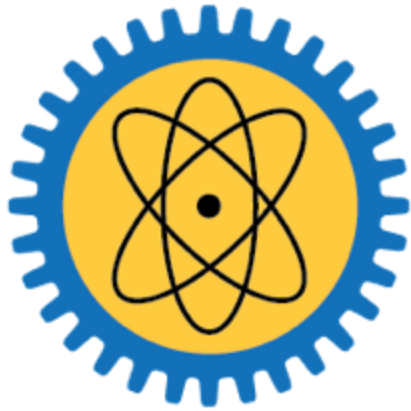




**BUSITEMA
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Pursuing excellence

**EVALUATING INDIGENOUS AND SCIENTIFIC WEATHER
FORECASTING TECHNIQUES FOR RESILIENCE TO
WEATHER EVENTS AMONG FISHING COMMUNITIES IN
JINJA**

BY

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(BU/GS22/MCC/28)

**A DISSERTATION SUBMITTED TO THE DIRECTORATE OF GRADUATE STUDIES,
RESEARCH AND INNOVATIONS IN PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR THE AWARD OF MASTER OF SCIENCE IN CLIMATE
CHANGE AND DISASTER MANAGEMENT DEGREE OF BUSITEMA UNIVERSITY**

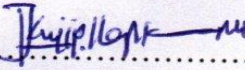
OCTOBER, 2025

DECLARATION

I the undersigned ,declare that this research dissertation/thesis is my original work,except where due acknowledgement has been made.I declare that this work has never been submitted to this University or to any other institution for funding/for partial fulfillment for any award.

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DEDICATION

I hereby dedicate this report to the Almighty God, my Late parents, My Wife Irene Kiprop, Children; Arthur Chemtai Kiprop, Laura Cherotich Kiprop, Emmanuel Kiprop, Joshua Cheptoek Kiprop, relatives and friends for the support they have given to me during my academic journey; spiritually, financially and emotionally to make it a success. May the almighty God bless you abundantly.

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TABLE OF CONTENTS

DECLARATION	Error! Bookmark not defined.
APPROVAL	Error! Bookmark not defined.
DEDICATION	iii
ACKNOWLEDGEMENT	iv
TABLE OF CONTENTS.....	v
LIST OF TABLES	ix
LIST OF FIGURES	x
LIST OF MAPS	xii
LIST OF ACRONYMS/ABBREVIATIONS	xiii
ABSTRACT.....	xiv
CHAPTER ONE: INTRODUCTION.....	1
1.0 Introduction.....	1
1.1 Background of the study	1
1.2 Statement of the Problem.....	2
1.3 Research objectives.....	3
1.3.1 General objective	3
1.3.2 Specific Objectives	3

1.4 Research questions.....	3
1.5 Scope of the study.....	4
1.6 Justification.....	4
1.7 Significance.....	5
1.8 Theoretical Framework.....	6
CHAPTER TWO: LITERATURE REVIEW	9
2.0 Introduction.....	9
2.1 Theoretical literature review	9
2.2 Trends of extreme weather events	10
2.3 Effectiveness of scientific forecasts against indigenous knowledge-based forecasts.....	13
2.4 Local community preparedness to extreme weather events	14
2.5 Communities responses to extreme weather events.....	16
CHAPTER THREE: METHODOLOGY	19
3.0 Introduction.....	19
3.1 Research Design.....	19
3.2 Study Area Description.....	20
3.3 Sample Size.....	21
3.4 Sampling Techniques and Procedure.....	21

3.5 Data types and sources.....	22
3.5.1 Data Collection Methods and Instruments.....	22
3.6 Data Analysis	24
CHAPTER FOUR: RESULTS AND DISCUSSION	31
4.0 Introduction.....	31
4.1 Socio-economic and demographic characteristics of respondents.....	31
4.2 Trends of extreme weather events at Masese Landing Site	31
4.3 Effectiveness of scientific forecasts and indigenous knowledge-based forecasts	42
4.3.1 Indigenous and Scientific weather forecasting practices	42
4.3.2 Feedback from the Focus Group Respondents on use of forecasts	45
4.3.3 Accuracy of the IK and SK.....	47
4.3.4 Score card forecast data for the IK,SK and Observed Data.....	47
4.3.5 Perceived impact of integrating IK and SK	54
4.3.6 Recommendation of improving the integration IK and SK more effective.....	55
4.4 Local Community preparedness to extreme weather events.....	56
4.5 Local community's responses to extreme weather events.....	58
CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS	60
5.1 Conclusions.....	60

5.2 Recommendations	61
References	63
APPENDIX-I	79
Research questionnaire	79
APPENDIX-II.....	86
Interview guide	86
APPENDIX-III	89
IK, SK FORECAST V/S OBSERVED DATA	89
RESEARCH.....	89
Score Card.....	89
Appendix IV:	92
Tables shows IK.SK and Observed Weather Raw Observations	92
Appendix VI:	100

LIST OF TABLES

Table 1: Landing Site Characteristics and Focus Group participants.....	23
Table 2: SPI Threshold values	28
Table 3: Indigenous Knowledge in predicting weather changes in Jinja fishing villages	46
Table 4: Hits and False Alarms table.....	50
Table 5: Hits and false alarms.....	54
Table 6: What are the trends of these weather parameters?.....	75
Table 7: Other trends of weather parameters	76
Table 8:Effectiveness of SK against IK-based Forecasts	77
Table 9: Local Community preparedness to extreme weather events	77
Table 10: Communities’ responses to extreme weather events	78

LIST OF FIGURES

Figure 1: Conceptual framework	7
Figure 2: Perceptions (1) in change in rainfall, S.E Wind speed, change in wind direction and Occurrence of storms	32
Figure 3: Perceptions (2) Rainfall intensity, N.E wind speed, change in wind speed, wave height, change in water currents and Temperature	33
Figure 4: Annual Maximum Temperature Anomaly for Jinja (1991-2022), MAM and SON Maximum Temp Anomaly.....	35
Figure 5: Annual Minimum Temperature Anomaly for Jinja (1991-2022), MAM and SON Minimum Temp Anomaly	36
Figure 6: Jinja SPI- 6 Months and 3months	38
Figure 7: Rainfall Anomaly for Jinja.....	40
Figure 8: Jinja Wind Rose Diagram for both morning and afternoon hours	41
Figure 9: March to June IK and SK weather forecast vs Time series.....	48
Figure 10: Cumulative curve for rainfall totals for the months indicated.....	49
Figure 11: Scatter plot for SK and IK FCST Vs OBS	50
Figure 12: March to June 2024 IK and SK wind Forecast vs Observation	51
Figure 13: March to June 2024 IK and SK wind Forecast Vs Observation	52
Figure 14: Scatter plot for SK and IK FCST Vs OBS	53
Figure 15: Showing preparedness for extreme weather events	56

Figure 16: Community Responses to extreme weather events.....	58
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LIST OF MAPS

Map 1: Maps showing Masese in Jinja City, Jinja City in Uganda and of Uganda in Africa 20

LIST OF ACRONYMS/ABBREVIATIONS

HIGHWAY	: HIGH impact Weather lAke SYStem
IK	: Indigenous Knowledge
IFRC	: International Federation of Red Cross and Red Crescent
IFRCTCS	: International Federation of Red Cross and Red Crescent Societies
ILO	: International Labour Office
IOD	: Indian Ocean Dipole
IPCC	: Intergovernmental Panel on Climate Change
IWF	:Integrated Weather Forecasting
MAM	: March, April and May Season
NWP	: Numerical Weather Prediction
PLE	: Primary Leaving Examination
SFDRR	: Sendai Framework for Disaster Risk Reduction
SK	: Scientific Knowledge
UACE	: Uganda Advanced Certificate of Education
UCE	: Uganda Certificate of Education
UNMA	: Uganda National Meteorological Authority
SOND	: September, October, November and December Season
SPI	: Standard Precipitation Index
SWF	: Scientific Weather Forecasting
TWF	: Traditional Weather Forecasting
WMO	: World Meteorological Organization

ABSTRACT

The aim of the study was to examine how evaluating indigenous and scientific weather forecasting techniques influence resilience to weather events among fishing communities in Jinja. The objectives were to analyse trends of weather events, assess the relative effectiveness of scientific forecasts compared to indigenous forecasts, identify community preparedness, identify response strategies, and determine the impact of integrating forecasts on preparedness. The results, derived from survey responses and meteorological data analysis, show that 92.2% of participants apply indigenous methods using indicators like cloud patterns and wind shifts, while 70.2% rely on scientific sources, mainly radios and Television. Comparative analysis revealed that scientific forecasts recorded 90 Hits (67.5%) for rainfall and 92 Hits (67.6%) for wind, while indigenous forecasts had 47 Hits (34.3%) for rainfall and 44 Hits (32.4%) for wind. Correlation analysis established a 30% positive relationship between scientific forecasts and observed rainfall and wind records. Event trend analysis highlighted strong winds, heavy rainfall, and floods as the most frequent hazards. Using SPI-3, SPI-6 indices, and annual rainfall anomaly records for Jinja (1991–2023), wet years between 2019–2023 were confirmed. Preparedness strategies identified through survey responses included ensuring seaworthiness of vessels (24.8%), pulling boats ashore (15.8%), and minimizing fishing activity (15.8%). Response strategies emphasized maintaining vessel safety and scaling down fishing, reflecting proactive risk management. Regarding integration, 60.3% of respondents agreed both methods provide reliable forecasts, though scientific forecasts were consistently more effective. Overall, analysis confirms that scientific forecasts surpassed indigenous forecasts in accuracy. The study therefore recommends strengthening stakeholder participation and capacity building in applying scientific forecasts, enhancing dissemination systems, and engaging communities in integrating both approaches for wider acceptance. Further, expanding weather stations across the Lake Victoria basin emerged as critical for improving scientific accuracy, enhancing adoption, and ultimately strengthening fisherfolk safety and reducing vulnerability to extreme weather risks.

CHAPTER ONE: INTRODUCTION

1.0 Introduction

This chapter presents the; background to the study, problem statement, general objective, specific objectives, research questions, scope of the study, justification, theoretical/conceptual framework, and limitations/anticipated constraints.

1.1 Background of the study

Climate change is a major global challenge, with shifting weather patterns that have always occurred but now represent one of the most critical issues facing the world. The effects of climate change, along with the necessary actions such as mitigation and adaptation pose significant challenges for both economic and societal systems (Smith et al., 2020).

Approximately 90% of all natural disasters, such as floods, earthquakes, or hurricanes that lead to significant damage or loss of life, are driven by weather and climate patterns in Africa (Powell et al., 2020).

The global effects of climate change, such as floods, droughts, and extreme weather events, are already placing pressure on social and economic structures in many regions. Additionally, shifts in sectors like energy and forestry are transforming the labor market for individuals around the world (Adam & Łukasz, 2024). However, the consequences of climate change and the actions taken to address it tend to impact groups already facing social and economic vulnerabilities.

The (World Meteorological Organization (WMO), 2022) highlights that individuals who face social, economic, political, or institutional marginalization are particularly vulnerable to the impacts of climate change, as well as to the strategies for adaptation and mitigation.

It is noted that in Uganda, extreme weather events reduce the number of days available for fishing, which could negatively affect the livelihoods of coastal communities (Timmers, 2012). Access to accurate climate information services and timely seasonal forecasts can significantly support

fishing decisions amidst growing climate unpredictability and assist fisherfolk in adapting to changing climatic conditions.

The combination of hazards due to extreme weather events such as thunderstorms, lightning, floods, strong winds, fog and waterspouts within the Lake Victoria basin poses a major threat to fisher folk, including passengers on small boats, and has resulted in a large number of drownings (Kniveton et al., 2021). An estimated 3000 to 5000 people die each year due to drownings on Lake Victoria according to the International Federation of Red Cross and Red Crescent Societies.

Accurate climate services and timely seasonal forecasts are essential for strengthening decision-making in the fishing sector, particularly amid rising climate variability, enabling fisherfolk to adapt to shifting weather conditions. Indigenous weather knowledge, rooted in generations of close environmental observation, relies on signs such as animal behavior, wind patterns, and cloud movements, and is passed on through elders, parents, local experts, and personal experiences (Patrick et al., 2016). On Lake Victoria, weather prediction traditions among fishing communities have long depended on such indigenous methods (Powell et al., 2020). Evidence shows that before 2018, fisherfolk lacked access to specialized scientific forecasts. Since then, scientific knowledge (SK) has been introduced, particularly through marine forecasts generated by the HIGHWAY project for East African nations. These forecasts are now distributed across fourteen districts in the Lake Victoria Basin, enhancing accessibility to timely climate information (Powell et al., 2020).

1.2 Statement of the Problem

Extreme weather events, particularly floods and storms, continue to pose serious risks to the livelihoods and safety of vulnerable communities (Zhang et al., 2021). Effective weather forecasting is not only about accuracy but also about accessibility, timeliness, clarity, and the extent to which forecasts are trusted and acted upon by local communities. In Uganda, fishing communities depend on a blend of indigenous weather knowledge and emerging scientific forecasts, reflecting a complex interaction between tradition and modernity. Although marine forecasts were formally introduced in 2018 through the HIGHWAY Project, many fisherfolk still struggle with issues of limited dissemination, difficulties in interpretation, and inconsistent

adoption of forecasts. Existing studies have primarily focused on the reliability of forecasts, but little attention has been given to how indigenous and scientific methods can be integrated to improve preparedness, trust, and decision-making. This gap underscores the need for research on integration strategies to enhance resilience among fishing communities.

1.3 Research objectives

1.3.1 General objective

The general objective of the study was evaluating indigenous and scientific weather forecasting techniques for resilience to weather events among fishing communities in Jinja.

1.3.2 Specific Objectives

The specific objectives of the study were to:

- i. To analyze the trends of weather events in the study area.
- ii. To compare the effectiveness of scientific forecasts against indigenous knowledge-based forecasts.
- iii. To identify the local community preparedness to extreme weather events.
- iv. To identify the local community's responses to extreme weather events.

1.4 Research questions

The study sought to address the following research questions:

- i. What are the trends of extreme weather events in the study area?
- ii. How effective are scientific forecasts compared to indigenous knowledge-based forecasts?
- iii. How is local community prepared for extreme weather events?
- iv. What are the local community's responses to extreme weather events?

1.5 Scope of the study

The study was conducted at Masese in Jinja district in Eastern Uganda and investigated the impact of integrating indigenous and scientific weather forecasting on resilience to extreme weather events among fishing communities. The study focused on utilization of IK and SK for a period of more than 10 years.

1.6 Justification

Fishing communities like Masese Landing Site in Uganda are increasingly vulnerable to extreme weather events, which pose significant threats to their lives, livelihoods, and infrastructure. Despite the availability of scientific weather forecasting, many of these communities continue to rely on indigenous knowledge systems to predict weather patterns. However, the effectiveness of integrating these two forecasting approaches remains under-explored.

Conducting this study is essential to assess whether combining indigenous and scientific weather forecasting can enhance the accuracy and reliability of predictions, thereby strengthening community resilience. Without such integration, fishing communities may continue to face challenges in preparedness and response to climate-related risks. This research aims to provide insights into how a combined approach can improve early warning systems, inform policy interventions, and promote sustainable development in vulnerable communities. By addressing this gap, the study can contribute to the development of more effective and culturally relevant strategies for mitigating the impact of extreme weather events.

Recent studies have highlighted the importance of integrating indigenous knowledge with scientific methods to improve weather forecasting and community resilience. For instance, research in East Africa has documented the use of local indicators for weather forecasting among smallholder farmers and pastoralists, emphasizing the need for systematic documentation and integration of indigenous knowledge systems (Okonya & Jurgen Kroschel, 2013). Additionally, a study in Uganda's Rwenzori region identified various environmental indicators used by local communities to predict rainfall patterns, underscoring the potential benefits of combining indigenous and scientific forecasting methods (Nkuba et al., 2020).

By building upon these findings, this study seeks to evaluate the practical applications of integrating indigenous and scientific weather forecasting in fishing communities, aiming to enhance their resilience to extreme weather events.

1.7 Significance

This study aims to enhance resilience among fishing communities by integrating indigenous and scientific weather forecasting. Key outputs include developing a structured framework to combine indigenous knowledge (IK) and scientific knowledge (SK) for improved weather prediction accuracy and early warning systems. The study will create actionable guidelines to enhance preparedness, reduce fatalities, minimize asset losses, and optimize fishing activities. Additionally, the study will provide policy recommendations for incorporating IK into national disaster risk reduction strategies and document indigenous forecasting methods for educational and training purposes. Enhanced collaboration models for engaging local communities, meteorological agencies, and disaster management organizations will also be developed.

These outputs align with Sustainable Development Goals (SDGs), particularly SDG 13 on climate action, SDG 14 on life below water, and SDG 11 on sustainable cities and communities. The study supports the Sendai Framework for Disaster Risk Reduction (SFDRR) targets, especially Target G on increasing access to early warning systems and Target B on reducing the number of affected people. It also addresses SFDRR priorities such as understanding disaster risk through the integration of indigenous knowledge and enhancing disaster preparedness and response through localized forecasting systems (Kniveton et al., 2014).

At the national level, the study contributes to Uganda's National Development Plan III (NDP III) under key programmes, including the Natural Resources, Environment, Climate Change, Land, and Water Management Programme, which strengthens climate resilience and disaster preparedness. It also supports the Community Mobilization and Mindset Change Programme by fostering stakeholder engagement in disaster risk reduction and the Innovation, Technology Development, and Transfer Programme by advancing the integration of indigenous knowledge with scientific innovations (Uganda Ministry of Health, 2020).

By addressing these global and national priorities, the study will contribute to the development of sustainable, community-centered climate adaptation strategies that reduce vulnerability and enhance resilience among fishing communities in Uganda.

1.8 Theoretical Framework

Cross-Knowledge Integration Theory refers to the process of merging original unrelated knowledge structures into a single, coherent whole, encompassing both individual and organizational learning and knowledge sharing. The key to understanding integration is the positive efficiency and learning properties of knowledge specialization and requirements it imposes for integrating diverse knowledge (Grant 1996 & Postrel 2002). These works emphasize that shared knowledge is a key factor in knowledge integration and that integrating knowledge across boundaries is essential for innovation. (Tell et al., 2016) has contributed to discussions on knowledge integration, particularly in the context of innovation management and organizational learning.

This theory posits that the integration of different knowledge systems, such as SK and IK, can lead to more comprehensive and accurate forecasts. It is based on the premise that diverse perspectives enhance the understanding of complex phenomena. The theoretical literature review for the study on "Assessing the impact of Integrating SK and IK to provide a comprehensive understanding of the conceptual framework for this research. This review highlights relevant theories, concepts, and prior research that form the foundation for investigating the relationship between integrating Scientific Knowledge (SK) and Indigenous Knowledge (IK) weather forecasting practices in the community and its impact on integrated weather forecasting that leads to enhanced disaster preparedness and community resilience.

1.9 Conceptual framework

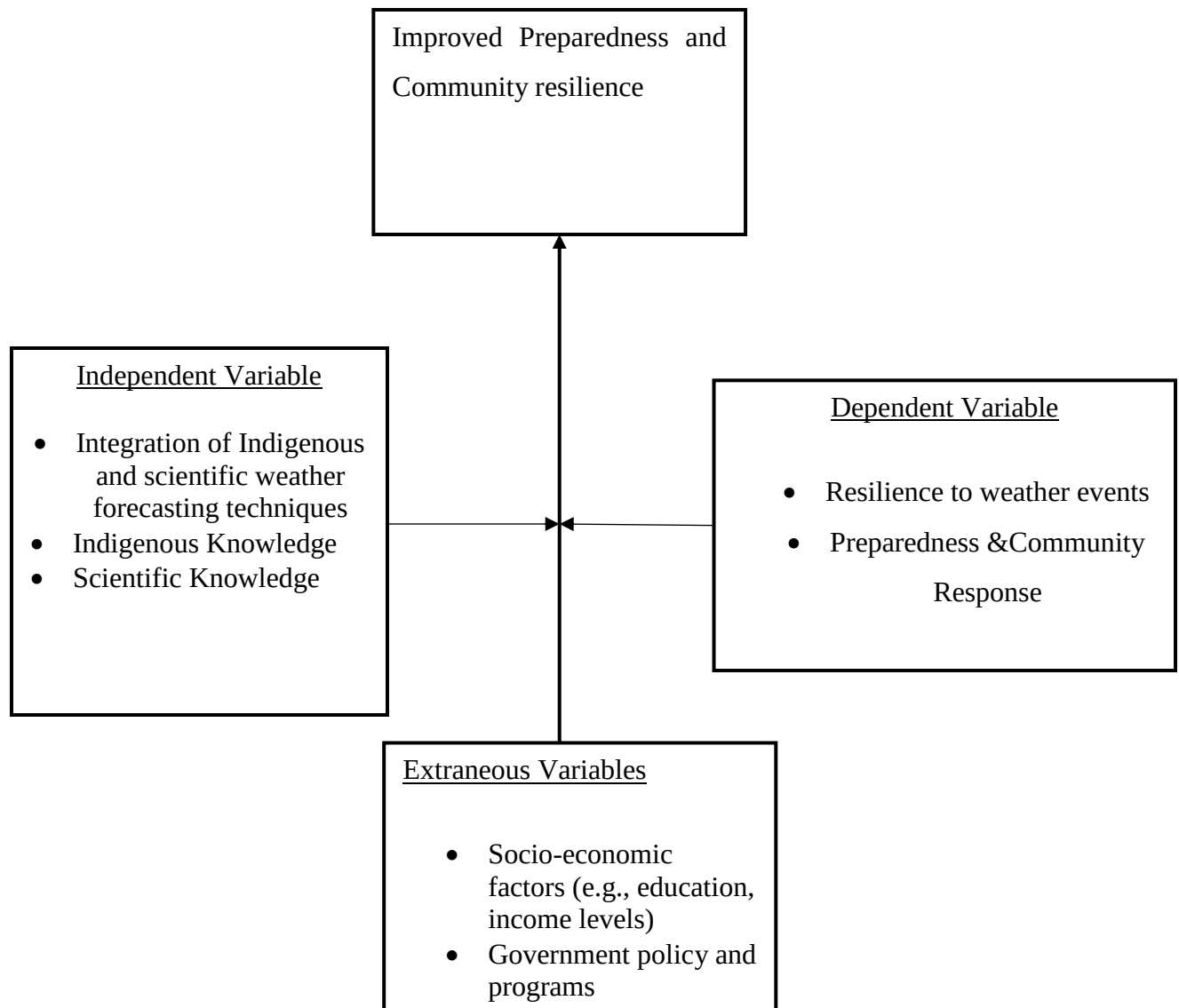


Figure 1: Conceptual framework

The independent variables for this study include Integrated Weather Forecasting (IWF) and Scientific Weather Forecasting (SWF) practices, reflecting the extent to which communities rely on indigenous knowledge and modern scientific meteorological forecasts. The dependent variable is the resilience of local communities to extreme weather events, encompassing preparedness measures and responsive actions, while socio-economic conditions and government policies and

programs serve as extraneous variables. These extraneous factors, such as government policies, programs, and socio-economic services, play a pivotal role in supporting the integration of indigenous and scientific knowledge, thereby enhancing community resilience and preparedness. Policy advocacy involves collaboration with policymakers to establish frameworks that institutionalize the integration of indigenous and scientific forecasting, ensuring sustained resources and support, from district local governments to central authorities. Socio-economic factors, including education level, income, and food security, are critical; many fishing communities face low educational attainment, limited income, and food insecurity. Deficiencies in these areas hinder the community's ability to interpret and act upon integrated forecasts effectively, which in turn limits informed decision-making for preparedness and disaster response. This conceptual framework guided the empirical investigation, providing a structure for analyzing the relationships between indigenous and scientific forecasting practices, their integration, early warning systems, community preparedness, response mechanisms, and overall resilience. The framework specifically contextualizes these dynamics at Masese Landing Site in Jinja, capturing the complex interplay between traditional knowledge, modern science, socio-economic conditions, policy environments, and the practical application of forecasts in strengthening local adaptive capacity and reducing vulnerability to extreme weather events.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

This chapter presents a review of literature on the impact of integrating indigenous and scientific weather forecasting on resilience of fishing communities to extreme weather events.

2.1 Theoretical literature review

The Social-Ecological Systems (SES) Theory provides a framework for understanding the complex interactions between human communities and their environment (Michael D & Elinor, 2014). The theory emphasizes that social and ecological systems are interdependent, dynamic, and adaptive, with changes in one component affecting the other. In the context of fishing communities in Jinja, Uganda, SES theory helps explain how the integration of Indigenous Knowledge (IK) and Scientific Knowledge (SK) in weather forecasting contributes to community resilience against extreme weather events. IK, derived from generations of observation and experience, allows communities to interpret local environmental cues such as cloud patterns, wind shifts, and animal behavior, while SK provides standardized, broader meteorological forecasts that are often communicated through radios, television, and mobile applications (Yegbemey & Egah, 2021). The combination of these knowledge systems enhances the capacity of communities to anticipate, prepare for, and respond to storms, floods, and other extreme events, thereby improving overall resilience.

The SES framework assumes that human and ecological systems maintain a level of adaptability, and that communities can self-organize to cope with disturbances (Folke et al., 2010). It also presupposes that knowledge systems, whether indigenous or scientific, can complement one another if effectively integrated and utilized within local decision-making processes. However, limitations exist. The theory may not fully account for rapid environmental changes caused by climate variability or human interventions, and integration of IK and SK can be hindered by differences in epistemologies, communication barriers, and institutional biases favoring scientific approaches over indigenous perspectives (Reyes-García et al., 2018) Additionally, socio-economic

factors such as low literacy, poverty, and limited access to communication technologies may reduce the ability of fisherfolk to fully leverage both types of knowledge.

Despite these constraints, SES theory remains useful for guiding research on the integration of IK and SK in enhancing community preparedness and adaptive capacity. Applying this framework in Jinja allows researchers to examine not only forecast accuracy but also the broader aspects of accessibility, adoption, trust, and practical use of weather information in strengthening community resilience to extreme weather events.

2.2 Trends of extreme weather events

Extreme weather events, including storms, floods, droughts, and heatwaves, have become more frequent and intense due to climate change. These events significantly affect communities reliant on natural resources, such as fishing communities in Jinja, Uganda. Understanding the trends in extreme weather events is crucial for integrating indigenous and scientific forecasting methods to enhance resilience (Intergovernment Panel on Climate Change, 2021).

Globally, extreme weather events have increased in frequency and severity over the past few decades. According to the Intergovernmental Panel on Climate Change (IPCC), the global mean temperature has risen by approximately 1.1°C above pre-industrial levels, contributing to intensified heatwaves, heavy rainfall, and tropical storms. Studies indicate that the number of climate-related disasters has increased nearly fivefold since the 1970s (United Nations Conference on Trade and Development, 2022).

Heatwaves have become more prolonged and intense in many regions, affecting ecosystems and human livelihoods S.E Perkins-Kirkpatrick & S.C Lewis (2020) and highlight that the frequency of extreme heat events has significantly increased since the 1950s, with many regions experiencing heatwaves beyond historical records. Similarly, extreme precipitation events have intensified, leading to increased flood risks, particularly in tropical and subtropical regions (Selma et al., 2018).

Africa is one of the most vulnerable continents to climate change due to its heavy reliance on climate-sensitive sectors such as agriculture and fishing. Evidence shows an upward trend in extreme weather events across the continent. According to (Christian et al., 2021) Africa has experienced more frequent droughts and floods, with rainfall variability increasing significantly over the past two decades. The continent has also recorded a rise in tropical storms, particularly affecting coastal and lake regions (World Meteorological Organization (WMO),, 2024).

Droughts are becoming more frequent and severe, especially in East Africa, where recurrent dry spells have disrupted food and water security. (Nicholson, A detailed look at the recent drought situation in the Greater Horn of Africa, 2013) reports that droughts in the Horn of Africa have become more persistent, exacerbating food shortages and displacement. On the other hand, extreme rainfall events have also increased, causing floods that displace communities and destroy infrastructure (Wainwright et al., 2021). These trends highlight the growing unpredictability of weather patterns, necessitating the integration of indigenous and scientific forecasting approaches for disaster reduction. (Thirze et al., 2022).

Uganda has experienced increasing occurrences of extreme weather events, with significant impacts on agriculture, fisheries, and water resources. According to the Uganda National Meteorological Authority (UNMA), the country has recorded rising temperatures, erratic rainfall patterns, and frequent extreme events such as floods and droughts. The Uganda Climate Change Action Plan (2021) highlights that floods and landslides have become more common, particularly in eastern Uganda, where heavy rains trigger disasters in districts such as Bududa and Jinja (Anna et al., 2021).

Lake Victoria, which supports thousands of fishing communities, has experienced increasing water level fluctuations due to extreme weather patterns. (NASA Earth, 2021) note that heavy rains have contributed to rising lake levels, leading to flooding, swamped farmland, inundated homes, displaced tens of thousands of people. and destruction of fishing infrastructure. Conversely, prolonged dry spells have led to reduced fish stocks, affecting livelihoods. These patterns align with findings by (Ogutu et al., 2012) who report that erratic weather conditions have increasingly threatened the sustainability of fisheries in Uganda.

Fishing communities in Jinja are particularly vulnerable to extreme weather events due to their dependence on Lake Victoria. Increased storm surges, unpredictable rainfall, and fluctuating lake levels have disrupted fishing activities, leading to economic and food insecurity. Studies indicate that storm frequency on Lake Victoria has risen, making fishing more dangerous (Ranaivo & Kathryn, 2024). Strong winds and heavy rains have negatively affected fishing activities (Mahiri, 2021).

Additionally, rising temperatures have affected fish breeding cycles, altering fish migration patterns and availability. (Mahiri, 2021) note that the warming of Lake Victoria has led to changes in fish species distribution, affecting traditional fishing grounds. This has forced fishers to travel longer distances, increasing operational costs and risks. The unpredictability of these events has made it challenging for fishing communities to plan their activities, highlighting the need for accurate and reliable weather forecasting using machine learning-based forecasting (Huijin et al., 2025).

Given the increasing frequency of extreme weather events, combining indigenous knowledge with scientific forecasting is essential for enhancing resilience. Indigenous weather forecasting, based on environmental cues such as cloud formations, animal behavior, and wind patterns, has been used by fishing communities for generations (Ben et al., 2020). However, scientific forecasting, using satellite data and meteorological models, provides more precise and data-driven predictions (Yuting & Wei, 2024).

A hybrid approach that integrates both forecasting methods can improve the accuracy and accessibility of weather predictions for fishing communities. Studies suggest that indigenous knowledge can complement scientific models by providing localized insights, making forecasts more practical for decision-making (Thirze et al., 2022). This integration can help communities better prepare for extreme weather events, reducing losses and enhancing adaptive capacity (Walter L. F. et al., 2022).

Extreme weather events have increased globally, with Africa and Uganda experiencing significant trends in droughts, floods, and storms. Fishing communities in Jinja, reliant on Lake Victoria, are

particularly vulnerable to these events, which threaten their livelihoods and safety. The rising unpredictability of weather patterns underscores the importance of integrating indigenous and scientific forecasting methods to enhance resilience. By leveraging both traditional knowledge and modern meteorological tools, fishing communities can improve preparedness and adaptation strategies in the face of climate change (Ben et al., 2020).

2.3 Effectiveness of scientific forecasts against indigenous knowledge-based forecasts

Weather forecasting is a critical component of disaster preparedness and resilience, particularly for vulnerable communities like fishing populations in Jinja, Uganda. Scientific weather forecasting, relying on satellite imagery, meteorological models, and artificial intelligence, has advanced in precision and scope (Nyadzi et al., 2021). However, indigenous knowledge-based forecasting, grounded in local environmental observations, remains vital for community-level decision-making, particularly where access to modern meteorological data is limited (Elias et al., 2019).

Scientific weather forecasts are data-driven, using climate models, radar observations, and historical trends to predict weather patterns with increasing accuracy (Goneri et al., 2020). These forecasts provide early warning systems that aid policymakers in disaster preparedness and risk reduction (Claire L & Katherina, 2017). Modern advancements in machine learning and climate modeling enhance predictive reliability, improving the ability to forecast extreme weather events (Vijendra et al., 2023).

Despite these advantages, scientific forecasts often struggle with localized accuracy due to limitations in meteorological station coverage and challenges in downscaling global models to specific areas like Jinja (Harrison & Ngaruiya, 2021). Moreover, the effectiveness of these forecasts depends on timely communication and community trust in the information provided (James et al., 2019).

Indigenous knowledge-based forecasting depends on ecological signals, such as wind directions, animal behavior, and cloud formations (Lisa et al., 2015). Many fishing communities apply this knowledge to anticipate storms, rainfall, and changes in water levels, supporting adaptive actions

(Opare, 2016). This forecasting approach is deeply embedded in cultural traditions and local ecological understanding, making it highly relevant to specific regions (Walter F. L. et al., 2022). Indigenous forecasts are often more accessible and widely trusted by local communities than scientific forecasts (Elias et al., 2019). However, their reliability is challenged by changing climate patterns that alter traditional environmental indicators (Nyadzi et al., 2021).

Additionally, indigenous knowledge lacks standardized documentation and verification processes, leading to inconsistencies in predictive accuracy (USAID, 2023).

Studies show that integrating scientific and indigenous weather forecasting improves resilience to extreme weather events (Nyadzi et al., 2021). Scientific forecasts provide precise data, while indigenous forecasts offer localized, experience-based insights that enhance adaptive capacity (Talardia et al., 2020). In Uganda, a hybrid approach has been found to increase forecast uptake, as communities recognize the strengths of both systems (Richard et al., 2021).

The effectiveness of scientific forecasting surpasses indigenous methods in predicting large-scale meteorological events, such as cyclones and droughts, due to its reliance on advanced technology and climate models (Vijendra et al., 2023). However, indigenous forecasting excels in interpreting microclimatic changes and immediate environmental shifts (Opare, 2016). Combining both approaches lead to more robust, context-specific forecasting strategies (Lisa et al., 2015).

Scientific and indigenous weather forecasting methods each have strengths and weaknesses. Scientific forecasting offers precision and large-scale predictive capability, while indigenous knowledge provides localized insights that are immediately applicable to fishing communities. Integrating both approaches enhance resilience by combining empirical accuracy with community-based wisdom, ultimately improving preparedness for extreme weather events in Jinja.

2.4 Local community preparedness to extreme weather events

Local communities, particularly those reliant on natural resources such as fishing, are highly vulnerable to extreme weather events. Their preparedness determines their ability to mitigate risks, adapt to changing conditions, and recover from disasters (Rajesh et al., 2018). Preparedness

strategies often incorporate a combination of traditional knowledge and scientific approaches, enabling communities to enhance resilience (Madhav et al., 2014). Early warning systems, capacity building, and local adaptation strategies play crucial roles in strengthening preparedness.

Early warning systems (EWS) are critical in reducing the adverse effects of extreme weather events. EWS integrate indigenous knowledge with scientific forecasts to improve the accuracy and accessibility of weather predictions (Robert & Marc , 2018). In fishing communities, traditional indicators such as changes in wind patterns, sea currents, and animal behavior are often combined with meteorological data to enhance preparedness (Gugulethu et al., 2013). For example, studies in East Africa show that local fishermen rely on indigenous signs to anticipate storms, supplementing official forecasts provided by national meteorological agencies (Elias et al., 2019). However, gaps in communication channels and inadequate access to real-time data often reduce the effectiveness of EWS, limiting community preparedness (Duminda et al., 2020).

Capacity building enhances the ability of local communities to prepare for and respond to extreme weather events. Training programs focusing on disaster risk reduction, emergency response, and sustainable fishing practices have been instrumental in strengthening resilience (Adaptation Fund, 2023). For instance, participatory workshops in coastal communities in Uganda have helped fishermen understand climate variability and adopt safer fishing practices (Mulokozi, 2025). Additionally, community-based organizations play a key role in disseminating information and ensuring that preparedness measures align with local needs (Dr. Dimitrios et al., 2024). Despite these efforts, challenges such as limited financial resources and low literacy levels hinder the full implementation of preparedness strategies (Louis & Tirivangasi, 2021).

Local communities develop adaptation strategies to cope with the increasing frequency of extreme weather events. These strategies include diversifying livelihoods, reinforcing infrastructure, and adopting sustainable resource management practices (Dr. Elizabeth, 2016). Fishing communities along the coastal areas have begun incorporating indigenous weather prediction techniques with scientific forecasts to optimize fishing schedules and avoid hazardous conditions (Ramadhani & Seme, 2024). Furthermore, community-led initiatives such as constructing storm-resistant shelters and improving boat safety measures have proven effective in reducing vulnerabilities (Aaron,

2014). However, the success of these adaptation strategies depends on governmental support, access to funding, and integration with national disaster risk management frameworks (Mfitumukiza et al., 2020).

Despite the progress in strengthening community preparedness, several challenges persist. Limited access to climate information, inadequate infrastructure, and socio-economic constraints hinders effective disaster preparedness in fishing communities (Rodney et al., 2020). Additionally, traditional knowledge systems, though valuable, often lack institutional recognition, reducing their integration into formal disaster management plans however there is need to blend both the traditional and modern methods as we believe it can create a robust adaptive system for disaster preparedness, response, and recovery leading to safer and more resilient communities (Masego & Livhuwani, 2024). Climate change further exacerbates these challenges by increasing the unpredictability of weather patterns, making it harder for communities to rely solely on past experiences for preparedness (Heather, 2024).

Local community preparedness is essential for mitigating the impacts of extreme weather events. Integrating indigenous knowledge with scientific weather forecasting enhances early warning systems, strengthens capacity building, and improves local adaptation strategies. However, addressing socio-economic barriers and ensuring institutional support are necessary to enhance the effectiveness of preparedness measures. Future research should focus on policy frameworks that facilitate the integration of traditional and scientific approaches in disaster risk reduction.

2.5 Communities responses to extreme weather events

Communities respond to extreme weather events through various adaptive and reactive strategies. The effectiveness of these responses depends on factors such as early warning systems, infrastructure resilience, community awareness, and socio-economic conditions (Nyadzi et al., 2021). Many communities employ traditional coping mechanisms alongside modern disaster risk management approaches to mitigate the adverse effects of extreme weather (Stephanie et al., 2013).

One key response is the adoption of early warning systems. Communities that integrate both indigenous and scientific forecasting benefit from improved preparedness and response times (USAID, May 2023). Studies in East Africa have shown that the use of scientific meteorological data, combined with indigenous knowledge, enhances the effectiveness of early warnings, leading to better evacuation and protection measures (Japhet et al., 2025). Moreover, timely communication of weather forecasts has been found to significantly reduce casualties and property damage (Thomas et al., 2022).

Another response strategy involves infrastructure adaptation. Communities frequently modify their housing structures and drainage systems to withstand extreme weather conditions (Vijendra et al., 2023). For example, coastal communities in Southeast Asia have adopted stilt housing to mitigate the impacts of flooding, while African communities reinforce their homes with climate-resilient materials (Opare, 2016). Investments in climate-resilient infrastructure, such as reinforced embankments and improved water management systems, further strengthen community resilience (Goneri et al., 2020).

Livelihood diversification is another crucial response to extreme weather events. Many communities engage in alternative income-generating activities, such as agroforestry, fisheries diversification, and non-farm employment, to reduce dependence on climate-sensitive livelihoods (Lisa et al., 2015). Studies in Uganda indicate that fishing communities affected by erratic weather patterns often switch to alternative economic activities to sustain their livelihoods (Elias et al., 2019). Additionally, agricultural communities adopt climate-smart farming practices, such as drought-resistant crops and conservation agriculture, to mitigate the impacts of changing weather patterns (James et al., 2019).

Social networks and community-based support systems play a vital role in disaster response and recovery. In many rural areas, collective action enables communities to recover more effectively from extreme weather events (Philip & Thomalla, 2011). Mutual aid groups, savings cooperatives, and disaster preparedness committees facilitate resource mobilization and post-disaster assistance (USAID, May 2023). Research in flood-prone areas of Ghana highlights how community

solidarity strengthens resilience by ensuring timely access to emergency resources and support (Matthew et al., 2023).

Despite these proactive responses, challenges persist. Limited access to financial resources often hampers the ability of vulnerable communities to implement effective adaptation measures (Goneri et al., 2020). In some cases, reliance on indigenous knowledge alone may be insufficient to predict extreme weather accurately, necessitating integration with modern meteorological tools (Richard et al., 2021). Additionally, inadequate government support and policy implementation remain barriers to strengthening community resilience (Fiona et al., 2020).

In the end, communities employ diverse strategies to respond to extreme weather events, including early warning systems, infrastructure adaptation, livelihood diversification, and social networks. The integration of indigenous and scientific forecasting enhances the effectiveness of these responses, improving disaster preparedness and resilience. However, addressing financial constraints, policy gaps, and technological accessibility is essential to strengthening community responses to extreme weather events.

CHAPTER THREE: METHODOLOGY

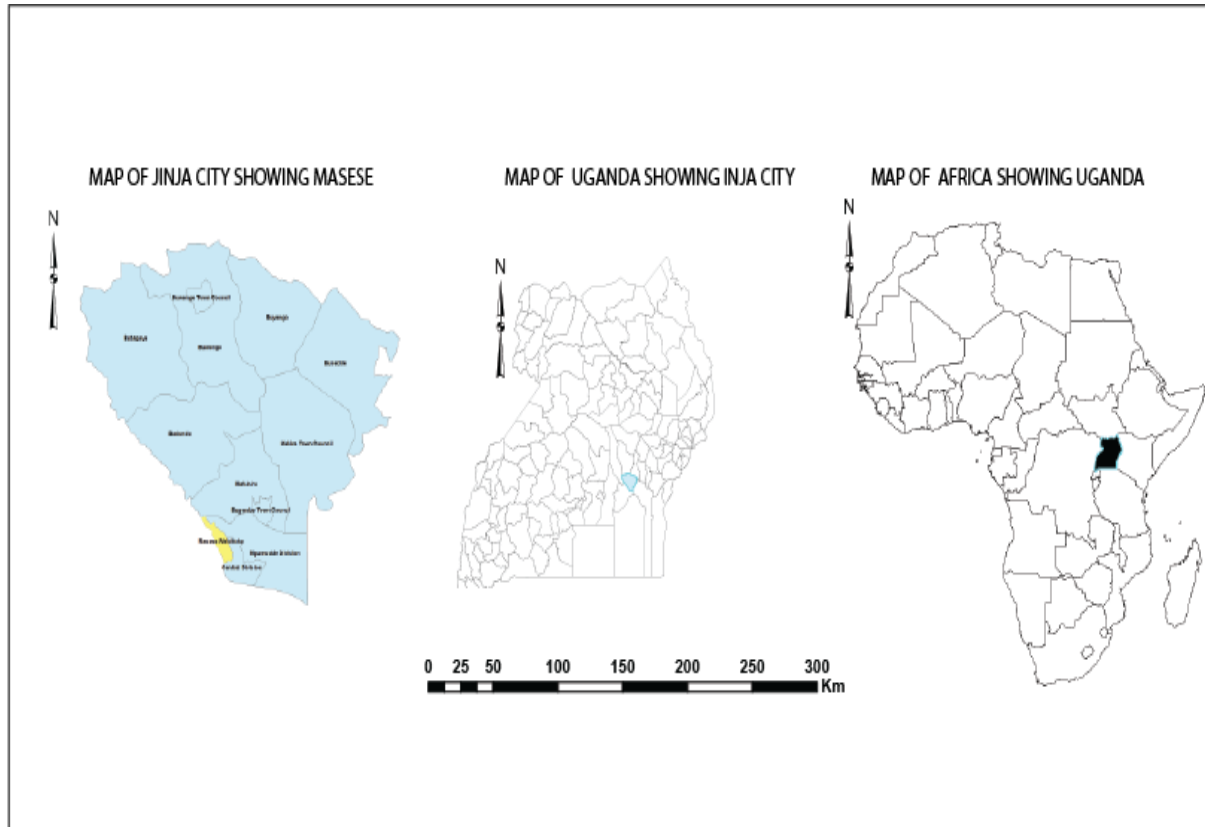
3.0 Introduction

This study employs a methodology to examine how integrating indigenous knowledge (IK) and scientific knowledge (SK) in weather forecasting influences the resilience of fishing communities in Jinja to extreme weather events (Anak et al., 2024). It details the study design, area, target population, sample size, sampling techniques, and data analysis procedures. Quantitative and qualitative approaches capture forecasting practices and community responses (Adams & Opare, 2018). The methods ensure reliable, valid findings that reveal how IK and SK integration enhances preparedness and adaptive capacity (Chilunjika, 2024).

3.1 Research Design

A descriptive survey was used, employing a mixed-methods approach, and drawing on quantitative and qualitative data.

3.2 Study Area Description



Map 1: Maps showing Masese in Jinja City, Jinja City in Uganda and of Uganda in Africa

The study was carried out at Masese Landing Site in Jinja City, Eastern Uganda (Map above), which serves communities from Masese, Walukuba East, and Walukuba West parishes. These parishes comprise 33 villages with an estimated population of approximately 36,219 individuals (Uganda Bureau of Statistics [UBOS], 2024) and cover an area of 5,221 km². The site is geographically positioned between latitudes 0°26'N and 0°27'N, and longitudes 33.14°E and 33.15°E. Masese Landing Site is located about 3 km from Jinja town along the shores of Lake Victoria, making it a strategic hub for fishing activities. The area was specifically selected for this study due to its vulnerability to frequent extreme weather events, including heavy rainfall, strong winds, and recurrent flooding, which significantly impact the livelihoods, safety, and resilience strategies of the local fishing communities. Its location and exposure to such environmental hazards make Masese an ideal setting for examining the integration of indigenous and scientific

weather forecasting practices and their influence on community preparedness and adaptive responses.

3.3 Sample Size

Based on the guidelines proposed by Krejcie and Morgan (1970), a total of 150 respondents were selected to participate in the study, ensuring that the sample was representative of the target population and sufficient for statistical analysis of the relationships between weather forecasting practices and community resilience.

3.4 Sampling Techniques and Procedure

The Masese area, encompassing its three parishes, was selected for this study because fishing is the primary economic activity, yet it faces significant environmental challenges, including pollution, waste dumping, land reclamation, intensified cage farming, and rampant unemployment, which has led to sand mining and land degradation. The area also has a documented history of community responses to extreme weather events, making it ideal for examining resilience strategies. Respondents were conveniently accessible due to their active involvement in fishing. To ensure representativeness, 15 villages were randomly chosen from the total 33 villages across the parishes. Cluster sampling was employed, as the population is naturally organized into villages, wards, and fishing communities. Within each selected village, 10 fisherfolk were randomly chosen, resulting in a total sample of 150 respondents. A systematic approach was applied, selecting every fifth household member actively engaged in fishing. This method ensured that participants represented diverse experiences with both indigenous and scientific fishing practices, making them well-suited to assess the effectiveness and integration of weather forecasting techniques in enhancing community preparedness and adaptive capacity.

3.5 Data types and sources

The study drew upon both primary and secondary data to ensure comprehensive and reliable findings. Primary data were collected directly from respondents within the study area, capturing first-hand insights on indigenous and scientific weather forecasting practices, community preparedness, and responses to extreme weather events. Secondary data were sourced from historical records of the former Uganda National Meteorological Authority (UNMA), now operating as the Department of Meteorological Services (DMS), including daily wind and rainfall data from the Jinja Meteorological Station. To strengthen the analysis, relevant published and unpublished materials from government offices, academic sources, and credible online repositories were also reviewed and synthesized. This triangulation of data sources enhanced the validity of the findings by cross-verifying field observations with official meteorological records and documented evidence, providing a robust foundation for assessing the integration of Indigenous Knowledge (IK) and Scientific Knowledge (SK) in forecasting and its impact on community resilience to extreme weather events.

3.5.1 Data Collection Methods and Instruments

Data collection for the study was conducted between March and June 2024, employing both quantitative and qualitative research methods to ensure a comprehensive understanding of the subject. Objectives one, three, and four were primarily addressed through questionnaire surveys and Key Informant Interviews (KII), while objective two was partially assessed using a weather scorecard. Indigenous forecasts were documented by community elders within the fishing communities, whereas scientific forecasts were obtained from daily UNMA Marine WhatsApp updates and observed rainfall and wind records at the Jinja Meteorological Station.

Quantitative data were gathered through structured questionnaires with closed-ended questions, while qualitative data were collected via open-ended questions administered during Focus Group Discussions (FGDs), seasonal calendars, and time-series analyses to capture local weather patterns. For objectives one, three, and four, qualitative insights were further obtained using open-ended interview guides for FGDs and KIIs with fisherfolk and relevant stakeholders. Household

surveys and FGDs were conducted in five randomly selected villages from the Masese parishes in Jinja City. Participants included a diverse range of fisherfolk, such as boat owners, boat crew, female silverfish dealers, and traders, ensuring representation of various experiences and perspectives related to both indigenous and scientific weather forecasting practices.

Fisher folk	Villages				
	Masese I	Masese II	Kisima II	Central village	Muyenga
Boat owners	4	5	5	5	6
Boat Crew	5	4	6	4	5
Female Silver fish(Mukene)	3	5	5	6	5
Traders	6	5	4	4	6
	18	19	20	19	22
Grand Total	98				

Table 1: Landing Site Characteristics and Focus Group participants

The study employed a combination of one-on-one interviews, group discussions, and Key Informant Interviews (KII) with group leaders and community members. The questions focused on assessing respondents' knowledge and understanding of **Indigenous Knowledge (IK)** and **Scientific Knowledge (SK)** forecasts, including the indicators used, practical application, and ways to improve their utilization. Additionally, participants provided insights on extreme weather events and shared strategies for preparedness and response. They were also encouraged to give recommendations for enhancing the integration and effectiveness of both forecasting approaches.

For specific objective two, data were captured using a structured scorecard with parameters including wind and weather conditions, IK and SK forecasts, and observed meteorological data. Indigenous forecasts were documented by community elders within the fishing communities, while scientific forecasts were obtained from daily UNMA Marine WhatsApp updates and recorded rainfall and wind data at the Jinja Meteorological Station.

The study also analyzed comprehensive monthly climate data spanning over 30 years (1991–2023), including precipitation, minimum and maximum temperatures, and daily wind speed and direction, obtained from the Uganda National Meteorological Authority (UNMA). This long-term dataset provided a representative overview of weather patterns in the study area, supporting a robust assessment of the effectiveness and integration of IK and SK in enhancing community preparedness and resilience to extreme weather events.

3.6 Data Analysis

For objective 1,3 and 4, quantitative data collected was analyzed using the Statistical Package for Social Sciences (SPSS) to generate descriptive statistics (percentages, percentages, frequency tables correlations, pie charts). Qualitative data from FGD, KII was analyzed using content analysis where by the text is coded into manageable groups on a variety of levels that include word, phrase, sentence, or theme and then inferences are made about the messages within the texts.

To perform drought and anomaly analysis, the Climate Data Tool (CDT) with all its utility functions freely available for installation at the GitHub repository <https://github.com/rijaf-iri/CDT> and depended on R programming language for its operation and functionality was utilized. It is a tool developed as part of the Enhancing National Climate Services (ENACTS) initiative by the International Research Institute for Climate and Society (IRI), part of the Earth Institute at Columbia University to enable National Meteorological and Hydrological services to carry out meteorological data quality control, homogenization, merging station data with satellite and others proxies such as reanalysis, Analyze and visualize station and gridded datasets (Tufa et al., 2022).

For part of objective 1, The secondary data for precipitation and temperature was analyzed to obtain the Standardized Precipitation Index (SPI) and Time Series Trend Analysis.

For the part of objective 2, the weather score card data was analyzed through the R program to generate the Time series Analysis, Cumulative Mean Analysis, regression analysis and the Hits and False Alarms.

For Objective 3 and 4, KIIs were conducted to understand existing preparedness mechanisms and responses. FGDs were held with fisher folk to explore traditional and modern adaptation strategies used to cope with extreme weather events and examine community experiences in past extreme weather events and documented traditional coping mechanisms.

a) Standardized Anomaly Index (SAI) Estimation Model.

A population Long Term Mean (Climatological Average) as guided by the World Meteorological Organization (WMO) reference period of 1991-2020 was computed for Precipitation and temperature on rainfall seasons (MAM and SON) and annual time scale.

Equation for computing Long Term Mean/average (Climatological/Population Mean)

$$\mu = \frac{\sum_{i=1}^N x_i}{N} \text{ -----equation 1}$$

Equation of Seasonal/annual Standard deviation.

$$\sigma = \sqrt{\frac{\sum (x_i - \mu)^2}{N}} \text{equation2}$$

where N is population size (30 years), $\mathcal{X}$ is the seasonal/Annual rainfall total or Seasonal/Annual Average temperature (min, max, mean) and μ is the computed climatological seasonal/Annual average rainfall or temperature (max, min and mean)

For general temporal variation in station/district/catchment annual average temperature, annual mean maximum temperature, annual mean minimum temperature, Average seasonal and average annual rainfall time series data, the analysis was performed using Standardized Anomaly Index (SAI). The SAI is a commonly used index for regional climate change (Koudahe et al., 2017). Station/basin/catchment annual temperature (min, max and mean), seasonal and annual rainfall is expressed as a standardized departure Z_1 from the annual or seasonal long-term mean (climatological/population mean) μ of temperature (min, max and mean) respectively in the base/reference period 1991-2020.

Equation for computing temperature SAI.

$$Z_1 = \frac{\chi - \mu}{\sigma} \text{-----Equation2}$$

Where χ is the annual mean (min, max and mean) temperature or total seasonal/annual rainfall, μ is the climatological annual mean, σ is the standard deviation of the annual temperature (min, max and mean) and rainfall for the climatological mean (1991-2020) and Z_1 is the computed annual/seasonal SAI for temperature (min, max and mean) and rainfall.

A period when SAI values below long-term average was dominated is considered as cooling/dry period in temperature/rainfall while a period when SAI values above long-term average was most persistent is a warming/wet period for temperature/rainfall.

b) Standardized Precipitation Index (SPI) Estimation Model

The SPI concept was developed by T. B. McKee, N.J. Doesken, and J. Kleist and in 1993 (McKee et al., 1993) during the proceedings of the 8th conference on Applied Climatology Anaheim, California 17th -22nd January 1993, 179-184 for purposes of defining and monitoring drought. The technique uses historical monthly rainfall data to compute SPI values of various time scales of 1, 3, 6, 9, 12, 24, 36 and 48 months depending on the interest of study.

For computation of SPI values, historical monthly rainfall data were fitted to gamma distribution whose probability density function is defined as;

$$g(x) = \frac{1}{\beta^\alpha \tau(\alpha)} x^{\alpha-1} e^{-\frac{x}{\beta}} \text{ for } x > 0 \text{-----Equation3}$$

where $g(x)$ is probability density function, α is a shape parameter ($\alpha > 0$), β is a scalar parameter ($\beta > 0$), ($x > 0$) and

$$\tau(\alpha) = \int_0^\infty y^{\alpha-1} e^{-y} dy \text{-----Equation4}$$

Where $\tau(\alpha)$ is the gamma function.

The parameters α and β are estimated using the following formulae

$$\alpha = \frac{1}{4A} \left[1 + \sqrt{1 + \frac{4A}{3}} \right] \text{-----Equation 5}$$

$$\beta = \frac{x}{a} \text{-----Equation 6}$$

Where $A = 1n\bar{x} - \frac{\sum 1n\bar{x}}{n}$ and n being the number of precipitation observations, and $\bar{x}$ is the mean precipitation over the time scale of interest.

When the probability density function is integrated with respect to x using the estimate of α and β , a cumulative probability $G(x)$ of an observed amount of rainfall in a given month and time scale is obtained as follows;

$$G(x) = \int_0^x g(x)dx = \frac{1}{\beta^{\bar{\alpha}} \tau(\bar{\alpha})} \int_0^x x^{\bar{\alpha}} e^{\frac{x}{\beta}} dx \text{-----Equation 7}$$

Substituting t for $\frac{x}{\beta}$ in the equation above gives

$$G(x) = \frac{1}{\tau(\bar{\alpha})} \int_0^x t^{\bar{\alpha}-1} e^{-t} dt \text{-----Equation 8}$$

Which is the incomplete gamma function. However, the gamma distribution function is undefined for $x = 0$ and $q = P(x = 0) > 0$ where $P(x = 0)$ is the probability of zero precipitation. Hence, *Edwards, D.C. and McKee, T.B. (1997)* suggested that the actual probability of non-exceedance $H(x)$ should be calculated as follows;

$$H(x) = q + (1 - q)G(x) \text{-----Equation 9}$$

Where $H(x)$ is actual probability of non-exceedance and q the probability of $x = 0$. If m is the number of zero in a sample of size n , then q is estimated as;

$$q = \frac{m}{n} \text{-----Equation 10}$$

Finally, the cumulative probability distribution $H(x)$ is transformed into the standard normal distribution to yield the SPI.

However, due to the complexity of following these steps for manual calculation of SPI values, Climate Data Tool (CDT) was utilized to compute SPI values of Jinja station monthly rainfall data at a required time scale of SPI-3 months, SPI-6 months which changes in precipitation can affect the agricultural and hydrological activities. A time series plot of the SPI values is performed using python programming language in anaconda environment.

For the SPI values, all negative value indicates the occurrence of dry periods while all positive values stand for wet periods. Table 1 presents the SPI magnitude and was used to determine wet or dry intensities over the study area of Jinja. For the purpose of this study, SPI values above 1.0 and below -1.0 describes moderate to Extreme wet and dry conditions respectively in the station over time.

Table of SPI Threshold values	
SPI Value	Interpretation
≥ 2.0	extremely wet
1.5 to 1.99	Severely wet
1.0 to 1.49	Moderately wet
0.99 to -0.99	Near Normal
-1.0 to -1.49	Moderately dry
-1.5 to -1.99	Severely dry
≤ -2.0	Extremely dry

Table 2: SPI Threshold values

Source: adopted from (McKee et al., 1993)

c) Time Series Trend Analysis

For climate change studies, time series trend analysis on temperature and rainfall Standardized Anomaly Index were performed using the Mann-Kendall test, a nonparametric method for trend analysis.

The Mann-Kendall test statistic is non-dimensional, and it does not offer any quantification of the scale of the trend in the units of the time series under study but is rather a measure of the correlation of a variable with time and as such it simply offers information as to the direction and a measure of the significance of observed trends. This method is widely used in climate studies. Some of the previous scholars that applied the method in their studies include (Caloiero et al., 2011) (Egeru et al., 2019)Click or tap here to enter text. (Ngaina et al., 2014)

The Mann-Kendall test statistic S (Kendall score) is computed as follows;

$$S = \sum_{j=1}^{n-1} \sum_{i=j+1}^n \text{sign}(x_i - x_j) \text{-----Equation11}$$

Where x_i is the data value at time i , n is the length of the dataset and $\text{sign}()$ is the sign function which can be computed as;

$$\text{sign}(x_i - x_j) = \begin{cases} 1 & \text{if } (x_i - x_j) > 0 \\ 0 & \text{if } (x_i - x_j) = 0 \\ -1 & \text{if } (x_i - x_j) < 0 \end{cases} \text{-----Equation12}$$

For $n > 10$, the test statistic Z (Kendall tau) approximately follows a standard normal distribution;

$$Z = \begin{cases} \frac{S-1}{\sqrt{\text{Var}(S)}} & \text{if } S > 0 \\ 0 & \text{if } S = 0 \\ \frac{S+1}{\sqrt{\text{Var}(S)}} & \text{if } S < 0 \end{cases} \text{-----Equation13}$$

In which $\text{Var}(S)$ is the variance of statistic S .

A positive value of Z indicates that there is an increase trend, and a negative value indicates a decreasing trend. The null hypothesis, H_0 that there is no trend in the record is either accepted or rejected depending on whether the computed Z statistics is less than or more than the critical value of Z statistics obtained from the normal distribution table at the 5% significance level. If $|Z| > Z_{(1-\alpha/2)}$, the null hypothesis of no autocorrelation and trend in dataset is rejected, in which $Z_{(1-\alpha/2)}$ is corresponding to the normal distribution with α being the significance level.

If the data has a trend, the magnitude of trend can be denoted by trend slope β

$$\beta = \text{Median} \left(\frac{x_i - x_j}{i - j} \right), \forall j < i \text{-----Equation 14}$$

Where x_i and x_j are data values at time t_i and $t_j (i > j)$, respectively.

d) Wind Rose Diagram

This study used Windrose diagram to assess the dominant direction and speed in Jinja station using python programming language for morning and evening hours. Secondary data captured for wind in the morning and evenings from 2019 to 2023 were utilized. This arose from objective two (2) which was handling on the extreme weather events and winds appeared on the IK and SK.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.0 Introduction

This chapter presents the results and interpretation of the study findings based on the specific objectives.

4.1 Socio-economic and demographic characteristics of respondents

This section shows that 65.2% of the respondents are male, reflecting the typical gender distribution in fishing communities, while 34.8% are female, often involved in ancillary roles like fish processing and selling. The age distribution reveals that 55.3% of respondents are adults above 35 years, 34.8% are youths above 18, and 9.9% are elderly above 60, who contribute essential indigenous knowledge. Moreover, 50.4% have completed primary education and only 29.1% have completed secondary education, and the majority earn between UGX. 10,000 and UGX. 50,000 per month, with 35.5% earning less than UGX. 10,000, highlighting a largely low-income community that may face challenges in investing in disaster preparedness measures.

The age distribution, with most respondents being adults above 35 years and youths above 18, is in line with (Nunan et al., 2022), who notes that fishing livelihoods rely on productive age groups while drawing on the indigenous knowledge of the elderly. However, the low education levels, with most respondents attaining only primary education, support (Adelekan & Asiyanbi, 2016) argument that limited literacy hinders the adoption of modern disaster preparedness strategies. In contrast, although the presence of elderly fishers contributes indigenous knowledge, the low-income levels, with many earning below UGX 10,000 monthly, limit their ability to act on such knowledge effectively, supporting the background assertion that financial vulnerability constrains resilience in fishing communities.

4.2 Trends of extreme weather events at Masese Landing Site

The study findings on perceptions of respondents reveal that only (33.3%) of the respondents were aware of various weather parameters that comprise of rainfall, wind direction, wave height, storms,

and temperature. This comprehensive understanding suggests that the community has inadequate foundational knowledge necessary for interpreting both indigenous and scientific forecasts.

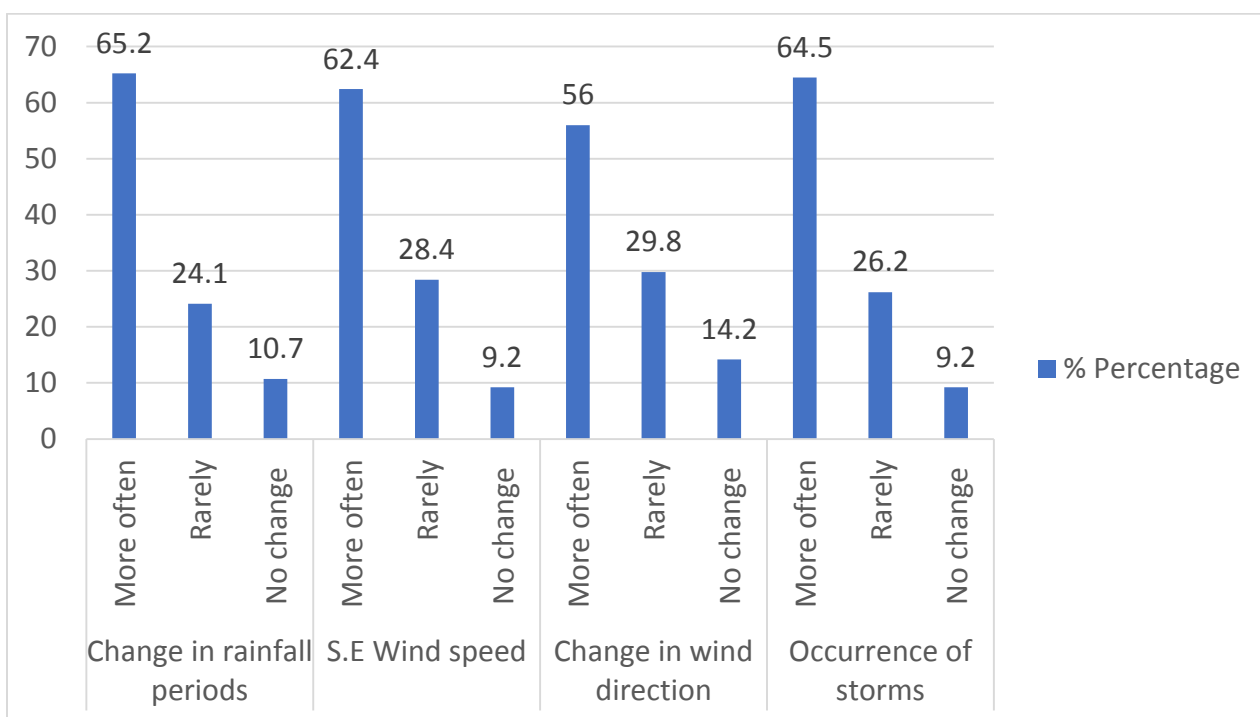


Figure 2: Perceptions (1) in change in rainfall, S.E Wind speed, change in wind direction and Occurrence of storms

Most of the respondents (65.2%) reported more frequent changes in; rainfall periods, (62.4%) wind speed, (56%) wind direction and occurrence of storms as indicated in Figure 2. The majority of respondents also reported an increase in; rainfall intensity, wind speed, wave height, water currents and temperature as indicated in Figure 3. The study findings on weather trends indicate high risks of flooding, waterlogging, loss of fishing nets, capsizing of boats and drowning which can disrupt fishing activities.

These results resonate with broader climate change patterns in East Africa, where shifts in rainfall and wind regimes have been linked to increased risks of flooding, capsizing of boats, and loss of fishing equipment (Kniveton et al., 2021). The reported rise in rainfall intensity, wave height, and water currents further supports earlier studies highlighting the growing vulnerability of Lake Victoria’s fishing communities to extreme weather events (Powell et al., 2020). In line with global climate change literature, the observed increase in temperatures

suggests broader climatic shifts that not only threaten fishing activities but also pose risks to health, water resources, and agricultural productivity (Smith et al., 2020).

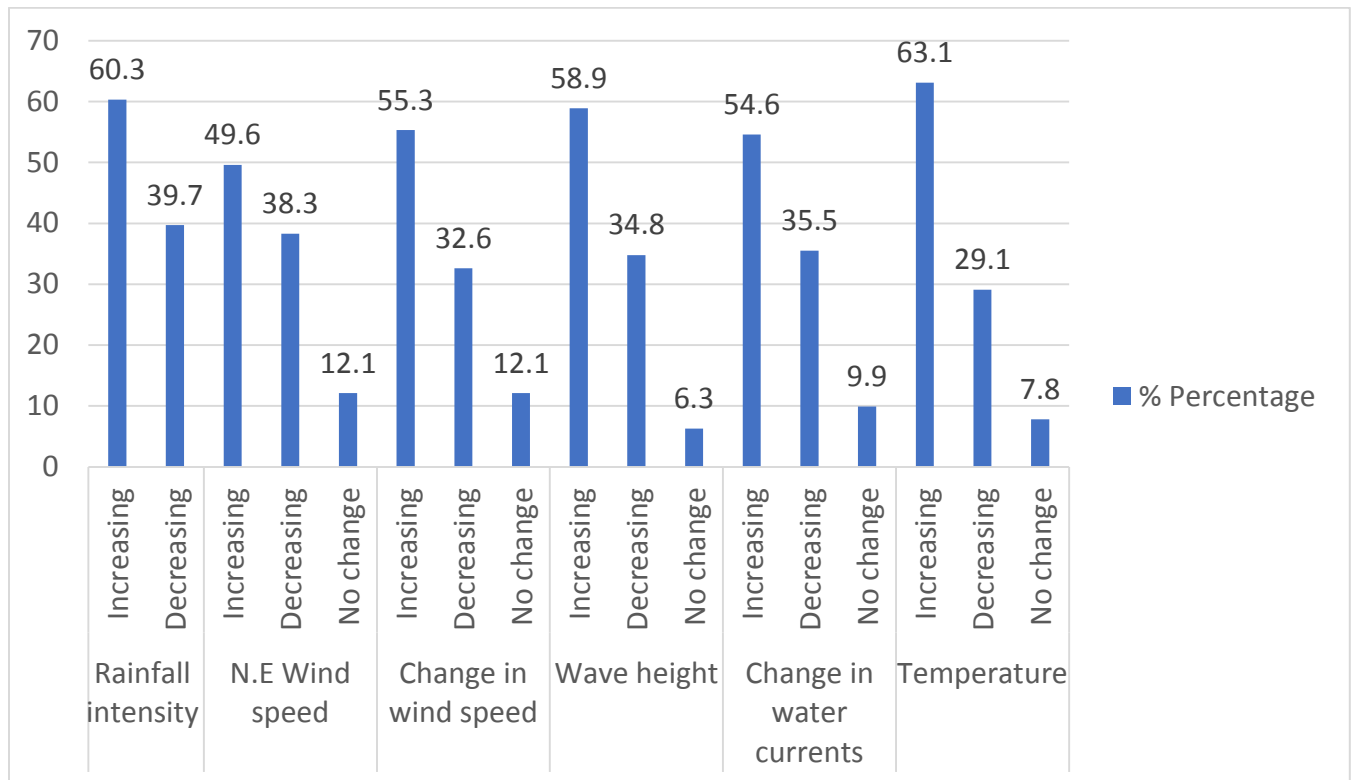


Figure 3: Perceptions (2) Rainfall intensity, N.E wind speed, change in wind speed, wave height, change in water currents and Temperature

The above findings on increasing temperature (63.1%) are in agreement with the standardized anomaly index on temperature which shows an increasing pattern in daytime seasonal and annual temperature for the Jinja (Figure 4).

4.2.1 Historical Scientific knowledge climate trends

a) Temperature Anomaly

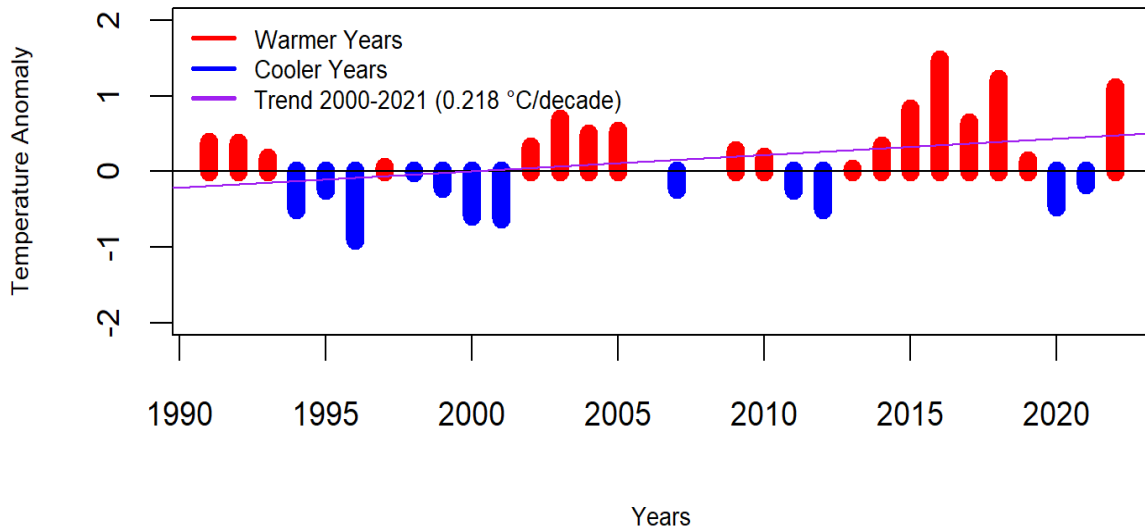
The study findings on analysis of historical maximum temperature (day time temperatures) data at a seasonal and annual temporal scale for the period 1992-2020 (Figure 4), showed that Jinja district

is experiencing a temperature increase of 0.218°C per decade on a yearly scale while for the seasons of March, April and May (MAM) and September, October and November (SON) showed a rate of increase of 0.124°C and 0.087°C respectively. Further analysis on the plots showed that the recent years/decade of 2010-2020 experienced warmer day time temperatures at annual and seasonal scale in Jinja district compared with the previous years.

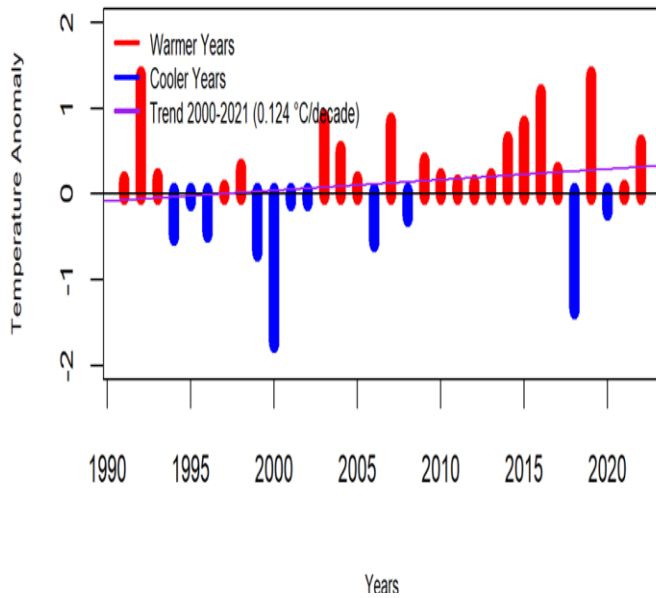
On the night minimum temperature (night time temperatures)-Figure 5, generally there is evidence of a cooling pattern in the night time temperatures. The yearly analysis showed a cooling rate of 0.609°C per decade while the seasons of MAM and SON depicted cooling rates of 0.585°C and 0.435°C per decade respectively. Further analysis also revealed that much of the cooling pattern was contributed by the recent decade or 2010 to 2020 compared to the previous that showed much warmer nights.

Therefore, the results presented in Figure 4 and 5 are in agreement with the findings from the survey showed indicated evidences of variability and increase in climatic variables over time in Jinja district and specifically at Masese landing site.

Annual Maximum Temperature Anomaly for Jinja (1991-2022)



MAM Season Maximum Temperature Anomaly for Jinja (1991-2022)



SON Season Maximum Temperature Anomaly for Jinja (1991-2022)

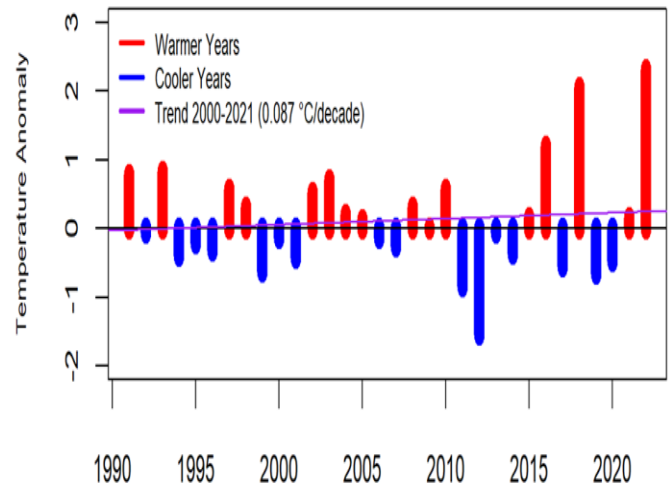


Figure 4: Annual Maximum Temperature Anomaly for Jinja (1991-2022), MAM and SON Maximum Temp Anomaly

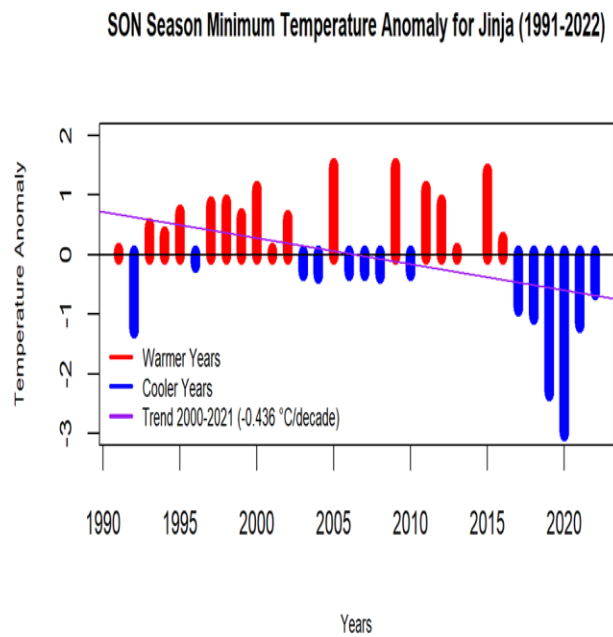
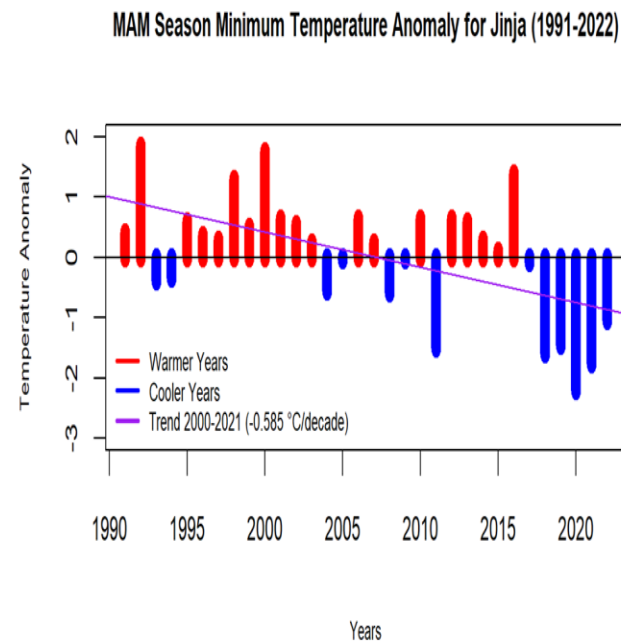
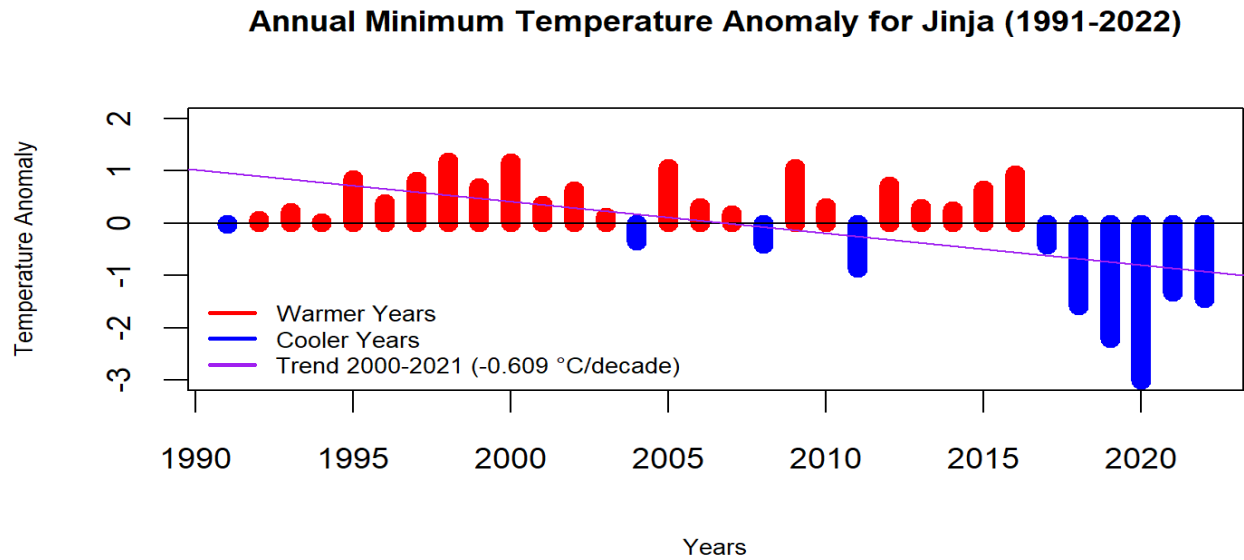


Figure 5: Annual Minimum Temperature Anomaly for Jinja (1991-2022), MAM and SON Minimum Temp Anomaly

b) Standardized Precipitation Index (SPI). This study used the standardized precipitation index (SPI) to examine the drought occurrences in Jinja district for the period 1991-2023 using the SPI-3 month and SPI-6 months (Figure 6). The 2 SPI are used since they represent seasonal drought occurrence and used to examine meteorological and agricultural drought which and provides results on crop monitoring while the 6-month SPI is used to examine the hydrological drought. The method also provides results that guide on examination the episodes of flood occurrence over the years in the district.

The SPI results on 3 and 6 months therefore showed that generally that Jinja experiences drought with a return period of about 3 to 5 years while longest drought/ suppressed rainfall periods last for about 2 to 3 years, a case in period are the failed rains of 2007 to 2009 and 2016 to 2018 as portrayed in both plots. Further evidences of intense drought conditions were also shown in the years of 1991to 1992 and 1993 to 1994. On the other hand, periods that indicated extreme wet conditions (flood episodes) included 1997/1998, 2019/2020 and 2023, making the recent years of 2019 to 2023 to have experienced much wetter conditions consecutively in Jinja district. It's also worth noting that the years with extreme wet conditions coincided with the periods of El Nino and IOD positive conditions (periods when the Sea surface temperatures in the Pacific and Indian Ocean basin are warmer/ above average respectively). Consequently, years of extreme drought also coincided with La Nina and IOD Negative conditions (Periods when the Pacific and Indian Ocean Sea surface temperatures are cooler/ below the average respectively)

The standardized precipitation index (SPI) for the study area also shows episodes of drought and floods (Figure 6). Droughts occurred in the frequency interval of 2 to 3 years before 2000 while only dry like conditions were frequent during the recent decades. The period 1991/1992, 1993/1994 experienced remarkably severe drought while the year 2016/2017 showed extreme prolonged drought like conditions in Jinja district. The flood-like conditions were observed in the years of 1997/1998, 2019/2020 and 2023. This coincided with the periods of El Nino and IOD, sea surface temperature warmings of the Pacific and Indian Ocean respectively. These findings

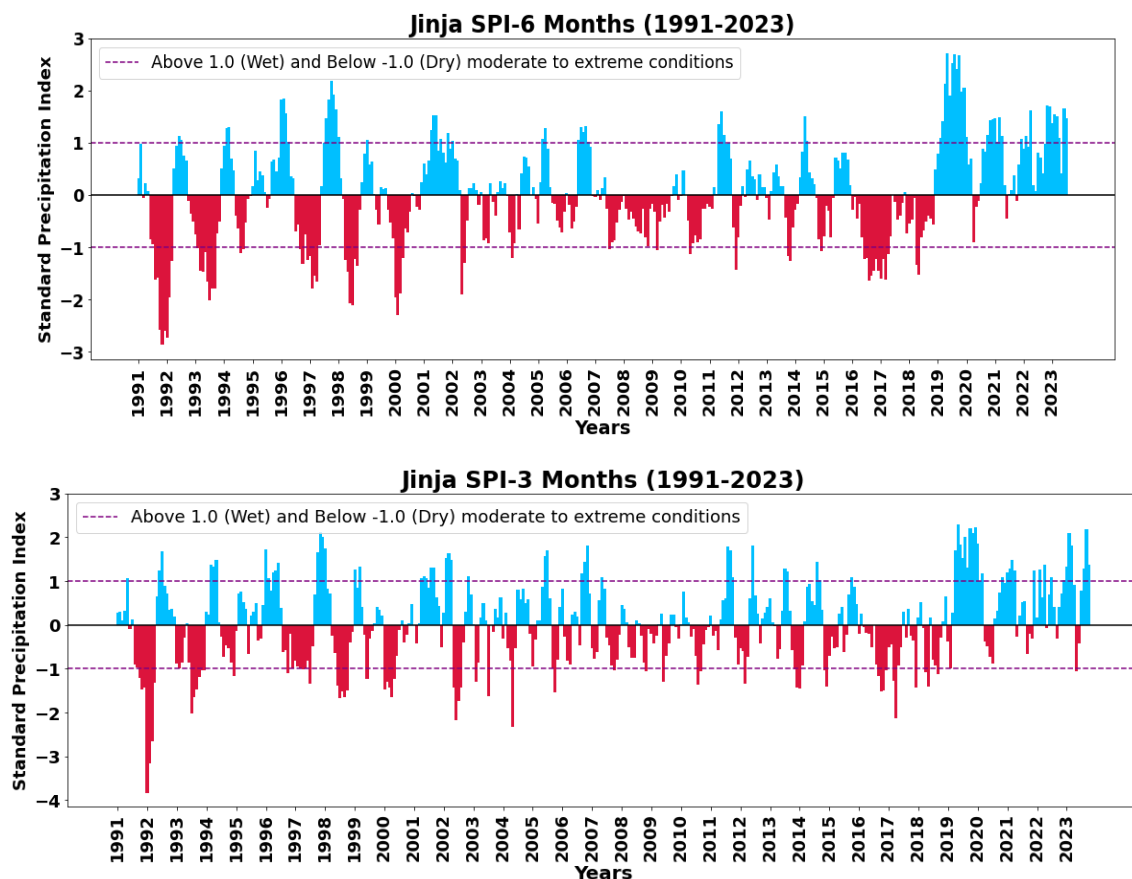


Figure 6: Jinja SPI- 6 Months and 3months

resonate with regional climate studies showing that East Africa is highly vulnerable to cyclical droughts linked to large-scale climatic drivers (Williams & Funk, 2011). In line with this, the observed flood-like conditions in 1997/1998, 2019/2020, and 2023 coincide with El Niño and

Indian Ocean Dipole (IOD) events, supporting evidence that sea surface temperature anomalies significantly influence rainfall variability in the region (Nicholson, Climate and climatic variability of rainfall over eastern Africa, 2017).

(c) Rainfall Anomaly

Rainfall anomalies showed an increasing pattern in both seasonal and annual time scale (Figure 7), with severe dry conditions experienced in 1992, 1998, 2012 and 2017 for the MAM season, and 1993 and 1998 for the SON season. The wetter years were observed in 1994, 1999, 2002, 2019, 2020 and 2023 for MAM, and 2001, 2006, 2011, 2019 and 2023 for SON season. On an annual basis, the rainfall anomaly showed severe dry conditions in 1993, 2000, 2016, 2017 and 2018 while the wetter conditions were experienced in the recent years of 2019-2023.

The dry conditions observed in 1992, 1993, 1998, 2012, 2016, 2017, and 2018 resonate with earlier findings that East Africa has experienced recurrent drought episodes tied to shifts in regional climate drivers (Nicholson, 2017). In contrast, the wetter years recorded in 1994, 1999, 2002, and more recently between 2019 and 2023, align with periods of intensified rainfall often associated with El Niño and Indian Ocean Dipole events, supporting evidence that sea surface temperature anomalies directly influence rainfall patterns in Uganda (Williams & Funk, 2011).

Results on Rainfall anomaly for annual and seasonal (Figure 7) showed a general increasing trend pattern of above average conditions in both annual and seasonal analysis. However, failure in rainfall during the MAM season is much showed in the years 2003 to 2019 with below average/Normal rainfall patterns. The favor of above normal in the seasonal and annual is observed in the recent five years. The second season of SON mostly depicted rainfall variability rather than a complete change in seasonal rainfall patterns. Moreover, most years that experienced above normal rainfall in the second season are mostly occurred during the El Nino and Indian Ocean positive dipole (IOD) mode indexes, (Bureau of Meteorology, n.d.). It also worth noting that years above 1 indicate years of extreme rainfall amount and portray years with likely flooding occurrences while years below -1 also indicate years with extreme suppressed rainfall and can lead to failure in rain fed economic activities. For example, the years 2019/2020 showed extreme

seasonal rainfall and corresponded to the 2019/2020 IOD positive years (Alupot et al., 2024) (Nicholson et al., 2022) which caused a lot of havoc over the East African Region, resulting to increase in the lake. Victoria water levels and flooding on the lake shores of Victoria and along the River Nile route (<https://doi.org/10.3390/s21134304>)

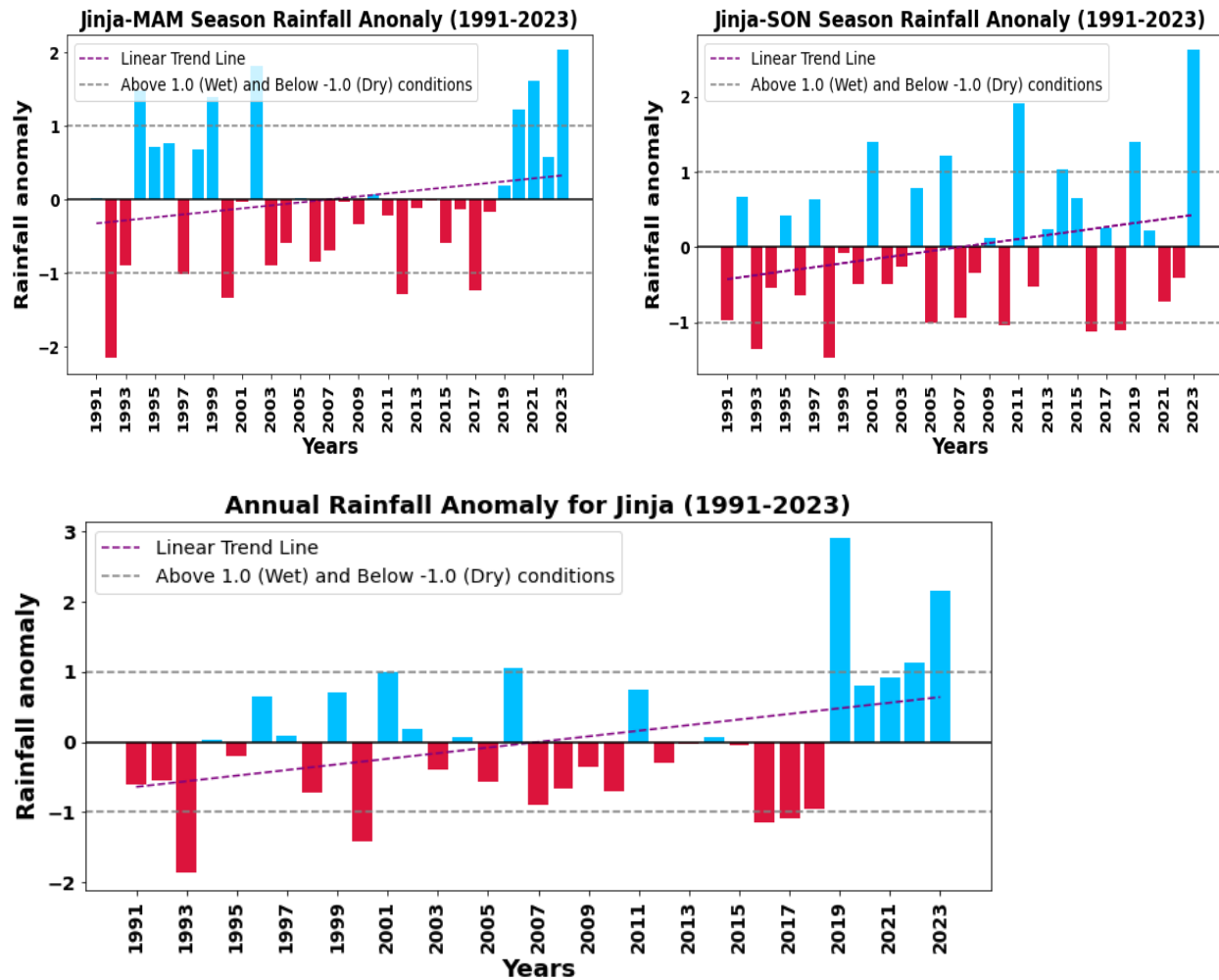


Figure 7: Rainfall Anomaly for Jinja

The dominant wind over Jinja during morning and evening hours is the Northerly winds while varying occasionally as North westerly and North easterly winds (Figure 8). The mean velocity of the wind is between 3.2 to 4.7 m/s in the morning and 2.9 to 4.1 m/s in the afternoon. This boosts the fisher folk who go for fishing activities at those times.

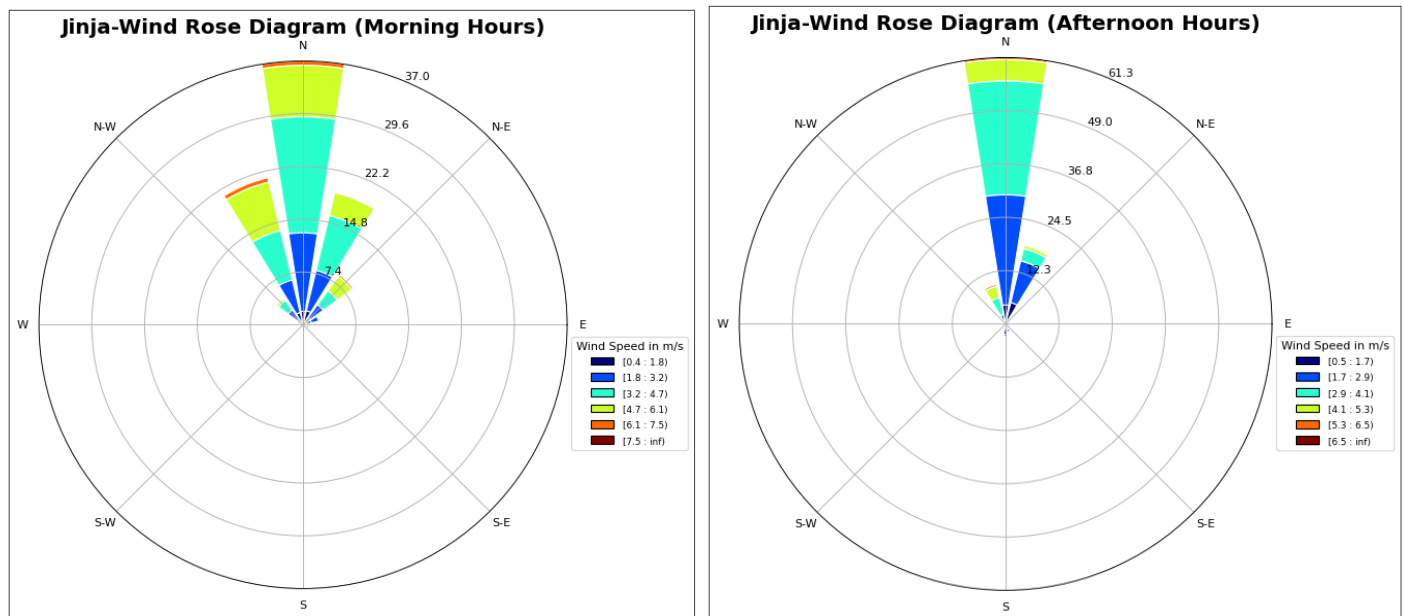


Figure 8: Jinja Wind Rose Diagram for both morning and afternoon hours

4.3 Effectiveness of scientific forecasts and indigenous knowledge-based forecasts

4.3.1 Indigenous and Scientific weather forecasting practices

The study findings reveal that majority of respondents (92.2%) use indigenous weather forecasting practices while (70.2%) use scientific weather forecasting practices. The majority of respondents reported that they get SK forecasts (94.9%) on or in time while only 42.3% revealed they get IK forecasts in time. This demonstrates the reliance on traditional methods within the community. The high utilization rate indicates that indigenous practices are integral to the community's daily life and decision-making processes. This reliance suggests that indigenous forecasting methods are trusted and considered effective by the community members, which has important implications for disaster preparedness and response strategies. Any intervention or improvement plan must acknowledge and incorporate these traditional methods to be successful.

This indicates acceptance of scientific weather forecasts among the community members. Most key respondents (85%) provided that the integration of scientific forecasting practices suggests that the community values the precision and reliability these methods can offer.

The most common IK indicators used for weather forecasting are; clouds accumulating with relationship to wind direction (27.7%), wind movements (24.6%), and insect and bird movements (21.5%). The reliance on natural and observable phenomena highlights the community's deep connection with their environment and traditional ecological knowledge. Furthermore, these practices are deeply rooted in cultural traditions and passed down through generations indicating a strong connection between community and their environment (Barberstock, 2024). (Nyong et al., 2007) noted that indigenous knowledge is invaluable in climate change mitigation and adaptation, highlighting its relevance in local weather prediction. This suggests that indigenous forecasting practices are tailored to local conditions and are potentially very accurate. Integrating these indicators into scientific models could improve the overall accuracy and relevance of weather forecasts.

The study findings indicate that indigenous weather forecasts are mainly used when preparing for fishing trips (40.8%) and during known bad weather months (37.7%) while SK was used during

movements on the lake and during fishing (50.5%). The findings indicate that (85.8%) recognized that the integration of IK and SK yielded better results for community preparedness. This usage pattern shows that the community relies on these forecasts for critical decision-making, particularly when their livelihoods are directly affected. Effective and accurate forecasting can significantly enhance safety and productivity. Therefore, improving the reliability and dissemination of these forecasts could have a direct positive impact on the community's preparedness and resilience.

The primary reasons for using indigenous weather forecasting are its accessibility and acceptance (39.2%) and cultural significance (23.1%). Indigenous practices are deeply rooted in the community's culture and are readily accepted by its members. This cultural integration suggests that any efforts to enhance weather forecasting should respect and incorporate the traditional methods to ensure they are effective and well-received.

The IK forecasting is mainly done by the Beach or Landing site chairmen (60.0%) and elders (23.1%). This could be because they have had a long experience in interpreting the weather and are able use their indigenous knowledge and skills predict or now cast the weather. The Uganda National Meteorological Authority (UNMA) is the primary source of scientific weather forecasts (62.6%) as revealed by the respondents. This highlights the credibility and trust placed in the official meteorological authority (UNMA). Strengthening the capacity and outreach of UNMA could further enhance the community's trust and reliance on scientific forecasts.

The majority of respondents who use SK (62.6%) rely on radios for receiving weather forecasts, followed by TV (20.2%). Radios are the most accessible and commonly used medium for receiving weather forecasts, indicating their critical role in disseminating weather information. This suggests that improving radio-based dissemination strategies could enhance the reach and effectiveness of scientific weather forecasts.

(Allison et al., 2009) discussed how climate change affects fish stocks and the resilience of fisheries, while (Cheung et al., 2010) explored the impact of climate change on the distribution and abundance of marine fish species, which is crucial for fisheries management. ((FAO), 2018)

highlights the global state of fisheries and aquaculture, examining how climate change and variability affect fish production. (Cecile, 2015) further emphasize the vulnerability of fisheries to climate change, particularly in tropical regions, stressing the need for adaptive strategies to safeguard fisheries productivity. These studies collectively underscore the significance of scientific forecasting in managing and mitigating the effects of climate change on fisheries.

(Bwambale et al., 2018) argue that traditional knowledge about local flooding risks is critical for effective mitigation strategies, which is essential for communities like Masese. Combining these methods is seen as beneficial, offering a more comprehensive understanding of weather patterns and enhancing community preparedness. The integration of indigenous and scientific practices helps bridge the gap between traditional wisdom and modern technology, providing a holistic approach to weather forecasting (Nyadzi et al., 2021).

The forecast results revealed that (50.5%) use SK everyday as they are beginning movements on the lake while 40.8% use IK all the times for the lake trips implying that integrating the two forecasts can produce better results for the fishing activities. This is an indication that they are well informed about the importance of Scientific Weather Forecasts which can be integrated with IK to boost fishing activities, highlighting their critical role in day-to-day decision-making. This could be that the dominant winds in Jinja are mainly north westerlies and North easterlies in the prescribed hours for motion. The reliance on weather forecasts during fishing activities underscores the importance of timely and accurate forecasts for ensuring the safety and productivity of fishing operations. Enhancing the reliability and accessibility of these forecasts could improve operational planning and risk management for the community.

The results revealed that the majority of respondents suggested integrating indigenous forecasts with scientific practices (50.8%). This suggests a recognition of the value in combining both types of knowledge to improve forecasting accuracy and reliability. One of the key respondents suggested, “sensitization of the community and conducting further research could facilitate this integration, enhancing overall disaster preparedness and community resilience.”

The majority of the respondents (61.6%) indicated that the scientific forecasts are more reliable and predictable. This remaining 39.4% could be an attitude problem and high negative energy due to the deep culture rooted in the communities on sticking to IK which could be handled by sensitization of communities around the landing sites about importance of scientific forecasts.

4.3.2 Feedback from the Focus Group Respondents on use of forecasts

They stated that they use the forecasts in the mornings and evenings when going for fishing and moving to islands. They further stated that they use the forecasts to make a decision at the onset of rains in the months of March and August rainfall seasons. The extreme weather events that affect the communities are mainly rainfall, floods and strong winds (southerly winds called **(omuyaga)**. Excessive flooding can have negative consequences for livelihoods and the stormy weather prevents fishing, and too much rain and cloudy sky can cause greater post-harvest losses of fish especially the silver fish (**Mukene**), damage to infrastructure (boats, houses, roads and gear).

Many participants stated that mild floods can increase incomes from both fishery and non-fishing activities because fish catches are better and rains bring high quality pasture for animals, and crops germinate and grow well.

Most fisher folk stated that there were more unusual patterns with winds with more sudden storms arising out of the lake. However, the majority stated that the most common winds are the north **(buvanduba)** easterlies and North**(buvanduba)** westerlies that dominate in the morning and afternoon which favor the fishing activities.

Indicator	Indicator description	Weather Parameter predicted
Insects (obumpooko)	Appearance of insects in the gardens	Rainfall in the coming few days
Wind (omuyaga)	Dangerous wind from the south	Cold water and low fishing potential
Fog (olufu)	Foggy conditions	Poor visibility, No fishing
Cloud movement	Fast formation of clouds	Rainstorms in the next few hours
Birds (owomini)	Flying and cheeping of small groups of white birds	Rainfall in the next few hours days
Moon	Thin and bright	Strong wind
Sun	Increased heat and presence of wide sun rays	Rainfall in the few hours or days

Table 3: Indigenous Knowledge in predicting weather changes in Jinja fishing villages

Majority of the people in FGD (71.4%) stated that to manage shocks from extreme weather events, they prepare themselves by using strong boats, renting or build strong houses for safety of lives and fishing gears, build channels, stay away from lake shores, aborting journeys, stocking charcoal during bad weather and listening to weather warnings (SK) from UNMA because they are accurate than the IK. These measures resonate with studies highlighting physical preparedness and livelihood diversification as key adaptive strategies (IPCC, 2022; Bryan et al., 2018). Respondents also rely on scientific forecasts from UNMA, perceived as more accurate than indigenous knowledge, supporting evidence that trusted climate services enhance adaptive decision-making (Coulibaly et al., 2020). This highlights the importance of combining local practices with reliable forecasts to strengthen community resilience.

After occurrences of disasters resulting from heavy rains, the communities respond to extreme weather events by taking shelter in bays, keeping boats on the shores, avoiding going to the lake after warnings, avoid overloading the boats, have enough fuel for those of motor engines, use of protective gear, use of life jackets, avoid buying fish during bad weather and use of tarpaulins (**amatundubaali**) to cover the smoked fish.

The majority of the fisher folk said that utilization of integrated forecasts (IK and SK) is the best practice since SK is better and integrating SK and IK would enhance the reliability of the forecasts which leads to getting accurate forecasts and avoid losses in business.

They recommended the following; creating more awareness among the stakeholders on IK and SK with the help of the media, install alarms at the lake shores to warning in case of over flooding, sensitize the fisher folk to appreciate the SK forecasts because they are accurate and recruit community people to be trained in UNMA forecasts who later train the community elders for multiplier effect.

4.3.3 Accuracy of the IK and SK

The majority of respondents indicated that the IK forecasts are fairly accurate (53.8%) and scientific forecasts very accurate (50.5%). This is evident that the communities may rely on the integration of SK and IK. The accuracy in SK indicates that they received SK/Marine forecasts from UNMA and appreciate their degree of accuracy. This resonates with the literature highlighting that while IK provides localized, experience-based insights, SK offers precise, data-driven predictions that enhance reliability (Nyadzi et al., 2021; Richard et al., 2021). The high perceived accuracy of SK reflects the community's access to UNMA marine forecasts and their trust in these services. In line with prior studies, this suggests that integrating IK and SK can optimize weather forecasting, combining cultural relevance with empirical precision to improve preparedness and resilience among fishing communities.

4.3.4 Score card forecast data for the IK,SK and Observed Data

The score card forecast data for the Indigenous Knowledge (IK) from fisher folk elders and Scientific Knowledge (SK) informed forecasts from UNMA and observed data for rainfall and wind for Jinja Met station was analysed in the section below where different graphs are shown to understand the data.

The figure 9 below shows timeseries of IK, SK and Observed data from which some findings were drawn. It was evident that using both methodologies was the best as indicated during the forecast

period where IK had the same pattern as the observed. However, the SK informed forecasts over estimated most cases as shown below: -

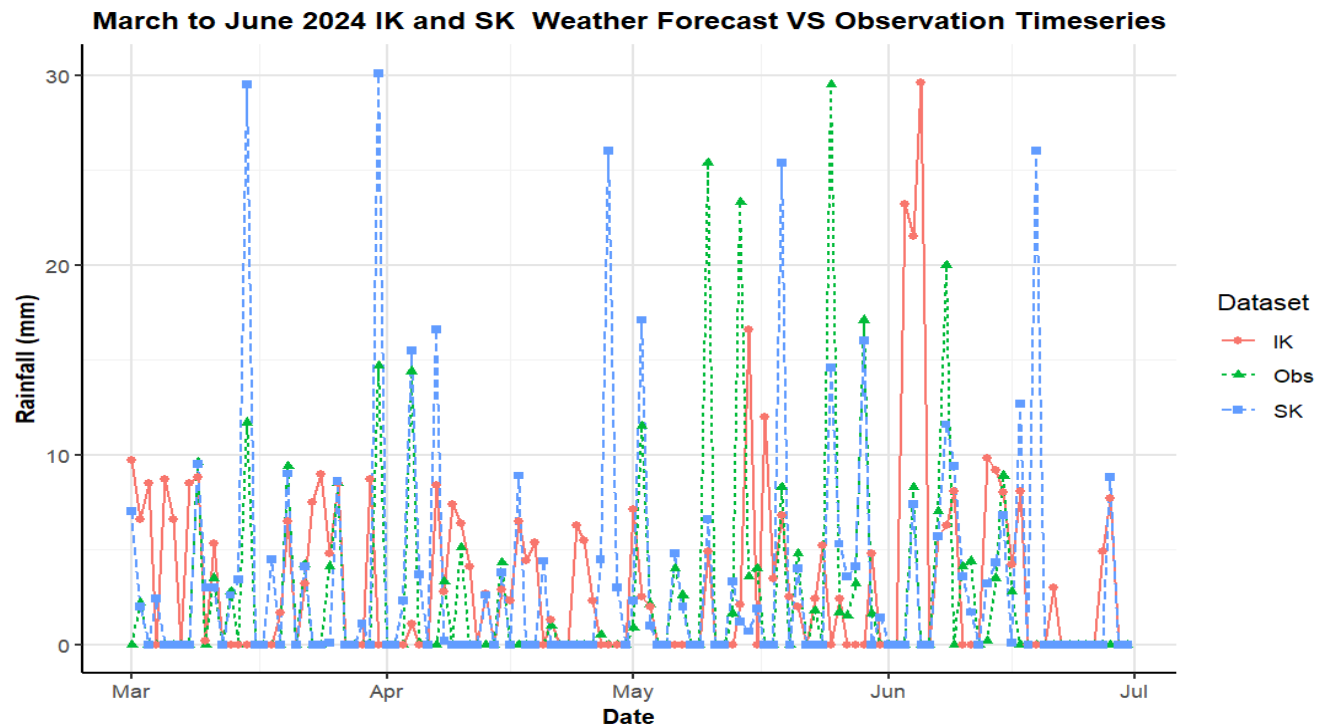


Figure 9: March to June IK and SK weather forecast vs Time series

To understand the pattern of the forecasted rainfall temporal variation from both IK and SK methods, this data was subjected to cumulative analysis. The cumulative curve of rainfall totals for period March to June indicated higher forecasted values by SK and IK compared to Observed values. However, the IK was closer to the observed values during the biggest period of the analysis. This calls for use of both methods and further investigation of the IK methodology for more accurate forecasts by the meteorological services.

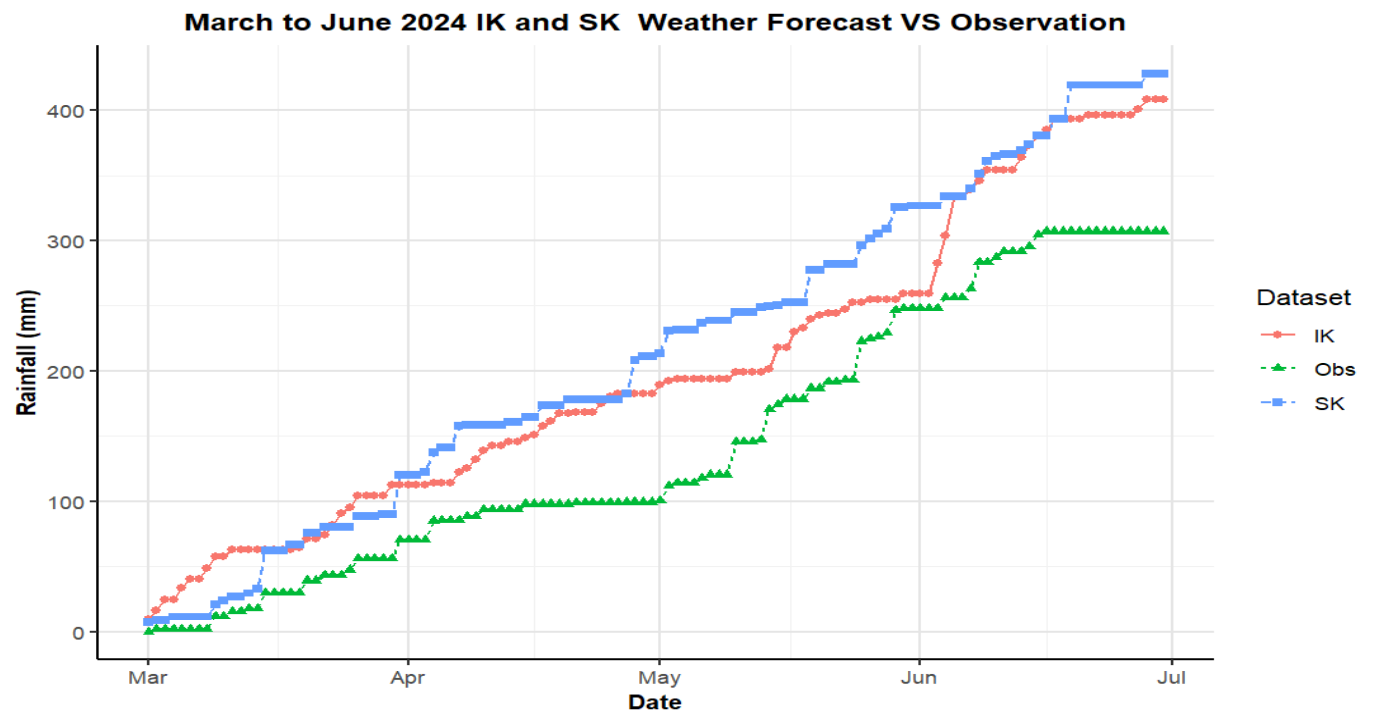


Figure 10: Cumulative curve for rainfall totals for the months indicated

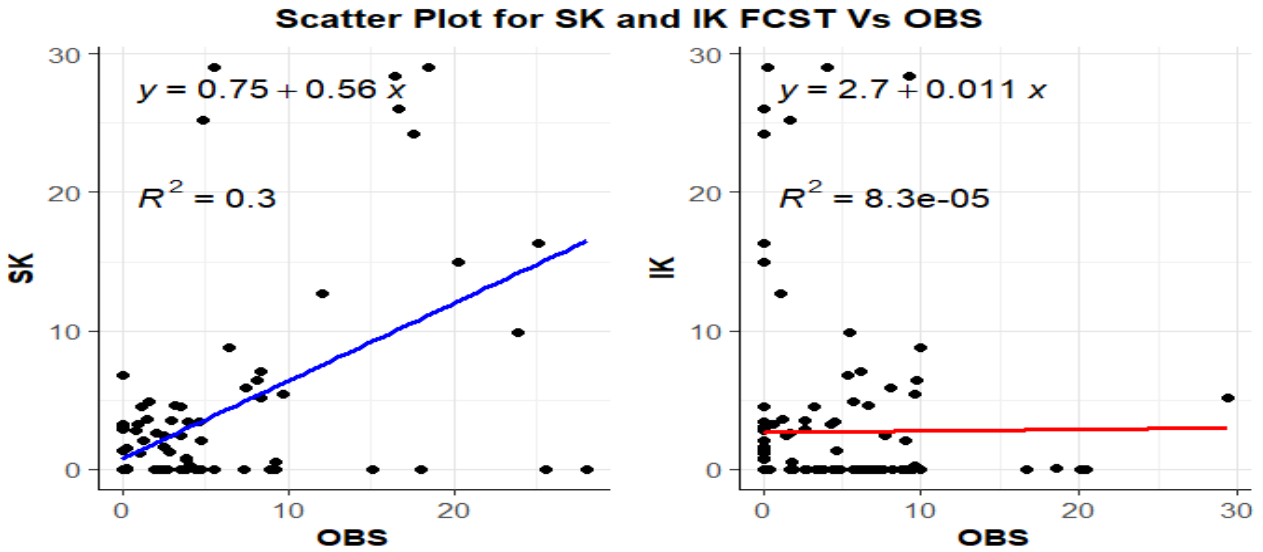


Figure 11: Scatter plot for SK and IK FCST Vs OBS

The regression graph for SK and Observed data indicate a positive correlation while the IK and Observed indicate no correlation.

From the table below out of the 137 Hits, 90(65.7%) of them were hits by the Scientific Forecast while 47(34.3%) of them were of Indigenous Knowledge and for False Alarms both methods presented equal number of false alarms as shown the table below.

Hits and False Alarms Table

Fcst	Hits	False_alarms
IK	47	32
SK	90	32
Total	137	64

Table 4: Hits and False Alarms table

The feedback from effectiveness of SK against IK for wind from the below contingency revealed that the SK hits were closer to the observed data values. There is need for stakeholder engagements to disseminate the SK forecasts more widely within the Lake Victoria basin.

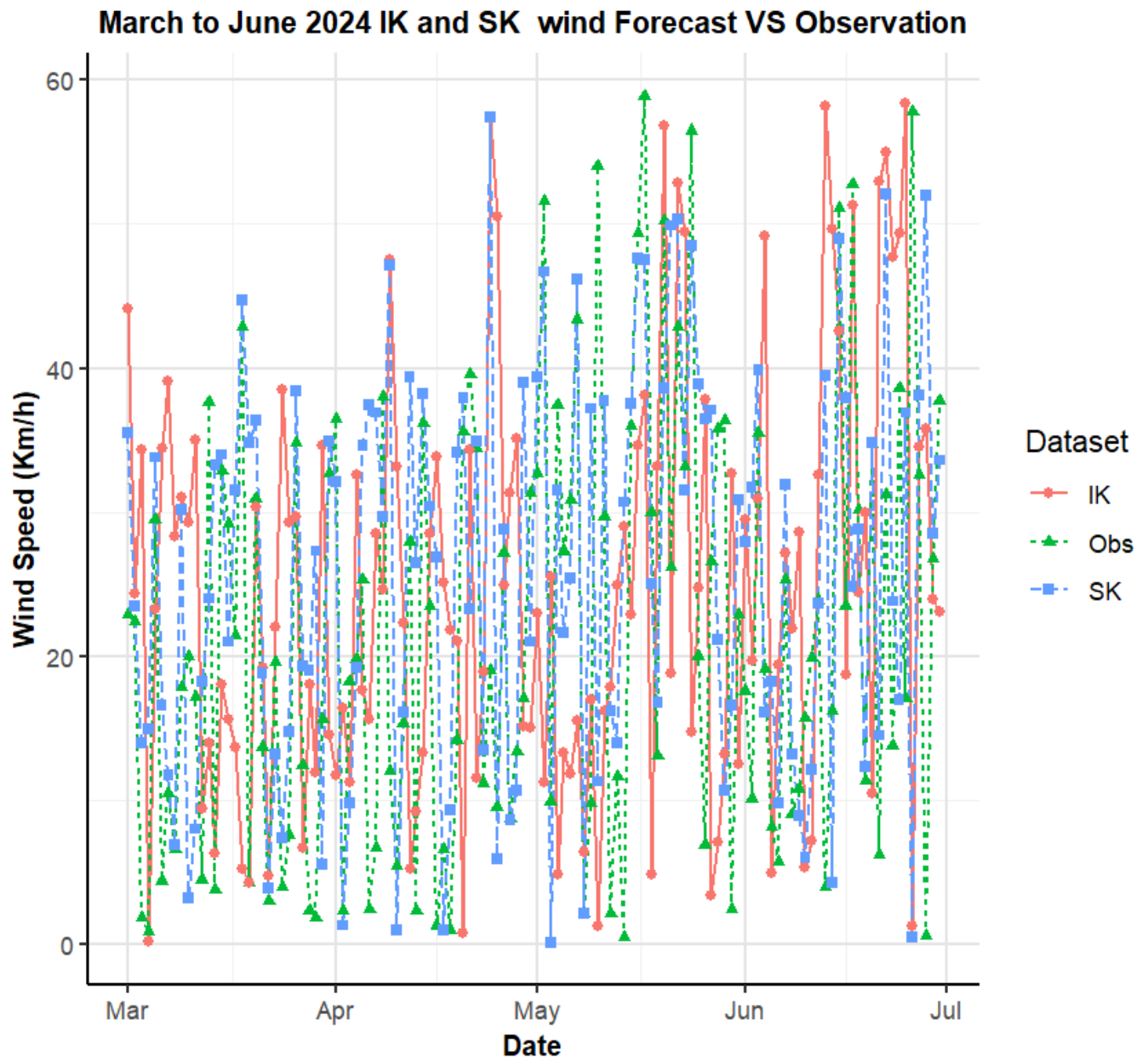


Figure 12: March to June 2024 IK and SK wind Forecast vs Observation

The figure 12 above shows timeseries of wind for observed and SK data higher than the IK for March and May. Generally the SK and Observed data are closely linked and this is a clear indication that SK is more accurate and reliable than the IK.

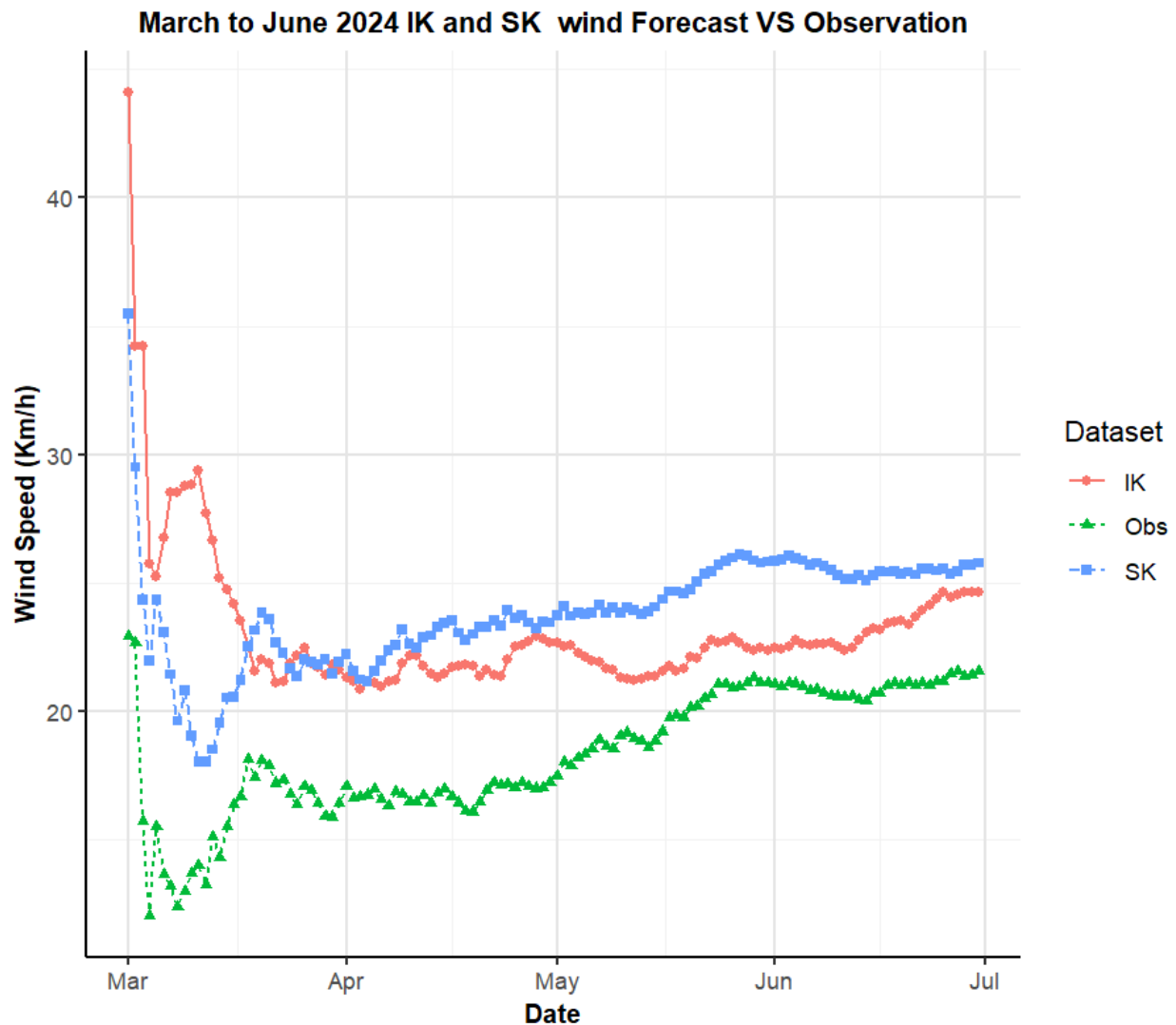


Figure 13: March to June 2024 IK and SK wind Forecast Vs Observation

The initial IK forecast wind data values for March were higher than the SK and Observed values. From the middle of March to June, the SK, IK and Observed values took a positive direction though the SK was higher and the Observed being the lowest.

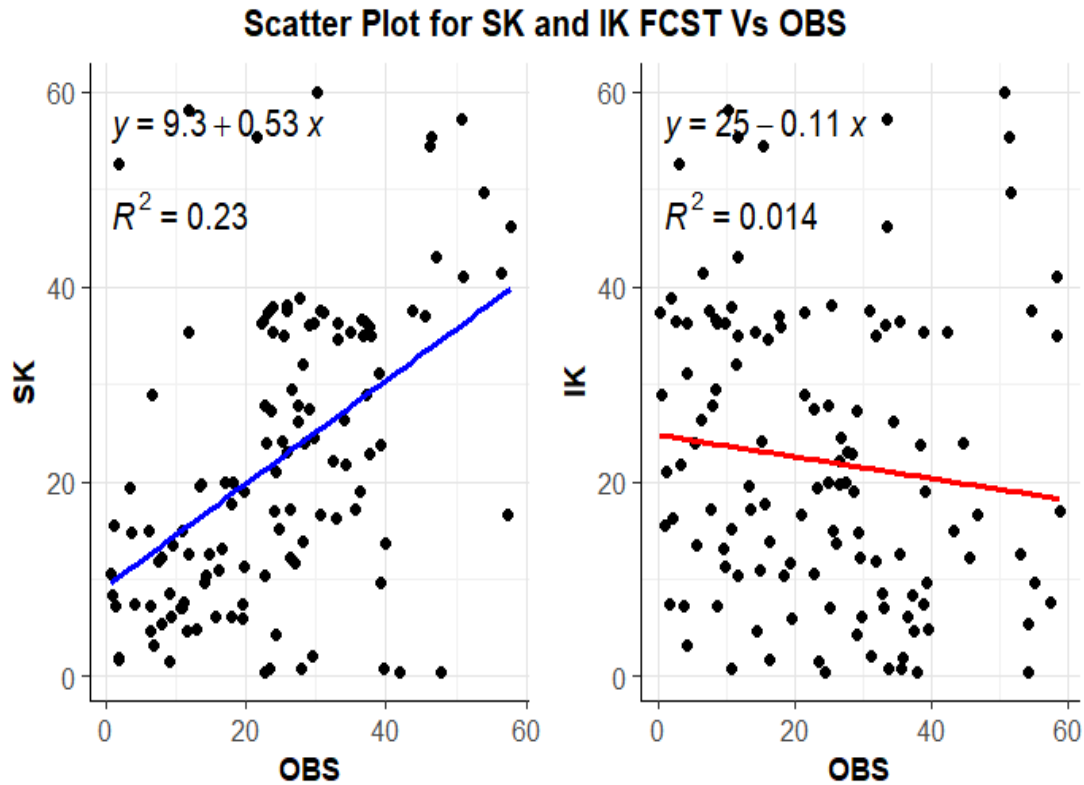


Figure 14: Scatter plot for SK and IK FCST Vs OBS

The scatter diagram for SK and Observed wind data Hit values indicate a positive correlation while the IK and Observed Data Hit values show almost no correlation.

From the table 5 below 67.6% of the hits were by the Scientific Forecast while 32.4% were by Indigenous Knowledge. For False Alarms IK presented 72.2% while SK had 27.8%

Hits and False Alarms Table

Fcst	Hits	False_alarms
IK	44	78
SK	92	30
Total	136	108

Table 5: Hits and false alarms

The feedback from effectiveness of SK against IK from the above contingency revealed that the SK hits were more than the IK compared with the observed data in Jinja Meteorological station observatory. There is need for stakeholder engagements to disseminate the SK forecasts more widely within the Lake Victoria basin.

Furthermore, basing on feedback from the Focus Group discussions on weather prediction, insects (obumpooko) revealed there was rainfall in the coming few days which contradicts results from (Shalli, 2016) on local knowledge of fishermen in weather prediction in Moa and Kwale coastal villages in Tanzania that revealed that small ants indicate sunny days in a few days to come. The findings on the bird (owomini) were in line with (Shalli, 2016) that rainfall was expected in the next few hours.

4.3.5 Perceived impact of integrating IK and SK

The majority of respondents 85(60.3%) said relating both IK and SF has proven SK more effective and reliable. This indicates that majority of the fishing communities have appreciated the marine (scientific forecasts) released daily by the met service (Powell et al., 2020).

The majority of respondents (60.3%) on table 8 revealed that they use both IK and SK weather forecasts while handling their daily activities, followed by SK 41(29.1%) while those who opted for indigenous Knowledge forecasts was 9(6.4%) and others 6(4.3%). This is evidence of acceptability of UNMA Scientific weather forecasts.

The results revealed the majority 106 (75.2%) revealed that relating IK and SK has proven SK to be effective and reliable. It creates a balance and options to use in responding to extreme weather conditions. This supports the literature reviewed in Chapter Two, which suggests that combining local, experience-based insights with precise, data-driven forecasts improves preparedness, trust, and adaptive capacity (Nyadzi et al., 2021; Richard et al., 2021; Talardia et al., 2020). Overall, these results underscore the value of hybrid forecasting systems, demonstrating that community's benefit from both the contextual relevance of IK and the predictive precision of SK in enhancing resilience to climate-related risks.

4.3.6 Recommendation of improving the integration IK and SK more effective

The majority of the respondents (69.6%) recommended strengthening scientific forecasts to capture areas like water spouts, improving and diversifying methods of disseminating weather forecast information and sensitizing the local's community leaders about the on integrated forecasts., improving and diversifying methods of disseminating weather forecasts information 31(22%). And the lowest strategy was sponsoring more media programs on 8(5.7%) This is evidence of the fishing communities utilizing the UNMA Marine twice daily scientific forecasts released which has had casualties reduced in Lake Victoria.

The integration of indigenous and scientific weather forecasting has a significant positive impact on the community's preparedness at Masese Landing Site. The majority of community members use both types of forecasts, enhancing their ability to make informed decisions and take proactive measures against extreme weather (Jessica et al., 2008). Combining these forecasting methods creates a balance and provides multiple options for responding to weather conditions. (Marcela et al., 2008) discussed the benefits of integrating diverse knowledge systems to manage uncertainty in weather forecasting. The integration has proven effective in reducing losses in business and improving overall community resilience (Opha & Sekhwela, 2008) which is in line with the study findings on this study. The study emphasized further improving this integration through sensitizing local leaders, sponsoring media programs on weather, and improving dissemination methods of weather information. (World Meteorological Organization (WMO), 2022) emphasizes the

importance of training and education in enhancing the effectiveness of integrated forecasting systems.

4.4 Local Community preparedness to extreme weather events

Most of the respondents (77.3%) reported that they were prepared for extreme weather events. The preparedness strategies employed include; using strong boats (40.4%), constructing strong, durable, and safe houses for people (32.6%), and personal safety measures like life jackets (19.1%). The findings reflect a high level of awareness and readiness among the Masese Landing Site community in mitigating extreme weather risks. Their combined use of indigenous and scientific forecasting practices creates a comprehensive strategy for disaster management. Nonetheless, the data reveal a need for ongoing education, improved infrastructure, and a more integrated approach to forecasting in order to further fortify resilience. Given the substantial impact of extreme weather on local economic activities and livelihoods, sustained support and targeted interventions from local authorities and disaster management agencies are essential to enhance the community's adaptive capacity and mitigate future risks. The findings resonate with studies highlighting the importance of physical and structural adaptations in reducing vulnerability to climate hazards (IPCC, 2022; Rajesh et al., 2018). These practices are in line with Madhav et al. (2014), who emphasize that combining infrastructural measures with individual safety actions strengthens community resilience.

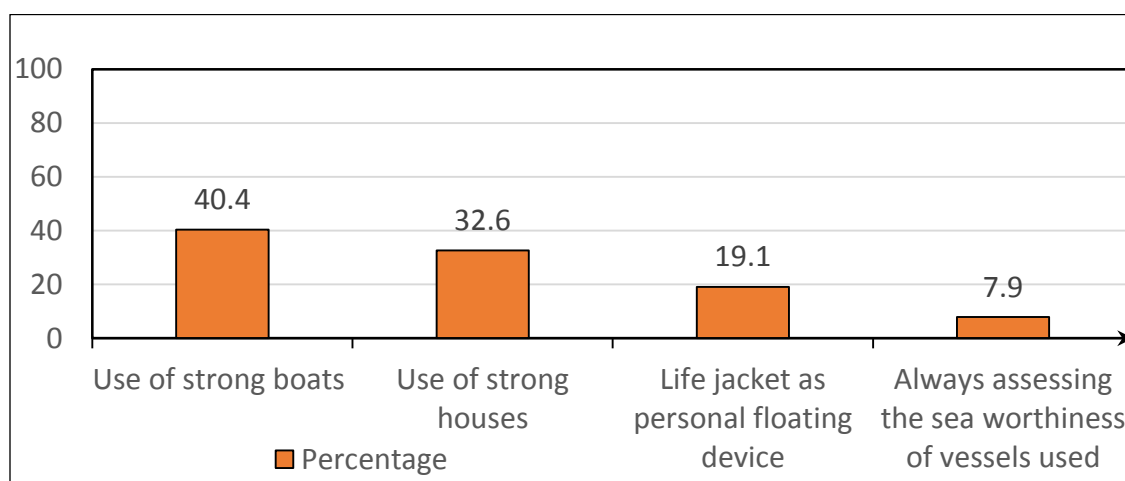


Figure 15: Showing preparedness for extreme weather events

The most affected group are the men 61(43.3%) who dominate fishing activities being the bread winners for their families while the least affected are the children 5(3.5%) who could have dropped out of school.

The study reveals that preparedness at Masese Landing Sites is closely tied to the integration of indigenous and scientific weather forecasts. This suggests that although Local Knowledge is a useful asset, it may not be adequate. Integrating it with scientific research is essential for enhancing its effectiveness. Previous research proposes that integrating conventional weather forecasting techniques with modern meteorological data can produce more accurate and reliable predictions, thereby improving decision-making and planning processes (Yanou et al., 2023).

Preparedness measures include ensuring the seaworthiness of fishing vessels, constructing stronger houses, and using life jackets. These results are in line with a study in Bangladesh whose residents constructed strong houses and invested in the education of family members; quality of life enhancing a sense of self security and well-being (Al-Maruf et al., 2021) and encouraging preparedness for an upcoming cyclone hazard.

The community also prepares by maintaining strategic reserves of food and other essentials. Established evacuation practices are part of the community's routine, where people move to safe areas or elevated ground as soon as they detect tsunami signals (Mirza et al., 2024). Government bodies and NGOs focusing on disaster risk reduction stand to gain from understanding and respecting the traditional knowledge held by these communities (Reduction & (UNDRR), 2022). When this knowledge is combined with modern scientific approaches, it strengthens disaster preparedness strategies. Such collaboration fosters culturally sensitive and community-driven initiatives, building trust and cooperation between residents and external stakeholders.

4.5 Local community's responses to extreme weather events

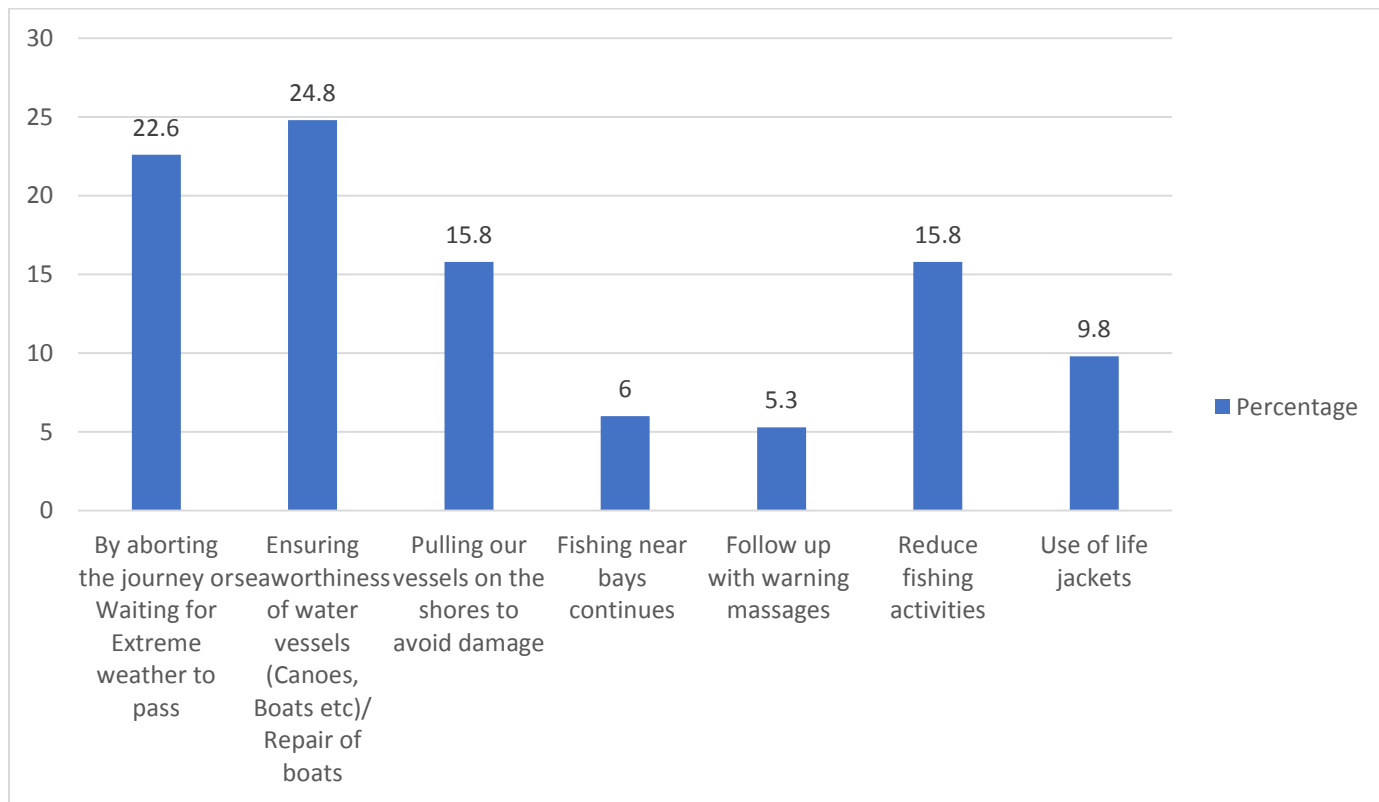


Figure 16: Community Responses to extreme weather events

The study findings reveal various community responses to extreme weather events. The most common responses include; ensuring the seaworthiness of water vessels (24.8%), aborting the journeys for fishing (22.6%), and pulling vessels on the shores to avoid damage (15.8%). The findings reveal that active community participation significantly enhances the effectiveness of disaster management policies by ensuring that local needs and preferences are addressed. This is consistent with the work of (Kristian & Mohammad, 2024) who underscores the value of incorporating local knowledge into decision-making processes to improve disaster response outcomes. Additionally, highlights that community involvement fosters a sense of ownership and trust, which are crucial for successful implementation of disaster strategies.

(Houston et al., 2015) support this by noting that community engagement enhances the accuracy and timeliness of information dissemination. However, challenges such as ensuring equitable participation and managing diverse viewpoints remain, as discussed by (Tierney, 2014).

These responses indicate a range of adaptive strategies employed by the community to mitigate the impacts of extreme weather on their livelihoods. By prioritizing actions such as ensuring vessel seaworthiness and reducing fishing activities during extreme weather events, the community demonstrates a proactive approach to risk management. These strategies reflect a deep understanding of the potential dangers posed by extreme weather and the importance of safeguarding both lives and assets.

Guided by both indigenous and scientific forecasts, community members prioritize swift actions aimed at reducing potential damage and loss. The findings illustrate that integrating local knowledge, scientific knowledge and community feedback into disaster management strategies significantly enhances the effectiveness of risk communication. This observation supports (Blanchard, 2024) argument that localized approaches facilitate more relevant and culturally sensitive communication, thereby improving community engagement. The integration of these forecasts helps the community to better understand and anticipate weather events, enhancing their ability to respond effectively (Miriam et al., 2011). Furthermore, the communal sharing of weather-related knowledge and experiences contributes to more coordinated and efficient responses (Paulina et al., 2015).

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

This section presents the conclusions and recommendations derived from the study, aligning them with the research objectives; Analyze the trends of extreme weather events in the study area, compare the effectiveness of scientific forecasts against indigenous knowledge-based forecasts, identify the local community preparedness to extreme weather events and identify the local community's responses to extreme weather events. The chapter also offers practical recommendations aimed at enhancing the effectiveness of weather forecasting and disaster preparedness in Jinja.

5.1 Conclusions

Arising from the findings of this study, the following conclusions were drawn;

- a) Analysis on historical temperature of Jinja showed an increasing pattern in the day time while night temperature exhibited a decreasing pattern in both seasonal and annual time scale. Flood-like events occurred in 1997/98, 2019/20, and 2023, coinciding with El Niño and Indian Ocean Dipole (IOD) episodes, consistent with global evidence linking East African hydro-climatic extremes to large-scale oceanic oscillations (Nicholson, 2017; Gebrechorkos et al., 2020). Indian Ocean Dipole (IOD), sea surface temperature warnings of the Pacific and Indian Ocean
- b) The scatter plot for SK and IK FCST Versus Observed data revealed SK hits were more than IK for rainfall and wind indicating higher accuracy. The majority of the fisher folk stated that integrating the IK and SK was the best approach for reliable forecasts and SK has proven more effective and reliable because it offers precise, technology-driven predictions. Nonetheless, the majority of fisher folk emphasized the value of integrating IK with SK, echoing studies that hybrid systems enhance forecast relevance and trust (Nyadzi et al., 2021; Richard et al., 2021).
- c) Much rainfall, strong winds and floods on the lake were mentioned as the major extreme weather events and were regarded as the most important to consider when planning their fishing expeditions. Community preparedness strategies such as using strong boats,

constructing durable houses, and adopting personal flotation devices align with adaptive practices documented in climate resilience literature, where structural and safety measures are central to reducing exposure and vulnerability (IPCC, 2022; Bryan et al., 2018).

- d) The community responses included ensuring seaworthiness of water vessels, aborting the journey or waiting for extreme weather to pass and pulling vessels on the shores to avoid damage. These actions are in line with evidence that anticipatory behavior and safety-first decisions significantly lower climate-related risks in small-scale fisheries (Allison & Bassett, 2015; FAO, 2021).

5.2 Recommendations

- a) To enhance and sustain effectiveness of IK and weather prediction, there is need for strong cooperation between the IK and SK prediction experts. This could be achieved through advocating for policies that support the integration of indigenous knowledge into national weather forecasting systems and disaster management plans, promoting active involvement of community members in weather monitoring and disaster preparedness activities, fostering a sense of ownership and responsibility
- b) Capacity building and active participation of stakeholders in training programs, improving dissemination methods, and fostering community engagement in integrating weather forecasting practices that improve utilization of the integrated forecasts with emphasis on utilizing the SK which has proven effective, accurate and reliable
- c) Education and awareness programs should be tailored to be easily comprehensible and accessible to those with lower education levels. Integrating indigenous knowledge, which might be more familiar to them, with scientific forecasts could improve their overall effectiveness and acceptance.
- d) There is need for continued efforts to improve dissemination methods, educate local leaders, and foster community engagement, thereby ensuring that both knowledge systems are utilized to their fullest potential in safeguarding the community against weather-related adversities
- e) Investments in more weather stations within Lake Victoria basin districts will therefore be a key factor in obtaining more accurate scientific forecasts and could lead to increased use

of the scientific Knowledge forecasts and improved safety and reduce on vulnerability of the fisher folk

- f) This demographic mix suggests that disaster preparedness programs should leverage the experience of the elderly while engaging the active participation of adults and youths in implementing these strategies. Encouraging intergenerational knowledge transfer can enhance community resilience.
- g) Therefore, it is critical to provide affordable and accessible weather forecasting tools and to offer financial support or subsidies for resilience-building measures.
- h) Further research to improve the accuracy and applicability of integrated weather forecasting methods, ensuring they meet the specific needs of the community.

References

- (FAO), F. a. (2018). *The State of Wolrd Fisheries and Aquaculture: Meeting the sustainable development goals*. Food and Agriculture Organization of the United Nations (FAO).
- (IPCC), I. P. (August 9, 2021). *Climate Change 2021: The Physical Science Basis*.
- (IFRC), T. I. (2008). *Early Warning, Early Action: An Evaluation of IFRC West and Central Africa Zone Flood Preparedness and Response, 2008*. The International Federation of Red Cross and Red Crescent Scocities.
- (UNCTAD), U. N. (2022). *The low-carbon transition and its daunting implications for structural transformation*. United Nations.
- (WMO), W. M. (2022, September 12). *United in Science: We are heading in the wrong direction*. Retrieved from WORLD METEOROLOGICAL ORGANIZATION: <https://wmo.int/media/united-science-we-are-heading-wrong-direction>
- Aaron, C.-G. (2014). *Concern Disaster Risk Reduction - Coastal Areas*. CONCERN WORLDWIDE.
- Adam, S., & Łukasz, K. (2024). Green economy and energy: Green labor market elements identification. *Journal of Infrastructure Policy and Development* , 8. <https://doi.org/10.24294/jipd.v8i6.4953>
- Adaptation Fund. (2023). *Strengthening Resilience through Disaster Risk Reduction and Early Warning Systems Interventions: Experiences and Lessons Learned from the Adaptation Fund Portfolio*. ADAPTATION FUND.
- Allison, E. H., Allison, P., Marie-Caroline, B., & Nicholas, K. D. (2009). Vulnerability of National Economies to the Impacts of Climate Change on Fisheries. *Fish and Fisheries*, 10, 173-196. <https://doi.org/10.1111/j.1467-2979.2008.00310.x>

- Al-Maruf, A., Jenkins, J., Bernzen, A., & Braun, B. (2021). Measuring Household Resilience to Cyclone Disasters in Coastal Bangladesh. *Climate*, 9. <https://doi.org/10.3390/cli9060097>
- Anna , B., Rose , H. O., Anthony , M., Mollen , N., Paul , M., Charles , M., & Benard , I. (2021). *Living in the climate crisis: young people in Uganda*. <https://doi.org/10.17863/CAM.75235>
- Anthony Nyong, F. A.-E. (2007). *The Value of Indigenous Knowledge in Climate Change Mitigation and Adaptation Strategies in the African Sahel*. <https://doi.org/10.1007/s11027-007-9099-0>
- Ayal DY, D. S. (2015). *Opportunities and Challenges of indigenous biotic weather forecasting among Borena herders of southern Ethiopia*.
- Barberstock, R. K. (2024, APRIL 15). *Traditional Ecological Knowledge: The Cornerstone of Indigenous Climate Adaptation in Canada*. Retrieved from Indigenous Climate Hub: <https://indigenousclimatehub.ca/2024/04/traditional-ecological-knowledge-the-cornerstone-of-indigenous-climate-adaptation-in-canada/>
- Ben , O., Rachael, S., Ezra, M., & So-Min, C. (2020). Climate Decision-Making. *Annual Review of Environment and Resources*, 45. <https://doi.org/10.1146/annurev-environ-012320-085130>
- Blanchard, K. (2024). *Intersectionality, marginalised groups & disasters: Culture & identity in disaster preparedness & response*. DRR Dynamics.
- Bwambale, B., Moses, M., & Nyeko, M. (2018). Traditional ecological knowledge and flood risk management: A preliminary case study of the Rwenzori. *Journal of Disaster Risk Studies*. <https://doi.org/10.4102/jamba.v10i1.536>
- Caloiero, T., Roberto, C., Ennio, F., & Marco, M. (2011). Trend detection of annual and seasonal rainfall in Calabria (Southern Italy). *International Journal of Climatology*, 31, 44-56. <https://doi.org/10.1002/joc.2055>

- Cecile, B. (2015). *CLIMATE CHANGE VULNERABILITY IN FISHERIES AND AQUACULTURE: A SYNTHESIS OF SIX REGIONAL STUDIES*. FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS .
- Chala Dechassa, B. S. (2017). *Farmers' Livelihoods Vulnerability to Climate Variability and Change in Didesa Basin Southern Part of Abay Basin, Ethiopia*. https://doi.org/10.1007/978-3-319-49520-0_17
- Cheung, W., Lam, V., Jorge, L. S., Daniel, P., Kelly, K., Reg, W., & Dirk, Z. (2010). Large-scale Redistribution of Maximum Fisheries Catch Potential in the Global Ocean under Climate Change. *Global Change Biology*, 16, 24-35. <https://doi.org/10.1111/j.1365-2486.2009.01995.x>
- Christian, S., Seshagiri, K. R., Todd, M. C., Ajay, B., Andy, D. J., Chris, R. J., . . . Declan , C. (2021). Climate variability affects water-energy food infrastructure performance in East Africa. *One Earth*, 4(3), 397-410. <https://doi.org/10.1016/j.oneear.2021.02.009>
- Claire L, D.-R., & Katherina, V. (2017). *Climate Risk and Vulnerability*.
- Dr. Dimitrios, I., Georgios, & Dellis. (2024). *Assessment of the role of community preparedness and engagement in risk and crisis communication* .
- Dr. Elizabeth, A. N. (2016). *Assessing the adaptive capacity of fishing communities to climate change in the Lake Victoria basin of East Africa*.
- Duminda , P., Jetal , A., Ousmane , S., & Riyanti , D. (2020). Identifying societal challenges in flood early warning systems. *International Journal of Disaster Risk Reduction*, 51. <https://doi.org/10.1016/j.ijdr.2020.101794>
- Elias, N., Andrea, T., Andrew, D. J., Emily, B. N., Oumar, K., Kamoru, L. A., . . . Tanya, W. (2019). Identifying user needs for weather and climate services to enhance resilience to climate shocks in sub-Saharan Africa. *Environmental Research Letters*. <https://doi.org/10.1088/1748-9326/ab4dfe>

- Fiona, H., Artur, S., Jane, F., & Geoff, W. (2020). Challenges of community engagement in a rural area: The impact of flood protection and policy. *Journal of Rural Studies*, 73, 225-233. <https://doi.org/10.1016/j.jrurstud.2019.11.004>
- Goneri, L., Matthieu, K., S, R., Chinwe, S. I., Pierric, F., Foumelis, M., . . . Hormoz, M. (2020). Space-Based Earth Observations for Disaster Risk Management. *Surveys in Geophysics*, 41, 1209-1235. <https://doi.org/10.1007/s10712-020-09586-5>
- Gugulethu, Z.-N., Kees, S., & Walker, S. (2013). Use of Traditional Weather/Climate Knowledge by Farmers in the South-Western Free State of South Africa: Agrometeorological Learning by Scientists. *Atmosphere*, 4, 383-410. <https://doi.org/10.3390/atmos4040383>
- Heather, S. (2024, December 9). Communities struggle to prepare for extreme weather.
- Houston, J. B., Spialek, M. L., Cox, J., Greenwood, M., & First, J. (2015). The centrality of communication and media in fostering community resilience: A framework of assessment and intervention. *American Behavioral Scientist*, 59, 270-283. <https://doi.org/10.1177/0002764214548563>
- Huijin, Z., Yaxin, L., Chongyu, Z., & Ningyun, L. (2025). Machine Learning Methods for Weather Forecasting: Survey. *Atmosphere*, 16(1). <https://doi.org/10.3390/atmos16010082>
- James, H. W., Catherine, V., Desire, K. M., Tufa, D., Edward, C. R., Jana, K., & Robert, Z. B. (2019). Climate Services Can Support African Farmers' Context-Specific Adaptation Needs at Scale. *Frontiers in Sustainable Food Systems*. <https://doi.org/10.3389/fsufs.2019.00021>
- Japhet, R., Shadrack, S., & Anesi, M. (2025). Contribution of flood early warning response measures in reducing flood effects in Kilosa District, Tanzania. *Climate Services*, 37. <https://doi.org/10.1016/j.cliser.2024.100534>

- Jessica, M., Ilan, K., Kate, L., & Sandie, S.-P. (2008). Reflections on use of participatory research for disaster risk reduction. *Area*, 40, 172-183. <https://doi.org/10.1111/j.1475-4762.2008.00797.x>
- Kniveton, D., Emma, V., Arame, T., Mariane, D., Richard, E., & Ezekiel, N. (2014). Dealing with uncertainty: intergrating local and scientific knowledge of climate and weather. *DISASTERS*, 39(s1), s35-s53. <https://doi.org/10.1111/disa.12108>
- Kniveton, D., Lea, O., John, O., Paul, O., Julius, K., & Emma Visman, O. C. (2021). *Integrating Scientific Knowledge and Traditional Knowledge in Impact Weather Forecasting - Executive Summary*. WISER HIGHWAY.
- Koudahe, K., Kayode, A., Samson, A., Adebola, A., & Djaman, K. (2017). Trend Analysis in Standardized Precipitation Index and Standardized Anomaly Index in the Context of Climate Change in Southern Togo. *Atmospheric and Climate Sciences*, 401-423. <https://doi.org/10.4236/acs.2017.74030>.
- Kristian, I., & Mohammad, O. (2024). Integrating Community-Based Approaches into National Disaster Management Policies: Lessons from Recent Natural Disasters. *The International Journal of Law Review and State Administration*, 4, 115-125. <https://doi.org/10.58818/ijlrsv2i4.150>
- Lisa , H., Luna, E., Syamsidik, & Jose, M. A. (2015). Local and Indigenous knowledge on climate -related hazards of coastal and small island communities in Southeast Asia. *Climate Change*, 128, 35-56. <https://doi.org/10.1007/s10584-014-1288-8>
- Louis, N., & Tirivangasi, M. H. (2021). *Barriers to Effective Climate Change Management in Zimbabwe's Rural Communities*. https://doi.org/10.1007/978-3-030-45106-6_251
- Madhav, K., Prabha, P., & Jay, R. A. (2014). *CLIMATE CHANGE: INTEGRATING INDIGENOUS AND LOCAL KNOWLEDGE INTO ADAPTATION POLICIES AND PRACTICES*.

- Mahiri, I. (2021). Effect of climatic and non climatic factors on fishing activities in Lake Victoria, Kisumu County, Kenya. *International Journal of Bonorowo Wetlands*, 11(1), 7-17. <https://doi.org/10.13057/bonorowo/w110102>
- Marcela, B., Art, D., Claudia, P.-W., & Tharsi, T. (2008). Toward a Relational Concept of Uncertainty: About Knowing Too Little, Knowing Too Differently, and Accepting Not to Know. *Ecol Soc*, 13. <https://doi.org/10.5751/ES-02616-130230>
- Masego, M. M., & Livhuwani, D. N. (2024). A framework to integrate indigenous knowledge into disaster risk reduction to build disaster resilience: insights from rural South Africa. *Disaster Prevention and Management*, 33(6), 73-85. <https://doi.org/10.1108/DPM-08-2024-0220>
- Matthew, A., Michael, O. E.-k., Seth, A. O., & Maund, K. (2023). Influence of personal and collective social capital on flood preparedness and community resilience: Evidence from Old Fadama, Ghana. *International Journal of Disaster Risk Reduction*, 94. <https://doi.org/10.1016/j.ijdr.2023.103790>
- McKee, T. B., Nolan, J. D., & John, K. (1993). THE RELATIONSHIP OF DROUGHT FREQUENCY AND DURATION TO TIME SCALES.
- Mfitumukiza, D., Roy, A. S., Belay, S., Hammill, A., Mohammed, R. F., & Saleemul, H. (2020). *Scaling local and community-based adaptation, Global Commission on Adaptation Background Paper*,.
- Miriam, K.-J., Cosmo, N., Lucy, C., & F., M. (2011). Integrating indigenous knowledge with conventional science: Enhancing localised climate and weather forecasts in Nessa, Mulanje, Malawi. *Physics and Chemistry of the Earth, Parts A/B/C*, 36(14-15), 996-1003. <https://doi.org/10.1016/j.pce.2011.08.001>

- Mirza, I., Cut, N., Laila, Q., & Mariana, M. (2024). City of prone natural disasters: Mitigating post-tsunami on the coastal of Banda Aceh, Indonesia. *Environmental Challenges*, 15. <https://doi.org/10.1016/j.envc.2024.100925>
- Mulokozi, J. (2025). Attitudes and practices of fishermen towards sustainable fisheries management in Lake Kyoga: A case study of Kagwara Landing site. *Agriculture and Food Science*, 13(1), 103-117.
- NASA Earth, O. (2021). *Lake Victoria's Rising Water Levels*. NASA Earth, Observatory, ;.
- Ngaina, J., Mutua, F., Muthama, N., Kirui, J., Sabiiti, G., Mukhala, E., . . . Mutai, B. K. (2014). Drought monitoring in Kenya: A case of Tana River County. *International Journal of Agricultural Science Research* , 3, 126-135.
- Nicholson, S. E. (2013). A detailed look at the recent drought situation in the Greater Horn of Africa. *Journal of Arid Environments*, 103, 71-79. <https://doi.org/10.1016/j.jaridenv.2013.12.003>
- Nkuba, M. R., Chanda, R., Mmopelwa, G., Mangheni, M. N., Lesolle, D., & Kato, E. (2020). Indigenous knowledge systems and indicators of rain: Evidence from Rwenzori Region, Western Uganda. *Weather, Climate, and Society*, 213–234. <https://doi.org/10.1175/wcas-d-19-0027.1>
- Nyadzi, E., Ajayi, O. C., & Ludwig, F. (2021). *Indigenous knowledge and climate change adaptation in Africa: a systematic review*. <https://doi.org/10.1079/PAVSNNR202116029>
- Nyong, A., Francis, A., & Balgis, O.-E. (2007). The Value of Indigenous Knowledge in Climate Change Mitigation and Adaptation Strategies in the African Sahel. *Mitigation and Adaptation Strategies for Global Change*, 12, 787-797. <https://doi.org/10.1007/s11027-007-9099-0>

- Ogutu, O. R., Odongkara, K., Okello, W., Wandera, S., Mbilingi, B., Efitre, J., . . . Mununuzi, D. (2012). *Impacts and Adaptations to Climate Variability and Change in Inland Riparian and Aquatic Ecosystems and Fisheries: A Review of Scientific Literature* . NaFIRRI.
- Okonya, J. S., & Jurgen Kroschel. (2013). Indigenous knowledge of seasonal weather forecasting: A case study in six regions of Uganda. *Agricultural Sciences*, 4, 641-648. <https://doi.org/10.4236/as.2013.412086>
- Opare, S. (2016). Adaptation to climate change impacts: coping strategies of an indigenous community in Ghana to declining water supply. 73-83. <https://doi.org/10.1080/17565529.2016.1184610>
- Opha, P. D., & Sekhwela, M. B. (2008). Indigenous knowledge, institutions and practices for coping with variable climate in the Limpopo Basin in Botswana. *Climate Change and Adaptation*.
- Patrick Nganzi, T. C. (2016). *Use of Indigenous Knowledge in Weather Forecasting in Uganda*. Word Vision Uganda & Africa Climate Change Resilience Alliance (ACCRA).
- Paulina, A., Ruth, B., Stuart, M. H., & Handmer, J. (2015). Resilience for disaster risk management in changing climate: Practitioners' frames and practices. *Global Environmental Change*, 30, 1-11. <https://doi.org/10.1016/j.gloenvcha.2014.10.010>
- Philip, I., & Thomalla, F. (2011). The Role of Collective Action in Enhancing Communities' Adaptive Capacity to Environmental Risk: An Exploration of Two Case Studies from Asia. *PLoS currents*. <https://doi.org/10.1371/currents.RRN1279>
- Powell, R., Watkiss, P., & Hunt, A. (2020). *Socio-Economic Benefits of the HIGHWAY project*.
- Rahman, S. U. (2014). *IMPACTS OF FLOOD ON THE LIVES AND LIVELIHOODS OF PEOPLE IN BANGLADESH: A CASE STUDY OF VILLAGE IN MANIKGANJ DISTRICT*.

- Rajesh, K. M., Ravindra, K. S., Tirthankar, B., Om, P. M., Diva, B., & Geetika, S. (2018). Disaster Risk Reduction including Climate Change Adaptation Over South Asia. *International Journal of Disaster Risk Science*, 10, 14-27. <https://doi.org/10.1007/s13753-018-0210-9>
- Ramadhani, J., & Seme, S. (2024). Unlocking the Perceptions of Fishing communities for Credible and Effective Weather Forecasting and Early-warning System in Zanzibar, Tanzania. *International Journal of Innovative Research and Developemnt*. <https://doi.org/10.24940/ijird/2023/v12/i11/NOV23005>
- Ranaivo , R., & Kathryn , F. (2024). *Lake Victoria: why so many fishers are dying and what can be done about it*. THE CONVERSATION.
- Reduction, U. N., & (UNDRR). (2022). *Words into Action: Using traditional and indigenous knowledges for disaster risk reduction*. UNDRR.
- Richard , M., Andrew, D. J., Joseph , M., Stella , A., Richard , G., David , A., . . . Franklin , O. (2021). Understanding the Role of User Needs and Perceptions Related to Sub-Seasonal and Seasonal Forecasts on Farmers' Decisions in Kenya: A Systematic Review. 3. <https://doi.org/10.3389/fclim.2021.580556>
- Robert , T. Š., & Marc , v. (2018). *Indigenous knowledge and early warning systems in the Lower Shire Valley in Malawi*.
- Rodney, T., Denver, N., & Paramu, M. (2020). The challenges experienced by small-scale fishing communities of Lake Kariba, Zimbabwe. *The Journal for Transdisciplinary Research in Southern Africa*, 16(1). <https://doi.org/10.4102/td.v16i1.704>
- S.E Perkins-Kirkpatrick, & S.C Lewis. (2020, July). Increasing trends in Regional Heat waves. <https://doi.org/10.1038/s41467-020-16970-7>
- Sanne Muis, B. G. (2015). *Flood risk and adaptation strategies under climate change and urban expansion: A probablistic analysis using global data*. <https://doi.org/10.1016/j.scitotenv.2015.08.068>

- Selma, G. B., Hayley , F. J., Renaud , B., Seth , W., Geert , L., Stephen , B., . . . Xiao-Feng , L. (2018). Detection of continental-scale intensification of hourly rainfall extremes. *Nature Climate Change* , 803–807. <https://doi.org/10.1038/s41558-018-0245-3>
- Shalli, M. S. (2016). Local knowledge of fishermen in weather prediction in Moa and Kwale coastal villages, Tanzania. *Western Indian Ocean Journal of Marine Science*, 15(1), 79-89.
- Smith, P., Calvin, K., Nkem, J., Campbell, D., Cherubini, F., Grassi, G., . . . Mann, F. C. (2020). Which practices co-deliver food security, climate change mitigation and adaptation, and combat land degradation and desertification? *Global Change Biology*, 26, 1532-1575. <https://doi.org/10.1111/gcb.14878>
- Stephanie, M. F., Jodi, T., Anna, G., & Michele Rumsey 1, N. K. (2013). Traditional Coping Strategies and Disaster Response: Examples from the South Pacific Region. *Journal of environmental and public health*. <https://doi.org/10.1155/2013/264503>
- Talardia, G., Erik, V. S., Fulco, L., Gordana, K.-B., & Spyridon, P. (2020). Harnessing Local Knowledge on Weather and Climat ein Ghana: Documentation, Skills, and Integration with Scientific Forecasting Knowledge. *Weather, Climate, and Society*, 13(1), 23-37. <https://doi.org/10.1175/WCAS-D-20-0012.1>
- Tell, F., Berggren, C., & Ven, S. B. (2016). *Managing Knowledge Intergration Across Boundaries*. <https://doi.org/10.1093/acprof:oso/9780198785972.001.0001>
- Thirze , H. D., Robert , T. Š., Marc J. C. , v., Hannah , B., Rebecca , S., & Anuszka , M. (2022). Exploring the integration of local and scientific knowledge in early warning systems for disaster risk reduction: a review. *Natural Hazards*, 114, 1125-1152. <https://doi.org/10.1007/s11069-022-05468-8>

- Thomas, P. A., Philip, A.-A., & Andrew, J. D. (2022). The contribution of weather forecast information to agriculture, water, and energy sectors in East and West Africa: A systematic review. *Interdisciplinary Climate Studies*, 10. <https://doi.org/10.3389/fenvs.2022.935696>
- Tierney, K. (2014). *The Social Roots of Risk Producing Disasters, Promoting resilience*. Stanford University Press.
- Timmers, B. (2012). *Impacts of climate change and variability on fish value chains in Uganda*. Penang, Malaysia: WorldFish Centre.
- Tufa, D., Rija, F., Shammunul, I., Glorioso, N., & Amanda, G. (2022). The Climate Data Tool: Enhancing Climate Services Across Africa. *Frontiers in Climate*, 3. <https://doi.org/10.3389/fclim.2021.787519>
- Uganda Bureau of Statistics (UBOS). (2024).
- USAID. (May 2023). *Community-led Resource Mobilization and Early Warning Systems Process Assessment*.
- Vijendra, K., Kul, S. V., Tommaso, C., Darshan, M. J., & Karan, S. (2023). Comprehensive Overview of Flood Modelling Approaches: A Review of Recent Advances. *Hydrology*. <https://doi.org/10.3390/hydrology10070141>
- Wainwright, C. M., Finney, D. L., Kilavi, M., & Marshan, E. B. (2021). Extreme rainfall in East Africa, October 2019-January 2020 and context under future climate change. 76. <https://doi.org/10.1002/wea.3824>
- Walter, L. F., Franziska, W., Edmond, T., Desalegn, Y. A., Luckson, Z., Nicholas, P. S., & Kumbirai, M. (2022). Is indigenous knowledge serving climate adaptation? Evidence from various African regions? *Development Policy Review*, 41. <https://doi.org/10.1111/dpr.12664>

- World Meteorological Organization (WMO). (2022). *Education and Training in a Period of Rapid Change: Highlights of the Fourteenth WMO Symposium on Education and Training (SYMET-14)*. World Meteorological Organization (WMO).
- Yanou, M. P., Mirjam, A. R.-T., James, R., Kaala, M., & Terry, S. (2023). Integrating local and scientific knowledge: The need for decolonising knowledge for conservation and natural resource management. *Heliyon*. <https://doi.org/10.1016/j.heliyon.2023.e21785>
- Yuting, W., & Wei, X. (2024). Data-Driven Weather Forecasting and Climate Modeling from the Perspective of Development. *Atmosphere*, 15. <https://doi.org/10.3390/atmos15060689>
- Zhang, Senevirante, S. I., & Xuebin. (2021). *Weather and Climate Extreme Events in a Changing Climate*. IPCC.

TABLES

Table 6: What are the trends of these weather parameters?

Variable	Parameters	No. of Respondents	% Percentage
Change in rainfall periods	More often	92	65.2
	Rarely	34	24.1
	No change	15	10.7
	Total	141	100.0
S.E Wind speed	More often	88	62.4
	Rarely	40	28.4
	No change	13	9.2
	Total	141	100.0
Change in wind direction	More often	79	56.0
	Rarely	42	29.8
	No change	20	14.2
	Total	141	100.0
Occurrence of storms	More often	91	64.5
	Rarely	37	26.2
	No change	13	9.2
	Total	141	100.0

Table 7: Other trends of weather parameters

Variable	Parameters	No. of Respondents	% Percentage
Rainfall intensity	Increasing	85	60.3
	Decreasing	56	39.7
	Total	141	100
N.E Wind speed	Increasing	70	49.6
	Decreasing	54	38.3
	No change	17	12.1
	Total	141	100
Change in wind speed	Increasing	78	55.3
	Decreasing	46	32.6
	No change	17	12.1
	Total	141	100
Wave height	Increasing	83	58.9
	Decreasing	49	34.8
	No change	9	6.3
	Total	141	100
Change in water currents	Increasing	77	54.6
	Decreasing	50	35.5
	No change	14	9.9
	Total	141	100
Temperature	Increasing	89	63.1
	Decreasing	41	29.1
	No change	11	7.8
	Total	141	100

Table 8: Effectiveness of SK against IK-based Forecasts

Variable	Frequency	Percentage
Which of these practices is better or more reliable?		
Indigenous Knowledge	9	6.4
Scientific Knowledge	41	29.1
Both indigenous knowledge and Scientific knowledge	85	60.3
Other	6	4.3
Total	141	100.0

Table 9: Local Community preparedness to extreme weather events

How prepared are you for these extreme weather events?	Not prepared	32	22.7
	Well prepared	57	40.4
	Very well prepared	52	36.9
	Total	141	100
How do you prepare for extreme weather events? Evidence	Use of strong boats	57	40.4
	Use of strong houses	46	32.6
	Life jacket as personal floating device	27	19.1
	Always assessing the sea worthiness of vessels used	11	7.9
	Total	141	100
Who are most affected?	Women	27	15.4
	Men who fish	61	34.9
	Children	5	2.9
	Sailors on long journeys	43	24.6
	Others	5	2.9
	Total	141	100

Table 10: Communities' responses to extreme weather events

Variable	Frequency	Percentage
How do you respond to these extreme weather events?		
By aborting the journey or Waiting for Extreme weather to pass	30	22.6
Ensuring seaworthiness of water vessels (Canoes, Boats etc.)/ Repair of boats	33	24.8
Pulling our vessels on the shores to avoid damage	21	15.8
Fishing near bays continues	8	6.0
Follow up with warning messages	7	5.3
Reduce fishing activities	21	15.8
Use of life jackets	13	9.8
Total	141	100.0

APPENDIX-I

Research questionnaire

Assessing the impact of Integrating Indigenous and Scientific weather forecasting on community resilience to extreme weather events among communities at Masese landing site in Jinja

Key Informants'/ Fishing Community – Assessment Questionnaire/Guide

Introduction

The research recognizes the existence of a wealth of indigenous knowledge on weather and climate forecasting among the target fishing communities. In a bid to integrate modern Scientific Knowledge (SK) weather forecasts with the Indigenous Knowledge (IK) of the research beneficiaries, the research is conducting an assessment to document the existing knowledge.

This study therefore, investigates the efficacy of using indigenous knowledge in the prediction of weather patterns in the target communities at Masese Landing Site in Jinja City. The study also seeks to confirm the use of reliable indigenous knowledge indicators that can be taken on together with those used by Science to improve weather predictability for enhanced fishing as well as community resilience to extreme weather events among communities and mitigating the adverse effects of climate change.

2.0 General Objective

The general objective of the study will be to evaluate the indigenous and scientific weather forecasting on resilience of fishing communities to weather events in Jinja

2.1 Specific Objectives

1. Analyze the trends of extreme weather events in the study area.

2. Compare the effectiveness of scientific forecasts against indigenous knowledge-based forecasts.
3. Identify the local community preparedness to extreme weather events.
4. Identify the local community's responses to extreme weather events.

3.0 Methodology

To achieve the above objectives, the Researcher intends to implement the above activity by conducting an assessment on the impact of integrating indigenous and scientific weather forecasting on community resilience to extreme weather events among communities at Masese landing site in Jinja.

QUESTIONNAIRE No. _____

Section: A Bio Data

District.....

1. **Sub-county.....**
2. **Parish** ☐ **Masese** ☐ Walukuba-East ☐ Walukuba-West.
3. **Village.....**
4. **Sex.....** ☐ Male ☐ Female
5. **Type of Person ...** ☐ Adult ☐ Male ☐ Female ☐ Youth ☐ Elderly
6. **Level of Education...** ☐ P.L.E ☐ U.C.E ☐ U.A.C. E ☐ Tertiary ☐ University
7. **Income Per Month...** ☐ Less than UGX. 10,000 ☐ UGX. 10,000 to 50,000 ☐ UGX. 50,000 to 100,000 ☐ More than UGX. 100,000
8. **Other**

Section B: Objective (i) Trends of weather events in the study area.

(a) Rainfall Intensity? Is it increasing or decreasing? ☐ Increasing ☐
Decreasing

(b) Change in rainfall periods
☐ More often ☐ Rarely ☐ No Change

(c) S.E wind speed

- ☐ More often ☐ Rarely ☐ No Change
- (d) N.E wind speed
- ☐ Increasing ☐ Decreasing ☐ No Change
- (e) Change in wind direction
- ☐ Increasing ☐ Decreasing ☐ No Change
- (e) Change in wind direction
- More Often ☐ Rarely ☐ No Change
- (f) Wave Height
- ☐ Increasing ☐ Decreasing ☐ No Change
- (h) Occurrence of storms
- ☐ More Often ☐ Rarely ☐ No Change
- (g) Change in Water Currents speed
- ☐ Increasing ☐ Decreasing ☐ No Change
- (i) Temperature
- ☐ Increasing ☐ Decreasing ☐ No Change

2. Give examples of Extreme Weather Events you have experienced

- ☐ Strong Storms ☐ Thunder ☐ Strong Winds
☐ Floods ☐ All the above

3. How frequent are these extreme weather events?.....

- ☐ Every month ☐ Every 3 months ☐ Every 4 months ☐ Every 6 months

Objective (ii) Effectiveness of scientific forecasts against indigenous knowledge based Forecasts

Indigenous Weather Forecasting

- Do you use Indigenous practices? ☐ Yes ☐ No
If Yes,
- What indicators do you use? ...
 - ☐ Clouds accumulating with relationship to wind direction
 - ☐ Wind movements to a given direction
 - ☐ Increase in fish

- ☐ Insects and bird's movements to a given direction
 - ☐ The sun
 - ☐ Any other
3. When do you use these forecasts.....?
 - ☐ When preparing for the fishing trip
 - ☐ at all times
 - ☐ in the known months for bad weather like June, July and August
 4. Who does it? ☐ Elders ☐ Opinion Leaders ☐ Beach Chairman/Landing site Chairmen
 5. Why do they use the Indigenous Weather Forecasting?.....
 - ☐ to make comparison with the Scientific Forecasts
 - ☐ Culture ☐ Accessible and acceptable
 - ☐ More accurate and reliable though sometimes is affected by climate changes
 6. How accurate is the weather forecast? ☐ Not Accurate ☐ Fairly Accurate ☐ Very Accurate
 7. What can be done to improve the indigenous Forecasts.....?
 - ☐ Sensitizing the fisher folk
 - ☐ Integrate indigenous forecasts into scientific practice as it provides evidence
 - ☐ Intensify research
 8. How timely is the weather information? ☐ In time ☐ On time ☐ Late ☐ None

(a) Scientific Weather Forecasting

1. Do you use Scientific practices? ☐ Yes ☐ No
If yes
2. What indicators do you use?
 - ☐ Internet
 - ☐ Whatsapp and email
 - ☐ TV
 - ☐ Radios
3. When do you use these forecasts.....?
 - ☐ Everyday they are dispatched ☐ During movements on the lake and fishing
 - ☐ Mornings and evenings
4. Who prepares these forecasts? ☐ UNMA ☐ Natural Resources Officers ☐ Beach Chairmen
5. Why do you use the Scientific Weather Forecasting?.....
 - ☐ Reliable ☐ More reliable ☐ predictable

☐ More reliable and predictable

6. How accurate is the weather forecast? ☐ Not Accurate ☐ Fairly Accurate ☐ Very Accurate

7. What can be done to improve the Scientific Forecasts.....?
☐ Periodic upgrading of weather Equipment ☐ Training of Forecasters and Communicators
☐ Training of Observers ☐ All the above?

8. How timely is the weather information? ☐ in time ☐ On time ☐ Late

(c) Impact of integrated weather forecasting on the community's preparedness

1. Which of these practices is better or more reliable? ☐ Indigenous Knowledge ☐ Scientific Knowledge ☐ Both IK and SK ☐ Other

2. Do you sometimes use both Indigenous Knowledge and Scientific Knowledge? ☐ Yes ☐ No

3. What is the impact of using both?.....

☐ Relating IK and SK has proven SK to be effective and Reliable

☐ It creates a balance and options to use in responding to extreme weather conditions

☐ Eliminating losses in business

What would be your recommendation of improving the integration more effective?

☐ Sensitizing the local community leaders about the integrated forecasts

☐ Sponsoring more media programs on weather

☐ Improving and diversifying methods of disseminating weather forecast information

☐ Appreciating IK from the locals as benefit before SK came into existence

☐ Strengthening scientific forecasts to capture areas of interest eg water spouts

☐ Scientific forecasts be communicated in line with travel routes in Lake Victor

4. ☐ All the above

Section C: Objective (iii) Community preparedness to extreme weather events based on both indigenous and scientific weather forecasts

1.What are some of the weather parameters you know? ☐ Rainfall ☐ Wind ☐ Wind Direction

☐ Wave height ☐ Storms ☐ Temperature ☐ All the above

2.What are extreme weather Events?

Risk events like ☐ Strong winds ☐ Heavy Storms ☐ Lightning and Thunder ☐ Much Rainfall
☐ Floods

3.What damage do extreme weather events cause?

☐ Break Boats ☐ Post Harvest losses for fish ☐ Loss of goods thrown overboard
☐ loss of life, property and stopping activities
☐ All the above

4.How prepared are you for these extreme weather events? ☐ Not Prepared ☐ Well Prepared ☐ Very well prepared.

5.How do you prepare for extreme weather events? Evidence: ☐ use of strong boats ☐ Use of Strong Houses ☐ Life jacket as personal floating device ☐ Always assessing the sea worthiness of vessels used

6.Who are most affected? ☐ Men who fish ☐ Women ☐ Children ☐ Sailors on long journeys
☐ Others.....

Section D: Objective (iv) Communities' responses to extreme weather events

How do you respond to these extreme weather events?

1. ☐ By aborting the journey or Waiting for Extreme weather to pass
2. ☐ Ensuring seaworthiness of water vessels (Canoes, Boats etc)/ Repair of boats
3. ☐ Pulling our vessels on the shores to avoid damage
4. ☐ Fishing near bays continues
5. ☐ Follow up with warning messages
6. ☐ Reduce fishing activities
7. ☐ Use of life jackets

The study team greatly appreciates your time and effort, as well as valuing your thoughts about the use of indigenous knowledge and Scientific Knowledge on resilience to extreme weather events among communities at Masese landing site in Jinja

Thank you!

APPENDIX-II

Interview guide

Assessing the impact of Integrating Indigenous and Scientific weather forecasting on community resilience to extreme weather events among communities at Masese landing site in Jinja

Key Informants'/ Fishing Community – Assessment Questionnaire/Guide

Category of Respondents: Male and Female Fisher Folk Groups in the community of different age groups. *There should be at least 1 Focus Discussion Group of each category comprising of at least 10 both male and female participants of different age groups in each village sampled. Male and female participants should be interviewed separately. This gives you a total of FGDs per Sub county. (Fill the responses).*

QUESTIONNAIRE No. _____

Section A: Bio Data

Key Informants' Background Information:

District..... Sub-county.....

Parish..... Village.....

Group.....

☐ **Boat Owners** ☐ **Fish Traders** ☐ **Female Silver fish processors** ☐ **Men who fish**

☐ **Others**

Section B: Objective (i) Trends of weather Events

1.What are some of the extreme weather events you know?

2.What are trends of these extreme weather events?

Section B:Objective (ii) Effectiveness of scientific weather forecasts against indigenous knowledge based forecasts

(b) Indigenous Weather Forecasting

1. Do you use Indigenous practices forecast weather?
2. What indicators do you use to predict weather? ...
3. When do you use these forecasts.....?
4. What can be done to improve the indigenous Forecasts.....?

(c) Scientific Weather Forecasting

1. Do you use Scientific practices?
2. What indicators do you use?
3. When do you use these forecasts.....?
4. What can be done to improve the Scientific Forecasts.....?

(c) Impact of integrated weather forecasting on the community's preparedness

1a) Which of these practices Indigenous Knowledge and Scientific Knowledge is better or more reliable? and why?

2.What is the impact of using both?.....

3. What would be your recommendation of improving the integration more effective?

Section C: Objective (iii) Community preparedness to extreme weather events based on both indigenous and scientific weather forecasts

1. What are some of the weather parameters you know?
2. What are extreme weather Events?
3. What damage do extreme weather events cause?

4. How do you prepare for extreme weather events? Evidence

Section D: Objective (iv) Communities' responses to extreme weather events

How do you respond to these extreme weather events?

The study team greatly appreciates your time and effort, as well as valuing your thoughts about the use of indigenous knowledge and Scientific Knowledge on resilience to extreme weather events among communities at Masese landing site in Jinja

Thank you!

APPENDIX-III

IK, SK FORECAST V/S OBSERVED DATA

RESEARCH

Score Card

Village ...Masese (Buvuma and North East)

Observer Team Elder.....

MonthMarch/April/May/June Year2024

Date	Parameter	IK Forecast	SK- Forecast	OBS
1	WIND			
	WEATHER			
2	WIND			
	WEATHER			
3	WIND			
	WEATHER			
4	WIND			
	WEATHER			
5	WIND			
	WEATHER			
6	WIND			
	WEATHER			
7	WIND			
	WEATHER			

8	WIND			
	WEATHER			
9	WIND			
	WEATHER			
10	WIND			
	WEATHER			
11	WIND			
	WEATHER			
12	WIND			
	WEATHER			
13	WIND			
	WEATHER			

Date	Parameter	IK Forecast	SK-UNMA FORECAST	Obs
14	WIND			
	WEATHER			
15	WIND			
	WEATHER			
16	WIND			
	WEATHER			
17	WIND			
	WEATHER			
18	WIND			
	WEATHER			

19	WIND			
	WEATHER			
20	WIND			
	WEATHER			
21	WIND			
	WEATHER			
22	WIND			
	WEATHER			
23	WIND			
	WEATHER			
24	WIND			
	WEATHER			
25	WIND			
	WEATHER			
26	WIND			
	WEATHER			
27	WIND			
	WEATHER			
28	WIND			
	WEATHER			
29	WIND			
	WEATHER			
30	WIND			
	WEATHER			

Appendix IV:

Tables shows IK.SK and Observed Weather Raw Observations

Dow	IK	SK	OBS
3/1/2024	Moderate rain	Moderate_rain	Cloudy
3/2/2024	Moderate rain	Light_rain	Light_rain
3/3/2024	Moderate rain	Sunny	Sunny
3/4/2024	Sunny	Light_rain	Cloudy
3/5/2024	Moderate_rain	Sunny	Sunny
3/6/2024	Moderate_rain	Cloudy	Cloudy
3/7/2024	Sunny	Sunny	Sunny
3/8/2024	Moderate_rain	Sunny	Sunny
3/9/2024	Moderate_rain	Moderate_rain	Moderate_rain
3/10/2024	Light_rain	Light_rain	Sunny
3/11/2024	Moderate_rain	Light_rain	Light_rain
3/12/2024	Sunny	Sunny	Sunny
3/13/2024	Sunny	Light_rain	Light_rain
3/14/2024	Sunny	Light_rain	Sunny
3/15/2024	Sunny_intervals	Heavy_rain	Heavy_rain
3/16/2024	Sunny	Sunny_intervals	Sunny
3/17/2024	Sunny	Sunny	Sunny
3/18/2024	Sunny	Light_rain	Sunny
3/19/2024	Light_rain	Sunny	Sunny
3/20/2024	Moderate_rain	Moderate_rain	Moderate_rain
3/21/2024	Sunny_intervals	Sunny	Sunny
3/22/2024	Light_rain	Light_rain	Light_rain
3/23/2024	Moderate_rain	Cloudy	Cloudy
3/24/2024	Moderate_rain	Cloudy	Cloudy
3/25/2024	Light_rain	Light_rain	Light_rain
3/26/2024	Moderate_rain	Moderate_rain	Moderate_rain
3/27/2024	Sunny	Sunny	Sunny
3/28/2024	Sunny	Sunny	Sunny
3/29/2024	Sunny	Light_rain	Sunny
3/30/2024	Moderate_rain	Sunny	Sunny
3/31/2024	Sunny	Heavy_rain	Heavy_rain
4/1/2024	Sunny	Sunny	Cloudy

4/2/2024	Sunny	Cloudy	Cloudy
4/3/2024	Sunny	Light_rain	Sunny
4/4/2024	Light_rain	Heavy_rain	Heavy_rain
4/5/2024	Sunny	Light_rain	Light_rain
4/6/2024	Sunny	Sunny	Sunny
4/7/2024	Moderate_rain	Heavy_rain	Sunny
4/8/2024	Light_rain	Light_rain	Light_rain
4/9/2024	Moderate_rain	Cloudy	Cloudy
4/10/2024	Moderate_rain	Sunny_intervals	Moderate_rain
4/11/2024	Light_rain	Sunny	Sunny
4/12/2024	Sunny	Cloudy	Cloudy
4/13/2024	Light_rain	Light_rain	Sunny
4/14/2024	Sunny	Cloudy	Cloudy
4/15/2024	Light_rain	Light_rain	Light_rain
4/16/2024	Light_rain	Cloudy	Cloudy
4/17/2024	Moderate_rain	Moderate_rain	Sunny
4/18/2024	Light_rain	Cloudy	Cloudy
4/19/2024	Moderate_rain	Sunny	Sunny
4/20/2024	Sunny	Light_rain	Sunny
4/21/2024	Light_rain	Sunny	Light_rain
4/22/2024	Sunny	Sunny_intervals	Cloudy
4/23/2024	Sunny	Sunny	Sunny
4/24/2024	Moderate_rain	Sunny	Sunny
4/25/2024	Moderate_rain	Cloudy	Cloudy
4/26/2024	Light_rain	Sunny	Sunny
4/27/2024	Sunny	Light_rain	Light_rain
4/28/2024	Sunny	Heavy_rain	Cloudy
4/29/2024	Sunny	Light_rain	Sunny
4/30/2024	Sunny	Sunny	Sunny
5/1/2024	Moderate_rain	Light_rain	Light_rain
5/2/2024	Light_rain	Heavy_rain	Heavy_rain
5/3/2024	Light_rain	Light_rain	Light_rain
5/4/2024	Sunny	Partly_cloudy	Cloudy
5/5/2024	Sunny	Partly_cloudy	Partly_cloudy
5/6/2024	Sunny	Light_rain	Light_rain
5/7/2024	Sunny_intervals	Light_rain	Light_rain
5/8/2024	Partly_cloudy	Cloudy	Cloudy

5/9/2024	Sunny	Sunny_intervals	Sunny
5/10/2024	Light_rain	Moderate_rain	Heavy_rain
5/11/2024	Sunny	Sunny	Sunny
5/12/2024	Sunny	Sunny	Sunny
5/13/2024	Sunny	Light_rain	Light_rain
5/14/2024	Light_rain	Light_rain	Heavy_rain
5/15/2024	Heavy_rain	Light_rain	Light_rain
5/16/2024	Sunny_intervals	Light_rain	Light_rain
5/17/2024	Heavy_rain	Sunny_intervals	Sunny_intervals
5/18/2024	Light_rain	Partly_cloudy	Partly_cloudy
5/19/2024	Moderate_rain	Heavy_rain	Moderate_rain
5/20/2024	Light_rain	Cloudy	Cloudy
5/21/2024	Light_rain	Light_rain	Light_rain
5/22/2024	Sunny_intervals	Sunny_intervals	Sunny_intervals
5/23/2024	Light_rain	Sunny_intervals	Light_rain
5/24/2024	Moderate_rain	Cloudy	Cloudy
5/25/2024	Sunny_intervals	Heavy_rain	Heavy_rain
5/26/2024	Light_rain	Moderate_rain	Light_rain
5/27/2024	Sunny	Light_rain	Light_rain
5/28/2024	Sunny	Light_rain	Light_rain
5/29/2024	Sunny	Heavy_rain	Heavy_rain
5/30/2024	Light_rain	Sunny_intervals	Light_rain
5/31/2024	Sunny	Light_rain	Sunny
6/1/2024	Sunny	Sunny	Sunny
6/2/2024	Sunny	Sunny	Sunny
6/3/2024	Heavy_rain	Sunny	Sunny
6/4/2024	Heavy_rain	Moderate_rain	Moderate_rain
6/5/2024	Heavy_rain	Sunny	Sunny
6/6/2024	Sunny	Sunny	Sunny
6/7/2024	Moderate_rain	Moderate_rain	Moderate_rain
6/8/2024	Moderate_rain	Heavy_rain	Heavy_rain
6/9/2024	Moderate_rain	Moderate_rain	Cloudy
6/10/2024	Sunny	Light_rain	Light_rain
6/11/2024	Sunny	Light_rain	Light_rain
6/12/2024	Cloudy	Cloudy	Cloudy
6/13/2024	Moderate_rain	Light_rain	Light_rain
6/14/2024	Moderate_rain	Light_rain	Light_rain

6/15/2024	Moderate_rain	Moderate_rain	Moderate_rain
6/16/2024	Light_rain	Light_rain	Light_rain
6/17/2024	Moderate_rain	Heavy_rain	Cloudy
6/18/2024	Cloudy	Sunny_intervals	Sunny_intervals
6/19/2024	Cloudy	Heavy_rain	Sunny
6/20/2024	Sunny	Sunny	Sunny
6/21/2024	Light_rain	Sunny_intervals	Sunny_intervals
6/22/2024	Cloudy	Cloudy	Cloudy
6/23/2024	Cloudy	Sunny_intervals	Sunny_intervals
6/24/2024	Sunny	Sunny	Sunny
6/25/2024	Sunny	Cloudy	Cloudy
6/26/2024	Sunny	Sunny	Cloudy
6/27/2024	Light_rain	Sunny	Sunny
6/28/2024	Moderate_rain	Moderate_rain	Cloudy
6/29/2024	Sunny	Sunny	Sunny
6/30/2024	Sunny_intervals	Sunny_intervals	Sunny_intervals

Appendix V: Tables shows IK.SK and Observed Weather Data Derived Values

Dow	IK	SK	OBS
3/1/2024	6.2	5.6	0
3/2/2024	7.7	2.5	2.4
3/3/2024	9.5	0	0
3/4/2024	0	0.3	0
3/5/2024	7.6	0	0
3/6/2024	7.2	0	0
3/7/2024	0	0	0
3/8/2024	6.5	0	0
3/9/2024	6.2	8.3	7.1
3/10/2024	0.4	4.8	0
3/11/2024	9	4.8	2.1
3/12/2024	0	0	0
3/13/2024	0	4.6	3.4
3/14/2024	0	2.4	0
3/15/2024	0	17.6	24.2
3/16/2024	0	0	0
3/17/2024	0	0	0
3/18/2024	0	2	0
3/19/2024	4.8	0	0
3/20/2024	9.6	9.7	5.4
3/21/2024	0	0	0
3/22/2024	1.5	3.5	2.4
3/23/2024	6.3	0	0
3/24/2024	6.6	0	0
3/25/2024	1.7	2.1	2.6
3/26/2024	8.1	7.5	5.9
3/27/2024	0	0	0
3/28/2024	0	0	0
3/29/2024	0	3.8	0
3/30/2024	8.2	0	0
3/31/2024	0	25.1	16.3
4/1/2024	0	0	0
4/2/2024	0	0	0
4/3/2024	0	2.1	0
4/4/2024	1.1	12	12.7
4/5/2024	0	0.1	3.1

4/6/2024	0	0	0
4/7/2024	5.7	18	0
4/8/2024	4.3	0.9	3.3
4/9/2024	6.8	0	0
4/10/2024	5.4	0	6.8
4/11/2024	3.3	0	0
4/12/2024	0	0	0
4/13/2024	3.8	4.4	0
4/14/2024	0	0	0
4/15/2024	2.7	3	3.5
4/16/2024	2.6	0	0
4/17/2024	8.8	7.3	0
4/18/2024	4.4	0	0
4/19/2024	9.2	0	0
4/20/2024	0	2.7	0
4/21/2024	2.6	0	2.9
4/22/2024	0	0	0
4/23/2024	0	0	0
4/24/2024	9	0	0
4/25/2024	6	0	0
4/26/2024	1.9	0	0
4/27/2024	0	0.3	1.5
4/28/2024	0	25.5	0
4/29/2024	0	3.5	0
4/30/2024	0	0	0
5/1/2024	9.6	4.1	0.3
5/2/2024	0.3	18.5	29
5/3/2024	4.5	4	3.4
5/4/2024	0	0	0
5/5/2024	0	0	0
5/6/2024	0	1.3	2.1
5/7/2024	0	3.9	0.8
5/8/2024	0	0	0
5/9/2024	0	0	0
5/10/2024	4.1	5.5	29
5/11/2024	0	0	0
5/12/2024	0	0	0
5/13/2024	0	1.1	1.2
5/14/2024	1.7	4.9	25.2

5/15/2024	18.6	0.3	0.1
5/16/2024	0	2.8	1.3
5/17/2024	20.4	0	0
5/18/2024	2.8	0	0
5/19/2024	5.5	23.8	9.9
5/20/2024	1.7	0	0
5/21/2024	1.2	1.5	3.6
5/22/2024	0	0	0
5/23/2024	0.6	0	3.3
5/24/2024	9.9	0	0
5/25/2024	0	20.2	15
5/26/2024	1.8	9.3	0.5
5/27/2024	0	2.5	1.6
5/28/2024	0	0.8	2.8
5/29/2024	0	16.6	26
5/30/2024	4.7	0	1.4
5/31/2024	0	3.9	0
6/1/2024	0	0	0
6/2/2024	0	0	0
6/3/2024	16.6	0	0
6/4/2024	29.4	8.4	5.2
6/5/2024	20.1	0	0
6/6/2024	0	0	0
6/7/2024	9.9	6.4	8.8
6/8/2024	9.2	16.4	28.4
6/9/2024	9.9	9.2	0
6/10/2024	0	3.5	4.5
6/11/2024	0	3.9	0.7
6/12/2024	0	0	0
6/13/2024	5.7	1.6	4.9
6/14/2024	6.6	3.2	4.6
6/15/2024	9.7	8.1	6.4
6/16/2024	3.2	1.2	4.5
6/17/2024	9.9	15.1	0
6/18/2024	0	0	0
6/19/2024	0	28	0
6/20/2024	0	0	0
6/21/2024	4.9	0	0
6/22/2024	0	0	0

6/23/2024	0	0	0
6/24/2024	0	0	0
6/25/2024	0	0	0
6/26/2024	0	0	0
6/27/2024	3.7	0	0
6/28/2024	7	8.9	0
6/29/2024	0	0	0
6/30/2024	0	0	0

Appendix VI:

Tables shows IK.SK and Observed Wind Raw Observations

Dow	IK	SK	OBS
3/1/2024	Strong	Moderate	Moderate
3/2/2024	Moderate	Moderate	Moderate
3/3/2024	Moderate	Light	Light
3/4/2024	Light	Light	Light
3/5/2024	Moderate	Moderate	Moderate
3/6/2024	Moderate	Light	Light
3/7/2024	Moderate	Light	Light
3/8/2024	Moderate	Light	Light
3/9/2024	Moderate	Moderate	Light
3/10/2024	Moderate	Light	Light
3/11/2024	Moderate	Light	Light
3/12/2024	Light	Light	Light
3/13/2024	Light	Moderate	Moderate
3/14/2024	Light	Moderate	Light
3/15/2024	Light	Moderate	Moderate
3/16/2024	Light	Moderate	Moderate
3/17/2024	Light	Moderate	Moderate
3/18/2024	Light	Strong	Strong
3/19/2024	Light	Moderate	Light
3/20/2024	Moderate	Moderate	Moderate
3/21/2024	Light	Light	Light
3/22/2024	Light	Light	Light
3/23/2024	Moderate	Light	Light
3/24/2024	Moderate	Light	Light
3/25/2024	Moderate	Light	Light
3/26/2024	Moderate	Moderate	Moderate
3/27/2024	Light	Light	Light
3/28/2024	Light	Light	Light
3/29/2024	Light	Moderate	Light
3/30/2024	Moderate	Light	Light
3/31/2024	Light	Moderate	Moderate
4/1/2024	Light	Moderate	Moderate
4/2/2024	Light	Light	Light
4/3/2024	Light	Light	Light
4/4/2024	Moderate	Light	Light

4/5/2024	Light	Moderate	Moderate
4/6/2024	Light	Moderate	Light
4/7/2024	Moderate	Moderate	Light
4/8/2024	Moderate	Moderate	Moderate
4/9/2024	Strong	Strong	Light
4/10/2024	Moderate	Light	Light
4/11/2024	Moderate	Light	Light
4/12/2024	Light	Moderate	Moderate
4/13/2024	Light	Moderate	Light
4/14/2024	Light	Moderate	Moderate
4/15/2024	Moderate	Moderate	Moderate
4/16/2024	Moderate	Moderate	Light
4/17/2024	Moderate	Light	Light
4/18/2024	Moderate	Light	Light
4/19/2024	Moderate	Moderate	Light
4/20/2024	Light	Moderate	Moderate
4/21/2024	Moderate	Moderate	Moderate
4/22/2024	Light	Moderate	Moderate
4/23/2024	Light	Light	Light
4/24/2024	Strong	Strong	Light
4/25/2024	Strong	Light	Light
4/26/2024	Moderate	Moderate	Moderate
4/27/2024	Moderate	Light	Light
4/28/2024	Moderate	Light	Light
4/29/2024	Light	Moderate	Light
4/30/2024	Light	Moderate	Moderate
5/1/2024	Moderate	Moderate	Moderate
5/2/2024	Light	Strong	Strong
5/3/2024	Moderate	Light	Light
5/4/2024	Light	Moderate	Moderate
5/5/2024	Light	Moderate	Moderate
5/6/2024	Light	Moderate	Moderate
5/7/2024	Light	Strong	Strong
5/8/2024	Light	Light	Light
5/9/2024	Light	Moderate	Light
5/10/2024	Light	Light	Strong
5/11/2024	Light	Moderate	Moderate
5/12/2024	Light	Light	Light
5/13/2024	Moderate	Light	Light
5/14/2024	Moderate	Moderate	Light

5/15/2024	Moderate	Moderate	Moderate
5/16/2024	Moderate	Strong	Strong
5/17/2024	Moderate	Strong	Strong
5/18/2024	Light	Moderate	Moderate
5/19/2024	Moderate	Light	Light
5/20/2024	Strong	Moderate	Strong
5/21/2024	Light	Strong	Moderate
5/22/2024	Strong	Strong	Strong
5/23/2024	Strong	Moderate	Moderate
5/24/2024	Light	Strong	Strong
5/25/2024	Moderate	Moderate	Light
5/26/2024	Moderate	Moderate	Light
5/27/2024	Light	Moderate	Moderate
5/28/2024	Light	Moderate	Moderate
5/29/2024	Light	Light	Moderate
5/30/2024	Moderate	Light	Light
5/31/2024	Light	Moderate	Moderate
6/1/2024	Moderate	Moderate	Light
6/2/2024	Light	Moderate	Light
6/3/2024	Moderate	Moderate	Moderate
6/4/2024	Strong	Light	Light
6/5/2024	Light	Light	Light
6/6/2024	Light	Light	Light
6/7/2024	Moderate	Moderate	Moderate
6/8/2024	Moderate	Light	Light
6/9/2024	Moderate	Light	Light
6/10/2024	Light	Light	Light
6/11/2024	Light	Light	Light
6/12/2024	Moderate	Moderate	Moderate
6/13/2024	Strong	Moderate	Light
6/14/2024	Strong	Light	Light
6/15/2024	Strong	Strong	Strong
6/16/2024	Light	Moderate	Moderate
6/17/2024	Strong	Moderate	Strong
6/18/2024	Moderate	Moderate	Moderate
6/19/2024	Moderate	Light	Light
6/20/2024	Light	Moderate	Moderate
6/21/2024	Strong	Light	Light
6/22/2024	Strong	Strong	Moderate
6/23/2024	Strong	Moderate	Light

6/24/2024	Strong	Light	Moderate
6/25/2024	Strong	Moderate	Light
6/26/2024	Light	Light	Strong
6/27/2024	Moderate	Moderate	Moderate
6/28/2024	Moderate	Strong	Light
6/29/2024	Moderate	Moderate	Moderate
6/30/2024	Moderate	Moderate	Moderate

Appendix VII: Tables shows IK.SK and Observed Wind Data Derived Values

Dow	IK	SK	OBS
3/1/2024	44.7	22.9	24
3/2/2024	21.3	23.2	37.4
3/3/2024	28.7	19.8	19.1
3/4/2024	9.7	19.7	11.3
3/5/2024	29	23.6	27.3
3/6/2024	27.5	18.1	19.9
3/7/2024	37.5	11.5	4.7
3/8/2024	29.6	7.9	12.3
3/9/2024	31.1	29.5	2.2
3/10/2024	39.3	14.1	9.7
3/11/2024	35.7	1.7	2
3/12/2024	4.2	6.8	3.2
3/13/2024	6.2	33.9	26.4
3/14/2024	19.4	27	11.7
3/15/2024	11.7	36.8	34.9
3/16/2024	15.2	25.1	24.1
3/17/2024	7.5	30.5	37.5
3/18/2024	15.4	46.2	54.5
3/19/2024	10.8	24.6	15.2
3/20/2024	38.4	39.1	23.8
3/21/2024	3.7	6.4	7.2
3/22/2024	5.6	9.6	13.5
3/23/2024	22.8	0.6	10.5
3/24/2024	25	10.9	7
3/25/2024	39.6	12.9	4.8
3/26/2024	26.6	32.3	22.1
3/27/2024	14.5	6.4	4.7
3/28/2024	15.7	17.8	17.8
3/29/2024	2.1	32.9	16.2
3/30/2024	25.6	6.1	15
3/31/2024	5.4	28.4	23.9
4/1/2024	2.5	36.9	36.5
4/2/2024	19.5	19.4	6
4/3/2024	8.7	1.4	7.3
4/4/2024	29.8	9.2	6.2

4/5/2024	3.3	34.3	21.7
4/6/2024	11.7	22.7	10.4
4/7/2024	26.1	39.9	13.6
4/8/2024	25.4	25.8	38.2
4/9/2024	54.1	41.9	0.5
4/10/2024	26.4	13.7	19.8
4/11/2024	36.4	15.7	6.1
4/12/2024	1.9	27.7	38.8
4/13/2024	16.4	28	13.8
4/14/2024	8.5	26.5	29.5
4/15/2024	35.4	22.5	36.5
4/16/2024	33.6	27.9	0.8
4/17/2024	29.4	3.6	14.8
4/18/2024	32.9	10.7	7
4/19/2024	21	30.6	16.6
4/20/2024	4.3	39	31.2
4/21/2024	34.4	27.5	26.2
4/22/2024	4.3	29.8	36.2
4/23/2024	16.3	1.7	1.8
4/24/2024	46.8	57.3	16.6
4/25/2024	54.1	7.9	5.5
4/26/2024	38.7	35	35.3
4/27/2024	23.2	3.4	19.3
4/28/2024	23.4	9.1	1.6
4/29/2024	13.6	35.6	17.1
4/30/2024	8.6	22.2	36.2
5/1/2024	28.3	37.7	22.8
5/2/2024	6.6	56.4	41.4
5/3/2024	24.9	17.1	19.9
5/4/2024	11.4	28	32.1
5/5/2024	17.8	37.6	35.9
5/6/2024	10.6	23.9	37.9
5/7/2024	11.7	46.4	55.3
5/8/2024	13.3	13.3	19.6
5/9/2024	10.6	39.6	0.9
5/10/2024	10.2	11.7	58.2
5/11/2024	0.3	31	37.4
5/12/2024	1	1.2	15.5
5/13/2024	38.7	19.4	7.5
5/14/2024	35.6	23.3	0.8

5/15/2024	24.8	22.7	27.9
5/16/2024	33.4	57.7	46.2
5/17/2024	33.4	50.7	57.2
5/18/2024	7.9	27.4	27.9
5/19/2024	36.4	17.9	6.1
5/20/2024	51.4	21.6	55.4
5/21/2024	17.7	45.5	37.1
5/22/2024	51.5	54	49.7
5/23/2024	58.2	25.3	34.9
5/24/2024	11.7	47.1	43
5/25/2024	29	24.3	4.4
5/26/2024	39	36.2	19.1
5/27/2024	14.2	23.8	35.3
5/28/2024	8.3	36.6	36.6
5/29/2024	0.4	6.6	28.9
5/30/2024	31.8	7.5	11.9
5/31/2024	9.8	33	36.2
6/1/2024	37.9	22.6	0.5
6/2/2024	7.7	26.4	17.2
6/3/2024	22.7	29	27.4
6/4/2024	52.9	11.7	12.6
6/5/2024	14.9	16.1	10.9
6/6/2024	1.7	4	7.5
6/7/2024	26.7	29.7	24.5
6/8/2024	32.7	9	8.6
6/9/2024	35.3	14.7	12.6
6/10/2024	18.3	14.3	10.4
6/11/2024	9.5	16.6	13.2
6/12/2024	31.8	37.8	34.9
6/13/2024	55	39.1	9.7
6/14/2024	57.3	11	7.7
6/15/2024	58.3	50.9	41.1
6/16/2024	1.1	24.2	21.1
6/17/2024	50.6	30.1	59.9
6/18/2024	27.7	25.8	23
6/19/2024	37.1	0.8	8.4
6/20/2024	16.1	33.1	34.6
6/21/2024	43.2	10.8	14.9
6/22/2024	54.5	43.7	37.6
6/23/2024	45.5	26.4	12.2

6/24/2024	42.4	11.7	35.4
6/25/2024	58.8	24.1	16.9
6/26/2024	3.1	1.9	52.6
6/27/2024	33.3	29.1	36.1
6/28/2024	24.3	47.8	0.5
6/29/2024	21.4	37.1	28.9
6/30/2024	30.9	25.9	37.6

APPENDIX-VIII-LETTER OF INTRODUCTION



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**OFFICE OF THE DEAN
FACULTY OF NATURAL RESOURCES AND ENVIRONMENTAL SCIENCES
NAMASAGALI CAMPUS**

March 30th, 2024

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

**RE: INTRODUCTION LETTER FOR MR. KIPROP JULIUS KAPKWOMU REG NO.
BU/GS22/MCC/28**

The above named person is a registered student of Busitema University, Faculty of Natural Resources and Environmental Sciences offering a masters' degree in Climate Change and Disaster Risk management. He is currently undertaking research on **ASSESSING THE IMPACT OF INTEGRATING INDIGENOUS AND SCIENTIFIC WEATHER FORECASTING ON COMMUNITY RESILIENCE TO EXTREME WEATHER EVENTS AMONG COMMUNITIES AT MASESE LANDING SITE**. He will be working in Jinja District, collecting data for his research project.

Any assistance rendered to him will be highly appreciated.

Yours sincerely


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