher to conduct the research in their institutions. The issues were reported to the competent authority (internship host institution) as well as to the university supervisor. Reports, communications and final version of the research are part of results method applied to MEL process.

Exploratory information were collected via qualitative and quantitative methods through exploratory and formal standardized Questionnaires. The closed-ended questions were leading questions framed in Likert 5-point scale in different statement mode. Unstructured questions for the open-ended questions were used to obtain viewpoints, opinions, attitudes, relationship and inter-connections.

3.7. Documents review

The Lake Tanganyika Authority Secretariat has shared some documents for allowing the student to design and understand the process of monitoring and evaluation within Lake Tanganyika Authority. A combination of LTA projects documents and report & literature review documents (Journal paper, books, internet...) helped to select transboundary water governance and management indicators.

3.8. Study Administration and ethical considerations

A semi-structured interview was conducted with a maximum of ethical considerations. The field plan for data collection considered the ethical consideration. The Participation in the study was on voluntary basis. Some participant refused to answer but sometimes they suggested who could help. Before starting the interview, to inform a consent was taken seriously. The interview process started with a short introduction, a summary of the content of the questionnaire and the objective of the research. The research ensured that the responses of the participants were kept confidential. After the project, the participants should be able to access the final work if they want through the archives of the Lake Tanganyika Authority or consult google.

3.9. Data collection, management and analysis

3.9.1. Survey Tools and Pilot

Through this study, two respondents with a broad M&E experience were involved to test the goodness of the questions. This was sent to them using the email.

3.9.2. Data Collection Procedures

The primary data were collected using two approaches, participatory and non-participatory approaches. However, the two approaches had various methodological advantages, benefits and challenges. The most important advantage of participatory approach is the knowledge development and action as well as community development (Gray et al., 2000). It provides well-informed objective information but suffer from being based on the views of only a few individuals in the region, participatory Monitoring and Evaluation empowering, cost-effective, more relevant and more accurate (Guijt et al., 1998). The participatory approach may be affected by political or ideological agenda of the organisation among others challenges.

3.9.3. Management of Fieldwork

Vehicles or motorcycles for field transportation and data collector helpers were hired sometimes. During the interviews, the material such as notepads, pens and recorder were carried.

3.10. Development of monitoring, evaluation and learning framework

3.10.1. Programme design/formulation

This research focuses on all the projects that have been executed by/under the supervision of Lake Tanganyika Authority. They helped to design MEL survey research. The questionnaires were formulated based on different projects objectives, output, activities and targets.

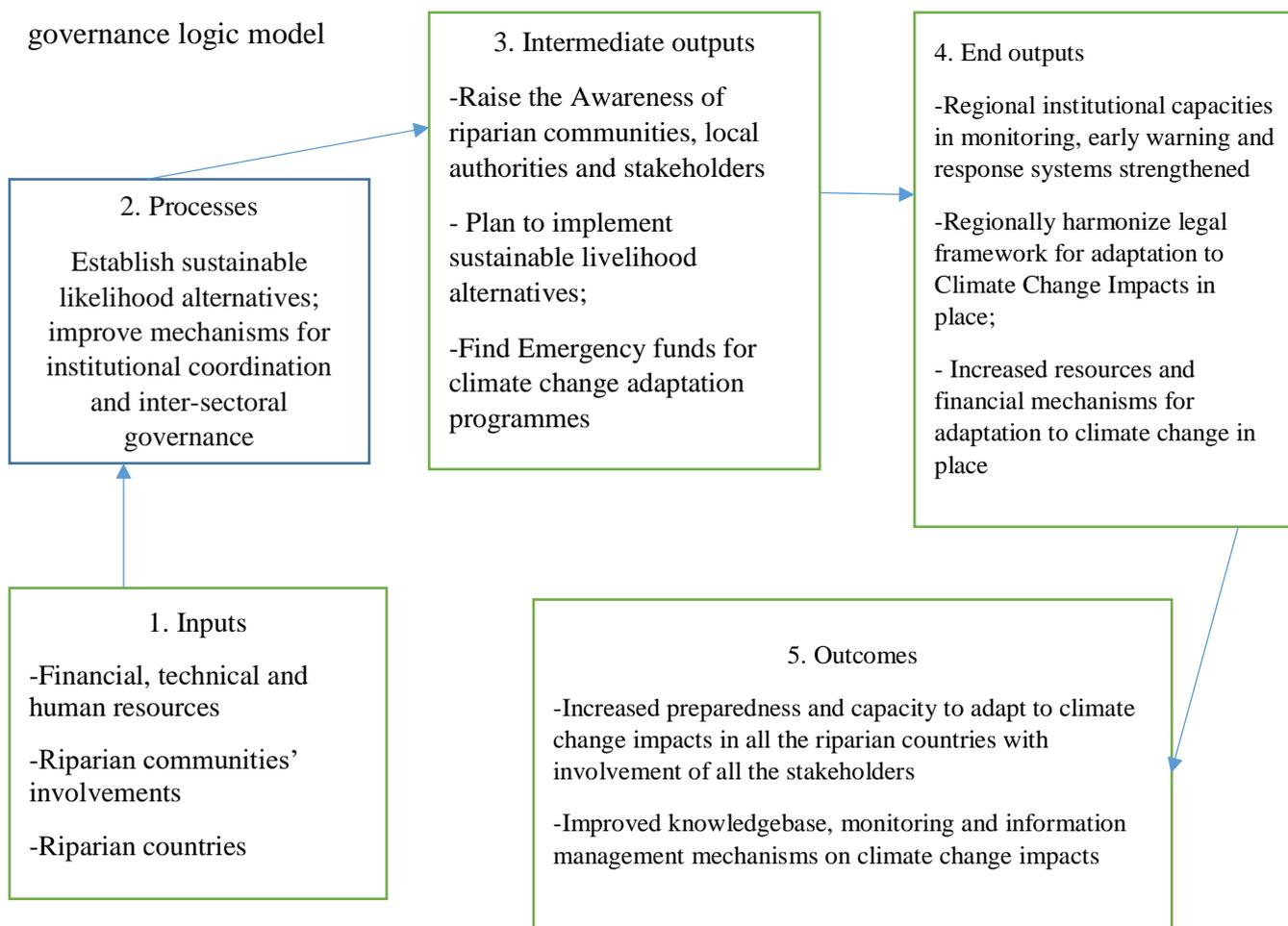
In Burundi, the LTA program on sustainable management of Lake Tanganyika complies with the national actions and policy documents that govern mostly environmental issues. The SAP is specifically linked to the following policy documents and legislation: The environmental code (2000), Measures to apply the environment code in relation to the environmental impact assessment (EIA) procedure (2010), Initial communication on the impact of greenhouse gases on climate change in Burundi (2001), growth and poverty reduction strategic framework (2006), and so on. The most relevant policy documents are the national adaptation plan of action to climate change (NAPA/CC) and the National Strategy and Action Plan for Biodiversity (SNPA –DB) adopted in 2000. (LTA secretariat, 2012, Page 106-107).

3.10.2. Results framework (Develop Logic Model/Indicators)

3.10.2.1. Logic model development

On Lake Tanganyika, the logical framework was developed using the broad objectives of the LTA program through SAP (2012). The SAP detailed the result-based indicators framework including verifiable indicators, the target, baseline indicators, short term results, medium-term results and long-term results as well as the risks and assumptions. All the indicators developed in the SAP (2012) are the qualitative indicators.

Example of logic model for increased preparedness and capacity to adapt to climate change impacts in Tanganyika lake Basin (LTA Secretariat, 2012:72) adapted from collaborative governance logic model



3.10.3.2. Programme theory of change underlying PRODAP (2007) adapted from (ORGANISATIONAL RESEARCH SERVICES, 2004)

Broad outcomes area (Initiative strategies)	Outcome statements
Change in regional consultation and cooperation	<ul style="list-style-type: none"> -Reduce potential sources of conflicts in the region -Active participation of the population in fisheries development and environmental protection -Local authorities and associations will be closely associated with the management of community infrastructure and equipment. -Very good interactive method of communication and the sharing of information and communication -Promote good governance
Change in policies and regulations (Harmonization)	<ul style="list-style-type: none"> -Standardize the prohibition of harmful fishing gear and practices

Broad outcomes area (Initiative strategies)	Outcome statements
	<ul style="list-style-type: none"> -Prevent conflicts between fishermen, and ultimately between the States -Promote good local governance
Change in wastewater collection and treatment system	<ul style="list-style-type: none"> -Reduce organic and chemical pollution

Table 5: Theory of Change underlying PRODAD and its impacts adapted from (ORGANISATIONAL RESEARCH SERVICES, 2004)

Outcome area (Initiative strategies)	Outcome statements
Change in living conditions of the population	<ul style="list-style-type: none"> -Better environment protection of the Lake -Rational use of the Lake resources -Promote good local governance
Change in economic conditions (Food security)	<ul style="list-style-type: none"> -Decreased poverty -Increase in net income -Sustainable economic growth -Economic cooperation and regional integration
Change in community infrastructure and equipment	<ul style="list-style-type: none"> -Enhance fish products -Promote trade -Ensure the social and economic welfare of the riparian population
Change in environmental education	<ul style="list-style-type: none"> -Sensitize the population on the implications of harmful fishing practices -Ensure their participation in biodiversity conservation and environmental protection. -Reduce risk of over-exploitation -Avoid destructive fishing practices

3.10.4. Learning and evaluation questions & actionable measurement framework

The indicators for MEL framework were identified using the problems that the LTA programs sought to address, past projects, literature reviews and the SAP (2012). A set of preliminary indicators were selected namely awareness, sustainability factors, participation, institution effectiveness, water cooperation and governance, programme monitoring and evaluation process, program monitoring process, communication and reporting. For each indicators, there are sub-indicators.

3.10.5. Measurements options

3.10.5.1. Measurement parameters

In this study, the focus is the identification of useful instruments that would help to introduce and adapt a better MEL framework for transboundary water governance and management through the evaluation and learning questions.

3.13.5.2. Monitoring, Evaluation and Learning plan and implementation

The contracting states, its funding partners and many stakeholders on the front line experts from the four countries bordering Lake Tanganyika completed the Transboundary Diagnosis Analysis (TDA) in 2000 and later the SAP. Through the SAP, the program has identified key governance and development challenges include the lack of sustainable livelihood, insufficient resources and financial constraints for adequately dealing with IWRM issues, inadequate updating, implementation, enforcement and monitoring of legislation, lack of sufficient mechanisms for institutional coordination and inter-sectoral governance and lack human resources and technical capacity in dealing with IWRM issues.

The convention on the sustainable management of Lake Tanganyika requires that the contracting states shall monitor the effectiveness of the SAP and shall revise it as necessary (Article 13, Paragraph 3 of the convention). LTA secretariat is responsible for overall coordination, monitoring and evaluation of the implementation of the SAP (LTA Secretariat, 2012, page 64:1). LTA Secretariat identified baseline indicators. They are included in the SAP documents. A regional framework for progress monitoring is required to be updated and linked to the current SAP. The monitoring process should be in a participatory and transparent manner. LTA secretariat reports twice a year to the national steering committees of the riparian countries. The results-based indicators generated through M&E process serve as an important tool to ensure the emerging issue.

Despite all the instruments that have been put in place, the implementation remains a problem for the sustainability of the Lake. For instance, the direction in charge of monitoring and evaluation is vacant. The LTA also lack financial means.

CHAPTER 4: PRESENTATION OF RESULTS

4.1. Respondent's information background

Table 6: Gender distribution of respondents

		N	Frequency
Valid	Male	22	83.3
	Female	5	16.7
	Total	27	100

Table 7: Age distribution of the respondents

		N	Frequency
Valid	15 - 24	1	4.2
	25 - 44	18	66.7
	45 - 64	7	25
	65+	1	4.2
	Total	27	100

4.2. Water use and management

Table 8: Sector distribution of the respondents

		Responses		
		N	Frequency	Percent
Sector distribution	Domestic drinking water	27	18	32.70%
	Fishing	27	14	25.50%
	Navigation	27	5	9.10%
	Industry	27	4	7.30%
	Transport	27	5	9.10%
	Other	27	9	16.40%
Total		27		100.00%

Table 9: Channel use Distribution to know Lake Tanganyika Authority

		Responses		
		N	Frequency	Percent proportion
Channels distribution frequencies	The Website	27	5	13.20%
	The Radio	27	7	18.40%
	Newsletters/Brochures	27	4	10.50%
	Friends/people	27	8	21.10%
	Others	27	14	36.80%
	Total	27		100.00%

4.3. Respondent's position

The below mentioned chart illustrates an overview of the respondents background where quarter (26%) of them are fishermen due to the fact that they are more affected of the management of the Lake than others, they rely on fishing activities. The key informants were from the department is charge of integrated water resources management (IWRM), the department of fisheries management and forestry and Lake Tanganyika water management (LATAWAMA).

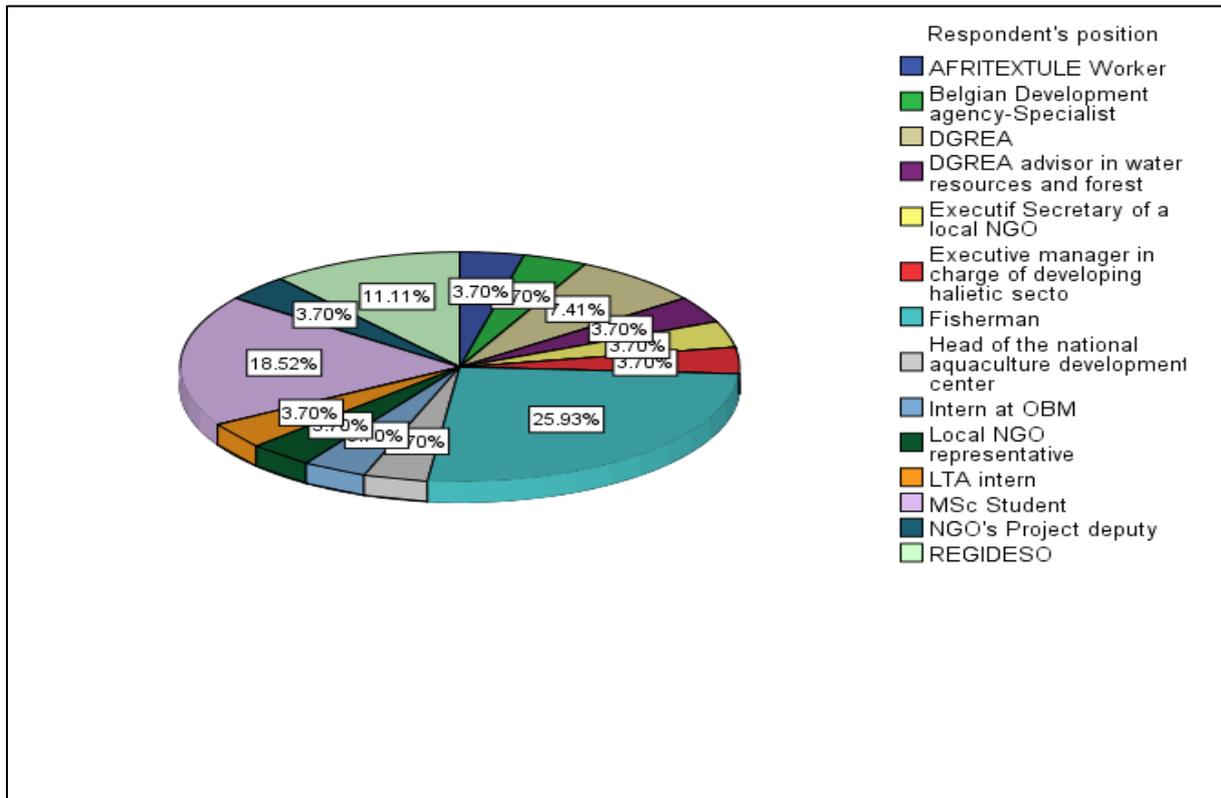


Figure 8: Breakdown of the respondent's position in the study

Level of satisfaction with the management and governance of Tanganyika waters.

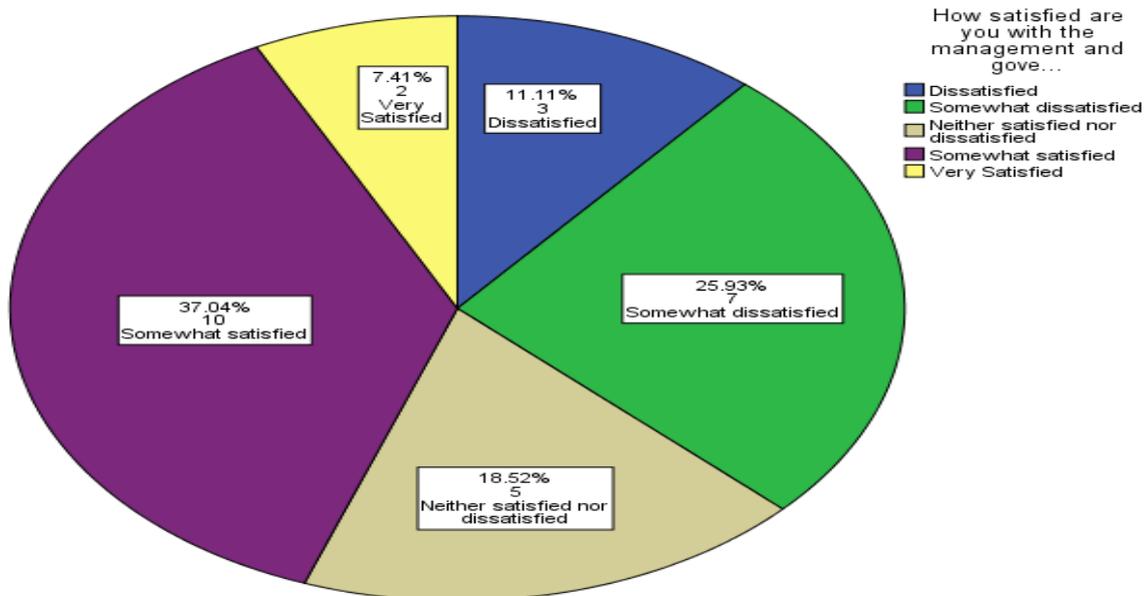


Figure 9: Level of satisfaction of the governance and management of Tanganyika waters.

4.4. Data analysis of the key indicators

Through this research, transboundary water governance with three (3) main targets related to public awareness, sustainability factors and community participation were taken as core indicators for this research.

The following tables will detail the percentage distributions of responses on different indicators and sub-indicators targeted in the research:

Table 10: Percentage distribution of responses for Monitoring and Evaluation on a Likert scale of 1 to 5

Indicators	Institutional Sub-indicators	Highly satisfactory (5)	Satisfied (4)	Neither satisfied nor dissatisfied (3)	Dissatisfactory (2)	Highly Dissatisfactory (1)	Total
Programme Monitoring and Evaluation process	Adequacy of the project/programme Monitoring and Evaluation process	3.7 %	33.3 %	51.9 %	11.1 %	0%	100 %
Programme Monitoring process	Regional Monitoring and surveillance system is developed, adopted and implemented	11.1 %	22.2 %	51.9 %	11.1%	3.7 %	100 %
	Regional monitoring, early warning and response systems are developed, adopted and implemented	7.4 %	22.2 %	33.3 %	33.3 %	3.7 %	100 %
	Mean	7.40%	25.90%	45.70%	18.50%	2.47%	100.00%

Table 11: Percentage distribution of responses for communication and reporting on Likert scale

Indicators	Institutional Sub-indicators	Highly satisfactory (5)	Satisfied (4)	Neither satisfied nor dissatisfied (3)	Dissatisfactory (2)	Highly Dissatisfactory (1)	Total
Communications and reporting	Communication to the public (web site presence...)	18.5 %	29.6 %	22.2 %	29.6 %	0	100 %
	Effective exchange mechanisms of data and information	7.4 %	40.7 %	37 %	11.1 %	3.7 %	100 %
	Communication channels among decision makers, scientists, and stakeholders	18.5 %	25.9 %	44.4 %	7.4 %	3.7 %	100 %
	Mean	14,8%	32,07%	34,53%	16,03 %	2,47 %	100%

Overall rating of the communication and reporting indicator:

Highly satisfactory	Satisfactory	Neither satisfied nor dissatisfactory	Dissatisfactory	Highly dissatisfactory	Rating
		34,53 %			Neither satisfactory nor dissatisfactory

Table 12: Institutional effectiveness and water cooperation factors

Institutional Sub-indicators	Excellent	Very good	Good	Average	Poor	Total
Level of Authority to the Burundian (riparian countries) institutions	14.8 %	37 %	40.7 %	3.7 %	3.7 %	100 %
The economic and technical capacity of the riparian states for implementation	7.4 %	11.1%	33.3 %	40.7 %	7.4 %	100 %
The institutional design processes and mechanism used for inter-institutional coordination	14.8 %	22.2 %	29.6 %	29.6 %	3.7 %	100%
Mean	12.33 %	23.4 %	34.53%	24.67 %	4.93 %	100 %

Overall rate for the institutional effectiveness

Excellent	Very good	Good	Average	Poor	Rating
		34.53%			Good

Table 13: Water cooperation and governance indicators

Institutional Sub-indicators	Highly satisfactory	Satisfactory	Neither satisfactory nor dissatisfactory	Dissatisfied	Highly Dissatisfactory	Total
Lake Tanganyika Coordination	22.2 %	37 %	29.6 %	7.4%	3.7 %	100%
Political willingness for cooperation	18.5 %	59.3 %	14.8 %	3.7 %	3.7 %	100 %
Collaboration between lakeshore local communities for mutual benefits	18.5 %	44.4 %	7.4 %	22.2 %	7.4 %	100 %
Information to the public concerning the environmental status and trends, and the potential environmental impacts of projects	18.5 %	25.9 %	33.3 %	18.5 %	3.7 %	100 %
Mean	19.43 %	41.65 %	21.28 %	12.95 %	4.63 %	100 %

Overall rate of water cooperation and governance:

Highly satisfactory	Satisfactory	Neither satisfied nor dissatisfied	Dissatisfactory	Highly dissatisfactory	Rating
	41.65 %				Satisfactory

Table 14: Percentage distribution of the public awareness

Transboundary water governance and management functions	Strongly Agree (5)	Agree (4)	Undecided (3)	Disagree (2)	Strongly disagree (1)	Total
I know the institution that governs and manages the Lake Tanganyika	44.4 %	22.2 %	18.5 %	11.1 %	3.7 %	100 %
I am aware of the importance of good sustainable agriculture practices and forest management and its benefits on Lake Tanganyika	48.1 %	29.6 %	18.5 %	3.7 %	0	100 %
I know the impact of climate change on Lake Tanganyika	59.3 %	33.3 %	3.7 %	3.7 %	0	100
I know the environmental status of Lake Tanganyika	40.7 %	44.4 %	14.8 %	0	0	100
Mean	48.13 %	32.38 %	13.88 %	4.63 %	0.93 %	100 %

Overall rating of the public Awareness indicator:

Strongly agree	Agree	Undecided	Disagree	Strongly disagree	Rating
48.13 %					Strongly agree

Table 15: Percentage distribution of Sustainability factors

Transboundary water governance and management functions	Excellent (5)	Good (4)	Average (3)	Minimal (2)	Inadequate (1)	Total
Social sustainability	3.7 %	11.1%	55.6 %	29.6 %	0	100 %
Environmental sustainability	3.7 %	7.4 %	7.4 %	48.1 %	3.7 %	100 %
Financial sustainability (Resources are used and conserved to ensure availability for future use.)	0	3.7 %	37%	37 %	22.2 %	100 %
Agricultural sustainability (Sustainable agriculture practices are developed, adopted and implemented)	3.7 %	0	33.3 %	33.3 %	29.6 %	100 %
Mean	2.78 %	5.55%	33.3%	37 %	13.88 %	100 %

Overall rating for sustainability factors:

Excellent	Good	Average	Minimal	Inadequate	Rating
			37 %		Minimal

Table 16: Percentage distribution of community participation indicators

Transboundary water governance and management functions	Very satisfied (5)	Satisfied (4)	Neither satisfied nor dissatisfied (3)	Dissatisfied (2)	Very dissatisfied (1)	Total
Level of water users (fishermen, transporters, local residents representatives) participation in Tanganyika water governance and management	3.7 %	25.9 %	33.3 %	29.6 %	7.4 %	100 %
Participatory forest management mechanism is developed and widely utilized as tool for forest management regime in target forests in the catchment basin	7.4 %	33.3 %	37 %	18.5 %	3.7 %	100 %
Participatory forest management policies, plans and legislation are in place in Burundi	3.7 %	59.3 %	25.9 %	7.4 %	3.7 %	100 %
Water users in the basin are directly involved in the development, planning and decision-making process that affects their water use right.	7.4 %	25.9 %	22.2 %	40.7 %	3.7 %	100 %
Mean	5.55%	36.10 %	29.6 %	24.05 %	4.63 %	100%

Overall rating for participation indicator:

Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	Rating
	36.10 %				Satisfied

4.5. Challenges

4.5.1. Challenges to governance and management of Tanganyika Lake

The interviews conducted on seven experts in water management highlighted the main challenge as the weakness of policies and laws on fisheries management and water management. Within the national water policy and water code, the government of Burundi has established the tampon zone of 150 meters from the Lake; however, the measure has not been implemented yet.

Table 17: Challenges to governance and management of Tanganyika Lake

Themes identified		N	Responses	
			Frequency	Percent proportion
Challenges to Governance and management	The weakness of policies and laws on fisheries and water management	7	3	33.3%
	Ineffective institution and legislation	7	2	22.2%
	The non-respect of the legal instruments	7	3	33.3%
	Inefficient Financial resources mechanisms	7	1	11.1%
Total		7	9	100.0%

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

4.5.2. Main challenges to sustainability of the Lake

Environmental issues (Pollution) followed by non -protection of the upstream to prevent the pollution and financial and economic constraints were seen as the main challenges to the sustainability of Lake Tanganyika. Few of the interviewees mentioned the social factors constraints such as population growth and its pressure on the Lake, poverty and poor urban planning within the Lake basin. The following main challenges were:

- The pollution : sedimentation, construction of the house in the cities without a well-designed urban planning and environmental impact assessment (EIA),
- Unsuitable governance : Ineffective implementation of solid & liquid waste management policies, non-respect of tampon zone of 150 meters from the Lake,
- Non protection of the upstream for preventing the Lake pollution,
- Financial challenges.

Table 18: Challenges to sustainability of Lake Tanganyika

Identified themes		N	Responses	
			Frequency	Percent
Challenges to sustainability of the Lake	Population growth and its pressure on the Lake	7	2	11.8%
	Financial challenges	7	2	11.8%
	Pollution	7	6	35.3%
	Unsuitable governance	7	2	11.8%
	Non -protection of the upstream to prevent the pollution	7	5	29.4%
Total		7	17	100.0%

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

4.5.3. Observation of Tanganyika Water Level and the reason

Within this year, the level of Lake Tanganyika has arisen, which has resulted in disturbance of all the activities near the Lake. Hotels and restaurants have lost a lot of money. The researcher asked the interviewees what they think; most of them agree that climate change is the main roots of the raising level of the Lake. Others agree that is just climate variability in the region, which resulted in heavy rain. The sedimentation from agricultural activities is also highlighted.

Table 19: Field observation on the change of Tanganyika water level and reason

Themes identified		N	Responses	
			Frequency	Percent
The raising level of Tanganyika waters	Climate change	7	6	60.0%
	Heavy rain in the region	7	2	20.0%
	Sedimentation due to poor agricultural practices	7	2	20.0%
Total		7	10	100.0%

4.5.4. Existing opportunities to improve the governance and management of Lake Tanganyika

Despite all the identified challenges, the interviewees identified the unexplored/unutilized opportunities to improve Lake Tanganyika governance and management. The following opportunities were identified:

- The existence of the legal instruments with regards to water resources
- Establishment of water monitoring tools based on known and consensual parameters for riparian countries
- Inadequate mean of fishing (lack of modern equipment)
- Lots of fish are not known and therefore not fished
- Tanganyika waters should be used in irrigation in the plain of Imbo (the case of Bujumbura)
- The existence of Lake Tanganyika Authority and the SAP

- Good political relationship between riparian countries
- Implementation of the legal instruments
- The respect of tampon zone
- Promote research development for sustainable management of natural resources of the Lake, by using scientific data from the research; these researches should be within the regional frame and must be participative.

4.5.5. Field observation images



Figure 10: Fishing materials in Tanganyika Lake (Kabezi, Rumonge province)



Figure 11: Raising water level in Tanganyika (Kabondo, Bujumbura urban)

4.6. Reliability

The reliability refers to the consistency of a measure (Chiang et al., 2015). The most common measure of the reliability is Cronbach's Alpha. An Alpha, which is higher than 0.75 is considered as reliable. For this research, the internal consistency is being measure.

Internal consistency : According to (Chiang et al., 2015), the internal consistency is the reliability across items. It is the consistency of people's responses across the items on a multiple-item measure.

Table 20: Internal consistency of the groups of indicators

Group of Indicators	Cronbach's Alpha	Cronbach's Alpha based on standardized Items	Number of items
Water cooperation and governance, programme M&E process, program monitoring process, communication and reporting	0.865	0.866	10
Institutional effectiveness	0.746	0.750	3
Participation	0.784	0.783	4
Sustainability factors	0.711	0.716	4
Awareness	0.850	0.860	4

From the table 18, the Cronbach Alpha coefficient for sustainability factors is estimated at 0.711, meaning that only 71 % of the variant in the composite score of four sub-indicators are not internally consistent variant (< 75 percent).

CHAPTER 5: ANALYSIS AND DISCUSSIONS

5.1. Identification of area of success

After data analysis, the following areas have been successful:

- *Community Participation (36.10 % satisfied),*

The overall indicator is rated very well (36.10 % Satisfied). The maximum rate was 36.10 % and the minimum rate was 4.63 % very dissatisfied. However, the people interviewed are not satisfied with the direct involvement of water users in the planning and decision-making process. There is a big challenge regarding the way decisions are taken. Fishermen agree that the decision that are taken are top-down decision. While they were supposed to be directly involved in formulation of any decision, they receive these decisions from the top. Most of the fishermen complain about these kinds of decision-making. There is no inclusion of local communities in the planning and decision-making process.

- *Public Awareness has been raising successfully (48.13 % Strongly agree)*

During the internship period, it was observed that most of the people in Bujumbura especially drivers; they were not aware even of the office of Lake Tanganyika Authority. The interviews conducted with fishermen reveal that the national institutions are those who are in charge of follow-up of their activities namely the local committees. For any changes in policy about their activities, they receive notifications. The fishermen admit that they get information about the change from them. However, these local committees do not evaluate the results or monitor the change. The maximum rate observed was 48.13 % strongly agree and the minimum was 0.93 % strongly disagree.

- *Water cooperation and governance (41.65 % Satisfactory).*

All the sub-indicators on cooperation and governance were satisfactory; (the maximum rate was 41.65 % satisfactory whereas the minimum was rated 4.63 % highly dissatisfactory) The interviews reveals that fishermen in Burundi are collaborating with others from DRC (Site of Gatumba), they

get informed by those in Democratic Republic of Congo. They also collaborate with others people who are doing other activities than fishing like traders (Site of Gitaza).

5.2. Identification of areas for program improvement

The student identified the areas of improvement by considering the rating of 3 and less on Likert 5 point scale. The following indicators and sub-indicators were considered as area for improvement:

- *Sustainability factors (37 % Minimal)*

All the sub-indicators were rated within 3 and less on the basis of Likert scale of 5 point. According to (Sindico, 2016), transboundary waters sustainability can only be achieved if transboundary water cooperation is met. While Lake Tanganyika Authority has made the transboundary water cooperation satisfactory, lots still have to be done. 37 % of people responded that the sustainability is minimal and 2.78 % see that the sustainability of the Lake is excellent

- *Institutional effectiveness (34.53 % Good)*

This indicator was rated good (3). The answers received from the experts in water management showed that the failure in institutional effectiveness might be one of the roots causes of all the failure in the water governance and management of the Lake Tanganyika. The majority of people (34.53%) see that the institutional effectiveness of the Lake is good and 4.93 % of people rated the institutional effectiveness as poor.

- *Communication and reporting (34.53 % neither satisfactory nor dissatisfactory)*

Communication and reporting indicator was rated as neither satisfactory nor dissatisfactory, only one sub-indicator was rated satisfactory (40.7 %). The communication to the public sub-indicator is considered as neither satisfactory nor dissatisfactory, the percentage distribution is equal on satisfactory and dissatisfactory (29.6 % for both sub-indicators). The overall indicator showed 34.53 % neither satisfactory nor dissatisfactory and the minimum of people rated the indicator as highly dissatisfactory (2.47 %).

- *Program monitoring and evaluation process and program monitoring process*

Both the program M&E and the program monitoring were rated as neither satisfactory nor dissatisfactory. The people interviewed complain that there is no system of alert; they rely on their knowledge on weather forecasting. However, they are grateful to the security who assists them when they are doing their activities (Fishing).

According to Fischer, Miller, & Sidney (2007), Evaluation is an analytical tool and procedure meant to do two things such as evaluation research to obtain all information pertinent to the assessment of its performance, both process and result and policy cycle evaluation that refers to the reporting of such information back to the policy-making process. On evaluation process, the fishermen approached admitted that if there is a new policy or any restricted measure regarding their activities, it is limited to the communication, there is no consultation on the progress of a that new measure or policy. The majority of people rated the indicator neither satisfactory nor dissatisfactory (45.70%) and few (2.47 %) rated the indicator as highly dissatisfactory.

5.3. Specific actions

The main objective of this research is to identify useful instruments that would help in establishing an efficient MEL framework for transboundary water governance and management in the Tanganyika lake basin for the improvement of its sustainability. Since the sustainability is a function of different actions, the following actions should be prioritized:

- *Programme/projects Monitoring and Evaluation process,*
- *Communication and reporting and direct involvement of water users in decision-making,*
- *Institutional effectiveness.*

5.4. MEL Framework Design in Tanganyika Transboundary water governance and management

Monitoring and evaluation processes are part of the activities undertaken on Lake Tanganyika. However, the two processes are inadequate due to different challenges (LTA Secretariat, 2012). The following challenges are hindering the effective MEL on Tanganyika Lake:

- Conceptual challenges : Lack technical capacity, therefore there are difficulties to get data for monitoring and evaluation of the interventions; the causality between interventions and observable effects is difficult as the change in one subset can affect many areas;
- Socio-political challenges including governance challenges : Lack of sustainable likelihood, lack of human resources., inadequate updating, implementation, enforcement and monitoring of legislation and lack of sufficient mechanisms for institution coordination,
- Financial challenges: Insufficient resources and financial constraints for dealing with IWMR issues.

For effective MEL in Tanganyika transboundary water governance and management, three main governance principles are proposed in this study:

1. Public awareness including capacity building for local institutions
2. Transboundary water cooperation, Management and governance systems including policy enforcement for transboundary water governance,
3. Community participation and involvement through a MSP (Multi Stakeholders platform).

CHAPTER 6: CONCLUSION AND RECOMMENDATION

6.1. Preamble

The study focused to introduce and adapt a better MEL system that improves water governance and management of the shared water resources in the Tanganyika Lake Basin. MEL framework is a tool that uses indicators and corresponding data and information. Such dataset helps to improve effectively human decision-making to enhance program impacts for the sustainability of Lake Tanganyika. In this context, MEL framework used two important components such as a component that will strengthen Monitoring, Reporting and Evaluation Function, and a component that builds a Collaborating, Learning and Adapting Institutional Practice. Both components lead to the sustainable management of the Lake. The data collection was conducted in Burundi, in three main provinces (Bujumbura urban, Bujumbura rural and Rumonge).

The main purpose of the study was to establish an efficient MEL framework for transboundary water governance and management in the Lake Tanganyika basin by specifically identifying the challenges to water governance and management, challenges to the sustainability of shared water resources; the study used also transboundary water indicators to introduce the MEL system. Different projects documents and literature were viewed to design the survey questionnaire and engage different stakeholders to get their perceptions. Appropriate utilization of the MEL tools that stands on multilateral relationships and a mechanism to diversification of water security risks among the stakeholders is used to bring regional stability, enhance sustainable development and management of the invaluable shared water resources.

6.2. Findings of the study

The study identified that the weakness of policies and laws on fisheries management and water management and the non-respect of the legal instruments as the main challenges to water governance and management in the Lake basin. The two conclusions were supported to almost a half of the experts in water management. The research also identified the main challenges to sustainability in the Lake basin as the environmental pollution issues and the non-protection of the upstream of the Lake to prevent the pollution. Other challenges to the sustainability were population growth and its pressure, financial shortfall, unsuitable governance. On the change of

the level of Tanganyika waters being observed this year, the reason advanced by more than a half is the climate change followed by the heavy rain and sedimentation from agricultural activities.

On learning and evaluation questions, the findings for different indicators show that three areas are successful; the public awareness (strongly agree), water cooperation and governance (satisfactory) and participation (satisfied) due to the laws in place which are participative. The areas of improvement were identified based on the rate of 3 and less, in this context, the sustainability factors (minimal), the institutional effectiveness (good), communication and reporting (Neither satisfactory nor dissatisfactory) and programme/project monitoring & programme /project monitoring and evaluation process (Neither satisfactory nor dissatisfactory) are to be improved. In order to improve sustainability, the priority of actions was seen as improving Program Monitoring and Evaluation process; this would surely improve the communication and reporting indicators and therefore results in institutional effectiveness improvement.

The MEL indicators of shared water resources are highly interconnected and interdependent. From the results, one sub-indicator can significantly affect all indicators, for instance if one sub-indicator in sustainability factors is inadequate, it would affect the whole indicator or if there is no regular exchange of data, it will affect water cooperation indicator.

Some shortcomings in water governance and management indicators were observed. While political willingness for cooperation (59 %) shall promote a positive participation of all waters users and ensure the success of the program plan, it is not clear how the level of water users participation in Tanganyika water governance and management (33.3 % neither satisfied nor dissatisfied) and their involvement in the planning and decision-making (40.7 % Dissatisfied) were not satisfied. However, political will has boosted the public awareness (48.13 %)

6.3. Recommendation and lessons

From the data collected near the experienced people in the field of management and governance, the following recommendations are proposed to improve the programme sustainability of the Lake Basin:

1. Stakeholder involvement and public awareness are key to good governance and to a success of environmental plan. The Involvement should be at the beginning of the process of any

program. It is important to involve key stakeholders into the MEL process for greater insight. Analytic deliberation should be emphasized for transparency and participation (Akamani & Wilson, 2011).

2. For the success of the Lake Tanganyika Authority in its function, there is a need to focus on local committees by providing them the capacity building which should be based on principles of good governance. The Lake Tanganyika Authority should also communicate its activities to the public through mobile application.
3. There is a need of improving the institutional capacity in the Lake Tanganyika basin by providing to the local institutions the capacity building on coordinated decision-making. It would therefore result in good communication and reporting while improving the M&E process. Coordination promotes the achievement of the environmental goals and objectives.
4. The communication and reporting indicator (effective exchange mechanisms of data and information and communication to the public) is the key to the success of transboundary water governance and management issues.
5. The Monitoring and evaluation process should be planned at the beginning of any projects, policy implementation and the competent authority should make sure that this happens regularly.

6.4. Limitations and delimitation of the study

The following problems are some of the core factors affected both the researcher's data collection field works processes:

- 1) **Coronavirus pandemic:** The current global pandemic of coronavirus (COVID-19) affected the research, transportation for data collection and one of the proposed methodologies of data collection (Focus group discussions). The borders between Burundi and Tanzania were closed. Therefore, the researcher could not move from Burundi to Tanzania for data collection,
- 2) **Political challenges :** Unexpected elections pushed key stakeholders not to work properly as they were involved in the election campaign; though they have informed the researcher that they would be available after 20th of May elections,
- 3) **Limited work in the office and on field:** Overall, COVID-19 challenges has pushed the official to limit their work on field.

- 4) **Constraints in field transportation:** The pandemic exposed the researcher to unintended additional costs on transportation in Burundi. Since the researcher removed FGDs as a methodology for the research, the researcher was obliged to meet people one by one. In total, 60 people were needed to complete the research but only 27 people were approached.
- 5) **Constraints in data collection and institutional interaction deception:** Most of the institutions in Burundi follow some rules (Administrative procedures), hence the researcher was facing a delay in collecting data due to the mentioned administrative procedures, which resulted in time management constraints.
- 6) **The sudden death of the President of the Republic of Burundi:** A week was given to the people living in Burundi to mourn; hence, most of the state office were not receiving people.

6.5. Future research directions

Due to complexity of the study, this piece of research, fieldwork and visit with regard to this study was focused in Burundi. Although the riparian countries are the least developed in the world and share the responsibilities to protect the Lake Biodiversity, the level of protection is not the same in all the countries; the sustainable management of the Lake depends on financial resources. It was observed that the local institutions are the best to follow the fishing activities; further research shall evaluate the performance of those local committees. Therefore, the researcher recommends a comprehensive study that can be conducted, which includes all the basin countries requiring further financial resources and research tools.

SUMMARY

The main objective in this case for both research thesis is to establish an efficient monitoring, evaluation and learning framework of transboundary water governance and management in the Tanganyika Lake Basin. By using MEL indicators as a system of improving transboundary water governance and management, the focus is on designing a tool that targets the sustainability of the Lake Tanganyika Basin, discussing mechanisms that should help to enhance the sustainability and improve water governance and management.

Review of the literature, especially LTA documents through its past projects shows the importance of conducting monitoring and evaluation of all the activities undertaken in the basin to ensure the sustainability of the Lake. The MEL framework is based on indicators; in this context, indicators were found in the past projects documents, in the literature and the SAP.

The learning and evaluation questions designed for establishing an efficient MEL system for the sustainability of Tanganyika Lake Basin were given to the respondents from the public, government officials, fishermen to express their perceptions. The findings of the analysis of the data identified the area of improvement as follows: the sustainability factors (average rate), the institutional effectiveness (good), communication and reporting (neither satisfactory nor dissatisfactory), programme/project monitoring and programme/project monitoring and evaluation (neither satisfactory nor dissatisfactory). The successful areas were identified as follow: the public awareness (strongly agree), the water cooperation and governance (satisfied).

The areas that should be focused on to enhance sustainability of shared water resources and improve water governance and management were seen as:

1. the importance of direct or indirect involvement of water users in the planning stage and decision-making process no matter what level of formal or informal education they have,
2. the improvement of the programme and projects monitoring and evaluation process especially applying MEL system for all the projects, communication and reporting process and institutional effectiveness,
3. Further emphases should be given in implementing and enforcing the regulatory systems and instruments such as water code, pollution management code and environmental code.

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LTA Documents

No	Documents Title
1	Convention on sustainable management of Lake Tanganyika
2	Strategic Action program for the protection of Biodiversity and sustainable management of natural Resources in Lake Tanganyika and its basin (2012)
3	Project to Support the Lake Tanganyika Integrated Regional Development Programme (PRODAP)
4	Final evaluation report (2013) of the UNDP / GEF project as well as the available PRODAP completion reports
5	Transboundary Diagnosis Analysis (TDA)

APPENDICES

Appendix 1: Objectives, achievements and lesson/recommendation matrix

Study objectives	Achievement with regard to objectives	Major section that support the findings	Recommendations according to the objectives and lessons
1.To assess the joint management practices and strategies within Tanganyika Lake Basin	<ul style="list-style-type: none"> -Water cooperation and governance -Public awareness -Participatory forest management mechanisms, policies, plan and legislation - Existence of Environmental and water code 	<p>Chapter 4, section 4.5, section 5.4</p> <p>Chapter 6, section 2</p>	<ul style="list-style-type: none"> -Need to focus on local committees by providing the capacity building based on principles of good governance. -Respect the legal instruments such as water code and environmental code -Improve the institutional capacity in the Lake Tanganyika basin -Provide to the local institutions the capacity building on coordinated decision-making
2.To enhance sustainability of the shared lake water resources	<ul style="list-style-type: none"> -Political willingness for cooperation -Effective exchange mechanisms of data and information -The existence of Lake Tanganyika Authority 	<p>Chapter 4, section 4.4, section 5.2, section 5.4</p> <p>Chapter 6, section 2</p>	<ul style="list-style-type: none"> -The direct involvement of water users in the decision-making process -Improve the programme M&E process, communication and reporting process and institutional capacity and effectiveness, -Respect of the legal instruments such as water code and environmental code
3.To introduce better MEL system that improves water governance and management of the shared water resources of the basin,	<ul style="list-style-type: none"> -Lake Tanganyika coordination -The existence of the LTA and SAP - M&E process on the LTA activities 	<p>Chapter 4, section 4.4, section 5.1, section 5.4</p> <p>Chapter 6, section 2</p>	<ul style="list-style-type: none"> -Improve M&E process -M&E should be planned at the beginning of any projects, policy implementation
4. To improve collaborative work, interconnectivity, economic development and integration among the Lake Tanganyika basin countries.	<ul style="list-style-type: none"> -Collaboration between lakeshore local communities for mutual benefits -Cooperation & Political willingness for cooperation -Effective exchange of data and information 	<p>Chapter 4, section 4.4, section 5.3, section 5.4</p> <p>Chapter 6, section 2</p>	<ul style="list-style-type: none"> -Stakeholder involvement and public awareness are key to good governance and to a success of environmental plan. -Improve communication and reporting process

Appendix 2: Identification of indicators

The contracting states, its funding partners and many stakeholders on the front line experts from the four countries bordering Lake Tanganyika completed the Transboundary Diagnosis Analysis (TDA) in 2000 and later the SAP. The Strategic Action Programme (SAP) for the Protection of Biodiversity and Sustainable Management of the Natural Resources in Lake Tanganyika and its Basin was updated in 2012.

The TDA identified key roots causes, threat and challenges that affect Lake Tanganyika sustainability including:

- Key root causes of development such as the increase of the population pressure, food insecurity and poverty, and inequality, inadequate governance, insufficient resources, inadequate knowledge and awareness and economic drivers.
- Key threats such as insufficient resilience to the impacts of climate change, unsustainable fisheries, unsustainable land management, destruction and alteration of critical habitats, biological invasions and increasing pollutions.
- Key governance and development challenges include the lack of sustainable livelihood, insufficient resources and financial constraints for adequately dealing with IWRM issues, inadequate updating, implementation, enforcement and monitoring of legislation, lack of sufficient mechanisms for institutional coordination and inter-sectoral governance and lack human resources and technical capacity in dealing with IWRM issues.

The SAP incorporates all the strategies for the riparian countries of Lake Tanganyika to address all the challenges on the Lake Resources and its biodiversity. The SAP and TDA tend to achieve by 2035 a set of six main environmental quality objectives.

The following four main conditions to be met to enhance the efficacy of the SAP implementation are (LTA Secretariat, 2012: page 2):

- Environmental education at all the level of society;
- Socioeconomic development and appropriate governance;

- Capacity building and Institutional reform;
- Effective information management.

Since the completion of the TDA and SAP, the LTA has taken different measures to strengthen environmental strategies through its different projects.

In 2008, the project to support the Lake Tanganyika integrated regional development programme (PRODAP) started with the overall objective of contributing to poverty reduction in the Lake Tanganyika basin. Specifically the project aims at:

1. Improving social and health conditions in the Lake Tanganyika Basin
2. Improving the food situation of the people.

In December 2020, Lake Tanganyika Management project started with the main objective of Contributing to fair utilization, benefit sharing and mitigation of common risks to transboundary waters of Lake Tanganyika and its basin. The specific objectives of LATAWAMA is to improve in a sustainable way the management and quality control of the transboundary waters of Lake Tanganyika and its basin.

The above-mentioned projects highlights the importance of economic drivers for achieving sustainable environmental benefits and outcomes. All the projects that LTA execute must comply with the SAP priorities of actions.

Baseline indicators

Considering water governance and development challenges in the basin, the following core indicators have been targeted in this research:

- **Awareness:** Awareness to understand the threats towards Lake Tanganyika biodiversity and other resources (climate change, good sustainable agriculture and sustainable fisheries management) and LTA as the regional body to govern and manage the Lake Tanganyika.
- **Institutional arrangements:** Institutional efficiency and effectiveness for managing and implementing the convention on sustainable management of the Lake and relating projects.

- **Information:** Requirement of the convention on sustainable management of Lake Tanganyika on public participation and access to information
- **Project management:** Sustainability factors as the fundamental aspect of all the operational projects on Lake Tanganyika
- **Water cooperation**
- **Monitoring and evaluation**
- **Communication and reporting**

All these baseline indicators were selected based on the research objectives, which were aligned with the desired program/projects level impacts.

Learning and evaluation questions and corresponding results framework outcomes and impacts in the sap

MEL indicators /questions	Target
PUBLIC AWARENESS	
<p>1. Awareness</p> <p>1.1. I know the institution that governs and manages the Lake Tanganyika</p> <p>1.2. I am aware of the importance of good sustainable agriculture practices and forest management and its benefits on Lake Tanganyika</p> <p>1.3. I know the impact of climate change on Lake Tanganyika</p> <p>1.4. I know the environmental status of Lake Tanganyika</p>	<ul style="list-style-type: none"> • Agricultural pollution reduced • Harbour pollution reduced • Pollution from lacustrine traffic reduced • Risks related to petroleum exploration and production reduced • Pollution from mining reduced • Existing biological invasions controlled, and future invasions prevented • Critical aquatic and terrestrial habitats protected, restored and managed • Protected area resource management improved • Sustainable land management strategies in place • Deforestation rates decreased • Sustainable agriculture activities increased • Ornamental fisheries controlled and managed • Reduced fishing pressure in the littoral zone • Reduced fishing pressure in the pelagic zone • Improved knowledge-base, monitoring and information management mechanisms • Increased preparedness and capacity to adapt to climate change impacts • Enhanced resilience of aquatic and terrestrial ecosystems
PROJECT MANAGEMENT	
<p>2. Sustainability factors</p> <p>2.1. Social sustainability</p> <p>2.2. Environmental sustainability</p>	<ul style="list-style-type: none"> • Sustainable agriculture activities increased • Reduced fishing pressure in the littoral zone

<p>2.3. Financial sustainability 2.4. Agricultural sustainability</p>	<ul style="list-style-type: none"> • Reduced fishing pressure in the pelagic zone • Protected area resource management improved • Sustainable land management strategies in place • Deforestation rates decreased • Risks related to petroleum exploration and production reduced • Agricultural pollution reduced • Harbour pollution reduced • Pollution from lacustrine traffic reduced • Risks related to petroleum exploration and production reduced • Pollution from mining reduced
<p>3. Participation 3.1. Level of water users participation in Tanganyika water governance and management 3.2. Participatory forest management mechanism is developed and widely utilized as tool for forest management regime in the target forests in the catchment basin 3.3. Participatory forest management policies, plans and legislation are in place in Burundi 3.4. Water users in the basin are directly involved in the development planning and decision-making process that affect their water use right</p>	<ul style="list-style-type: none"> • Agricultural pollution reduced • Harbour pollution reduced • Pollution from lacustrine traffic reduced • Pollution from mining reduced • Existing biological invasions controlled, and future invasions prevented • Protected area resource management improved • Sustainable land management strategies in place • Deforestation rates decreased • Sustainable agriculture activities increased • Reduced fishing pressure in the littoral zone • Reduced fishing pressure in the pelagic zone • Improved knowledge-base, monitoring and information management mechanisms • Increased preparedness and capacity to adapt to climate change impacts • Enhanced resilience of aquatic and terrestrial ecosystems
<p>4. Institution effectiveness 4.1. Level of Authority to the Burundian institutions 4.2. The economic and technical capacity of the riparian states for implementation</p>	<ul style="list-style-type: none"> • Risks related to petroleum exploration and production reduced • Agricultural pollution reduced • Harbour pollution reduced • Pollution from lacustrine traffic reduced

<p>4.3. The institutional design process and mechanism used for interinstitutional coordination</p>	<ul style="list-style-type: none"> • Risks related to petroleum exploration and production reduced • Pollution from mining reduced • Existing biological invasions controlled, and future invasions prevented • Existing biological invasions controlled, and future invasions prevented • Critical aquatic and terrestrial habitats protected, restored and managed • Protected area resource management improved • Sustainable land management strategies in place • Deforestation rates decreased • Sustainable agriculture activities increased • Ornamental fisheries controlled and managed • Reduced fishing pressure in the littoral zone • Reduced fishing pressure in the pelagic zone • Improved knowledge-base, monitoring and information management mechanisms • Increased preparedness and capacity to adapt to climate change impacts • Enhanced resilience of aquatic and terrestrial ecosystem
<p>WATER COOPERATION AND INFORMATION</p>	
<p>5. Water cooperation and governance 5.1. Lake Tanganyika coordination 5.2. Political willingness of the state for cooperation 5.3. Collaboration between lakeshore local communities for mutual benefits 5.4. Information to the public concerning the environmental status and trends, and the potential environmental impacts of projects</p>	<ul style="list-style-type: none"> • Risks related to petroleum exploration and production reduced • Agricultural pollution reduced • Harbour pollution reduced • Pollution from lacustrine traffic reduced • Risks related to petroleum exploration and production reduced • Pollution from mining reduced • Existing biological invasions controlled, and future invasions prevented • Existing biological invasions controlled, and future invasions prevented

	<ul style="list-style-type: none"> • Critical aquatic and terrestrial habitats protected, restored and managed • Protected area resource management improved • Sustainable land management strategies in place • Deforestation rates decreased • Sustainable agriculture activities increased • Ornamental fisheries controlled and managed • Reduced fishing pressure in the littoral zone • Reduced fishing pressure in the pelagic zone • Improved knowledge-base, monitoring and information management mechanisms • Increased preparedness and capacity to adapt to climate change impacts • Enhanced resilience of aquatic and terrestrial ecosystems
MONITORING AND EVALUATION	
<p>6. Project/programme monitoring and evaluation process</p> <p>7. Programme/project monitoring process</p> <p>7.1. Regional monitoring and surveillance system is developed, adopted and implemented</p> <p>7.2. Regional monitoring, early warning and response systems are developed, adopted and implemented</p>	<ul style="list-style-type: none"> • Improved knowledge-base, monitoring and information management mechanisms • Existing biological invasions controlled, and future invasions prevented • Risks related to petroleum exploration and production reduced • Agricultural pollution reduced • Harbour pollution reduced • Pollution from lacustrine traffic reduced • Risks related to petroleum exploration and production reduced
COMMUNICATION, REPORTING AND INFORMATION	
<p>8. Communications and reporting</p> <p>1.1. Communication to the public</p> <p>1.2. Effective exchange mechanisms of data and information</p>	<ul style="list-style-type: none"> • Risks related to petroleum exploration and production reduced • Agricultural pollution reduced • Harbour pollution reduced

<p>1.3. Communication channels among decision makers, scientists, and stakeholders</p>	<ul style="list-style-type: none"> • Pollution from lacustrine traffic reduced • Risks related to petroleum exploration and production reduced • Pollution from mining reduced • Existing biological invasions controlled, and future invasions prevented • Existing biological invasions controlled, and future invasions prevented • Critical aquatic and terrestrial habitats protected, • Critical aquatic and terrestrial habitats protected • Critical aquatic and terrestrial habitats protected, restored and managed • Protected area resource management improved • Sustainable land management strategies in place • Deforestation rates decreased • Sustainable agriculture activities increased • Ornamental fisheries controlled and managed • Reduced fishing pressure in the littoral zone • Reduced fishing pressure in the pelagic zone • Improved knowledge-base, monitoring and information management mechanisms • Increased preparedness and capacity to adapt to climate change impacts • Enhanced resilience of aquatic and terrestrial ecosystems
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Appendix 3: Sampling guideline

Sectors	Role	Number
Water body utility (REGIDESO)	Drinking water supply	3 officials
Department of forestry and water resources	Water resources management (IWRM)	4 officials
Department of fisheries and aquaculture	Fisheries management in Burundi	2 officials
Department of mine resources	Mining resources and environment	1 intern
Fishing	Fishing activities in Lake Tanganyika	8 fishermen
University of Burundi	Research	5 Master students in environment
NGOs and local associations		2 leaders
Project on Lake Tanganyika	Lake Tanganyika water management (LATAWAMA)	1 environmental specialist
Private sector		1 workers from AFRITEXTULE (clothing industry) and
Total		27

Appendix 4: Questionnaire design

Introduction of the researcher

My name is William NDIHOKUBWAYO, a MSc Student at Pan African University, Institute of Water and Energy sciences (PAUWES), conducting a research on **Establishing Efficient Monitoring, Evaluation and Learning Framework of Transboundary Water Governance and Management, the Case of Tanganyika Lake Basin**. I would like to hear from you about your engagement on water management and governance of Lake Tanganyika and your perception on how Lake Tanganyika water should be managed and governed. The responses of the questionnaire will remain anonymous.

For further information about the questionnaire, the following people can be contacted:

Researcher's contact address:

M. William NDIHOKUBWAYO of the Pan African University on +213 556 68 74 55, ALGERIA, and on +257 61 11 94 31, BURUNDI

Advisors:

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

Ir. Gabriel HAKIZIMANA, Director of Environment at Lake Tanganyika Authority on +257 79 93 20 99, e-mail: gabriel.hakizimana@lta-alt.org, BURUNDI

1. RESPONDENT'S BACKGROUND INFORMATION

1.1. Name (*Name optional*) _____

1.2. Country: _____ Location (administrative region): _____

1.3. Respondent's position : _____

1.4. What is your gender? Male, Female

1.5. What is your age?

15 – 24

25- 44

45- 64

65 +

1.6. What is your level of education?

Reading and writing only

Elementary school

High school

College/university

1.7. What is your personal and professional role/engagement in the basin?

Personal Role: _____

Professional Role/activity _____

2. WATER USE AND MANAGEMENT

1.1. Which one of these sectors describe you the best. I rely on Tanganyika waters for,

- Domestic drinking water
- Fishing
- Navigation
- Industry
- Transport
- Other_____

1.2. How satisfied are you with the management and governance of Tanganyika water?

- Very Satisfied
- Somewhat satisfied
- Neither satisfied nor dissatisfied
- Somewhat dissatisfied
- Dissatisfied

1.3. Which one of the following channels helped you to know Lake Tanganyika Authority and its activities:

- The website
- The Radio
- Newsletters/ brochures
- Friends/people
- Others_____

3. TRANSBOUNDARY WATER GOVERNANCE

Indicators	Transboundary water governance and management functions	Strongly Agree (5)	Agree (4)	Undecided (3)	Disagree (2)	Strongly disagree (1)
3.1. Awareness	I know the institution that governs and manages the Lake Tanganyika					
	I am aware of the importance of good sustainable agriculture practices and forest management and its benefits on Lake Tanganyika					
	I know the impact of climate change on Lake Tanganyika					
	I know the environmental status of Lake Tanganyika					

Indicators	Transboundary water governance and management functions	Excellent (5)	Good (4)	Average (3)	Minimal (2)	Inadequate (1)
3.2. Sustainability factors	Social sustainability (Sustainable Livelihood alternatives are developed, adopted and widely implemented at regional and national levels to adapt to the impacts of climate change and variability)					
	Environmental sustainability					
	Financial sustainability (Resources are used and conserved to ensure availability for future use.)					
	Agricultural sustainability (Sustainable agriculture practices are developed, adopted and implemented)					

Indicators	Transboundary water governance and management functions	Very satisfied (5)	Satisfied (4)	Neither satisfied nor dissatisfied (3)	Dissatisfied (2)	Very dissatisfied (1)
3.3. Participation	Level of water users (fishermen, transporters, local residents representatives) participation in Tanganyika water governance and management					
	Participatory forest management mechanism is developed and widely utilized as tool for forest management regime in target forests in the catchment basin					
	Participatory forest management policies, plans and legislation are in place in Burundi					
	Water users in the basin are directly involved in the development, planning and decision-making process that affects their water use right.					

4. INSTITUTION EFFECTIVENESS AND WATER COOPERATION FACTORS

Indicators	Institutional Sub-indicators	Excellent (5)	Very good (4)	Good (3)	Average (2)	Poor (1)
4.1. Institution effectiveness	Level of Authority to the Burundian (riparian countries) institutions					
	The economic and technical capacity of the riparian states for implementation					
	The institutional design processes and mechanism used for inter-institutional coordination					

Indicators	Institutional Sub-indicators	Highly satisfactory	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Highly Dissatisfied
4.2. Water cooperation and governance	Lake Tanganyika Coordination					
	Political willingness for cooperation					
	Collaboration between lakeshore local communities for mutual benefits					
	Information to the public concerning the environmental status and trends, and the potential environmental impacts of projects					

Indicators	Institutional Sub-indicators	Highly satisfactory (5)	Satisfied (4)	Neither satisfied nor dissatisfied (3)	Dissatisfied (2)	Highly Dissatisfactory (1)
4.3. programme Monitoring and Evaluation process	Adequacy of the programme Monitoring and Evaluation process					
4.4. Programme Monitoring process	Regional Monitoring and surveillance system is developed, adopted and implemented					
	Regional monitoring, early warning and response systems are developed, adopted and implemented					
4.5. Communications and reporting	Communication to the public (web site presence...)					
	Effective exchange mechanisms of data and information					
	Communication channels among decision makers, scientists, and stakeholders					

Collected on/.../2020

5. *QUESTIONNAIRE TO EXPERTS*

1. What are the main challenges to Lake Tanganyika Governance and management?

2. What are the main challenges that hinder sustainability of Lake Tanganyika?

3. How do you explain the change of Tanganyika water level?

4. What are the existing or unexplored/unutilised opportunities to improve Lake Tanganyika Governance and management?

THANK YOU !!!!

Appendix 5: Introductory Letter for data collection


LAKE TANGANYIKA AUTHORITY AUTORITE DU LAC TANGANYIKA

LTA/TI.7.1/TSM/2020/05

Bujumbura, Le 19 mai 2020

A QUI CELA CONCERNE

L'Autorité du Lac Tanganyika (ALT) est une institution régionale en charge de la gestion du Lac Tanganyika et au service des 4 pays riverains du Lac Tanganyika qui sont le Burundi, la République Démocratique du Congo (RDC), la Tanzanie et la Zambie pour la mise en œuvre des interventions communes par ordre de priorité. Ces dernières visent à promouvoir la conservation de la biodiversité et l'utilisation durable des ressources naturelles du Lac et de son bassin

L'Autorité du Lac Tanganyika (ALT) accueille des stagiaires étudiants et chercheurs pour la recherche scientifique et la documentation ou l'amélioration de leur connaissance dans le domaine de l'environnement, l'assainissement, la gestion intégrée des ressources en eau, la pêche et, l'aquaculture ou le perfectionnement de leurs études académiques.

A cet effet, l'ALT a reçu en tant que stagiaire depuis le mois d'avril 2020, M. William NDIHOKUBWAYO ,étudiant en master en politique de l'eau à l'Université Panafricaine, institut des sciences de l'eau et de l'énergie, Université de Tlemcen en Algérie, qui mène des recherches pour sa thèse de Master sur « l'établissement d'un cadre efficace de suivi, d'évaluation et d'apprentissage de la gouvernance et de la gestion des eaux transfrontalières, le cas du bassin du Lac Tanganyika ». Ainsi, pour compléter les informations utiles à son projet de recherche, nous l'orientons vers votre institution

L'Autorité du Lac Tanganyika vous remercie d'avance de votre franche collaboration


Directeur Exécutif
Tusanga MUKANGA Sylvain

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Appendix 6: Monitoring, Evaluation and Learning framework monthly work plan

Tasks	April 2020		May 2020				June 2020				July 2020					
1. Research institutions																
1.1. Research validation and financing (PAUWES, PAU)																
1.1. Internship for data collection (LTA)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
2. Development of Research protocol																
2.1. Adapt MEL survey protocol and tools		x	x	x	x	x										
2.2. Submit protocol to university supervisor							x	x								
2.3. Translate survey tools									x							
2.4. Submission of the translated survey tools the internship supervisor for review										x						
3. Fieldwork preparation																
3.1. Data collection Team recruitment											x					
3.2. Pre-testing, (survey suitability checking)											x					
3.3. Population Sampling											x					

Establishing Efficient Monitoring, Evaluation and Learning Framework of Transboundary Water Governance and Management, the Case of Tanganyika Lake Basin

Tasks	April 2020				May 2020				June 2020				July 2020			
7.3.Submit the report for reviews																x
7.4.Finalize the report																x
8. Final Research Thesis and Internship report																

Appendix 7: The Research Budget