International Journal of Recent Research in Thesis and Dissertation (IJRRTD)
Vol. 5, Issue 2, pp: (15-33), Month: July - December 2024, Available at: www.paperpublications.org

# LIVING THE CONSEQUENCES OF CLIMATE CHANGE: OPPORTUNITIES AND CHALLENGES OF CLIMATE CHANGE ADAPTATION IN ZAMBIA

LAURA NKHUWA

MSc in Climate Change and Sustainable Development

Mulungushi University, Kabwe, Zambia

**DOI: https://doi.org/10.5281/zenodo.12700570**

**Published Date: 09-July-2024**

***Abstract:*** **Zambia faces pressing climate change adaptation needs amidst escalating vulnerabilities from human-induced environmental degradation. This study presents a comprehensive framework to enhance Zambia's capacity to address climate challenges while advancing sustainable development goals. A qualitative research method was employed, involving expert interviews, questionnaires, and policy document reviews. Thematic analysis with NVIVO Pro (version 12) and secondary data triangulation provided a robust understanding of climate adaptation dynamics.**

**The research uncovered multifaceted barriers to effective climate adaptation, including inadequate rural outreach due to scarce extension officers, insufficient funding, and unreliable climate data. Additionally, poor stakeholder coordination and low adaptation strategy adoption rates hinder progress. Despite these challenges, the study identified significant opportunities in alternative livelihoods, resilient infrastructure, inclusive participation, and local innovation. Integrating climate considerations into development plans, investing in climate-smart agriculture and renewable energy, and fostering inclusive participation and capacity building were highlighted as critical strategies for enhancing resilience.**

**Key lessons from successful adaptation initiatives were distilled, underscoring the importance of participatory approaches, climate-smart agriculture, collaborative efforts, consistent funding, local leadership, effective risk management, community involvement, localized research, and the simplification of climate information. Moreover, the utilization of nature-based solutions, ensuring policy coherence and integration, and improving monitoring and evaluation mechanisms emerged as vital components for resilience-building.**

**In conclusion, the research emphasizes the necessity of holistic and integrated approaches to tackle Zambia's climate challenges. By integrating identified challenges, opportunities, and lessons into future strategies, Zambia can navigate climate complexities, promote sustainable development, and safeguard the well-being of its people and ecosystems. This study provides a strategic blueprint for bolstering climate resilience and advancing sustainable development amidst the evolving climate landscape.**

***Keywords:*** **Adaptation, climate change, sustainable development.**

## I. INTRODUCTION

### 1.1 Background

Climate change stands as one of the most pressing challenges facing humanity in the 21st century. Defined by the alteration of Earth's climate patterns, this phenomenon is propelled by human activities such as burning fossil fuels, deforestation, and industrial processes, leading to a rapid increase in greenhouse gas emissions. The consequences of climate change are

far-reaching, encompassing rising global temperatures, more frequent extreme weather events, melting ice caps, sea-level rise, and shifts in precipitation patterns. As these changes unfold, they pose significant threats to ecosystems, economies, and human well-being, emphasizing the crucial need for immediate and coordinated action on a global scale to mitigate their impacts and adapt to their realities. [1]

The Southern Africa region is currently facing a severe drought situation with significant implications for food security and humanitarian assistance. The ongoing strong El Niño event is expected to drive below-average rainfall across much of Southern Africa, leading to below-average 2024 harvests. Over 20 million people are estimated to be in need of food assistance during the peak of the crisis in early 2024, with concerns that the situation will worsen into the 2024/25 lean season. The expected below-average 2024 harvests will lead to high food assistance needs at the start of the following lean season in late 2024. Rising food prices, limited income opportunities due to below-normal labor activities, and high inflation rates are further straining households in the southern region.[2]

The 2023–2024 drought in Zambia has impacted crop yields, leading to a decline in agriculture output and a decrease in the country's gross domestic product (GDP). The drought has also resulted in water shortages, leading to electricity rationing and food security issues.[3] The drought has prompted the Zambian government to declare a national disaster and emergency. However, drought is endemic to Zambia; the country has a history of drought years: 1987/88, 1991/92, 1994/95, 1997/98, 2001/03, 2004/05, 2011/12, 2015/16, and 2018/2019. This sequence implies that the country experiences drought every 4 to 5 years, and the frequency is projected to increase in the future due to climate change. Drought brings reduced agricultural production from erratic rains, increased dry spells, water logging, and false and late starts. Given that roughly 90% of cultivation in Zambia is rain-fed, small-scale agricultural producers are particularly vulnerable to drought. The severe drought of 2018–2019 affected 2.3 million people, who experienced increased food insecurity and a sharp rise in food prices due to reduced agricultural production and harvest.[4]

Therefore, there is an urgent need for the successful adoption of climate adaptation strategies in Zambia, and this can be done by addressing the challenges and opportunities in climate adaptation in Zambia. The government's commitment to developing and implementing adaptation plans like the National Adaptation Programme of Action (NAPA), the National Climate Change Response Strategy (NCCRS), the Nationally Determined Contribution (NDC), and the National Adaptation Plan (NAP) demonstrates Zambia's dedication to addressing climate change challenges and seizing opportunities for sustainable development. [5]

### 1.2 Aim of the Study

The aim of the study was to examine the opportunities and challenges of climate change adaptation in Zambia.

### 1.3 Research Objectives

1. To identify the challenges and limitations in implementing climate adaptation measures.

2. To identify existing and unexplored opportunities for climate adaptation.

3. To identify lessons drawn from the successful application of adaptation initiatives.

### 1.4 Research Questions

1. What are the challenges and limitations in implementing climate adaptation measures?

---

[1] Yadvinder et al (2020) Climate change and ecosystems: threats, opportunities and solutionsPhil.Trans.R.Soc.B375201901 0420190104http://doi.org/10.1098/rstb.2019.0104

[2] FEWSNET (2023) Strong El Niño will drive high needs across Southern Africa through early 2025.https://fews.net/southern-africa/alert/november-2023

[3] International Food Policy Research Institute (IFPRI), 2023. From Climate Risk To Resilience: Unpacking The Economic Impacts Of Climate Change In Zambia Report.

[4] FAO (2019). Climate-change vulnerability in rural Zambia: the impact of an El Niño-induced shock on income and productivity. FAO Agricultural Development Economics Working Paper 19-02.

[5] Rawlins, J., Kalaba, F.K. (2021). Adaptation to Climate Change: Opportunities and Challenges from Zambia. In: Oguge, N., Ayal, D., Adeleke, L., da Silva, I. (eds) African Handbook of Climate Change Adaptation. Springer, Cham. https://doi.org/10.1007/978-3-030-45106-6_167

2. What are the existing and unexplored opportunities for climate adaptation?

3. What are the lessons drawn from the successful application of adaptation initiatives?

### 1.5 Significance of the Study

The study will help stakeholders identify opportunities to integrate climate change adaptation into development planning and implementation processes. This will build resilience not only to current climate risks but also to future uncertainties associated with climate change. It will also facilitate knowledge sharing and collaboration among various stakeholders, including government agencies, non-governmental organizations, research institutions, and local communities. This collaboration will enhance the of adaptation efforts by leveraging diverse expertise and resources.

## 2. LITERATURE REVIEW

### 2.1 Theories of Climate Adaptation

#### 2.1.1 Vulnerability to Resilience (V2R) Framework

The Vulnerability to Resilience (V2R) framework provides a structured approach to understanding and addressing the impacts of climate change on communities. It focuses on analyzing vulnerability factors that expose communities to climate change impacts and identifying resilience factors that help them cope and adapt effectively. This theory involves assessing social, economic, and environmental vulnerabilities and enhancing resilience through actions such as community capacity building, infrastructure enhancements, and ecosystem restoration. The framework aims to reduce vulnerability by addressing exposure to hazards, fragile livelihoods, future uncertainty, and weak governance. It also emphasizes the importance of integrating climate analysis and action within a holistic approach to enhance resilience. By understanding and addressing these factors, communities can better prepare for and respond to the challenges posed by climate change, ultimately improving their ability to withstand and recover from adverse impacts.[6]

#### 2.1.2 Social Learning Theory

Social learning theory suggests that individuals and communities can effectively adapt to climate change by acquiring new knowledge, skills, and behaviors through social interaction and collective action. This theory underscores the significance of participatory processes, knowledge sharing, and collaborative decision-making in enhancing adaptive capacity and achieving sustainable adaptation outcomes. The integration of social learning into climate change adaptation strategies can help address complex challenges by leveraging shared experiences, building social capital, and fostering organizational learning.[7]

#### 2.1.3 Adaptive Governance Theory

Adaptive governance theory emphasizes the necessity of flexible and adaptive governance systems to effectively address the dynamic and uncertain challenges posed by climate change. It advocates for inclusive decision-making processes, multi-level governance structures, and adaptive management approaches to enable coordinated and responsive adaptation actions across various scales and sectors. This approach aims to promote diversity, innovation, and the ability to quickly adapt to new information and experimental results, moving away from traditional top-down approaches towards a more decentralized and participatory model.[8]

#### 2.1.4 Transformational Adaptation Theory

Transformational adaptation theory emphasizes the necessity for fundamental changes in social, economic, and environmental systems to effectively address certain climate impacts. This approach calls for transformative interventions

[6] FSNetwork (2011)From Vulnerability to Resilience: A Framework for Analysis and Action to Build Community Resilience. https://www.fsnnetwork.org/resource/vulnerability-resilience-framework-analysis-and-action-build-community-resilience

[7] Orsato, Renato J., and Simone R. Barakat. "Social Learning for Anticipatory Adaptation to Climate Change: Evidence From a Community of Practice." *Organization & Environment*, (2018). Accessed March 21, 2024. https://doi.org/10.1177/1086026618775325.

[8] Bronen, Robin, and F. S. Chapin. "Adaptive Governance and Institutional Strategies for Climate-induced Community Relocations in Alaska." *Proceedings of the National Academy of Sciences 110*, no. 23 (2013): 9320-9325. Accessed March 21, 2024. https://doi.org/10.1073/pnas.1210508110.

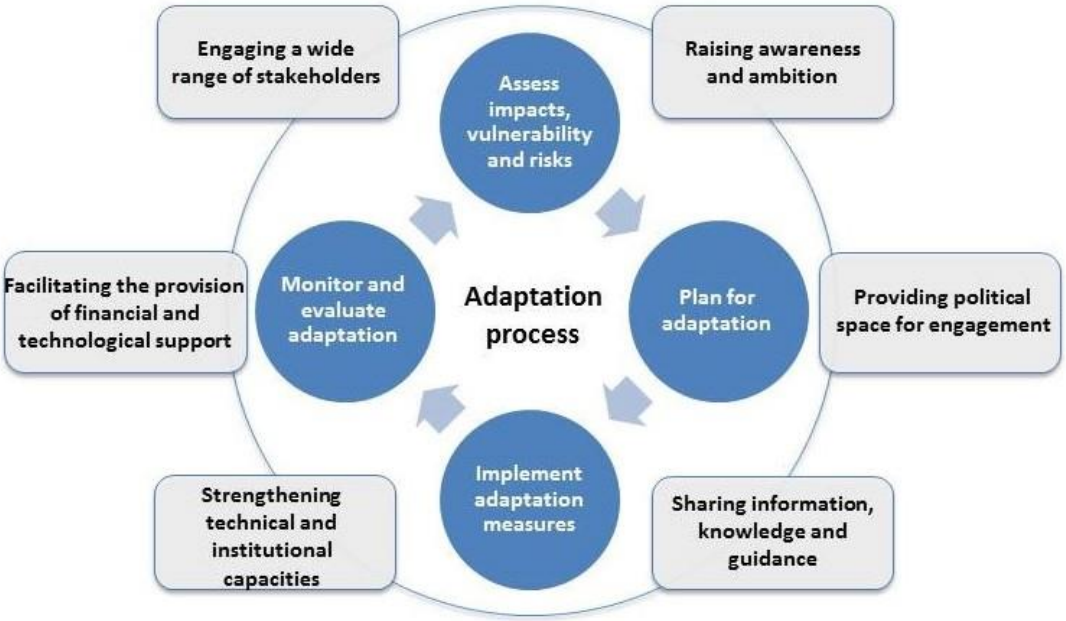
that challenge existing norms, values, and institutions to enhance resilience and foster sustainable development amidst climate change challenges.[9]

### 2.1.5 The Cultural Theory of Risk

The Cultural Theory of Risk emphasizes that individuals and communities interpret and address climate risks through the lens of their cultural values, beliefs, and worldviews. This theory underscores the significance of considering cultural perspectives when developing strategies for climate change adaptation. It stresses the influence of cultural norms, traditions, and identities on shaping adaptive behaviors and interventions to effectively address climate challenges.[10]

### 2.2 Adaptation Policy Framework

At COP 28, Parties adopted the UAE Framework for Global Climate Resilience which marked a major milestone for adaptation under the Paris Agreement. The purpose of the framework is to guide the achievement of the global goal on adaptation and the review of overall progress in achieving it with a view to reducing the increasing adverse impacts, risks and vulnerabilities associated with climate change, as well as to enhance adaptation action and support.




## 3. MATERIALS AND METHODS

### 3.1 Introduction

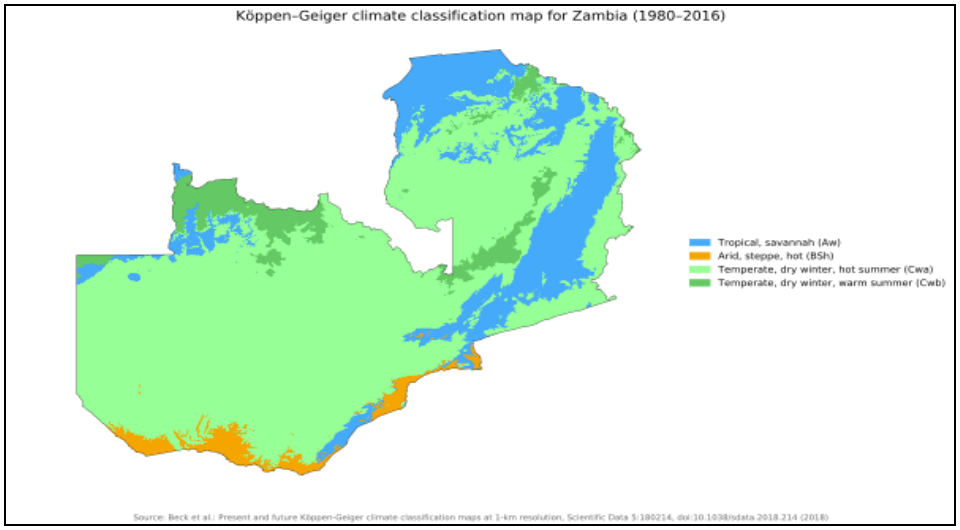
The third chapter of this study consisted of the methods that were used in the study. It specifically focused on the location of the study, the research design, the population target, the sample size as well as the sampling procedures, the instruments that were used, the procedure for data collection, how the data was analyzed. Finally, the ethical considerations that guided the researcher when conducting the study were discussed at the end of the chapter.

### 3.2 Research Location

The research study was conducted in Zambia, Southern Africa. Zambia is a landlocked country renowned for its diverse landscapes, encompassing vast savannas, forests, and the famous Victoria Falls. With a predominantly agrarian economy, agriculture is pivotal to Zambia's livelihoods, employing a significant portion of its population and contributing substantially to its GDP.

[9] Parry (2017) Building a Climate-Resilient City: Transformational adaptation https://www.iisd.org/publications/brief/building-climate-resilient-city-transformational-adaptation

[10] McNeeleyand Lazrus (2014) The Cultural Theory of Risk for Climate Change Adaptation. Page(s): 506–519 https://doi.org/10.1175/WCAS-D-13-00027.1 https://journals.ametsoc.org/view/journals/wcas/6/4/wcas-d-13-00027_1.xml




### 3.3 Research Design

Qualitative study of both primary and secondary methods comprising of desk reviews of policy papers, articles, reports and key informant interviews on the opportunities and challenges of climate change adaptation in Zambia.

### 3.4 Target Population and Sample Size

The participants for the KIIs were recruited through purposive sampling based on interest, availability, and ability to provide relevant information to the research question. The number of interviews was based on the principle of saturation.

### 3.5 Sampling Procedures

The experts were sampled purposely and the questionnaires were sent to them via; emails and other media such as Whatsapp and Linkedin for the Key Informat Interviews.

### 3.6 Data Collection Methods

Primary and secondary data collection was used. Questionnaires were the main instrument for data collection for primary data and a review of policy documents, articles, reports and journals for secondary data.

### 3.7 Data Analysis Methods

The responses were analyzed using the thematic framework approach to qualitative data analysis using NVIVO Pro (version 12). Secondary data was used to triangulate the study.

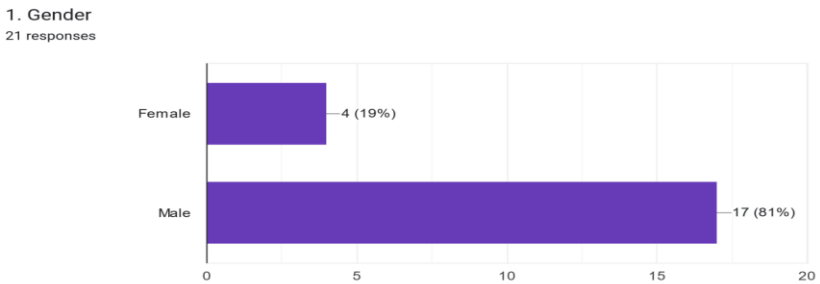
### 3.8 Ethical Consideration

The researcher ensured the names of the respondents were not indicated or mentioned. Hence the participants were entrusted with their full immunity to participate in the research by giving information freely without fear or favor.

## 4. PRESENTATION OF THE FINDINGS

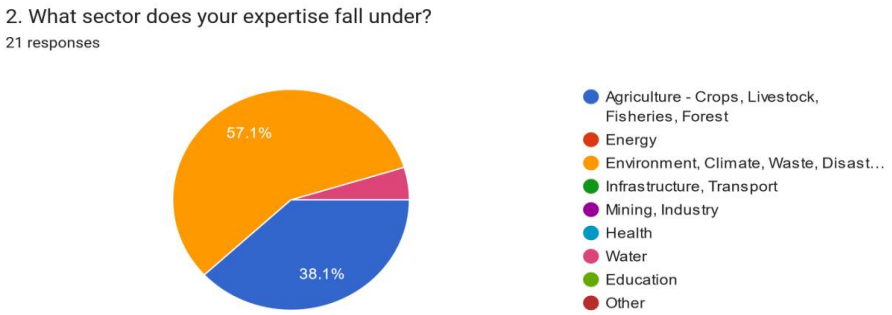
### 4.1 Disagregation of the respondents

21 experts were interviewed disagregated as 4 females (19%) and 17 males representing 81% of the respondents.



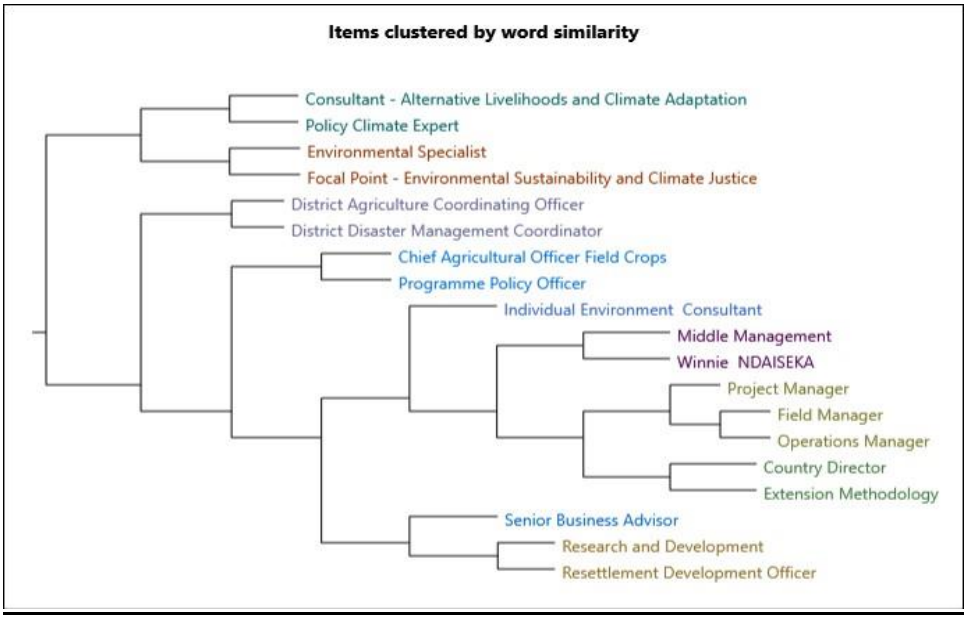
### 4.2 Sector of the Respondents

57.1% of the respondents represented the Environment sector, 38.1% from the Agriculture sector and 4.8% from the water sector.



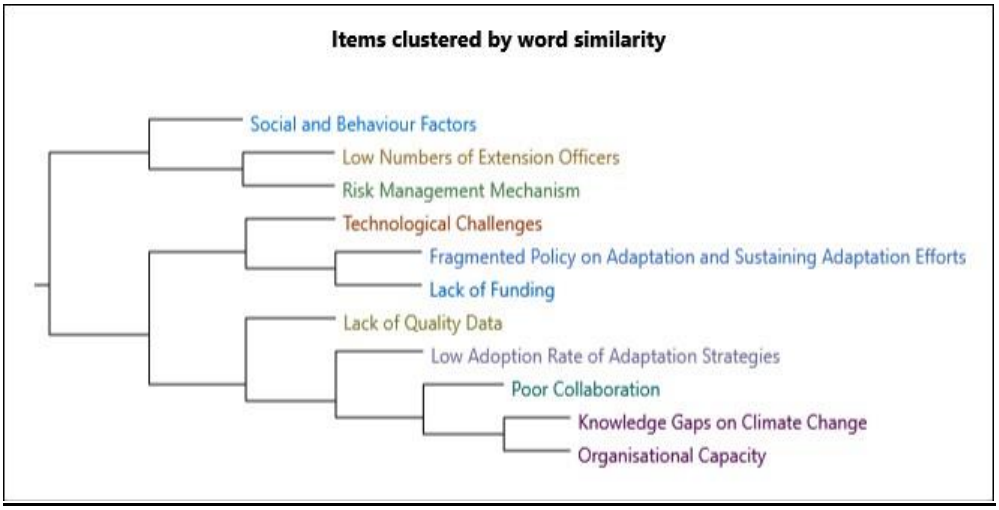

### 4.3 The Roles of the Respondents

The respondents comprised of experts in middle and senior management.



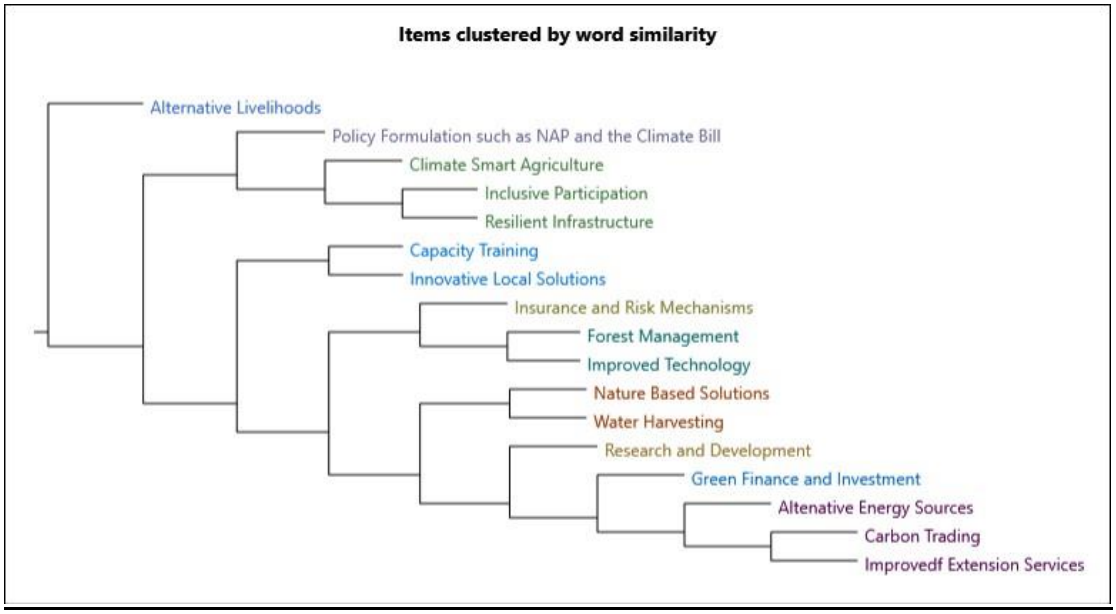

### 4.4 Challenges and Limitations in Implementing Climate Adaptation Measures

Thematic analysis was used to group the data and visualize as follows.



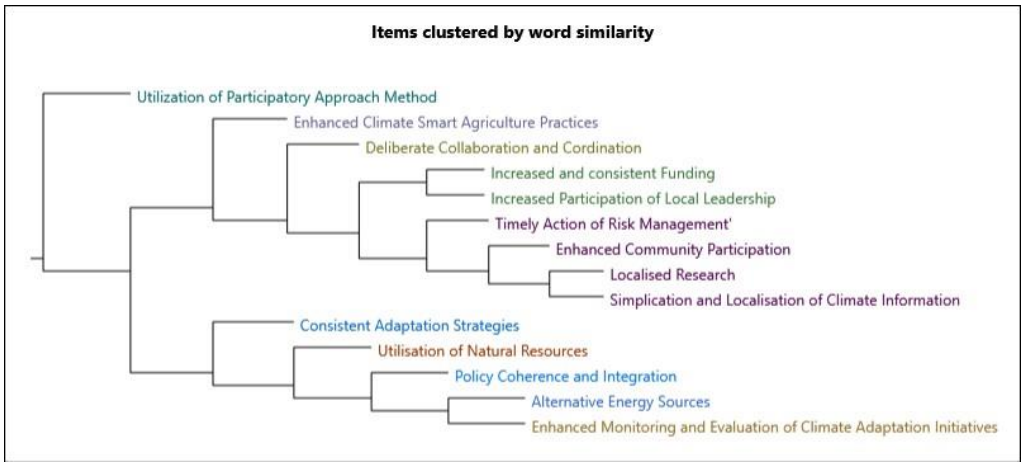
### 4.5 Opportunities for Climate Adaptation

The identified by the respondents were grouped as follows;




### 4.6 Lessons drawn from the Successful Application of Adaptation Initiatives

The following are the recommendations for the successful implementation of climate projects.




## 5. DISCUSSION OF THE FINDINGS

### *5.1 Challenge of Climate Adaptation in Zambia*

#### 5.1.1 Social and Behaviour Factors

The multifaceted nature of climate change impacts poses significant challenges to traditional adaptation approaches, necessitating innovative strategies such as Social Behavior Change (SBC) interventions. These interventions, designed to promote proactive behaviors like preemptive evacuation, hinge upon addressing key determinants such as perceived risk, social norms, self-efficacy, and response efficacy. However, a critical obstacle lies in the psychological distance individuals perceive regarding climate information, rendering it abstract and disconnected from immediate concerns. Moreover, the tendency to discount future rewards associated with adaptation behaviors further complicates efforts to spur action. Consequently, integrating insights from behavioral science into adaptation planning becomes imperative to surmount these challenges and effectively engage communities in climate-resilient practices.[11]

[11] USAID (2019) Integrating Social and Behavior Change in Climate Change Adaptation https://www.climatelinks.org/sites/default/files/asset/document/2019_USAID_ATLAS_SBC%20Guide.pdf

### 5.1.2 Number of Extension Officers

The scarcity of extension officers in Zambia is a critical barrier to climate change adaptation efforts, particularly in the agricultural sector. This issue hampers the dissemination of vital information and the adoption of climate-resilient practices among rural farmers, who are the backbone of the economy and livelihoods for a majority of Zambians. The absence of adequate extension support undermines farmers' ability to implement adaptive measures in response to increasingly erratic weather patterns and other climate-related challenges, leading to a heightened risk of decreased agricultural productivity, food insecurity, and heightened vulnerability to climate impacts among rural communities.[12]

### 5.1.3 Risk Management Mechanism

The Zambia National Disaster Risk Management Framework emphasizes the critical role of risk management in mitigating the impacts of various hazards, such as droughts, floods, and epidemics, which can escalate into disasters when combined with vulnerability.[13] To address these challenges, Zambia is committed to operationalizing the Sendai Framework for Disaster Risk Reduction and mainstreaming disaster risk reduction into national development planning processes. While significant progress has been made in knowledge management and logistical capacity growth of the Disaster Management and Mitigation Unit (DMMU), the country still grapples with limited financial resources, inadequate infrastructure, and fragmented governance structures, which hinder its capacity to effectively anticipate, mitigate, and respond to climate risks. Disparities in access to risk management resources further exacerbate vulnerabilities, particularly among marginalized populations, necessitating comprehensive efforts to bolster resilience and promote inclusivity.[14]

### 5.1.4 Technological Challenges

In Zambia, the intersection of technology challenges and climate change adaptation presents a multifaceted dilemma. While advancements in technology offer promising solutions for mitigating the impacts of climate change, Zambia grapples with various barriers hindering their effective implementation. Limited access to reliable electricity and internet connectivity undermines the utilization of innovative technologies such as remote sensing, climate modeling, and data analytics, crucial for informed decision-making in agriculture, water resource management, and disaster preparedness. Furthermore, inadequate infrastructure and institutional capacities constrain the dissemination of climate-resilient technologies to rural communities, where vulnerability to climate change is highest.

### 5.1.5 Policy Fragmentation: Impeding Sustainable Adaptation

The National Adaptation Plan (NAP) for Zambia serves as a comprehensive roadmap for addressing climate change vulnerability and enhancing resilience. Developed through a multi-sectoral and participatory approach, it prioritizes adaptation actions in key sectors like agriculture and water resources, leveraging tools such as Multi-Criteria Analysis (MCA). The NAP integrates monitoring, evaluation, learning, and reporting mechanisms, along with a robust resource mobilization and communication strategy. However, inconsistencies in policy implementation and enforcement further exacerbate vulnerabilities to climate-related risks, particularly in sectors crucial for livelihoods such as agriculture, water resource management, and infrastructure development. This fragmentation also hampers collaboration between government agencies, civil society organizations, and other stakeholders, hindering the development and dissemination of best practices and innovative solutions.

### 5.1.6 Lack of Funding

The absence of adequate funding significantly hampers Zambia's efforts to adapt to the impacts of climate change, particularly in rural areas where communities are most vulnerable. Despite notable projects like the World Bank's Zambia Strengthening Climate Resilience Project, funded by the Climate Investment Funds' Pilot Program for Climate Resilience (PPCR) and the renewable energy financing framework supported by the Green Climate Fund and the African Development Bank, insufficient financial resources remain a critical barrier to implementing crucial adaptation measures. Without sufficient funding, the adoption of climate-resilient technologies, infrastructure improvements, and capacity-building

[12] GRZ (2023) National Adaptation Plan. https://unfccc.int/sites/default/files/resource/NAP-Zambia-2023.pdf

[13] GRZ (2017)ZaMbia National Disaster Risk Management Framework-(2017 – 2030) Operationalising The Sendai Framework https://drmims.sadc.int/sites/default/files/document/2020-03/Final%20DRM%20Framework%20-10102018.pdf

[14] Xinhua (2022) Zambia launches guidelines to mitigate public sector risks https://english.news.cn/20221123/b7c7f1c699b047d7b14c27a10bfc57fa/c.html

initiatives is limited, leaving communities exposed to climate-related risks such as extreme weather events and changing precipitation patterns. Moreover, the lack of funding constrains the government's ability to mobilize resources for monitoring, evaluation, and reporting on adaptation efforts, hindering effective decision-making and policy development in the face of escalating environmental challenges.[15]

### 5.1.7 Lack of Quality Data

In Zambia, the absence of reliable climate data presents a formidable obstacle to effective adaptation efforts. This dearth impairs the accurate assessment of current and future climate risks, hindering evidence-based strategies and priority setting for intervention. Moreover, it undermines targeted resilience measures and obstructs the monitoring and evaluation of adaptation initiatives, impeding progress.[16]

### 5.1.8 Low Adoption Rates of Adaptation Strategies

Low adoption rate of adaptation strategies poses a critical challenge to effectively addressing the impacts of climate change. Despite the development of various adaptation measures, such as conservation agriculture, drought-resistant crops, water conservation techniques, and early warning systems, the uptake and implementation of these strategies remain limited. Despite a high adoption rates of conservation agriculture (CA) practices compared to the neighboring countries, with 33% of farmers embracing full CA practices barriers persist such as limited technical knowledge, labor intensity, and financial constraints.[17]

### 5.1.9 Poor Coordination

Poor collaboration among stakeholders presents a significant impediment to effective climate change adaptation efforts. The lack of coordination and cooperation between government agencies, non-governmental organizations, local communities, and other relevant actors undermines the development and implementation of coherent and impactful adaptation strategies. This fragmentation leads to duplication of efforts, inefficient use of resources, and gaps in knowledge sharing and capacity building. Additionally, disjointed approaches hinder the integration of local perspectives and traditional knowledge systems into adaptation planning and implementation, limiting the relevance and effectiveness of initiatives.[18]

### 5.1.10 Knowledge Gaps on Climate Change

Knowledge gaps on climate change pose a significant challenge to effective adaptation efforts. Insufficient understanding of the complex interactions between climate variables, ecosystem dynamics, and socio-economic factors impedes the development and implementation of targeted adaptation strategies. These gaps in knowledge also hinder the identification of vulnerable populations, priority areas for intervention, and suitable adaptation measures.[19]

### 5.1.11 Organizational Capacity

Organizational capacity significantly influences the effectiveness of climate change adaptation efforts. Challenges such as limited technical expertise, inadequate funding, and weak institutional structures hamper the formulation, implementation, and monitoring of adaptation strategies across government agencies, non-governmental organizations, and community-based organizations. Fragmented coordination and communication channels exacerbate these challenges, leading to duplication of efforts and inefficiencies in resource allocation.

---

[15]World Bank (2022) Climate adaptation in action: Strengthening resilience for better livelihoods in Zambia https://blogs.worldbank.org/en/c-limatechange/climate-adaptation-action-strengthening-resilience-better-livelihoods-zambia

[16] Rawlins, J., Kalaba, F.K. (2021). Adaptation to Climate Change: Opportunities and Challenges from Zambia. In: Oguge, N., Ayal, D., Adeleke, L., da Silva, I. (eds) African Handbook of Climate Change Adaptation. Springer, Cham. https://doi.org/10.1007/978-3-030-45106-6_167

[17] IAPRI (2016) Determinants of Conservation Agriculture Adoption among Zambian Smallholder Farmers https://pdf.usaid.gov/pdf_docs/PA00MGQ4.pdf

[18]Global Centre on Adaptation (2023)Cultivating Adaptation in Zambia: Engaging Stakeholders in Digital Climate Advisory Services. https://gca.org/cultivating-adaptation-in-zambia-engaging-stakeholders-in-digital-climate-advisory-services/

[19] Baninla, Yvette, Ayyoob Sharifi, Zaheer Allam, Suiven J. Tume, Ngeh N. Gangtar, and Ngiamte George. "An Overview of Climate Change Adaptation and Mitigation Research in Africa." *Frontiers in Climate 4*, (2022): 976427. Accessed April 14, 2024. https://doi.org/10.3389/fclim.2022.976427.

### *5.2 Opportunities in Climate Adaptation*

#### 5.2.1 Alternative Livelihoods

Alternative livelihoods in Zambia offer a promising avenue for climate adaptation by providing diversified income sources less vulnerable to climate change impacts. Transitioning from traditional sectors like agriculture, which are highly susceptible to climate variability, can enhance resilience and reduce vulnerability. Alternative livelihood options such as eco-tourism, renewable energy projects, sustainable fisheries, and non-timber forest products not only bring economic benefits but also support environmental conservation and ecosystem restoration. These alternative livelihoods empower local communities, especially women and marginalized groups, by offering opportunities for skills development, entrepreneurship, and social inclusion.[20]

#### 5.2.2 Policy Formulation

The formulation of policies is a critical opportunity for climate adaptation in Zambia, providing a framework for coordinated action and strategic planning across sectors. Well-designed policies can facilitate the integration of climate considerations into development plans, ensuring that adaptation measures are mainstreamed and prioritized effectively. By establishing clear guidelines, incentives, and regulations, policies can encourage the adoption of climate-resilient practices and technologies, promote sustainable resource management, and enhance institutional capacities for adaptation planning and implementation. In addition, the formulation of inclusive and participatory policies can engage diverse stakeholders, including local communities, civil society organizations, and the private sector, fostering ownership and collaboration in adaptation efforts. [21]

#### 5.2.3 Climate Smart Agriculture

Climate-smart agriculture (CSA) represents a significant opportunity for climate adaptation in Zambia, offering a holistic approach that integrates climate resilience, food security, and sustainable development objectives. By adopting CSA practices such as agroforestry, conservation agriculture, and improved water management techniques, farmers can enhance their resilience to climate variability and extreme weather events while simultaneously increasing agricultural productivity and reducing greenhouse gas emissions. CSA promotes the use of climate-resilient crop varieties, efficient irrigation systems, and soil conservation practices, which not only mitigate the impacts of climate change but also contribute to ecosystem conservation and biodiversity conservation. Moreover, CSA initiatives can empower smallholder farmers, particularly women and youth, by providing access to training, technology, and market opportunities, thereby enhancing their livelihoods and economic resilience.[22]

#### 5.2.4. Inclusive Participation

Inclusive participation represents a significant opportunity for climate adaptation in Zambia, offering a platform for diverse stakeholders to contribute their knowledge, experiences, and perspectives to the adaptation process. By involving local communities, civil society organizations, academia, the private sector, and government agencies in decision-making and planning, inclusive participation fosters ownership, legitimacy, and effectiveness of adaptation initiatives. Inclusive processes ensure that adaptation strategies are contextually relevant, socially acceptable, and equitable, considering the needs and priorities of vulnerable populations, including women, youth, and marginalized groups.[23]

#### 5.2.5 Resilient Infrastructure

Resilient infrastructure in Zambia plays a crucial role in climate adaptation, offering a foundation for sustainable development and disaster risk reduction. By investing in infrastructure designed to withstand climate change impacts like floods, droughts, and extreme temperatures, Zambia can enhance its resilience and minimize negative consequences of

---

[20] Rawlins, J., Kalaba, F.K. (2021). Adaptation to Climate Change: Opportunities and Challenges from Zambia. In: Oguge, N., Ayal, D., Adeleke, L., da Silva, I. (eds) African Handbook of Climate Change Adaptation. Springer, Cham. https://doi.org/10.1007/978-3-030-45106-6_167

[21] USAID (2012) Climate Change Adaptation in Zambia https://www.climatelinks.org/sites/default/files/asset/document/zambia_adaptation_fact_sheet_feb2012.pdf

[22] FAO (2021)Climate-Smart Agriculture. https://www.fao.org/climate-smart-agriculture/en/

[23] GRZ (2021)ClImate Change Adaptation Planning In Zambia https://www.gwp.org/globalassets/documents/gwpsa/zambia-nap-policy-brief_digital.pdf

climate-related hazards. Resilient infrastructure encompasses improved water management systems, reinforced buildings and roads, and diversified energy sources. These measures not only boost the country's ability to handle climate variability but also contribute to long-term economic growth and social well-being. Additionally, resilient infrastructure can lower the costs linked to climate-related disasters, improve livelihoods, and enhance access to essential services, especially in rural and vulnerable communities.[24]

### 5.2.6 Capacity Building Training

Capacity building training plays a pivotal role in climate adaptation in Zambia, enabling stakeholders to enhance their adaptive capacity and implement effective strategies. By investing in programs targeting policymakers, government officials, communities, and other relevant actors, Zambia can bolster its resilience to climate change. Such initiatives encompass training on climate science, risk assessment, early warning systems, and adaptation planning, as well as skill development in areas like sustainable agriculture, water management, and disaster preparedness. Recognizing this importance, the Zambian government has integrated capacity building measures into the National Adaptation Plan (NAP), which outlines clear goals and actions for reducing vulnerability, enhancing resilience, and promoting climate-resilient development in alignment with Vision 2030, National Development Plans, and the Nationally Determined Contribution (NDC). Through these efforts, Zambia aims to systematically implement priority adaptation actions, ensuring a more resilient future amidst climate uncertainties.[25]

### 5.2.7 Innovative Local Solutions

Innovative local solutions present a significant opportunity for climate adaptation in Zambia, harnessing indigenous knowledge and community-driven approaches to address climate-related challenges effectively. By tapping into the creativity and resilience of local communities, Zambia can develop context-specific adaptation measures that are tailored to the needs and priorities of different regions and ecosystems. These solutions may include agroecological practices, water harvesting techniques, community-based early warning systems, and natural resource management strategies that build on traditional practices and local resources. Moreover, innovative local solutions empower communities to take ownership of adaptation efforts, fostering social cohesion, knowledge exchange, and collective action.[26]

### 5.2.8 Insurance and Risk Management Mechanism

Insurance and risk management mechanisms represent a crucial opportunity for climate adaptation in Zambia, providing financial protection and promoting resilience against climate-related hazards. By investing in insurance schemes, such as weather index insurance or crop insurance, Zambia can mitigate the economic impacts of climate variability and extreme weather events on farmers, businesses, and households. These mechanisms can help buffer against losses incurred due to crop failures, livestock deaths, property damage, and income disruptions caused by climate-related disasters.[27]

### 5.2.9 Forest Management

Forest management presents a significant opportunity for climate adaptation in Zambia, offering multiple benefits for ecosystem resilience, carbon sequestration, and community livelihoods. By implementing sustainable forest management practices, such as reforestation, afforestation, and improved forest conservation, Zambia can enhance its capacity to mitigate and adapt to climate change impacts. Healthy forests play a crucial role in regulating local climate patterns, maintaining water cycles, and supporting biodiversity, thereby reducing the vulnerability of ecosystems and communities to climate-related risks such as floods, droughts, and soil erosion. Furthermore, sustainable forest management creates opportunities for income generation, eco-tourism, and sustainable resource utilization, contributing to poverty alleviation and socio-economic development.[28]

---

[24] CIF (2020) TrAnsformational Change Case Study Zambia: Building a Resilient Future https://www.cif.org/sites/cif_enc/files/knowledge-documents/tc_zambia_case_study_june_2020.pdf

[25] GRZ (2023) National Adaptation Plan. https://unfccc.int/sites/default/files/resource/NAP-Zambia-2023.pdf

[26] GRZ (2023) National Adaptation Plan.https://unfccc.int/sites/default/files/resource/NAP-Zambia-2023.pdf

[27] World Bank Group (2020) The World Bank Group Global Index Insurance Facility in Zambia. https://annualreport.insuresilience.org/global-index-insurance-facility-zambia/

[28] FAO (2021)Climate Change Adaptation in Forest and Agricultural

Mosaic Landscapes https://www.fao.org/3/cb6860en/cb6860en.pdf

### 5.2.10 Improved Technology

Technology presents a significant opportunity for climate adaptation in Zambia, offering innovative solutions to address climate-related challenges and enhance resilience. By harnessing advancements in technology, such as remote sensing, geographic information systems (GIS), and climate modeling, Zambia can improve its understanding of climate risks and vulnerabilities, enabling more targeted and effective adaptation planning and decision-making. Additionally, technologies like renewable energy systems, drip irrigation, and climate-resilient crop varieties can help mitigate the impacts of climate change on agriculture, water resources, and energy security. Furthermore, digital platforms and mobile applications can facilitate early warning systems, disaster response, and information dissemination, empowering communities to prepare for and respond to climate-related hazards. [29]

### 5.2.11 Nature Based Solution

Nature-based solutions present a significant opportunity for climate adaptation in Zambia, offering sustainable approaches to mitigate the impacts of climate change while simultaneously enhancing biodiversity and ecosystem services. By conserving and restoring natural ecosystems such as forests, wetlands, and grasslands, Zambia can increase its resilience to climate-related hazards such as floods, droughts, and erosion. Nature-based solutions not only provide natural barriers against extreme weather events but also regulate local climate patterns, improve water quality and availability, and support livelihoods dependent on ecosystem services. [30]

### 5.2.12 Water Harvesting

Water harvesting in Zambia is a crucial strategy for climate adaptation, providing a sustainable solution to combat water scarcity and enhance resilience to climate change impacts. By implementing techniques like rooftop harvesting, terracing, and small-scale reservoirs, Zambia can increase water availability for domestic use, agriculture, and livestock production, especially during drought periods. This approach helps mitigate the effects of unpredictable rainfall patterns and extended dry periods, reducing dependence on vulnerable groundwater and surface water sources.[31]

### 5.2.13 Research and Development

Research and Development (R&D) presents a crucial opportunity for climate adaptation in Zambia, where the impacts of climate change are increasingly felt, particularly in agriculture, water resources, and infrastructure. Through targeted R&D initiatives, Zambia can develop innovative solutions tailored to its specific climate challenges, such as drought-resistant crops, efficient irrigation systems, and resilient infrastructure designs. Moreover, investing in R&D can foster local capacity building and knowledge exchange, empowering communities to adapt and thrive in the face of changing environmental conditions. By harnessing the potential of R&D, Zambia can not only enhance its resilience to climate change but also spur economic growth and sustainable development for the benefit of its citizens and ecosystems.[32]

### 5.2.14 Green Finance and Investment

Green finance and investment present a crucial opportunity for climate adaptation in Zambia, enabling the mobilization of essential funding for sustainable projects. Given Zambia's susceptibility to climate change impacts like irregular rainfall and extreme weather events, investments in renewable energy, climate-smart agriculture, and resilient infrastructure are imperative. By utilizing green finance tools such as climate funds, green bonds, and sustainable investment frameworks, Zambia can secure funding for projects that reduce greenhouse gas emissions and enhance adaptive capacity.[33]

---

[29] USAID (2012) Climate Change Adaptation in Zambia. https://www.climatelinks.org/sites/default/files/asset/document/zambia_adaptation_fact_sheet_feb2012.pdf

[30] UNEP (2021) Ecosystem-based Adaptation in Zambia. https://www.unep.org/topics/climate-action/adaptation/ecosystem-based-adaptation/ecosystem-based-adaptation-zambia

[31] Stadtbäumer, C., Ruesink, B. & Gronau, S. Climate change scenarios in Zambia: modeling farmers' adaptation. Agric & Food Secur 11, 52 (2022). https://doi.org/10.1186/s40066-022-00382-5

[32] GRZ (2023) National Adaptation Plan. https://unfccc.int/sites/default/files/resource/NAP-Zambia-2023.pdf

[33] UNDP (2024) BIOFIN Zambia is driving the transformation of green finance with the launch of three key financial solutions https://www.biofin.org/news-and-media/biofin-zambia-driving-transformation-green-finance-launch-three-key-financial

### 5.2.15 Alternative Energy Sources

Alternative energy sources offer a promising opportunity for climate adaptation in Zambia, where traditional energy reliance on fossil fuels contributes to both environmental degradation and vulnerability to climate change impacts. By transitioning towards renewable energy sources such as solar, wind, and hydropower, Zambia can reduce its carbon footprint while enhancing energy security and resilience.[34]

### 5.2.16 Carbon Trading

Zambia has the opportunity to utilize carbon trading mechanisms to generate revenue and combat climate change effectively. By engaging in international carbon markets and establishing strong monitoring, reporting, and verification systems, Zambia can attract investments for climate-resilient projects, bolster its adaptive capabilities, and foster a transition to a low-carbon economy. Additionally, participation in carbon trading can facilitate technology transfer, knowledge sharing, and capacity building, enabling Zambia to address climate challenges and variability effectively. Leveraging these mechanisms can not only benefit Zambia economically but also contribute significantly to global climate action efforts.[35]

### 5.2.17 Improved Extension Services

Improved extension services in Zambia present a significant opportunity for climate adaptation in the agricultural sector. By enhancing these services, Zambia can bolster farmers' access to climate-smart agricultural practices, technologies, and information, thereby increasing their resilience to climate-related challenges. Tailored extension programs can facilitate the adoption of drought-resistant crop varieties, sustainable land management techniques, and efficient water use practices, empowering farmers to adapt to changing climatic conditions while maintaining or even boosting productivity. Strengthening the capacity of extension workers and fostering partnerships with research institutions and local communities can facilitate the development and dissemination of customized adaptation solutions, promoting sustainable agricultural growth and food security in Zambia.[36]

## *5.3 Recommendations of Successful Climate Adaptation Initiatives*

### 5.3.1 Participatory Approach Method

By actively involving local communities, governmental agencies, NGOs, and other relevant actors, participatory approaches enable a deeper understanding of the diverse needs, priorities, and capacities within the Zambian context. This inclusive approach fosters ownership, buy-in, and accountability, ensuring that adaptation strategies are contextually relevant, culturally appropriate, and socially equitable.[37]

### 5.3.2 Climate Smart Agriculture

Climate-smart agriculture (CSA) initiatives have yielded critical insights for climate adaptation efforts. Diversification of agricultural practices, particularly in groundnut, maize, and soybean value chains, has been emphasized, aiming to enhance resilience for smallholders, including women and young farmers, through improved access to climate-smart inputs and markets. Conservation agriculture techniques like minimal tillage and agroforestry have proven effective in bolstering soil health and water retention, addressing broader development goals while mitigating climate risks. Community engagement and knowledge-sharing platforms, exemplified by the Zambia Climate Smart Agriculture Investment Plan (CSAIP), have been pivotal in fostering grassroots adoption of CSA practices, ensuring sustainability and scalability. Lastly, policy support and institutional frameworks, as outlined in initiatives like the World Bank's CSAIP, are deemed essential for long-term resilience building, prioritizing investments in climate-resilient infrastructure and capacity building to navigate climate change impacts effectively.[38]

---

[34] Sparkman &Tobin (2023) Country spotlight: Unlocking a high-energy future for Zambia https://www.atlanticcouncil.org/blogs/energysource/country-spotlight-unlocking-a-high-energy-future-for-zambia/

[35] GGGI (2023)Assessing Article 6 Readiness https://www.greenpolicyplatform.org/sites/default/files/downloads/best-practices/SPAR6C_Technical%20Brief%20Zambiab416d3ffb5b02dc263d4f072547fc5e230ebce4fbd73d07124087b31abc0ee33.pdf

[36] Global Centre on Adaptation (2023) https://gca.org/scaling-up-climate-adaptation-solutions-for-zambias-smallholder-farmers/

[37] GRZ (2023) National Adaptation Plan.https://unfccc.int/sites/default/files/resource/NAP-Zambia-2023.pdf

[38] Connel (2021)What's Missing from the World Bank's Zambia Climate Smart Agriculture Investment Plan? https://bankinformationcenter.org/en-us/update/whats-missing-from-the-world-banks-zambia-climate/

### 5.3.3 Deliberate Collaboration and Coordination

Effective collaboration and coordination in climate adaptation initiatives in Zambia have revealed several important lessons. Firstly, the significance of engaging multiple stakeholders and forming partnerships across government, civil society, and the private sector has become evident for successful climate action planning and execution. Secondly, improving communication channels and sharing information among stakeholders has been crucial for fostering transparency, trust, and accountability in adaptation endeavors. Thirdly, establishing clear roles, responsibilities, and decision-making mechanisms has facilitated efficient coordination and allocation of resources, optimizing the use of available funds and expertise. Lastly, promoting local ownership and leadership in adaptation projects has bolstered community resilience and sustainability, empowering vulnerable groups to actively participate in shaping their adaptive strategies and outcomes.[39]

### 5.3.4 Increased and Consistent Funding

Increased and consistent funding in climate adaptation initiatives in Zambia has yielded valuable lessons. Firstly, sustained financial support enables long-term planning and implementation of adaptation measures, fostering resilience against climate change impacts. Secondly, predictable funding streams facilitate the development of comprehensive and effective adaptation strategies, ensuring timely responses to evolving climate challenges. Thirdly, investment in capacity building and institutional strengthening is essential for maximizing the impact of adaptation funding, enhancing the country's ability to effectively manage climate risks and build resilience at all levels. Lastly, ensuring equitable distribution of funds and prioritizing the needs of vulnerable communities are critical for promoting social inclusion and addressing climate justice concerns in Zambia's adaptation efforts.[40]

### 5.3.5 Participation of Local Leadership

The participation of local leaders in climate adaptation initiatives in Zambia has provided valuable insights. Firstly, their involvement fosters ownership and commitment within communities, leading to the successful implementation and sustainability of adaptation measures. Secondly, local leaders serve as trusted sources of information and play a crucial role in raising awareness about climate change impacts and adaptation strategies among community members. Thirdly, their engagement facilitates the identification of context-specific challenges and opportunities, enabling the design of tailored adaptation interventions that address the unique needs of each locality. Lastly, the empowerment of local leaders strengthens governance structures and promotes bottom-up decision-making processes, enhancing resilience and fostering self-reliance in the face of climate uncertainties.[41]

### 5.3.6 Effective Risk Management

Effective risk management in climate adaptation initiatives in Zambia has yielded valuable lessons. Firstly, proactive identification and assessment of climate-related risks enable timely intervention and the implementation of appropriate adaptation measures. Secondly, incorporating flexibility and adaptive management approaches into adaptation planning allows for adjustments in response to evolving climate threats and changing socio-economic conditions. Thirdly, investing in early warning systems and disaster preparedness measures enhances resilience by enabling timely responses to extreme weather events and other climate-related emergencies. Lastly, promoting multi-sectoral collaboration and coordination facilitates comprehensive risk management strategies, ensuring a holistic approach to building climate resilience across various sectors and communities in Zambia.[42]

### 5.3.7 Community Participation

The participation of community members in climate adaptation initiatives in Zambia has been instrumental in fostering a sense of ownership and commitment towards the successful implementation and sustainability of adaptation measures. Local knowledge and traditional practices play a significant role in identifying climate risks and developing context-specific

[39] Global Centre on Adaptation (2023)Cultivating Adaptation in Zambia: Engaging Stakeholders in Digital Climate Advisory Service. https://gca.org/cultivating-adaptation-in-zambia-engaging-stakeholders-in-digital-climate-advisory-services/

[40]GIZ (2023) Understanding Climate Finance Readiness Needs in Zambia https://www.cbd.int/financial/climatechange/zambia-climate-giz.pdf

[41] UNDP (2023) Partnerships with Communities and Traditional Leadership Towards Climate Action https://www.undp.org/zambia/news/partnerships-communities-and-traditional-leadership-towards-climate-action

[42] Irish Aid (2015) Zambia Climate Action Report https://www.irishaid.ie/media/irishaid/allwebsitemedia/20newsandpublications/publicationpdfsenglish/Country-Climate-Action-Reports-Zambia-FINAL.pdf

adaptation strategies that are culturally appropriate and effective. Community participation also enhances social cohesion and strengthens resilience by promoting collective action and mutual support networks. Furthermore, empowering marginalized groups, such as women and youth, to actively engage in decision-making processes ensures that adaptation efforts are inclusive and equitable, leading to more resilient communities in Zambia.[43]

### 5.3.8 Localized Research

Localized research in climate adaptation initiatives in Zambia has provided invaluable lessons. Firstly, it enables a deeper understanding of the specific climate risks and vulnerabilities faced by different regions and communities within the country, allowing for the development of targeted adaptation strategies. Secondly, involving local researchers and stakeholders in the research process fosters ownership and buy-in, enhancing the relevance and effectiveness of adaptation interventions. Thirdly, integrating indigenous knowledge systems with scientific research enriches adaptation efforts by incorporating traditional practices that have proven resilient to climate variability. Lastly, localized research promotes adaptive learning and knowledge exchange, empowering communities to continuously improve their adaptive capacity and resilience to climate change impacts in Zambia.

### 5.3.9 Simplifying and Localizing Climate Information

Simplifying and localizing climate information in climate adaptation initiatives in Zambia has proven effective by enhancing accessibility and understanding of climate risks and adaptation strategies among local communities, facilitating informed decision-making and action. Tailoring climate information to specific geographic locations and socio-economic contexts enables more effective planning and implementation of adaptation measures, while involving local stakeholders fosters ownership and trust, empowering communities to proactively build resilience. Integrating indigenous knowledge systems with scientific data enriches understanding of climate variability and resilience strategies, demonstrating the importance of collaboration between traditional and scientific knowledge.[44]

### 5.3.10 Consistent in the Adaptation Strategies

Consistency in adaptation strategies is crucial for building long-term resilience and adaptive capacity. By maintaining consistent approaches, Zambia can ensure coherence and continuity in efforts to address climate change impacts, fostering stability and predictability for stakeholders. Consistent strategies also enable the accumulation of knowledge and experience, facilitating learning and refinement of adaptation strategies based on evidence and best practices. This, in turn, contributes to building long-term resilience and adaptive capacity, reinforcing Zambia's ability to withstand and respond to the challenges posed by climate change in a systematic and sustained manner.[45]

### 5.3.11 Utilization of Nature-based Solutions

The utilization of nature-based solutions in climate adaptation initiatives in Zambia has provided valuable lessons. Firstly, it underscores the importance of harnessing natural ecosystems and processes to enhance resilience to climate change impacts, such as floods, droughts, and soil erosion. Secondly, nature-based solutions offer cost-effective and sustainable alternatives to conventional infrastructure, while also providing additional co-benefits such as biodiversity conservation, water purification, and carbon sequestration. Thirdly, integrating traditional ecological knowledge with scientific approaches enriches the design and implementation of nature-based solutions, ensuring they are contextually appropriate and socially inclusive. Lastly, the successful implementation of nature-based solutions highlights the need for supportive policy frameworks and institutional mechanisms that incentivize and facilitate their adoption, promoting the mainstreaming of nature-based approaches into Zambia's broader climate adaptation strategies.[46]

---

[43] OXFAM (2016) Impact evaluation of Citizen Participation in Adaptation to Climate Change. https://oxfamilibrary.openrepository.com/bitstream/handle/10546/620475/er-resilience-zambia-effectiveness-review-mgmt-response-310518-en.pdf%3Bjsessionid=89364FB77668B6CFF9EEEE0B437B5E65?sequence=4

[44] Chisanga, Kafula & Mvula, Andrew & Habibu, Taban. (2017). The Role of Indigenous Knowledge in Climate Adaptation: Experiences with Farmer Perceptions from Climate Change Project in Sedumbwe Agricultural Camp of Southern Zambia. International Journal of Scientific and Research Publications. 7. 94-101.

[45] FAO (2021)Climate Change Adaptation in Forest and Agricultural Mosaic Landscapes. https://www.fao.org/3/cb6860en/cb6860en.pdf

[46] UNEP (2021) Zambia turns to nature to tackle climate change. https://www.unep.org/gan/news/press-release/zambia-turns-nature-tackle-climate-change

### 5.3.12 Policy Coherence and Integration

Lessons from policy coherence and integration in climate adaptation initiatives in Zambia reveal several key insights. Firstly, aligning climate adaptation policies across sectors fosters synergy and effectiveness in addressing interconnected challenges, such as food security, water management, and disaster risk reduction. Secondly, integrating climate adaptation considerations into existing policy frameworks enhances resilience across multiple sectors, promoting holistic and sustainable development outcomes. Thirdly, fostering collaboration and coordination among government agencies, civil society organizations, and other stakeholders facilitates the implementation of integrated adaptation strategies, ensuring that efforts are complementary and mutually reinforcing. Lastly, establishing monitoring and evaluation mechanisms enables the tracking of progress and the identification of gaps, facilitating iterative learning and adaptive management approaches to enhance the coherence and effectiveness of climate adaptation initiatives in Zambia.[47]

### 5.3.13 Enhanced Monitoring and Evaluation in Climate Adaptation

Zambia's National Adaptation Plan (NAP) stands as a pivotal initiative in addressing climate change impacts, engaging key stakeholders to enhance capacity and institutional structures for national adaptation planning. Central to its efficacy is a comprehensive monitoring and evaluation framework, facilitating evidence-based decision-making and adaptive management by assessing the effectiveness and impact of adaptation measures. Valuable lessons have emerged, emphasizing the importance of robust monitoring frameworks for tracking progress and identifying gaps, participatory approaches involving local communities for accountability and effectiveness, regular evaluations to identify best practices, and ensuring reliable data availability to strengthen adaptation strategies in Zambia.[48]

### 5.3.14 Alternative Energy Sources

Lessons from Zambia's utilization of alternative energy sources in climate adaptation initiatives emphasize several key points. Firstly, diversifying energy sources, notably towards solar and wind power, reduces reliance on fossil fuels, thereby curbing greenhouse gas emissions and bolstering climate resilience, particularly in remote areas. Secondly, community-driven renewable energy projects, like the Lusaka Renewable Energy Project, not only provide clean electricity but also empower local communities, spur economic growth, and enhance resilience to climate impacts. Thirdly, supportive policy frameworks and investment incentives are pivotal in driving the widespread adoption of alternative energy solutions, contributing to Zambia's transition to a low-carbon and climate-resilient future. Lastly, partnerships and technical assistance play a crucial role in the successful development and implementation of renewable energy projects.[49]

## 6. CONCLUSION

Zambia's climate adaptation journey has faced significant challenges, including social and behavioral barriers, technological limitations, and policy fragmentation. The scarcity of extension officers, inadequate funding, unreliable climate data, poor stakeholder coordination, and knowledge gaps have hindered resilience-building efforts. Despite these hurdles, Zambia has identified numerous opportunities for adaptation across sectors. Promising avenues include alternative livelihoods, resilient infrastructure, and inclusive participation. Policies integrating climate considerations into development, climate-smart agriculture, renewable energy, and capacity building highlight Zambia's potential to navigate climate impacts successfully.

Key to Zambia's success in adaptation are participatory approaches, deliberate collaboration, and increased funding. Local leadership, effective risk management, and community involvement are pivotal. Localized research, simplified climate information, and consistent strategies address vulnerabilities. Nature-based solutions, policy coherence, improved monitoring and evaluation, and alternative energy integration further strengthen resilience.

These experiences underscore the importance of holistic, integrated approaches that engage diverse stakeholders, leverage local knowledge, and prioritize vulnerable communities. By incorporating these lessons into future strategies, Zambia can effectively tackle climate challenges, promote sustainable development, and enhance the well-being of its people and

[47] England, M.I., Dougill, A.J., Stringer, L.C. *et al.* Climate change adaptation and cross-sectoral policy coherence in southern Africa. *Reg Environ Change* **18**, 2059–2071 (2018). https://doi.org/10.1007/s10113-018-1283-0

[48] GRZ (2023) National Adaptation Plan https://unfccc.int/sites/default/files/resource/NAP-Zambia-2023.pdf

[49] Jain, Prem (2017) "Coal Power in Zambia: Time to Rethink," *Southern African Journal of Policy and Development*: Vol. 3: No. 2, Article 6. Available at: https://scholarship.law.cornell.edu/sajpd/vol3/iss2/6

ecosystems. Committed to resilience-building, Zambia aims for a sustainable, prosperous, and resilient future in the face of climate change.

**Suggestions for Future Research**

A study will be required for the following topics:

1. Research could focus on documenting and preserving indigenous knowledge systems, understanding cultural dimensions of vulnerability and resilience, and exploring opportunities for integrating indigenous perspectives into adaptation policy and practice.

2. Research could examine the role of multi-level governance structures, policy coherence across sectors, and strategies for mainstreaming adaptation into sectoral policies and planning processes.

3. More focused research is required to identify key adaptation capacity needs, models that ensure inclusive participation across governance levels, and conditions under which climate action platforms add value to contextual policy implementation processes.

## REFERENCES

[1] Baninla, Yvette, Ayyoob Sharifi, Zaheer Allam, Suiven J. Tume, Ngeh N. Gangtar, and Ngiamte George. "An Overview of Climate Change Adaptation and Mitigation Research in Africa." *Frontiers in Climate 4*, (2022): 976427. Accessed April 14, 2024. https://doi.org/10.3389/fclim.2022.976427.

[2] Bronen, Robin, and F. S. Chapin. "Adaptive Governance and Institutional Strategies for Climate-induced Community Relocations in Alaska." *Proceedings of the National Academy of Sciences 110*, no. 23 (2013): 9320-9325. Accessed March 21, 2024. https://doi.org/10.1073/pnas.1210508110.

[3] Connel (2021)What's Missing from the World Bank's Zambia Climate Smart Agriculture Investment Plan? https://bankinformationcenter.org/en-us/update/whats-missing-from-the-world-banks-zambia-climate/

[4] Chisanga, Kafula & Mvula, Andrew & Habibu, Taban. (2017). The Role of Indigenous Knowledge in Climate Adaptation: Experiences with Farmer Perceptions from Climate Change Project in Sedumbwe Agricultural Camp of Southern Zambia. International Journal of Scientific and Research Publications. 7. 94-101.

[5] CIF (2020) TrAnsformational Change Case Study Zambia: Building a Resilient Future https://www.cif.org/sites/cif_enc/files/knowledge-documents/tc_zambia_case_study_june_2020.pdf

[6] England, M.I., Dougill, A.J., Stringer, L.C. *et al.* Climate change adaptation and cross-sectoral policy coherence in southern Africa. *Reg Environ Change* **18**, 2059–2071 (2018). https://doi.org/10.1007/s10113-018-1283-0

[7] FAO (2021)Climate Change Adaptation in Forest and Agricultural Mosaic Landscapes https://www.fao.org/3/cb6860en/cb6860en.pdf

[8] FAO (2019). Climate-change vulnerability in rural Zambia: the impact of an El Niño-induced shock on income and productivity. FAO Agricultural Development Economics Working Paper 19-02.

[9] FAO (2021)Climate-Smart Agriculture. https://www.fao.org/climate-smart-agriculture/en/

[10] Global Centre on Adaptation (2023) https://gca.org/scaling-up-climate-adaptation-solutions-for-zambias-smallholder-farmers/

[11] FAO (2021)Climate Change Adaptation in Forest and Agricultural Mosaic Landscapes. https://www.fao.org/3/cb6860en/cb6860en.pdf

[12] FEWSNET (2023) Strong El Niño will drive high needs across Southern Africa through early 2025.https://fews.net/southern-africa/alert/november-2023

[13] FSNetwork (2011)From Vulnerability to Resilience: A Framework for Analysis and Action to Build Community Resilience.https://www.fsnnetwork.org/resource/vulnerability-resilience-framework-analysis-and-action-build-community-resilience

[14] GIZ (2023) Understanding Climate Finance Readiness Needs in Zambia https://www.cbd.int/financial/climatechange/zambia-climate-giz.pdf

[15] GGGI (2023)Assessing Article 6 Readiness https://www.greenpolicyplatform.org/sites/default/files/downloads/best-practices/SPAR6C_Technical%20Brief%20Zambiab416d3ffb5b02dc263d4f072547fc5e230ebce4fbd73d07124087b31abc0ee33.pdf

[16] Global Centre on Adaptation (2023)Cultivating Adaptation in Zambia: Engaging Stakeholders in Digital Climate AdvisoryServices.https://gca.org/cultivating-adaptation-in-zambia-engaging-stakeholders-in-digital-climate-advisory-services/

[17] GRZ (2023) National Adaptation Plan.https://unfccc.int/sites/default/files/resource/NAP-Zambia-2023.pdf

[18] GRZ (2017)Zambia National Disaster Risk Management Framework-(2017 – 2030) Operationalising The Sendai Frameworkhttps://drmims.sadc.int/sites/default/files/document/2020-03/Final%20DRM%20Framework%20-10102018.pdf

[19] GRZ (2021)ClImate Change Adaptation Planning In Zambia https://www.gwp.org/globalassets/documents/gwpsa/zambia-nap-policy-brief_digital.pdf

[20] GRZ (2023) National Adaptation Plan. https://unfccc.int/sites/default/files/resource/NAP-Zambia-2023.pdf

[21] IAPRI (2016) Determinants of Conservation Agriculture Adoption among Zambian Smallholder Farmers https://pdf.usaid.gov/pdf_docs/PA00MGQ4.pdf

[22] International Food Policy Research Institute (IFPRI), 2023. From Climate Risk To Resilience: Unpacking The Economic Impacts Of Climate Change In Zambia Report.

[23] Irish Aid (2015) Zambia Climate Action Report https://www.irishaid.ie/media/irishaid/allwebsitemedia/20newsandpublications/publicationpdfsenglish/Country-Climate-Action-Reports-Zambia-FINAL.pdf

[24] Jain, Prem (2017) "Coal Power in Zambia: Time to Rethink," *Southern African Journal of Policy and Development*: Vol. 3: No. 2, Article 6. Available at: https://scholarship.law.cornell.edu/sajpd/vol3/iss2/6

[25] Orsato, Renato J., and Simone R. Barakat. "Social Learning for Anticipatory Adaptation to Climate Change: Evidence From a Community of Practice." *Organization & Environment*, (2018). Accessed March 21, 2024. https://doi.org/10.1177/1086026618775325.

[26] OXFAM (2016) Impact evaluation of Citizen Participation in Adaptation to Climate Change. https://oxfamilibrary.openrepository.com/bitstream/handle/10546/620475/er-resilience-zambia-effectiveness-review-mgmt-response-310518-en.pdf%3Bjsessionid=89364FB77668B6CFF9EEEE0B437B5E65?sequence=4

[27] Parry (2017) Building a Climate-Resilient City: Transformational adaptation https://www.iisd.org/publications/brief/building-climate-resilient-city-transformational-adaptation

[28] Rawlins, J., Kalaba, F.K. (2021). Adaptation to Climate Change: Opportunities and Challenges from Zambia. In: Oguge, N., Ayal, D., Adeleke, L., da Silva, I. (eds) African Handbook of Climate Change Adaptation. Springer, Cham. https://doi.org/10.1007/978-3-030-45106-6_167

[29] Sparkman &Tobin (2023) Country spotlight: Unlocking a high-energy future for Zambia https://www.atlanticcouncil.org/blogs/energysource/country-spotlight-unlocking-a-high-energy-future-for-zambia/

[30] Stadtbäumer, C., Ruesink, B. & Gronau, S. Climate change scenarios in Zambia: modeling farmers' adaptation. Agric & Food Secur 11, 52 (2022). https://doi.org/10.1186/s40066-022-00382-5

[31] UNEP (2021) Ecosystem-based Adaptation in Zambia. https://www.unep.org/topics/climate-action/adaptation/ecosystem-based-adaptation/ecosystem-based-adaptation-zambia

[32] UNEP (2021) Zambia turns to nature to tackle climate change. https://www.unep.org/gan/news/press-release/zambia-turns-nature-tackle-climate-change

[33] UNDP (2024) BIOFIN Zambia is driving the transformation of green finance with the launch of three key financial solutions https://www.biofin.org/news-and-media/biofin-zambia-driving-transformation-green-finance-launch-three-key-financial

[34] UNDP (2023) Partnerships with Communities and Traditional Leadership Towards Climate Action https://www.undp.org/zambia/news/partnerships-communities-and-traditional-leadership-towards-climate-action

[35] USAID (2012) Climate Change Adaptation in Zambia https://www.climatelinks.org/sites/default/files/asset/document/zambia_adaptation_fact_sheet_feb2012.pdf

[36] USAID (2019) Integrating Social and Behavior Change in Climate Change Adaptation https://www.climatelinks.org/sites/default/files/asset/document/2019_USAID_ATLAS_SBC%20Guide.pdf

[37] World Bank (2022) Climate adaptation in action: Strengthening resilience for better livelihoods in Zambia https://blogs.worldbank.org/en/c-limatechange/climate-adaptation-action-strengthening-resilience-better-livelihoods-zambia

[38] World Bank Group (2020) The World Bank Group Global Index Insurance Facility in Zambia. https://annualreport.insuresilience.org/global-index-insurance-facility-zambia/

[39] Xinhua (2022) Zambia launches guidelines to mitigate public sector risks https://english.news.cn/20221123/b7c7f1c699b047d7b14c27a10bfc57fa/c.html

[40] Yadvinder et al (2020) Climate change and ecosystems: threats, opportunities and solutionsPhil.Trans.R.Soc.B 375201901042019010 4http://doi.org/10.1098/rstb.2019.0104