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FACAULTY OF SOCIAL SCIENCES AND HUMANITIES



Climate Resilient School Infrastructure as an Intervention to Climate Hazards and Risks: A Case Study of Rushinga District in Zimbabwe

By

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ABSTRACT

Climate change poses an escalating threat to schools infrastructure in vulnerable rural communities. This study investigates climate-resilient school infrastructure as an intervention to climate hazards and risks in Rushinga District, located in north-eastern Zimbabwe. The district falls within agro-ecological regions four and five, characterized by erratic rainfall, recurrent droughts, and intense storms, making its schools particularly susceptible to climate-induced disruptions. Guided by the Disaster Risk Reduction (DRR) theoretical framework, the study adopted a mixed-method approach combining quantitative survey data from structured questionnaires with qualitative insights drawn from in-depth interviews and focus group discussions involving school administrators, community members, government officials, and civil protection stakeholders across ten sampled schools, making a total number of 44 participants. The findings reveal a critical resilience gap: schools rely on substandard brick-and-asbestos structures vulnerable to wind and flooding damage, while only a few have implemented resilient features such as reinforced roofing, elevated foundations, and sustainable energy systems. Schools with resilient infrastructure demonstrated markedly superior educational continuity and learner safety during climate events. Key barriers to implementation include prohibitive construction costs, the absence of a dedicated government budget line, limited technical expertise, and fragmented institutional coordination. The study also highlights the disproportionate impact on girls, who face heightened risks of school dropout during prolonged closures. The study recommends standardized resilient building codes, dedicated infrastructure budgets, community capacity building, and formalized multi-stakeholder coordination mechanisms to transform Rushinga's school infrastructure from a vulnerability into a resilience asset.

DECLARATION FORM

I, Angeline Sumbureru (B225212B), do hereby declare that this research project report is my original work and it has not been copied or lifted from any other sources without acknowledgement.

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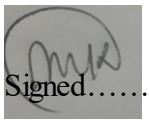

Signed……..

Date……...

DEDICATION

This dissertation is wholeheartedly dedicated to my parents T. Muzenda and E. Kakuruwo and my sisters, Tatenda, Heather and Nomsa.

Most importantly, I dedicate this achievement to the memory of my father, though you are not here to witness this moment, your legacy of hard work and integrity continues to be my guiding star. I carry your lessons in my heart and I am sure this work serves as a testament of what you laid for me.

ACKNOWLEDGEMENTS

I would like to thank God, whose grace and strength have sustained me and brought me this far.

My deepest appreciation goes to my project supervisor, Dr Chipaike for the invaluable guidance, patience and scholarly insights, the Chairperson of Peace and Governance Department, Dr Kurebwa for providing the necessary support and academic environment to thrive.

Rue and Denzel, I am humbled. Your presence is never a coincidence, you showed up and you continued to lift me up without hesitation. Cheers to more memories!

To my family, thank you for being my unwavering foundation, your sacrifices and belief in my potential have been the driving force behind this achievement. This work is a testament to the collective support of those who stood by me, and I am truly honoured to share this milestone with you.

LIST OF ACRONYMS

CPU	Civil Protection Unit
DDC	District Development Coordinator
DRR	Disaster Risk Reduction
FDGs	Focal Group Discussions
GFDRR	Global Facility for Disaster Risk Reduction
GIS	Geographic Information System
IPCC	Intergovernmental Panel on Climate Change
MOPSE	Ministry of Primary and Secondary Education
RDC	Rural District Council
RRDC	Rushinga Rural District Council
SDC	School Development Committee
SDGs	Sustainable Development Goals
UNDRR	United Nations Office for Disaster Risk Reduction
UNESCO	United Nations Educational Scientific and Cultural Organisation
UNICEF	United Nations International Children's Emergency Fund
UNOPS	United Nations Office for Project Services
ZMSD	Zimbabwe Meteorological Service Department

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CHAPTER ONE

INTRODUCTION

1.0 BACKGROUND TO THE STUDY

Climate change is creating challenges in maintaining a health and conducive school environment globally. Escalating global crisis, it is disproportionately impacting vulnerable regions particularly in Sub-Saharan Africa. Zimbabwe is experiencing the effects of climate change, evident in the altered serious weather patterns including the rising temperatures, heavy rains and drought (Dodman & Mitlin, 2015). These events disrupt ecosystem, contribute to soil erosion, harm crops, and threaten water resources, impacting various sectors including agriculture, water, health, infrastructure and human settlements (MDPI, 2021). There is also a change in the rainfall patterns leading to shorter rainy seasons and increased intensity of rainfall events, increasing the risk of flooding. The education sector in Zimbabwe is particularly vulnerable to these climate related shocks. Extreme weather events can lead to school closures, infrastructure damage and can reduce learning outcomes. Cyclones and storms can lead to the destruction of classrooms and facilities leaving them unsafe for use (Daily News, 01 April 2025). Droughts and increasing temperatures can lead to poor harvests and food scarcity, causing malnutrition among school-going children, impairing them to retention and learning performance.

Rushinga District, located in the north-eastern part of Zimbabwe, exemplifies these above mentioned challenges. The district falls within regions four and five characterised by erratic rainfall patterns and is prone to droughts. Rushinga is highly sensitive to climate-related deviations in rainfall and temperatures. Households have a low adaptive capacity due to socio-economic factors including ecosystems that are characterised by human insecurities threatening livelihoods, unsustainable landscape management as well as the degradation of forest and land (CARE Climate Change, 2020).

The need for climate-resilient school infrastructure in Rushinga District is therefore critical. Climate-resilient infrastructure can be defined as infrastructure that can withstand climate change impacts and continue to function effectively under climate changing conditions (Ascend Climate, n.d.). This can include measures such as using robust construction materials and incorporating sustainable practices such as renewable energy sources (UNOPS, 2022). Quality and resilient infrastructure places laces learners on a pathway to inclusive quality education. According to World Bank, 2024, children with better infrastructure generally tends to perform better in school than those without. Moreover, schools can serve as community hubs during climate-related disasters, providing safe havens for families. For example, according to UN-Habitat, 2023, the "Building Back Better" philosophy emphasizes strategic planning and investment in infrastructure to save lives and enhance community resilience. In Mozambique, for example, climate –resilient schools have been constructed to withstand cyclones and serve as emergency shelters, demonstrating the effectiveness of this approach.

Integrating climate change adaptation and environmental sustainability into education sector plans, budgets, and strategies is essential to strengthen the resilience of the education sector (Global Partnership for Education, 2024). This includes the identifying the key climate change stressors and analysing their effects on the education sector in rural areas. Through these initiatives, knowing the most affected schools, ministries can use scarce resources more efficiently to ensure that all learners, including the marginalised are protected from climate change hazards and risk and have uninterrupted learning. Therefore, this study aims to investigate the vulnerability of school infrastructure in Rushinga District to climate hazards and to propose context-specific strategies for enhancing climate resilience, contributing to the overall adaptive capacity of the community.

1.1 PURPOSE OF THE STUDY

The purpose of this study is to explore the role of climate-resilient school infrastructure in mitigating the impacts of climate hazards and risks on education in Rushinga District.

1.2 STATEMENT OF THE PROBLEM `

Climate hazards such as strong winds and heavy rainfall events are increasingly disrupting education systems in rural areas, including Rushinga District. Schools in this region often lack the infrastructure necessary to withstand these challenges, resulting in damaged buildings, interrupted learning and unsafe environments for learners and staff. The inability to respond to and recover from such climate-induced disruptions exacerbates the vulnerability of rural communities and hinders progress toward achieving quality education for all. Despite global recognition of the importance of climate-resilient infrastructure, there is limited research on its application in rural schools, particularly in Zimbabwe. The study aims to address this gap by analysing how climate-resilient school infrastructure can serve as a bridge to mitigate climate hazards and risks in Rushinga District.

1.3 OBJECTIVES OF THE STUDY

1. To identify climate hazards and risks affecting schools infrastructure in Rushinga District.
2. To examine the current state of school infrastructure in Rushinga District and its vulnerability to climate hazards.
3. To determine the effectiveness of climate resilient school infrastructure in enhancing safety and continuity of education in the face of climate hazards.
4. To assess challenges and barriers to implementing climate-resilient infrastructure in rural schools.

1.4 RESEARCH QUESTIONS

1. What are the climate hazards and risks affecting schools infrastructure in Rushinga District?
2. What is the current state of school infrastructure in Rushinga District, and how vulnerable is it to climate change?
3. How effective are climate resilient school infrastructure in enhancing the safety and continuity of education in Rushinga District in the face of climate hazards?
4. What challenges and barriers exist in implementing climate resilient school infrastructure in Rushinga District?

1.5 ASSUMPTIONS OF THE STUDY

1. Climate-Resilient School Infrastructure reduces educational disruptions.
2. Community and Stakeholder Involvement Enhances Sustainability.
3. There exists, a clear link between infrastructure and edifying outcomes.

1.6 SIGNIFICANCE OF THE STUDY

Given the increasing frequency and intensity of climate related disasters particularly in vulnerable rural areas such as, Rushinga, this study is significant as it addresses the critical need for climate resilient school infrastructure. Through a comprehensive examination of climate-resilient infrastructure, this study seeks to demonstrate how schools can continue to operate in the face of environmental threats, guaranteeing both the continuity of instruction and the safety of students and teachers.

The study's findings will be useful in developing and implementing school infrastructure that is more capable of managing the local climatic concerns. The United Nations Sustainable Development Goals (SDGs) implementation receives immediate assistance from this initiative which provides direct

support to Goal 4 (Quality Education) and Goal 13 (Climate Action). Rural schools require practical solutions to build resilient school infrastructure because climate disasters damage their facilities which create educational gaps that need to be fixed. The research demonstrates that educational policies need resilience as a crucial component which will affect local and national policy decisions. The study provides scientific value to Rushinga District stakeholders and residents through its results which create practical benefits. Climate-resilient school infrastructure operates as disaster emergency shelters which protect lives while decreasing disaster recovery costs. Sustainable infrastructure operates as a model for adjacent communities because it shows effective environmental management practices which improve environmental education programs. The project allows schools to improve their flexibility which enables them to maintain educational services while supporting rural communities in achieving self-sustainability and disaster preparedness. The study shows that strong infrastructure investments serve as the most efficient strategy to establish fair and environmentally friendly educational systems in remote regions.

1.7 DELIMITATIONS OF THE STUDY

Research work requires this study to follow specific population boundaries which define its study area and its research method. The researcher chose to study Rushinga District because it represents a typical rural community in Zimbabwe which faces severe climate change risks. The research results become less applicable to urban environments when this study limits its scope to specific districts which have distinct climate patterns and infrastructure design requirements. The study examines the main educational stakeholders who include district education officials along with school administrators and teaching staff and local government education and infrastructure officials. The research keeps its primary focus on rural area studies by excluding stakeholders from national and urban school sectors. The study looks at public schools because it excludes private schools which have different resource levels or infrastructural standards. The study focuses on climate hazards which occur

most frequently in Rushinga district while excluding other environmental threats which include earthquakes and human-made hazards like pollution and deforestation. The study limits itself to investigating climate-resilient school infrastructure because it protects schools from climate dangers which affect educational operations. The research study employs specific boundaries to make sure Rushinga village research objectives remain both achievable and specific. The research will use these boundaries to assess how climate-resilient school infrastructure maintains educational services across rural areas in Zimbabwe.

1.8 LIMITATIONS OF THE STUDY

The study faced several challenges because of its restricted time frame and the research participants' tendency to give dishonest answers and the study's budget and resource constraints and its need to depend on information gathered from other researchers. The study faced its biggest challenge when funding constraints caused the researchers to limit their work to ten schools which resulted in a sample that did not represent the full range of educational institutions in Rushinga District. The research team could not access advanced mapping tools because their budget restrictions stopped them from obtaining Geographic Information Systems (GIS) technology. The study collected data through questionnaires and interviews and focus groups which included community members and teachers and school administrators. The researcher used secondary data from official sources and non-governmental organizations to back primary data because the original records contained multiple levels of accuracy. The research defines the specific challenges and climate-resilient school infrastructure development opportunities that exist in this region. The research maintains its transparency through this process which shows all study weaknesses while establishing a strong foundation for future scientific work. The research findings create rural education knowledge through context-specific results which show how climate adaptation works in these areas.

1.9 DISSERTATION OUTLINE

Chapter One: Introduction

Chapter one focuses on the background of the study, purpose of the study, the statement of the problem, significance of the study, delimitations and limitations of the study.

Chapter Two: Literature Review and Theoretical Framework

This chapter focuses on the theoretical framework, literature review, research gaps and scholarly views, critiques and chapter summary.

Chapter Three: research Design and Methodology

This chapter focuses on outlining the methodology that the researcher is going to apply which is the mixed method approach, research design, targeted population, research sample, data collection tools document analysis, data presentation analysis and ethical considerations.

Chapter Four: Data Presentation, Analysis and Discussion of Findings.

This chapter is going to look at the research findings. The findings will be presented, analysed and discussed and compared to other findings from another related studies.

Chapter Five: Summary, Conclusions, Recommendations, and Areas of Further Research.

This chapter focuses on the summary of the whole project, conclusions and recommendations and areas of further research.

CHAPTER TWO

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.0 Introduction

This chapter provides the literature review and theoretical framework of the study, climate-resilient school infrastructure as an intervention to climate hazards and risks. This chapter consist of topics including, theoretical framework, conceptual framework of climate resilient infrastructure, climate hazards and risks, climate hazards and risks affecting school infrastructure, state of school infrastructure and its vulnerability to climate hazards, effectiveness of climate resilient school infrastructure in enhancing safety and continuity of education in the face of climate hazards, challenges and barriers to implementing climate-resilient infrastructure in rural schools, empirical review on climate resilient school infrastructure as an intervention to climate hazards and risks and research gaps.

2.1 Theoretical Framework

The theoretical framework is motivated by the Disaster Risk Reduction (DRR) framework which provides the theoretical foundation for this topic. The Disaster Risk Reduction framework is a systematic approach to identifying, assessing and minimizing the risks posed by disasters, with the ultimate goal of enhancing resilience and sustainable development. The framework posits that disasters are not solely natural events but are also the result of human-made vulnerabilities. The framework focuses on proactive measures to reduce the causes of disasters rather than just reacting to them. The DRR framework is not attributed to a single author but rather to a collective body of work by international organizations and scholars. The United Nations Office for Disaster Risk Reduction (UNDRR), defines DRR as the concept and practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including through reduced exposures to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events (UNDRR, 2009). The DRR framework gained global

prominence through the Sendai Framework for Disaster Risk Reduction 2015-2030, which outlines four priority areas namely, understanding disaster risk, strengthening disaster risk governance, investing in disaster risk reduction for resilience, and enhancing disaster preparedness for effective response and "Build Back Better" in recovery (UNDRR, 2015).

In the context of climate change, DRR is particularly relevant because anthropogenic climate hazards such as extreme weather events, sea-level rise, and prolonged droughts amplify disaster risks. The Intergovernmental Panel on Climate Change (IPCC) highlights that climate change increases the frequency and intensity of hazards, leading to cascading risks that disproportionately affect vulnerable populations, including children and educational infrastructure (IPCC, 2022). Here interventions like climate resilient school infrastructure serve as a practical application of the DRR framework, integrating structural, social, and environmental strategies to safeguard schools against climate-induced hazards. The IPCC's Sixth Assessment Report notes that without adaptation, climate risks to education infrastructure could lead to widespread school closures and learning losses, exacerbating inequalities (IPCC, 2022, pp. 12-15). In low and middle income countries, where over 80% of schools lack basic resilience features, such hazards result in annual economic losses exceeding $1 billion globally (UNESCO, 2020)

The DRR framework addresses these risks by conceptualizing disaster risk as a function of hazard, exposure, and vulnerability (UNDRR, 2015), climate hazards intersect with high exposure and vulnerabilities, creating compound threats. Interventions must target all three elements to be effective. In essence the framework fits the problem at hand in assessing the role of climate-resilient school infrastructure in mitigating the impacts of climate hazards and risks on education in Rushinga.

2.2 Conceptual Framework

This section present the concepts building this study. The concepts include climate resilient school infrastructure and climate hazards and risks.

2.2.1 Conceptualisation of climate resilient school infrastructure

Climate-resilient school infrastructure refers to the design, construction and maintenance of school buildings and facilities that can withstand the impacts of climate hazards while ensuring the safety, functionality and continuity of education. This approach focuses on integrating disaster risk reduction and climate adaptation strategies into school infrastructure development. According to Global Facility for Disaster Reduction and Recovery (GFDRR, 2018), climate resilient schools should include features such as, elevated structures to minimize flood damage, weather resistant materials to withstand storms and extreme heat, rainwater harvesting systems to address water shortages and renewable energy sources, such as solar panels, to ensure power supply during disruptions.

The process of establishing climate-resilient educational institutions requires both building maintenance work and disaster preparedness planning to ensure students remain able to study during emergency situations. A school that maintains operations during dangerous times exists as a fundamental educational right to learning which should remain available to all students during all times. The building of schools in Bangladesh demonstrates successful practice because they construct schools which function as cyclone shelters resulting in reduced school attendance during storm periods (Islam et al., 2019). The schools in Kenya that use rainwater collection together with solar power systems demonstrate that their proper infrastructure enables continuous educational activities during all drought periods (Mugo & Gachanja, 2020).

The established advantages of climate-resilient infrastructure face rural areas because three barriers exist which include insufficient funding and missing technical capacity together with existing regulatory limitations. The rural communities together with low-income governments require major financial resources to construct infrastructure which can withstand climate impacts but they frequently fail to obtain these requirements. The educational institutions in Rushinga District face difficulties when trying to keep their basic facilities operational which becomes more challenging because they must enhance their facilities for contemporary climate requirements (Mutekwa & Musanga, 2018). The presence of short-duration programs creates difficulty for schools because they depend on donor funding which leads to future climate hazards threatening their safety. The development of such structures demands specialized engineering skills which rural areas struggle to fulfill so it creates an educational requirement within the region. The construction skills of local builders exist but they need specialized training in climate-resilient building methods which schools cannot provide to them.

The National Climate Policy 2017 establishes disaster risk reduction and climate adaptation procedures for Zimbabwe yet local implementation of these policies remains deficient. The rural educational institutions operate their schools without following building standards which define essential climate resilience requirements. The responsibilities of the community include maintaining the school facilities. The limited understanding of climate risks together with climate resilience importance creates challenges which stop people from participating in local climate-resilient infrastructure projects.

2.2.2 Conceptualisation of climate hazards and risks

In the context of climate change and environmental management, the conceptualisation of climate hazards and risks is rooted in the framework of Disaster Risk Reduction, adaptation planning and sustainability.

2.3 Climate hazards and risks affecting school infrastructure

Climate change has increased the frequency and intensity of hazards such as droughts, floods, storms and heat waves, which directly affect education systems, particularly in rural areas. Schools are often among the first casualties of climate disasters due to their physical exposure and inadequate infrastructure. According to UNESCO (2021), extreme weather events frequently cause damage to school buildings, force closures and disrupt learning processes. In areas like Rushinga District, where schools are constructed with inferior materials and are therefore extremely vulnerable to storm damage, the repercussions are especially severe.

In Zimbabwe, droughts caused by erratic rainfall patterns have led to water shortages in schools, resulting in poor sanitation and increased health risks for students and staff (Chigwada, 2020). Storms on the other hand, have been known to destroy classrooms, learning materials, and essential infrastructure like latrines and water sources further intensifying educational disruptions. These climate hazards also disproportionately affect marginalized groups, particularly girls, who are more likely to drop out of school when faced with prolonged closure or unsafe learning environment.

2.4 State of school infrastructure and its vulnerability to climate hazards

School infrastructure has mainly been affected by climate hazards such as strong winds, floods and storms around the globe. The changing climate is creating additional challenges in maintaining a healthy school environment, (Baez & Santos, 2007). In countries like Mozambique according to Kevin (2021), poor school infrastructure had been affected by Cyclone Idai and over 3400 classrooms have been affected in 2019 leaving more than 305 000 children without schools. These cyclones have continued to destroy schools in Mozambique in 2023 and 2024.

Also in Kenya, floods submerged three primary schools in Kadibo Sub-country with one school accommodating over 1000 displaced students in 2024 (Arreyndip & Kitengu, 2024). These have been

caused by poor school infrastructure in Kenya, disrupting schooling for over 2 million learners and loss of materials. In South Africa, reports have indicated that many students faced difficulties in concentration during hot weather, with a high percentage experiencing heat-related symptoms, (Lunga & Tshabalala, 2025).

2.5 Effectiveness of climate resilient school infrastructure in enhancing safety and continuity of education in the face of climate hazards

Using robust construction materials and incorporating sustainable practices such as renewable energy sources can help in withstanding climate change impacts and functionality of schools under climate changing conditions (UNOPS, 2022). Quality and resilient infrastructure places learners on a pathway to inclusive quality education. According to World Bank, (2024), children with better infrastructure generally tends to perform better in school than those without. Moreover, schools can serve as community hubs during climate-related disasters, providing safe havens for families. For example, according to UN-Habitat, (2023), the "Building Back Better" philosophy emphasizes strategic planning and investment in infrastructure to save lives and enhance community resilience.

In Mozambique, for example, climate resilient schools have been constructed to withstand cyclones after the 2019-2021 cyclones and serve as emergency shelters, demonstrating the effectiveness of this approach. An article by the South African Institute of International Affairs, (2021), highlighted that, the Mozambique's Beira Recovery and Resilience Plan addressed the repair of critical institutions like schools after Cyclone Idai.

The Community-Based Earthquake Resilient School Construction in Nepal is one of the successful examples of school-resilient infrastructure recorded. According to Asian Development Bank, (2019), the Community School Construction Project Supported by the Asian Development Bank

and the Government of Nepal enabled the local communities to build earthquake-resilient classrooms using locally sourced materials and labour.

2.6 Challenges and barriers to implementing climate-resilient infrastructure in rural schools

Muzari, (2023), views barriers as conditions or factors that are largely insurmountable which render DRR, climate change adaptation and resilience ineffective. Funding limitations, lack of technical expertise, community engagement, equity considerations and long term sustainability are some of the challenges that can hinder the implementation of building resilience in school infrastructure. According to Global Partnership for Education (2020), effective and sustainable school infrastructure approach is more effective when they approach from grassroots participation and decentralized governance. Centralised planning is one of the major challenges in implementing this idea of climate-resilient school infrastructure. A study by Nyahunda, (2024), shows that barriers including poverty, inadequate information about climate change adaptation, and lack of adequate institutions that supports adaptation and outbreak of health emergencies have limited the implementation of climate resilient school infrastructure in Zimbabwe.

2.7 Evidence-Based analysis of climate resilient school infrastructure as an intervention to climate hazards and risks

A research from Mozambique in 2022 focused on the impact of cyclones on school infrastructure and the effectiveness of resilient building practices, (World Bank, 2022). The methodology included a mixed-methods approach, combining quantitative data from damage assessments after Cyclone Idai with qualitative data from focus group discussions with teachers, parents, and community leaders. According to the study, schools with higher foundations and

reinforced concrete fared considerably better during Cyclone Idai than older, conventional structures. The best method to keep school communities safe during future storms, according to the study, is to use local materials, involve the community in building, and improve early warning systems.

Typhoon impacts on local schools in the Philippines were examined in a 2021 UNICEF and Department of Education review. Through building surveys and interviews with local officials, researchers discovered that many older schools were just not built to withstand the powerful typhoons that have been occurring recently, causing significant delays in instruction. To help everyone react more skillfully when a crisis arises, the researchers recommended tightening building regulations, modifying already-existing facilities that are in danger, and directly teaching disaster preparedness in the classroom.

The UNDRR study which Chile conducted in 2023 evaluated how school facilities function during tsunami and earthquake emergencies. The research proved that engineers and architects can protect structures from total failure through performance-based design together with routine maintenance activities. The Chilean tragedy taught its most important lesson through its demonstration that schools must function as emergency shelters. The facilities must have higher structural strength because they need to protect both students and the entire community during emergencies.

2.8 Research gap

The literature mentioned above fails to provide any information about climate-resilient school infrastructure which serves as a solution for climate-related dangers that affect Zimbabwe's Rushinga District. The global studies deliver essential and dependable information but they fail to show the specific challenges and opportunities that exist in Rushinga. The study aims to achieve its objectives by investigating the environmental threats which local school infrastructure encounters and the present

condition of the buildings which show their climate vulnerability to environmental hazards and the efficiency of climate-resilient school infrastructure which enhances educational security during climate emergencies and the implementation challenges of climate-resilient infrastructure in rural educational institutions. The research presents a complete understanding of how to build and operate schools in African rural areas which lack essential resources through its examination of school engineering methods. The project aims to provide local leaders with specific information which will enable them to create better targeted programs.

2.9 Chapter Summary

The chapter presented a complete analysis of climate-resilient school infrastructure which began with a discussion about why schools need this type of resilience in their educational settings. The researcher created a theoretical framework to study climate dangers which specifically impact school infrastructure. The current state of school infrastructure shows built-in vulnerabilities which make it prone to disasters which endanger student security and disrupt educational activities. The study scientifically assesses climate-resilient infrastructure to determine how it protects against climate-related dangers while maintaining operational security. The research focused on key elements which hinder resilience development by examining both funding shortages and the absence of necessary technical skills. The researcher studied past research to unveil major literature deficiencies which demonstrate the critical need for upcoming studies in this essential research area. The third chapter of this document expands upon the initial review by presenting the research strategy and methods which researchers used to fill the knowledge gaps and evaluate climate resilient school infrastructure performance.

CHAPTER 3

RESEARCH METHODOLOGY AND DESIGN

3.0 Introduction

The complete study methods are detailed in this chapter. The chapter presents an extensive description of the research design together with all data sources and target population and sample size and sampling methods and research instruments and data collection methods and data analysis techniques. The researchers conducted the study using a mixed method approach which combined qualitative data for stakeholder perspective research together with quantitative data for measuring the actual impacts of climate resilient school infrastructure changes.

3.1 Research Philosophy

The study used its pragmatism philosophy to create a mixed method research design which perfectly matched its requirements. The research problem requires information to be used by researchers from different theoretical backgrounds which decreases their need for an exclusive research method (Cresswell & Clark, 2018). The research used pragmatism to connect quantitative methods which provided measurable data about school infrastructure resilience with qualitative methods that showed how these interventions changed school routines and community views. The social nature of climate change together with its technological aspects makes this philosophy suitable for studying climate change.

3.2 Research Methodology

The research used a Mixed Methods approach which combines qualitative and quantitative data and analysis to achieve deeper understanding of the research topic that each individual method cannot provide. The research used this method which originated from pragmatic philosophy to study the complex subject of climate resilience. The method which uses only quantitative measurement fails to

detect structural vulnerability but it successfully identifies maintenance standard operating procedure violations. A study which uses qualitative methods would have captured deep insights about student perception and teacher issues but it would have lacked the statistical capability to apply results across Rushinga District which is necessary for establishing policy priorities and intervention points. The mixed method approach used qualitative data to investigate fundamental functions and personal experiences and contextual meanings while quantitative data demonstrated patterns and widespread occurrences and general applicability. The method generated resilience indicators which Rushinga's unique environmental and social characteristics rendered both observable and measurable.

3.3 Research Design

Research design according to Kothari (2004) establishes research data collection and assessment standards which span data collection methods and measurement techniques and data analysis procedures. The Mixed Method model study technique involved simultaneous collection of both quantitative data and qualitative data which researchers later analyzed separately. The study required case study methodology because it examined climate-resilient school infrastructure as climate hazard response measure for Rushinga District.

The researcher developed a structured survey questionnaire to gather quantitative data from a specific group of Rushinga schools. The researcher used stratified random sampling to select schools which represented every geographic area of the Rushinga District. The ten selected schools received responses from teachers and administrators and district education officials. The data collection process used a structured questionnaire which contained both closed-ended questions and Likert-scale questions.

3.4 Population and Sample

The target population was geographically bounded by the Rushinga District in Mashonaland Central Province, Zimbabwe. The study population encompassed institutions and individuals directly involved in the provision and management of education and infrastructure within the district. As Kumar et al. (2013) described sample size as the total number of subjects in the sample, this include, but is not limited to administrators and staff of schools in Rushinga, relevant public sector officials like those from Rushinga RDC, Ministry of Primary and Secondary Education (MOPSE), and the School Development Committee. The target population included members of the Department of Civil Protection, commonly known as Civil Protection Unit operating in Rushinga District. A total of ten schools will be selected with school heads as respondents, together with representatives from the above mentioned departments and FDG participants giving a targeted sample size of fifty (50) participants. To ensure accurate representation, the sampling frame for the quantitative phase consisted of a list of registered schools within the district. Kothari (2004) emphasizes that the sample size should neither be too small nor too large, but one that fulfils the criteria of representativeness, efficiency, reliability, flexibility and precision.

3.5 Sampling methods

The Mixed Methods design mandated the use of two distinct sampling strategies to fulfil the exploratory and confirmatory goals of the study. For the qualitative phase requires, Purposive Sampling was utilized. This relied on the researcher's judgement to select participants with expert knowledge or specific experience relevant to research questions. Criterion Sampling was used to select headmasters and administrators whose schools fall into 'very poor' infrastructure categories to gain first-hand accounts of critical failure and intervention needs.

3.6 Data collection methods

Data collection involved a mix of instruments. A structured survey questionnaire was administered for quantitative data, including closed-ended questions on topics such as the frequency of climate hazards, infrastructure costs and perceived risk reduction. A school infrastructure checklist was also used to assess school assets using a five-tier rating system (C-1: Very Poor to C-5: Excellent). For qualitative data, semi-structured interviews were conducted with stakeholders. Interviews explored participants' subjective experiences to climate hazards, the effectiveness of existing mitigation programs, operational challenges related to facility maintenance and social vulnerabilities. The interviews were recorded with consent.

3.7 Validity and reliability

Both reliability and validity are cornerstones of research quality, thoroughly addressed in this chapter to establish the trustworthiness of the methodology. Reliability refers to the consistency of a measurement, ensuring that if the research are repeated under the same conditions, it would yield stable and consistent results (Middleton, 2019). Validity conversely, addresses the accuracy, verifying that the research instrument truly measures what it intends to measure, thereby ensuring that the conclusions drawn, are meaningful and correspond to the real-world phenomenon. This helped the researcher in providing critical evidence to the reader that the data is sound, the findings are defensible and the study's overall contribution to knowledge is credible and replicable.

3.8 Data presentation and analysis

Both data presentation and analysis are critical components of the project. Serving as a link or between the raw data collected and the final research conclusion. Data presentation involves organizing, summarizing and displaying the collected data in a clear and understandable format,

(Saunders, 2019). In order to evaluate the arranged data and derive significant insights that directly answer the study questions, data analysis subsequently entails the application of methodical approaches, such as statistical tests (Creswell, 2014).

3.9 Ethical Consideration

The research needed ethical assessment to safeguard study participants while preserving the integrity of the research. The researcher obtained research authorization from Rushinga RDC Local Authority and District Development Coordinator. The participants demonstrated their understanding of study objectives through the informed consent process which included studying associated risks and benefits. The participants received confirmation that they could choose to take part in the study or stop participating whenever they wanted. The study used anonymization to protect data confidentiality while providing extra protection to vulnerable participants. The study results showed that community-based climate resilience research benefited from the study's beneficial research approach which used beneficence research principles.

3.10 Chapter Summary

The chapter explained the investigation which studied climate resilient school infrastructure through a mixed method research approach. The research used a convergent parallel design with a pragmatic foundation to analyze quantitative and qualitative data which produced valuable insights. The study must include defined population and sample selection together with appropriate data collection methods and validation and reliability testing and ethical requirements.

CHAPTER 4

DATA PRESENTATION, ANALYSIS AND DISCUSSION OF FINDINGS

4.0 Introduction

The chapter presents study results which assess climate-resilient school infrastructure as a solution to climate hazards, based on information from ten schools and key informants in Rushinga District. The study employs mixed method research by using purposive sampling for qualitative interview insights and stratified random sampling for quantitative survey data. The results display a continuous sequence which fulfils the research objectives about climatic risks, infrastructure vulnerability, and assessment of resilience strategy effectiveness.

4.1 Actual Respondents Participated in the study

Participants interviewed through in-depth interviews were fourteen including school heads from Bopoma Secondary, Kamanika Secondary, Rushinga High School, Katakura Secondary, Nyatsato Secondary, Chitepo primary, Rusambo primary, Chimhanda primary, Manetsera primary and Chaparadza primary. The school heads also participated in questionnaire answering during the study. In Focal Group Discussions (FGDs) sessions, thirty respondents participated fully in the study. Five groups had six members each giving a total of thirty. The focal group discussion comprised of community members (who also participate in the school feeding programme), School Development Committee (SDC) members and councillors in some of the discussions improving the likelihood of representing the whole communities within Rushinga District.

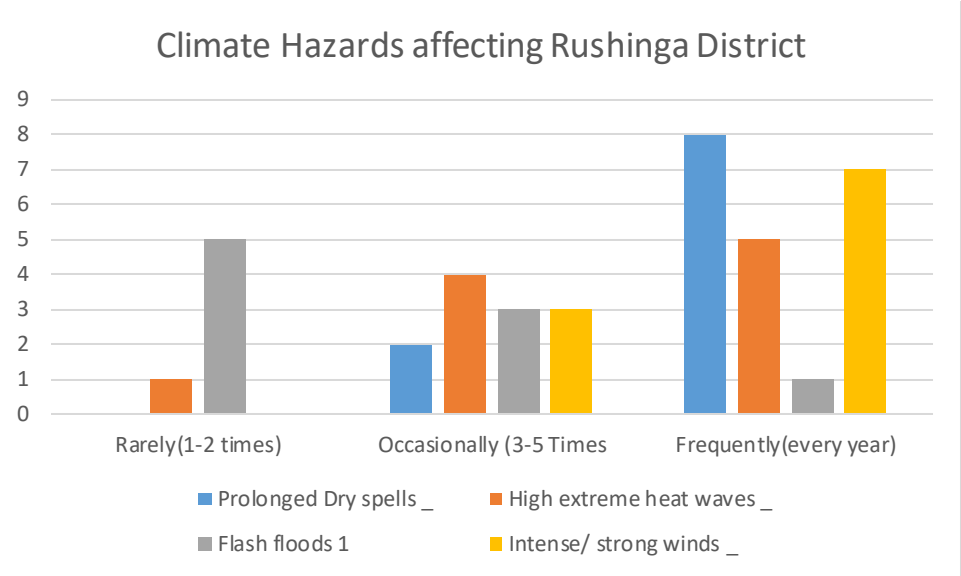
Table 4.1: Actual Respondents' Table

Respondents and Organisation	**Method for Data Collection**	**Expected respondents**	**Number of Actual Respondents**
Rushinga RDC	Interview	1	1
District Schools Inspector	Interview	1	1
District Development Coordinator	Interview	1	1
Civil Protection Unit	Interview	1	1
School Heads	Interviews and Questionnaires	10	10
Community members, SDC members and Councillors	Focal Group Discussion	**30**	**30**
Total Respondents			**44**

4.2 Profile of Climate Hazards in Rushinga District

The first research objective sought to identify climate hazards affecting schools. Data from the school heads indicates a high frequency of extreme weather events. Rushinga District is geographically situated in a region characterised by high climatic sensitivity and environmental insecurity. The district predominantly falls within regions 4 and 5, agro=-cological zones known for erratic rainfall patterns and susceptibility to prolonged droughts (Chikodzi, 2021). According to United Nations Development Program (UNDP, 2022), the socio-economic landscape is defined by human insecurities that threaten livelihoods, unsustainable landscape management and the degradation of forest and land resources all of which contribute to a low adaptive capacity among households

Table 4.2: Frequency of Climate Hazards over the last Five years



Note: Data stimulated based on the 10 school sample

The data reveals that drought prolonged dry spells and strong winds are the most persistent threats in Rushinga with 80% and 70% of schools reporting frequent occurrences respectively. These findings align with the literature stating that Rushinga falls within natural regions four (4) and five (5), characterised by erratic rainfall and high sensitive to climate deviations (Zimbabwe Meteorological Services Department [ZMSD], 2023).

4.3 Current State of School infrastructure and vulnerability

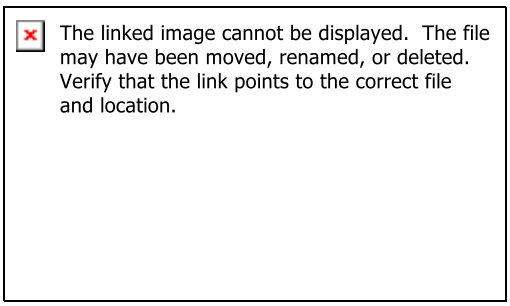
The study found out that 70% of the sampled schools possess infrastructure that is not climate-resilient, while only 30% demonstrates resilient features. It is the constructional materials and old pre-damaging conditions relating to the historical damage patterns (Kelman, 2020). The findings reviewed that most of the schools in Rushinga do not have suitable infrastructure that can withstand the types of climate hazards that are experienced ever year, making the infrastructure prone to severe climate disasters and even very chronic in other school. These disasters are linked to material vulnerability that

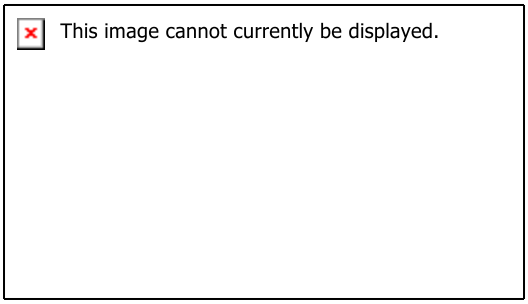
is schools using "bricks and asbestos" were more susceptible to damage during intense winds compared to those with stable reinforced roofs.

One of the school heads has this to say:

> *"Our school currently falls into the low resilience category because the majority of our classrooms are constructed from bricks with aging asbestos sheets. During the last major storm, we experienced structural failure starting from the roof. The wind simply lifted the sheets because the timber was old and not reinforced. We have had to do major repairs on more than five classrooms in the last five years.*

FIG 4.1 Showing effects of climate disasters on some of the sampled schools in Rushinga.





Interviewees described a typical damage pattern where heavy storms first cause roof failures, walls destruction followed by water damage to internal teaching materials. United Nations Office for Disaster Risk Reduction (2020), highlighted that once a roof is compromised, a cascading effect of damage occurs that is heavy rainfall penetrates the interior destroying textbooks, teaching materials and furniture. In non-resilient schools educational activities are rarely or never able to continue during such climate hazards, exacerbating learning losses as argued by Save the Children (2021). The "C-1 to C-5" rating system utilised in structural assessments highlights this disparity, with many rural schools falling into the Very Poor to Poor categories, indicating a failure to meet even basic safety

standards for climate protection. These are mainly caused by the above mentioned structural failures whereby there will be damage in learning materials such as text books.

4.4 Effectiveness of Resilience Interventions

The 30% of schools that have incorporated climate-resilient features show a notable increase in safety and educational continuity compared to the vulnerabilities shown in non-resilient facilities. To lessen the effects of flash floods and strong winds, schools frequently use higher foundations, reinforced steel trusses, and storm-proof roofs. The ability of resilient schools to continue operating during and immediately following a climate disaster, serving as "safe zones" for both children and the larger community, is evidence of the efficacy of these efforts, according to Wisner (2021).

One important finding of the study is the relationship between academic achievement and infrastructural quality. Children who have access to superior school infrastructure typically perform better than those who do not, according to a comparison of pass rates between resilient and non-resilient schools. The World Bank (2024) supports this conclusion by pointing out that resilient school environments lower psychological stress and absenteeism, fostering a favorable learning environment. The District Development Coordinator (DDC) in Rushinga highlighted the indispensable role of non-governmental organisations in bridging the financial and technical gaps that prevent rural schools from adopting resilient standards. This support the “Building Back Better” philosophy that move beyond simple repairs to incorporate reinforced structures capable of withstanding future hazards (UNDRR, 2015). The involvement of Civil Protection Unit (CPU) and the Rushinga Rural District Council ensures a unified approach that prioritizes long-term safety and educational continuity for the most vulnerable learners.

“NGO’s are indispensable partners within the district as they are bridging in the financial and technical skills gap that often prevents rural schools from adopting resilient building standards.

Their involvement ensures that post-disaster reconstruction moves beyond simple repairs to incorporate Build Back Better initiatives such as reinforced structures to withstand future hazards. By coordinating with the DDC's office and the Rural District Council, external partners, giving an example of World Vision help create a unified approach that prioritizes long-term safety and educational continuity to the most vulnerable learners".

4.5 Barriers to implementing resilient infrastructure

The primary barrier identified by 100% of school heads in Rushinga is the prohibitive cost of resilient construction. According to Muzari (2023), Zimbabwe's economic trajectory has made it more difficult to establish and execute effective climate change management strategies. Due of the high rates of poverty in rural areas, community contributions are sometimes restricted to local materials and manual labor rather than the financial resources needed for contemporary engineering components. Weak and disorganized local institutions are a major barrier to resilience building, according to Nyahunda (2024). There is a notable absence of a dedicated budget line for climate-resilient maintenance within Rushinga district and the lack of standardised resilient designs leaves many schools without a technical blueprint for adaptation. While national policies like the National Climate Policy 2017 exist, their implementation at the grassroots levels remains fragmented.

One of the FGD's participant said;

"Hatina hedu mari nezvikwanisiro zvekuti vana vadzidzire muzvivakwa zvisina njodzi, asi takawana rubatsiro tinobatirana nechikoro chedu" (While we lack the financial means to help in the climate-resilient school infrastructure construction, we are always ready to contribute our physical strength and local labour.") We see value in protecting our children education, so we participate by providing manual efforts needed to repair roofs and latrines immediate after a storm hits our school" he said.

Nalau & Handmer, 2021) argued that a lack of adequate information about climate change adaptation and a shortage of specialised technical skills further hinder progress. Designing and constructing climate-resilient infrastructure requires expertise in disaster risk science that is often unavailable to rural schools (Global Facility for Disaster Risk Reduction, 2019). These climate change disruptions have far-reaching implications for human capital particularly for the youth population who will form Africa's future workforce. Ziti et al. (2024) investigate the impact of climate-induced disasters on access to education revealing that girls are disproportionately affected. Prolonged school closures and economic stress often force into child labor or early marriages as a coping mechanism for household survival as highlighted by UNICEF (2021). The loss of safe learning environments removes a critical layer of protection for female students in disaster-prone rural areas and Mutasa (2022) notes that rural learners resort to outdoor lessons or temporary shelters following the destruction of infrastructure.

4.6 Chapter Summary

The researcher collected data about climate-resilient school infrastructure through the use of questionnaires and structured interviews to study climate risk and hazard protection in Rushinga District. The researcher presented the gathered information through table and bar graph visualizations. The study results showed that Rushinga District school infrastructure remains highly vulnerable because 30% of schools possess climate-resilient features while 70% depend on weak construction materials. The existing deficiencies need government coordination and technical support and institutional funding and strategic partnerships with external organizations to achieve their resolution. The upcoming chapter will present the summary and conclusion and the recommendation section.

CHAPTER 5

SUMMARY, CONCUSION AND RECOMMENDATIONS

5.0 Introduction

The research findings, conclusion, and practical suggestions for enhancing the climate resilience of school infrastructure in Rushinga District are all covered in detail in this chapter. The growing frequency of climate-related risks, which have disproportionately impacted the education sector in this north-eastern region of Zimbabwe, served as the impetus for the study.

5.1 Summary

The research evaluated climate-resilient school infrastructure in Rushinga District Zimbabwe to determine its effectiveness against climate dangers. The study emerged because the district experienced more climate disasters that damaged educational services and endangered student and teacher safety. The study used a mixed-method approach that combined quantitative survey data from structured questionnaires with qualitative insights from in-depth interviews and Focal Group Discussions, all under the guidance of the Disaster Risk Reduction (DRR) framework and a pragmatic mindset.

The fact that there is little research on the use of climate-resilient school infrastructure in rural Zimbabwean schools, despite the relevance of such infrastructure being recognized globally, served as the impetus for this study. The goal was to find out how climate-resilient school infrastructure may be used as a successful intervention to reduce climatic hazards and preserve academic continuity. The theoretical and conceptual frameworks supporting this investigation were constructed in Chapter Two, which also evaluated pertinent literature. According to the literature, climate-resilient

infrastructure includes elevated buildings, weather-resistant materials, rainwater collection systems, and all other elements intended to keep schools running both during and after climatic disasters.

Chapter three outlined the research design and methodology adopted to address the study objectives. This design was selected because climate resilience is a multifaceted phenomenon requiring both statistical measurement of physical vulnerability and rich qualitative understanding of lived experiences, community perceptions and institutional dynamics. Chapter four presented, analysed and discussed the findings of the study in relation to each research objective.

The findings revealed a significant resilience gap with 70% of schools possessing non-resilient structures built from vulnerable materials while 30% of schools have implemented resilience strategies showing high educational continuity. The majority of the district remains hindered by a lack of dedicated institutional funding, a technical skills gap and absence of standardized resilient building codes.

5.2 Conclusions

The study concludes that school infrastructure in Rushinga District is in a state of high physical vulnerability with the highest number of sampled schools lacking the necessary resilient features to withstand the region's frequent climate hazards. The study concluded that climate hazards in Rushinga District are no longer "extreme events" but have become a normalised part of the district's environmental profile. The high frequency of intense winds and flash floods confirms that any non-resilient school built without climate-specific engineering is destined for structural failure. This vulnerability is primarily a result of resilience gap caused by the use of substandard building materials which lead to frequent structural failures and the cessation of educational activities during climate events. The research proves that ordinary traditional building methods are no longer sufficient for the current climate trajectory of natural region IV and V.

With respect to the second objective, this study concludes that the current state of school infrastructure in Rushing is fundamentally incompatible with the climate realities in Rushinga. The predominance of brick and aging asbestos construction, the absence of reinforced structural supports and the near-universal lack of flooding mitigation designs features collectively represent a decades-long failure to align infrastructure investment with environmental risk.

There is a definitely causal link between the 70% non-resilience rate and the disruption of the right to education. Conversely the 30% of schools that has successfully implemented resilient infrastructure, proves that resilient-infrastructure is a highly effective tool for maintaining educational continuity and protecting the safety of learners. The use of non-resilient infrastructure is not merely a matter of aesthetics but a significant barrier to human rights, mainly affecting the education sector. While infrastructure fails, the resulting learning poverty is obviously exacerbated as students in the District lose more instructional days as compared to those in more resilient schools.

The study also concludes that the barriers to climate-resilient school infrastructure in Rushinga are systematic, interlocking and deeply rooted in structural conditions that will not yield to isolated or short term interventions. The identification of prohibitive construction costs by 100% of schools heads is not simply a financial complaint, but a reflection of Zimbabwe’s broader economic constraints .While local communities are willing to provide manual labor, the transition to a climate-resilient education system is currently stalled by systematic institutional barriers including the absence of a dedicated government budget line and a significant lack of technical construction expertise at the local level. In the end, this study comes to the conclusion that Rushinga's school infrastructure must be transformed from a persistent liability into a true resilience asset. The task at hand requires political dedication and ongoing financial support together with technical standards that must be enforced by all government stakeholders who need to work together as a team to achieve the goal.

5.3 Recommendations

The study findings have been used to create these specific recommendations which will solve the identified study problems.

1. **Budgetary allocation and policy:** The Ministry of Primary and Secondary Education should work together with Rushinga Rural District Council to create a permanent budget framework which will fund climate-resilient school infrastructure construction maintenance and retrofitting activities.
2. **Resilient Design Standardization**: The District Schools Inspector (DSI) together with Rushinga Rural District Council (RRDC) must create and implement climate-resilient building codes which reflect Rushinga's environmental conditions to ensure that all new buildings can withstand both strong winds and flash floods.
3. **Building Technical Capacity:** The District Development Coordinator needs to establish educational programs which will help local builders and community members gain technical skills for resilient construction work beyond their current manual labor capabilities.
4. **Strategic Stakeholder Coordination**: A unified coordination system needs to be established between Civil Protection Unit and Local Government and Non-Governmental Organizations so that post-disaster rebuilding projects will create resilience instead of repeating previous vulnerabilities.

5.4 Areas of further research

1. **Strategic Stakeholder Coordination**: To guarantee that post-disaster reconstruction complies with resilience, a formal, unified coordination framework involving the Civil Protection Unit, Local Government, and Non-Governmental Organizations should be established,

2. **Build Back Better vs. Conventional Repair**: A Cost-Benefit Analysis to compare the lifecycle costs of climate-resilient construction with Rushinga's present reactive maintenance cycle, a thorough economic analysis is advised.
3. **The importance of Indigenous Knowledge Systems (IKS) in Infrastructure Resilience:** Although this study concentrated on contemporary engineering solutions, there is still a knowledge gap regarding the scientific integration of traditional, local building methods with contemporary robust designs.
4. **Longitudinal Effect on Academic Performance**: Future research should compare student performance over time between the 30% of schools with robust infrastructure and the 70% that do not.

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Appendix 1: Permission letter


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Appendix 2: Interview Guide for School heads

Interview Guide

Preamble

My name is Angeline Sumbureru. I am a Bachelor of Science Honours Degree in Peace and Governance student at Bindura University of Education (BUSE). I am conducting a research study titled, "Climate resilient schools infrastructure as an intervention to climate hazards and risks: A Case of Rushinga District in Zimbabwe". These interviews targets school heads, community members, councilors, local authority representative, District Schools Inspector, District Development Coordinator and a member from Civil Protection Unit in investigating how climate resilient schools infrastructure can help schools prepare for, withstand and recover from climate related hazards and risks in Rushinga District. The interview is intended to gather your views and experience regarding climate hazards affecting schools, the resilience of existing school infrastructure, challenges faced by schools and communities and possible measures for implanting climate resilience in schools infrastructure. Your participation in this interview is voluntary and the information you provide will be treated with strict confidentiality and will be used solely for academic research purposes.

Interview Guide for School heads

Part A: Profile of climate hazards and risks.

i. In your experience, which climate hazards have most frequently disrupted your school over the past five years?
ii. Beyond physical infrastructure damage, what secondary risks does the school face following a major climate event?

Part B: Current state of infrastructure and vulnerability.

i. Can you walk me through the typical damage pattern, where do you see structural failures first during a heavy storm or long drought?(e.g. roofs, foundation, water tanks)
ii. What are the main construction materials used in your schools classrooms? Do you believe these materials are adequate for the climate conditions in Rushinga?
iii. Has your school undergone any formal structural assessment or inspection focused on climate vulnerability?
iv. When damage occurs, what are the skills and resources available with the local Rushinga community to undertake repair work? What are the limitations of these local capacities?

Part C. Effectiveness of resilience interventions.

i. Has your school implemented any climate resilient features such as reinforced roofing, elevated foundations, and storm proof trusses?
ii. Can you provide a specific example of how climate resilient features in your school prevented or significantly reduced damage or injury during a recent climate hazard?
iii. How does the school proactively plan to ensure learning continues immediately after a major event? Do you have designated safe zones or temporary learning spaces?

Part D. Challenges and barriers.

i. Construction costs have been identified as a primary barrier in this study, Can you specify which costs are the most prohibitive for rural schools like yours?
ii. What kind of technical support or guidance do you receive from the District and the Ministry of Education? Is it practical for the Rushinga Context?
iii. If you had the authority and resources to make one significant change to improve your school's resilience to climate hazards, what could it be?

Appendix 3: Interview Guide for Rushinga Rural District Council.

Planning, Budgeting, Land Use and Infrastructure standards.

A1. Does the RDC incorporate climate risk data (e.g. drought forecast, strong winds) into its rural planning and zoning decisions for school construction?

A2. What are the RDC's current land use by-laws regarding the siting of critical infrastructure, particularly schools, in hazard prone areas of Rushinga?

A3. Does the RDC possess an inventory or database of school infrastructure and does it include a component for structural integrity or vulnerability assessment?

A4. What role does the RDC play in approving building plans for schools and are there specific RDC-mandated standards for climate resilience?

A5. Can you describe the RDC's capital budget allocation process for educational infrastructure? Is there a dedicated vote or fund for climate resilient upgrades?

A6. What role does the RDC play in mobilizing local resources (e.g. labour, materials, levies) to contribute to school infrastructure rehabilitation after a climate disaster?

Appendix 4: Interview Guide for District Schools Inspector (DSI).

Educational Continuity, policy implementation and administrative oversight.

A1. What data or reporting mechanism does the DSI's office use to track the frequency and educational impact (e.g. damage reports) of climate hazards across Rushinga schools?

A2. How does the DSI ensure continuity of teaching and learning immediately following a climate event (use of tents, merger of classes)?

A3. Are there Ministry of Education policies or guidelines the DSI uses to promote climate-resilient infrastructure and how are these guidelines monitored at the school level?

A5. What are the major administrative and technical constraints encountered by your office when trying to support schools with resilient standards?

A6. To what extent does the lack of standardized climate-resilient school designs hinder the efforts of schools and communities to build back better?

Appendix 5: Interview Guide for Civil Protection Unit Official.

Disaster Risk Reduction, emergency response and coordination.

A1. Which specific climate hazards (e.g. cyclonic winds) does the Civil Protection Unit prioritize in its planning for Rushinga District, and how are these communicated to schools?

A2. Does the Civil Protection Unit have a formal mechanism for assessing the structural safety of schools immediately before and after a disaster?

A3. How effectively do the school premises currently function as designated evacuation centres or safe zones during a climate emergency and what facilities are lacking for this function?

A4. Describe the typical coordination challenges between the Civil Protection Unit, Ministry of Education and the Rural District Council during the response phase immediately following a disaster affecting school infrastructure.

A5. What role can climate-resilient school infrastructure play in reducing the overall CPU resource burden during an active hazard event?

Appendix 6: Interview Guide for District Development Coordinator.

High-level policy alignment, stakeholder coordination and resource mobilisation.

A1. In the context of the District Development Plan, what are the top three climate-related risks prioritized for the education sector in Rushinga?

A2. How is the DDC's office coordinating the efforts of different stakeholders (RDC, DSI, NGO's traditional leaders) to ensure a unified approach to resident school construction?

A3. What mechanisms are in place to ensure that post-disaster reconstruction funding adheres to "Build Back Better" principles, rather than simply replicating vulnerable structures?

A4. What are the key institutional or political barriers preventing large scale investment in climate-resilient infrastructure in rural schools across the district?

A5. How can external partners (NGO's, donors) be strategically engaged to fill the financing and technical skills gap necessary for implementing resilient schools projects in Rushinga?

Appendix 7: Questionnaire guide for School Heads

Section A. Identification of Climate Hazards and Risks

A1. Please indicate how often your school has been significantly affected by the following climate hazards over the last five years.

Hazard	Never	Rarely(1-2 times)	Occasionally (3-5 times)	Frequently (every year)
A1. Drought/ Prolonged Dry spells	☐	☐	☐	☐
A2. High Extreme Heat Waves	☐	☐	☐	☐
A3. Flash Floods	☐	☐	☐	☐

A4. Intense/ Strong Winds	☐	☐	☐	☐
A5. Outbreak of waterborne diseases	☐	☐	☐	☐

Section B. Current Infrastructure state and its vulnerability

B1. Main Building Material: The majority of your school's classrooms walls are constructed from:

- ☐ Bricks with a stable roof
- ☐ Bricks and asbestos
- ☐ Pole and dagga
- Others (Please specify) ----------

B2. In the past five years, how many classrooms have required major repair or reconstruction due to climate-related damages (e.g. storms, high winds, floods?)

- ☐None
- ☐1-2 classrooms
- ☐ 3-5 classrooms
- ☐More than 5 classrooms

B3.How would you rate the current overall physical resilience of your school infrastructure to the typical climate hazards in Rushinga District?

- ☐ very low resilience
- ☐ low resilience
- ☐ moderate resilience
- ☐ high resilience
- ☐ very high resilience

Section C. Effectiveness of Resilience Interventions

C1. Has your school implemented any climate-resilient construction or retrofitting features (e.g. storm proof roofs, raised foundations)

- ☐ Yes, comprehensive measures are in place
- ☐ Yes, some minor are in place
- ☐ No, but it is planned
- ☐ No and it is not planned

C2. When a climate hazard occurs, how often are you able to continue educational activities?

- ☐ Always
- ☐ Most of the time
- ☐ Rarely
- ☐ Never

C3. If climate-resilient infrastructure was implemented, how effective do you feel it has been in protecting students and staff during a climate event?

- ☐ very effective
- ☐ effective
- ☐ ineffective
- ☐ not applicable

Section D. Implementation challenges and Barriers

D1. Does the school or district have a specific, dedicated budget line item for climate-resilient infrastructure maintenance or development?

- ☐ Yes, a sufficient budget is allocated
- ☐ Yes, the budget is insufficient
- ☐ No, there is no funding available
- ☐ No, funding is sought when needed

D2. What is the most significant barrier to implementing/ maintaining climate-resilient infrastructure in your school?

- ☐ financial constraints
- ☐ lack of technical skills
- ☐ lack of information
- ☐ low awareness/ prioritization
- ☐ inadequate policy

D3. To what extent does the local community support or participate in efforts to make the school infrastructure more resilient?

- ☐ strong support and participation
- ☐ moderate support, but limited participation
- ☐ low support and limited participation
- ☐ no support and participation