FACTORS INFLUENCING SMES' COPING STRATEGIES TO CLIMATE VARIABILITY AND CHANGE IN KAJIADO COUNTY

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DECLARATION

I declare that this is my original work and has not been previously submitted for the award of a degree to this or any other University. To the best of my knowledge, the thesis does not contain any material previously published or written by any other person except where due reference is made in the thesis itself.

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ABSTRACT

This study was undertaken in Kajiado county to determine the influence of awareness and knowledge, resource availability, technology capacity and size of the organization on SMEs' coping strategies to climate variability and change. The research design utilized for the study was descriptive. The research targeted registered SMEs in Ongata Rongai Sub County, with 372 SMEs according to the records in the sub-county. Due to the limited number, a census of all the SMEs was conducted and the owners of the SMEs were the respondents. The collection of primary data involved the utilization of structured questionnaires that incorporate a series of closed-ended questions. The study used a multivariate probit (MVP) to determine how the independent variable relates to the dependent variable, The results show that SMEs in Kajiado County adopt coping strategies to climate variability and change as complements. Results also show that the availability of financial resources, access to climate change information, technology capacity and organization size are the major determinants of the coping strategy adopted. In Kajiado County, where the impacts of climate variability and change are increasingly evident, fostering awareness and knowledge among SMEs is pivotal for economic resilience and environmental sustainability. Implementing a series of recommendations can significantly contribute to a positive impact on climate adaptation and mitigation efforts. Targeted awareness campaigns should be initiated, specifically designed for SMEs operating in the region. These campaigns facilitated through collaborations with local environmental organizations and community leaders, aim to educate businesses about the current and potential implications of climate change. Workshops, seminars, and training sessions can serve as valuable platforms for disseminating information on climate-resilient business practices. Harnessing available technology is pivotal for SMEs in Kajiado County to effectively cope with the challenges posed by climate variability and change. There is a need to promote the adoption of climate-smart technologies among SMEs. This involves encouraging the use of advanced weather forecasting tools and data analytics that provide real-time, localized information on climate patterns.

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LIST OF ABBREVIATIONS

SSA - Sub-Sahara Africa.

SME- Small and medium-sized enterprises.

IPCC - Intergovernmental Panel on Climate Change.

AR5 - fifth assessment report.

ASAL - Arid and semi-arid lands.

UK - United Kingdom.

RBV - Resource-Based View.

TAM - Technology Acceptance Model.

UNFCCC - United Nations Framework Convention on Climate Change.

MVP - Multivariate Probit

ICT - Information communication technology

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DEDICATION

I dedicate this work to the almighty God, my parents Mr. and Mrs. Dida not forgetting Guido Maria Villa for their unwavering support towards my education and success.

CHAPTER ONE

1.1 Introduction

This chapter entails the background of the Study, Problem Statement, research objectives, research questions, scope of the study and significance of the study.

1.2 Background of the study

The human species has demonstrated the ability to flourish in diverse climatic environments. It is widely acknowledged among scholars in academic literature that climatic variables and extreme weather events can have a significant impact on economic outcomes (Jayasinghe & Kumar, 2021). Comprehending and proficiently handling the correlation between climate and the economy is a crucial element of economic advancement. The extent to which economic agents can adapt to climate-related pressures is a fundamental inquiry in the discourse on climate and economics. According to recent research conducted by Kotz et al. (2021), economic agents, such as farmers, can modify their production techniques in response to evolving climatic conditions. Several challenges, including economic, institutional, and behavioral factors, have been identified by (Moser et al., 2019) as potential obstacles to achieving successful coping.

As defined by the Intergovernmental Panel on Climate Change (IPCC, 2007) and Robinson (2020), the concept of "climate change coping" refers to proactive measures taken to reduce vulnerability to the adverse impacts of climate change. It involves both minimizing the negative consequences and maximizing the potential benefits associated with a changing climate. Enhancing the adaptive capacity of small and medium-sized enterprises (SMEs) is crucial in pursuing this objective.

SMEs are particularly susceptible to the impacts of climate change, as they are often heavily affected by extreme weather events and tend to have limited ability to adapt (Crick et al., 2018). Small and Medium Enterprises play a crucial role in the economies of developing countries. According to Dougherty-Choux et al. (2015), the majority of employment opportunities in Sub-Saharan Africa (SSA) are provided by SMEs which also play a crucial role in fostering a more inclusive and equitable form of development. They are recognized as significant catalysts for societal coping and harnessing the potential benefits of climate change. However, there is a lack of empirical research that combines scientific and social sciences to comprehensively understand how

businesses can effectively adapt to climate change while maintaining their sustainability (Polukhina et al., 2021).

Climate change is a widespread and largely accepted phenomenon, as shown by the research of Trenberth et al. (2015). Human actions have changed the planet's environment for the worse, while the population of the globe keeps growing. Several studies have shown the negative impacts of climate change on the African continent. Weak agricultural policy, slow technical progress, widespread poverty, extreme weather occurrences, and persistent economic challenges all contribute to this precarious state of affairs (Lawson et al., 2020). Several elements have been discovered across research that increase African farmers' sensitivity to climate change. Included in this category are obstacles related to learning, money, technology, institutions, and culture (Lawson et al., 2020). The issue of climate change has emerged as a highly intricate environmental and societal issue that hampers advancements in sustainable development, particularly in developing nations. It has also been identified as a significant disadvantage for key economic sectors that rely heavily on natural resources, such as agriculture, fisheries, livestock, forestry, and tourism (Malhi et al., 2021), this makes it important to understand the adaptive reactions put in place by SMEs.

The idea of adaptive capacity requires a shift away from traditional reactive approaches to dealing with disasters and extreme events. Instead, it emphasizes the need for strategies that proactively anticipate future changes and promote resilience. This involves integrating adaptability in the timing of responses, considering new information and patterns, and improving the system's resilience to sudden events such as droughts, floods, bushfires, and heat waves. Some coping responses can effectively deal with both abrupt shocks and long-term trends (Zighan & Ruel, 2023). The process of coping is marked by its ongoing and dynamic nature. It involves a series of interconnected activities, including decision-making, planning, acting, observing outcomes, and importantly, engaging in social learning and making ongoing adjustments (Polukhina et al., 2021). The global scope, complex characteristics, and controversial nature of climate change have made it a topic of intense interest and debate. There is a tight connection between climate risk and susceptibility. Impacts from climate change occur when the vulnerabilities of societies and systems vulnerable to climate-related risks come together (Mavrodieva & Shaw, 2020).

Most research has focused on farmers' tactics for adjusting to shifting weather patterns, ignoring a wider range of contextual elements that may potentially play a role. Furthermore, the study of what variables affect certain coping techniques has not been a top emphasis.

1.3 Problem statement

Small and medium-sized enterprises may face greater financial difficulties in the aftermath of natural disasters and may also have limited capacity to adapt compared to larger businesses due to a range of factors (Skouloudis et al., 2023). Small businesses often do not have a wide range of products or operations, which limits their ability to minimize risks. Usually, they lack comprehensive contingency plans to compensate for losses using profits from other products. Moreover, their cash reserves are comparatively smaller, and they possess limited capacity to mitigate risk through mechanisms such as property damage insurance and business interruption coverage (Chang et al., 2022).

According to Skouloudis et al. (2020), small and medium-sized businesses (SMEs) in the UK are more susceptible to climate change's negative effects. Managing extreme weather and other natural catastrophes successfully is challenging for SMEs, as a result, they are less able to respond to climate change and variability (Alam et al., 2022). This puts them at risk of being affected by extreme climatic events. This circumstance additionally diminishes their capacity to adjust to such occurrences (Ijeoma et al., 2020). Furthermore, according to Kump and Schweiger (2022), many small businesses have short planning horizons and tend to adopt a reactive stance by observing the situation rather than proactively creating plans and strategies for coping.

The region of Sub-Saharan Africa (SSA) has been identified as one of the areas that is most affected by the vulnerabilities caused by climate change impacts that impede development and climate change adaptation (Schipper et al., 2020). The IPCC's fifth assessment report (AR5) states that agricultural systems, especially in arid and semi-arid lands (ASALs), are becoming more vulnerable due to the combination of climate change factors and non-climate drivers and stressors. The growing susceptibility, along with other contributing factors like extensive land degradation, diminishing soil quality, elevated poverty rates, decreasing farm sizes, insufficient knowledge and skills, limited adoption of technology, and ineffective agricultural practices and policies, has significantly impeded the need for adoption strategies (Arora, 2019).

Kajiado County is characterized by a semi-arid to arid climate, making it vulnerable to climate change. The agricultural sector in this region is directly affected by challenges such as frequent droughts, limited water availability, and unpredictable weather patterns, reduced yield and land degradation, (Hoffman & Vogel, 2008).

SMEs operating in the agricultural sector play a vital role in the local economy, making substantial contributions to livelihoods and ensuring food security. Hence, it is crucial to comprehend the factors that impact their ability to adapt and the strategies they employ to cope.

There have been a lot of studies looking at how individuals adapt and deal with climate change and unpredictability. Ndichu (2021) conducted a comprehensive study to gain a deeper understanding of how small-scale farmers in Kenya's arid and semi-arid agroecological zones cope with unpredictable climate conditions. Unfortunately, the research did not look at what variables affect SMEs' ability to adapt or how they cope with climate change. Kagunyu (2014) looked at how climate change affected the economy and coping mechanisms of the Borana people in Northern Kenya's Isiolo County but did not look at the factors influencing how SMEs cope with climate change. The need for further study has been highlighted by these studies. The fundamental purpose of this research was to analyze factors influencing SME'S coping strategies to climate variability and change in Kajiado County.

1.4 Research objectives

1.4.1 Main Objective

The main objective of this study was to determine the factors influencing SME's coping strategies to climate variability and change in Kajiado County.

1.4.2 Specific Objectives

i. To determine the influence of awareness and knowledge on SMEs' coping strategies to climate variability and change in Kajiado County.

ii. To determine the impact of technology capacity on SMEs' coping strategies to climate variability and change in Kajiado County.

iii. To determine the role of resource availability on SMEs' coping strategies to climate variability and change in Kajiado County.

iv. To determine the influence of the size of the organization on SMEs' coping strategies to climate variability and change in Kajiado County.

1.5 Research questions

i. What is the influence of awareness and knowledge on SMEs' coping strategies to climate variability and change in Kajiado County?
ii. What is the impact of technology capacity on SMEs' coping strategies to climate variability and change in Kajiado County?
iii. What is the role of resource availability on SMEs' coping strategies to climate variability and change in Kajiado County?
iv. What is the influence of the size of the organization on SMEs' coping strategies to climate variability and change in Kajiado County?

1.6 Scope of the study

The research focused on small and medium-sized enterprises (SMEs) located in Ongata Rongai sub-county, Kajiado County. Its objective was to investigate how these enterprises adapt and handle climate variability and change. The study aimed to analyze the factors that influence their coping strategies, with a specific focus on four independent variables: awareness and knowledge, availability of resources, organization size, and technology. The primary data was collected from the participants through the administration of questionnaires.

1.7 Significance of the study

1.7.1 Importance to SME Owners

SMEs have a considerable impact on national and global economies. They contribute to the creation of new businesses and new jobs, which in turn helps the economy grow. The consequences of climatic fluctuation and change may have a profound impact on the day-to-day operations, financial performance, and long-term survival of SMEs. A better knowledge of the factors that determine coping with climate change may help business owners devise more effective ways to reduce financial losses and increase SMEs' resilience.

1.7.2 Importance to the Community

Businesses in the SME size range often operate at the neighborhood level and have personal relationships with locals. A company's adaptability to weather shifts may affect not just its bottom line, but also the lives of its workers, customers, and the community at large. Recognizing

socioeconomic vulnerabilities and developing solutions to help impacted communities may be aided by studying the elements that affect the capacity of small and medium-sized businesses (SMEs) to adapt and cope.

1.7.3 Importance to Policymakers

Supporting SMEs' coping via the implementation of suitable laws, regulations, and incentives is mostly the responsibility of policymakers and government institutions. Policymakers may better understand the unique difficulties encountered by SMEs by learning more about the elements that affect their adaptability. This study has the potential to guide the creation of strategic initiatives and programs that help small and medium-sized enterprises (SMEs) become more climate-resilient and adopt sustainable practices.

1.7.4 Importance to Researchers

The study findings will be important to researchers and academicians who will conduct similar studies, this is because the findings of the research will act as a reference point for future studies.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter examines the existing literature on the various factors that influence the process of coping with climate change and variability and the relevant theories. The literature review examines several key themes, namely awareness and knowledge, resource availability, technology, and organizational size. The final section discusses the areas of research that have not yet been explored and introduces the conceptual framework.

2.2 Theoretical review

2.2.1 Resource-based theory

The Resource-Based View (RBV) was first introduced by Penrose (1959), who argued that a firm can achieve a competitive advantage by effectively managing its resources. Wernerfelt (1984) found that the success of a company depends on how it effectively manages and controls its essential resources. The Resource-Based View (RBV) focuses on the qualities of resources and capabilities and their source to explain a company's differences, performance, and ability to endure, as proposed by Morheney and Pandian in 1992. Resources are essential for gaining a competitive advantage in a highly competitive market. A firm's success relies heavily on its capacity to recognize, cultivate, strategically position, and protect distinctive resources.

Barney and Hesterly (2010) argue that resources consist of three essential elements: resources, capabilities, and competencies. Competencies are the strengths of an organization that help it distinguish its products or services by creating technological systems that meet the needs of its beneficiaries. This, in turn, improves the organization's capacity to compete more effectively and attain greater success in comparison to its rivals hence a better chance to survive the impacts of climate variability. Capability refers to the amalgamation of skills, knowledge, abilities, and experience that empowers an organization to proficiently oversee its activities and make the most of its resources to attain optimal performance.

The RBV theory is important for this study because it highlights the importance of internal resources and capabilities in determining an organization's competitive advantage and performance. The RBV theory can be applied to examine the particular resources accessible to

small and medium enterprises (SMEs) in Kajiado County and their role in facilitating their capacity to adapt to climate change.

2.3 Empirical review

2.3.1 Awareness and knowledge and coping strategies for climate variability and change

The establishment of the United Nations Framework Convention on Climate Change (UNFCCC) in 2012 represented a significant milestone in the global effort to create a legal framework that promotes education and knowledge sharing of climate change and its variations. This framework ensures that all participating nations adhere to the established regulations. The inclusion of Article 6 in the UNFCCC and Article 10(e) in the Kyoto Protocol demonstrates the international community's strong commitment to addressing and accommodating the challenges posed by climate change and its various manifestations. Both articles highlight the importance of implementing public education and awareness campaigns to communicate the impacts of climate change and variability. Additionally, there is a clear emphasis on the need for transparent and easily understandable information dissemination about climate change and its consequences to the general public. It is also crucial to strengthen national organizations and provide opportunities for professional growth for individuals in scientific, technical, and managerial roles (McKenzie, 2021).

Farmers have limited access to resources, new information, and chances to increase their skills, according to Asfaw et al. (2019), making it difficult for them to adjust to changing conditions and embrace alternative livelihood methods. To provide farmers with the knowledge and skills to increase crop yields, better agricultural practices, and successfully adjust to climate change and unpredictability, ongoing education and awareness activities are important. Saddique, et al., (2022) argue that this will help students learn more effectively. There are conflicting reports concerning the extent to which African farmers are aware of the need for awareness and comprehension in coping. In their research on climatic change and variability in Ethiopia and East Africa, Khatibi et al. (2021) and Umwigama et al. BBC World Service Trust (2019), Mwanza et al. (2023), and Elia (2021) found that farmers and the general population in several African nations were aware of climate change, contradicting the conclusions of the aforementioned research.

In their seminal study, Abbasi and Nawaz (2020) investigated the intricate interplay between individuals' understanding of climate change and their subsequent endeavors to adapt to its impacts. This scholarly inquiry shed light on the multifaceted challenges that emerged as a consequence of

these coping efforts. The primary objective of this study was to provide support to local initiatives in Khyber Pakhtunkhwa and Punjab, Pakistan, which are focused on mitigating the effects of climate change on agricultural practices. The agricultural sector in Pakistan is susceptible to adverse consequences due to shifts in the global climate. These changes can potentially manifest in various detrimental forms, such as diminished crop yields, degradation of arable land, scarcity of water resources, and depletion of vital agricultural inputs. The mitigation of climate change's adverse effects can be facilitated within agricultural communities through enhanced awareness and widespread adoption of sustainable solutions. Nevertheless, it is imperative to acknowledge that the intensity and characteristics of each individual's reaction may exhibit significant divergence (Abbasi & Nawaz, 2020). Farmers in developed nations, exemplified by the United States, exhibit a more profound comprehension of climate change and possess enhanced abilities to effectively adapt to its impacts, in contrast to their counterparts in developing regions like Pakistan. The study examined individuals' knowledge of climate change, their level of preparedness in response to its effects, and the challenges encountered during the process of coping.

In a comprehensive study conducted by Elia (2017), Tanzanian farmers were surveyed to assess their level of comprehension regarding the impacts of climate change and variability. This research employed a qualitative methodology to gather and analyze data. The employed methodologies for data collection encompassed both individual interviews and focus groups. The study comprised individuals employed in the agricultural sector. A rigorous examination of the qualitative data was conducted through the application of content analysis techniques. The findings of this study suggest that agricultural practitioners possess a discerning understanding of climate change and its inherent variability, and are actively devising innovative strategies to effectively address these challenges. Farmers possess a considerable understanding of coping strategies and frequently employ them in their agricultural practices. However, their comprehension of climate change and its inherent unpredictability remains somewhat constrained. Various factors exert influence on the knowledge and comprehension of farmers, encompassing the media's selection of communication channels, existing gaps in communication, the perceived lack of reliability and timeliness of information, as well as the financial limitations arising from low income and budgetary constraints.

Ochieng and Koske performed research in 2013 to see how elementary school teachers in Kisumu Municipality were informed about and felt about climate change. Data on educators' familiarity

with and thoughts on climate change were gathered using a standardized questionnaire. One hundred students from twenty elementary schools in the area were selected at random to fill out the survey. According to the results, primary school educators in Kisumu Municipality have a standard level of knowledge on global warming. However, they know very little about the topic. Primary school educators in Kisumu Municipality see climate change as a risk, according to the data. In light of these results, it is clear that efforts should be made to better equip educators in Kenya to participate in climate change awareness initiatives.

In a recent study conducted by Ndiritu (2021), the aim was to investigate the factors that influence the decision-making process of pastoralists in Laikipia County when it comes to selecting strategies for adapting to climate change. This study specifically examines how people's perceptions of climate extremes, such as dry spells and droughts, as well as their access to early warning information and private ranch grazing, influence their decisions in response to climate change. The primary data collected from 440 sample households was analyzed using the multivariate probit (MVP) model. The findings indicated that pastoralists employ these coping strategies both as complements and substitutes. Based on the study's findings, early warning institutions must enhance their presence in semi-arid regions by investigating efficient approaches to the timely dissemination of climate risk information. Efforts should be made to enhance accessibility to market and private ranch grazing in the semi-arid regions of Kenya. Since pastoralists' views on climate change and climate risk play a crucial role in their decision-making for coping, it is important to enhance our comprehension of how pastoralists perceive changes in their climate conditions.

2.3.2 Technology and coping strategies for climate variability and change

To solve the world's most pressing issue, climate change, technological solutions are essential. Indeed, man-made issues need man-made answers that can't be found in nature. The development of technology, especially in the fields of transportation and renewable energy production, is vital to the realization of a sustainable world (Lu et al., 2019). The United Nations Framework Convention on Climate Change (2005) defines coping technology as "the application of technology to increase the resilience of natural or human-made systems to the adverse effects of climate change." It includes "hard" technologies like machinery and "soft" technologies like administrative procedures and "institutional structures (Lee & Kim, 2021). However, challenges arise when

categorizing innovations like new crop varieties, as they may not fit neatly into these classifications. Climate change, along with other environmental, economic, and social challenges, exposes vulnerabilities that can be addressed through a variety of different technologies. These technologies have the potential to reduce the risks associated with future climate change impacts. Various strategies can be employed across different industries to mitigate the consequences of climate change.

According to Ahmed et al. (2019), energy efficiency improvements focus on addressing climate change through the development of efficient energy technologies and the goal of minimizing energy consumption while still achieving the same desired outcomes. It is an essential technique for managing climate change that preserves and utilizes resources in the long term. These enhancements result in cost reductions in the transition of the energy sector to address climate change. The most effective method to address the growing energy demands is by implementing energy-saving measures or conservation practices.

However, data has shown that many developing nations face challenges in balancing energy efficiency and economic growth as they strive to keep up with their expanding economies. This is because meeting the demands of a growing economy necessitates a significant increase in energy production and consumption (Suman, 2021). Lu et al. (2019) argue that enhancing energy efficiency involves more than simply reducing carbon dioxide emissions. It also depends on the energy supply for the particular technology, such as fossil fuels obtained from a coal-fired power plant that generates gasoline for vehicles. Increased productivity can lead to a decrease in emissions from fossil-fueled technologies when connected to low-carbon sources such as electricity generated from renewable energy.

ICT tools and platforms help individuals adapt to climate variability. Information and Communication Technology (ICT) offers various possibilities for stakeholders to share knowledge, communicate, and coordinate with one another. Khanal et al. (2019) examine the utilization of mobile applications, social media platforms, and online networks in the distribution of climate information, facilitation of community involvement, and promotion of collective efforts. These technologies enable communities to exchange experiences, obtain crucial information, and mobilize resources to address climate-related challenges.

Although technology has great potential, obstacles to access and adoption can impede its advantages and perpetuate inequalities. Birkmann et al. (2015) emphasize the significance of addressing technological inequalities among various socio-economic groups to achieve fair coping. It is essential to address challenges related to cost, availability, and skill development for technology to adequately assist in coping and resilience efforts for all communities, including those who are marginalized and vulnerable.

2.3.3 Resource availability and coping strategies to climate variability and change

All businesses, regardless of their size, need to possess internal knowledge, skills, and resources to effectively manage climate risk. The distinct characteristics of a business, such as its size and industry, can impact its ability to adjust to these risks. The capacity of a company to engage in coping measures might be constrained by a dearth of pertinent knowledge, insufficient resources, and inadequate expertise (Talanow et al., 2021).

There is a correlation between the business environment that companies face, which affects their overall potential for growth, and their ability to adapt to risks related to climate change. Several factors, including strong institutions, a competent workforce, effective public services, and accessible credit, have a substantial impact on both economic and social results (Gernaat et al., 2021). A study conducted by Di Falco et al. (2012) found that Ethiopian farmers' levels of coping vary depending on factors such as credit accessibility. Researchers have conducted thorough investigations into the difficulties encountered in Africa's business environment, particularly focusing on the effects on SMEs in comparison to larger corporations (Stein et al., 2013).

Surveys have identified inadequate infrastructure services, specifically electricity supply, as well as limited access to financial resources as the primary obstacles. According to a study conducted by Khanal and Wilson, (2019) using data from the World Bank's Enterprise Survey, it was discovered that over 25% of companies in Africa consider the accessibility and affordability of financial resources to be their primary obstacle. This percentage is nearly double the proportion observed in regions outside of Africa. Women-owned small and medium enterprises (SMEs) and informal SMEs face significant financial limitations (Ayenew et al., 2020). Insufficient access to technology, knowledge, and markets is a notable issue in sectors like agribusiness.

The limited availability of crucial resources, such as water, food, and energy, increases the susceptibility of communities to fluctuations and shifts in climate. According to Ali (2021), individuals who have limited access to resources are more likely to face higher levels of climate risks, especially those who belong to marginalized communities. This vulnerability arises due to socioeconomic factors such as poverty, insufficient infrastructure, and inequitable resource allocation. For example, areas that heavily depend on agriculture may face lower crop production as a result of shifting rainfall patterns. This can worsen issues related to food insecurity and economic hardship (Ali, 2021).

The implementation of effective coping measures is significantly hindered by limitations in resources. According to Smit and Wandel (2006), having access to financial, technological, and human resources is crucial for effectively adapting to new circumstances. However, the adoption of innovative technologies, infrastructure development, and capacity building required for coping is often hindered by resource limitations. The lack of investment in climate-resilient agriculture, coastal protection, and early warning systems can result in heightened susceptibility to climate-related consequences.

Communities employ diverse coping mechanisms when confronted with limited resources and the consequences of climate change. Godde et al. (2021) classified these strategies into autonomous, planned, and reactive responses. Autonomous responses encompass various strategies such as diversifying livelihoods, altering cropping patterns, and reallocating resources within households. Nevertheless, these strategies frequently have restricted applicability and may not be adequate to tackle enduring climate-related difficulties.

Developing resilience is essential in effectively addressing the challenges presented by limited resources. According to Huey and Kingsolver (2019), it is crucial to enhance adaptability by considering the social, economic, and ecological aspects of resilience. This includes improving organizational structures, promoting social cohesion, and investing in human capacity development. Additionally, by prioritizing sustainable resource management, encouraging the use of renewable energy, and incorporating nature-based solutions, we can effectively mitigate the negative effects of climate change while also preserving resources for future generations.

2.3.4 Size of the organization and coping strategies to climate variability and change

The magnitude of an organization's scale exerts a discernible influence on its approach to formulating strategies aimed at accommodating and navigating the challenges posed by climate variability and change. According to Cinner and Barnes (2019), larger organizations, characterized by their ample resources and hierarchical frameworks, tend to possess greater capacity to effectively tackle the multifaceted obstacles posed by climate change, in contrast to their smaller counterparts. Larger organizations tend to possess greater financial resources, allowing them to invest in cutting-edge technologies and infrastructure. This strategic allocation of resources enhances their capacity to adapt and respond effectively to changing circumstances. A pioneering study conducted by Chen et al. (2018) uncovered a significant trend among larger corporations, indicating their strong inclination to allocate resources for the adoption of renewable energy sources and energy-efficient technologies. This strategic investment enables them to effectively mitigate the negative effects of climate change. Such investments play a vital role in helping larger organizations reduce their greenhouse gas emissions, improve resource efficiency, and incorporate more sustainable business practices.

The prevalence of hierarchical structures within larger organizations serves to effectively streamline and enhance the coordination and decision-making processes. The aforementioned structures play a pivotal role in establishing a hierarchical framework of authority, thereby enabling the efficient implementation of coping strategies (Duchek, 2020). In addition, it is common for larger organizations to establish dedicated departments or teams that bear the responsibility of overseeing environmental management and promoting sustainability. These organizations are committed to the development and implementation of strategies designed to effectively respond to the challenges posed by climate change. The case study of Unilever, a prominent multinational corporation, serves as a compelling illustration of how the integration of sustainability initiatives within their hierarchical framework and decision-making mechanisms has empowered them to adeptly address the challenges posed by climate change (Beck et al., 2016).

Smaller organizations face unique obstacles in adapting to climate change due to their limited resources and lack of hierarchical structures. Smaller organizations often face constraints in terms of their financial resources, which can present obstacles to their ability to make investments in technologies or infrastructure that have the potential to enhance their adaptive capacity (Seddon et

al., 2020). Furthermore, it is worth noting that smaller entities may encounter obstacles when it comes to formulating and executing strategies for coping. This can be attributed to the absence of specialized departments or personnel specifically dedicated to the pursuit of sustainability, as highlighted by Hartmann et al. (2017).

Nevertheless, it is worth noting that smaller entities possess the capacity to adopt alternative approaches to proficiently address the repercussions arising from climate variability and change. These strategies often involve the establishment of collaborative partnerships and networking with other organizations, along with proactive involvement in local communities and engagement with stakeholders. The findings of a recent study conducted by Oreggioni et al. (2020) shed light on the behavior of smaller organizations operating in sectors that are prone to risks, such as agriculture and tourism. The study reveals that these organizations exhibit a greater propensity to engage in cooperative networks, which serve as platforms for sharing resources, exchanging knowledge, and embracing best practices. The capacity of collaborations to enhance their adaptive capabilities can be significantly bolstered through the integration of resources and knowledge. This amalgamation empowers them to collectively confront the multifaceted challenges presented by the phenomenon of climate change.

Small and medium-sized agricultural enterprises often confront significant obstacles in adapting to climate change due to their limited resources and organizational capacities. To enhance their adaptive capacity, these businesses can benefit greatly from adopting advanced technologies and infrastructure. However, they often face challenges in making such investments (Seddon et al., 2020). Additionally, the absence of dedicated sustainability departments or personnel within these enterprises can hinder the development and implementation of coping strategies. Despite these challenges, agricultural enterprises have the potential to employ alternative strategies to effectively address the diverse challenges they face. One promising approach involves forming collaborative networks with organizations, farmers' associations, or cooperatives. By leveraging these interconnected networks, small and medium-sized enterprises (SMEs) can engage in the collaborative exchange of valuable resources, knowledge, and best practices. Strengthening the capacity of small and medium-sized enterprises (SMEs) to address climate change challenges within the agricultural sector can be achieved through the establishment of alliances and active engagement with neighboring communities (Di Gregorio et al., 2019).

In a recent study conducted by Mwinkom et al. (2021), an exploration was undertaken in Ghana's Black Volta Basin to examine the factors that impact the implementation of coping strategies aimed at mitigating the effects of climate change. A total of 450 residences were selected randomly from eight distinct districts employing a multistage sampling technique. These selected households were then administered a comprehensive questionnaire. The study revealed that various demographic and socioeconomic factors have a substantial impact on households' capacity to adapt to climate change. The correlation matrix of the MV probit model suggests the presence of complementarity among the various coping tactics employed by household heads. Enhancing the adaptability of household leaders ought to be regarded as a paramount concern, as emphasized by Mwinkom et al. (2021). The allocation of financial resources by both governmental and non-governmental entities towards climate-resilient endeavors is of utmost importance. The government must allocate funds towards initiatives aimed at educating and empowering family leaders within the Black Volta Basin region to effectively respond and adapt to the challenges posed by climate change. Several approaches encompass altering the timing of crop planting, adopting inventive agricultural techniques, and cultivating crops that exhibit rapid maturation or possess inherent tolerance to arid environments. Workshops and other instructional events have the potential to offer valuable assistance in this regard.

2.4 Summary and Research Gaps

Table 2.1 Summary and research gaps.

Author	Title	Findings	Research gap
Abbasi and Nawaz (2020)	Impact of climate change awareness on climate change adaptions and climate change coping issues.	The mitigation of climate change's adverse effects can be facilitated within agricultural communities through enhanced awareness and widespread adoption of sustainable solutions.	This study was conducted in Pakistan. This study was conducted in Kenya.
Florence Crick, Shaikh M.S.U. Eskander, Sam Fankhauser	How do African SMEs respond to climate risks? Evidence from Kenya and Senegal	The findings indicate that financial barriers are the key reason why firms resort to unsustainable adaptation, They also found that general business support, access to information technology	The study looked at sustainable and unsustainable adaptation and used a bivariate probit model.

and Mamadou Diop (2018)		and adaptation assistance encourages sustainable adaptation.	This study used a multivariate probit model.
Elia (2017)	Farmers' awareness and understanding of climate change and variability in central semi-arid Tanzania	Agricultural practitioners possess a discerning understanding of climate change and its inherent variability and are actively devising innovative strategies to effectively address these challenges.	The study was conducted in Tanzania and focused on farmers. This study was conducted in Kenya and will focus on SMEs.
Ochieng and Koske, (2013)	The level of climate change awareness and perception among primary school teachers in Kisumu municipality.	Primary school educators in Kisumu Municipality have a standard level of knowledge on global warming and see climate change as a risk.	The study focused on primary school educators. This study focused on SMEs' knowledge.
Ndiritu (2021)	Drought responses and coping strategies to climate change by pastoralists in the semi-arid area, Laikipia County, Kenya	There is a need for early warning institutions to increase their visibility in the semi-arid areas by exploring effective methods of delivering climate risk information in good time. Improving access to market and private ranch grazing should be promoted in the Kenyan semi-arid areas.	The study focused on pastoralist households in Laikipia County. This current study focused on SMEs.
Di Falco, S., Yesuf, M., Kohlin, G., & Ringler, C. (2012)	Estimating the impact of climate change on agriculture in low-income countries: household level	Ethiopian farmers' levels of coping vary depending on factors such as credit accessibility	The study focused on farmers and was conducted in Ethiopia and this study focused on SMEs and will be conducted in Kenya.

	evidence from the Nile Basin, Ethiopia.		
Mwinkom, F. X., Damnyag, L., Abugre, S., & Alhassan, S. I. (2021)	Factors influencing climate change coping strategies in North-Western Ghana	Various demographic and socioeconomic factors have a substantial impact on households' capacity to adapt to climate change.	The study focused on households. This current study focused on SMEs.
Ashraful et al. (2022).	SMEs respond to climate change: Evidence from developing countries	climate change has a significant positive impact on SMEs' innovation performance.	This study explores the impact of climate change on SMEs' innovation from a resource-based view (RBV) standpoint. Using the generalized method of moments (GMM) estimation. This current study explored the factors that influence how SMEs respond to climate variability.
Florence Crick et al. (2021).	What role for multi-stakeholder partnerships in adaptation to climate change? Experiences from Private Sector Adaptation in Kenya	Through action and investment from donors and the public sector in areas such as research, data access, relationship building, training and capacity building, access to finance and business incubation, MSPs can enable a wide range of private sector actors to deliver adaptation resources to SMEs.	The study focused on the role of MSP in enhancing SME adaptation, and the current study focused on the factors influencing SMEs' coping strategies to climate variability.

Enoch and Abubakari (2022)	Climate change adaptation strategies of cocoa farmers in the Wassa East District: Implications for climate services in Ghana	The study found that key adaptation strategies include changing planting dates, diversification to non-farm activities, planting improved cocoa varieties, crop diversification, and tree planting.	This study was conducted in Ghana and focused on cocoa farmers, the current study will be conducted in Kenya and will focus on SMEs.

Source: Author (2023)

This study was undertaken to bridge gaps noted in similar studies held in different countries and a broad range of sectors. Here is how this study fills those research gaps:

2.4.1 Geographical Context: The previous studies were conducted in Pakistan, Tanzania, Ghana, Ethiopia and Senegal. However, the current research aims to study Kenya, specifically Kajiado County. What is noteworthy here is that changes in geographical situations offer a chance to compare the adaptation strategies from various regions, leading to a more valuable and holistic recognition of climate change adaptation in diverse environments.

2.4.2 Sectoral Focus: Notably, earlier studies have spared no effort to look at sectors like agriculture, livestock, and education, among others. For the specific case of SMEs, the sector receiving substantially lower attention, the research is focused on that group. This study seeks a strong position in the literature, filling a gap by exploring how firms deal with climate variability and change.

2.4.3 Methodological Approach: Although the previous research employed bivariate probit models or methodologies that surveyed just educators of primary schools, this study employs a multivariate probit model. Such adjustment in the analysis method enables a more intricate assessment of factors behind the SMEs' adaptation strategies, presenting insights into the intricate relationships of these distinct elements.

2.5 Conceptual framework

A conceptual framework shows the relationship between the independent and dependent variables Figure 2.1 below is this study's framework showing the independent variables which are the awareness and knowledge, technology capacity, resource availability and size of the organization and how they relate to the dependent variable which is the decision to adopt flood insurance, product innovation, Membership to a business group/association for coping and relocation to safer areas.

Independent variables **Dependent variable**

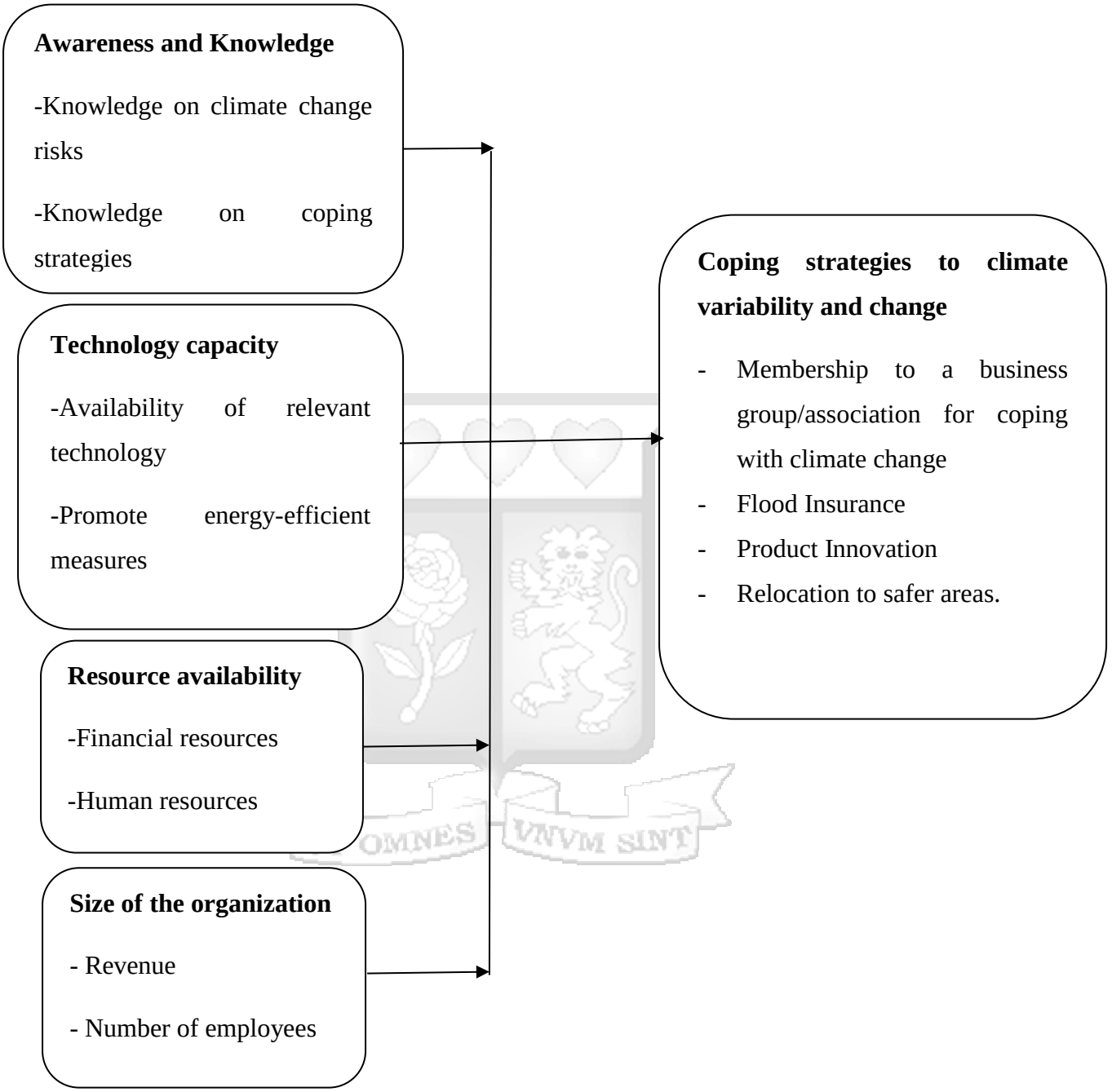

Figure.2.1 Conceptual Framework

Source: Author (2023)

2.6 Operationalization of the variables

Table 2.2 Operationalization of the variables.

Variable	Type	Indicators	Data analysis technique
Coping strategies to climate variability and change	Dependent variable	- Membership to a business group/association for coping to climate change. - Flood Insurance - Product Innovation - Relocation to a safer area.	Regression analysis
Awareness and Knowledge	Independent variable	-Information on climate change risks -Information on coping strategies -Access to climate information.	Descriptive (mean and standard deviation Inferential (linear regression)
Technology capacity	Independent variable	-Availability of relevant technology -Promote energy-efficient measures	Descriptive (mean and standard deviation Inferential (linear sion)
Resource availability	Independent variable	-Financial resources -Human resources -Infrastructure	Descriptive (mean and standard deviation Inferential (linear regression)
Size of the organization	Independent variable	-Revenue -Number of employees - Market share	Descriptive (mean and standard deviation Inferential (linear regression)

2.7 Chapter Summary

The chapter has literature related to factors influencing SMEs' coping strategies to climate variability and change. Both theoretical and empirical literature have been reviewed. The chapter also looks at a summary of research gaps, conceptual framework and operationalization of the variables.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This part of the research highlights the study mechanisms, the chapter highlights the research philosophy, design, population and sampling, data collection method, data analysis and presentation, research quality methods and finally the means of conducting the research legally.

3.1 Research philosophy

The study employed an ontological research philosophy paradigm. Ontology is viewed as the study of "being" Baikie (1993). It entails studying the nature of reality, that can be measured. There are two important aspects of ontology: objectivism (or positivism) and subjectivism.

Positivism was adopted to guide this study, this is because this approach allows for a deterministic view of nature and finally positivist reasoning was applied to make conclusions from the performed analysis. The study employed an ontological research philosophy paradigm. Ontology is viewed as the study of "being" Baikie (1993). It entails studying the nature of reality that can be measured. Two critical aspects of ontology exist: objectivism (or positivism) and subjectivism. Positivism was adopted during the study as the primary ontological approach. Positivism equals creationism thinking, which emphasizes an objective man-less nature that exists independently from the perception of humans. This approach aspires to extract the laws governing the phenomena, whether they agree with empirical verifications or the most robust causal relationships. Positivism can produce a coherent and orderly structure into which we can insert all the factors triggering SMEs' adaptation to climate change in Kajiado County.

Subjectivism is another way of conceptualizing the existence of reality in research philosophy. Subjectivism allows a view that reality is artificial through individuals' subjective perception, interpretation, and experience. On the contrary, positivists argue that an objective reality exists despite our observation, while subjectivism proposes that actuality is socially constructed and gets relative contextually. Subjectivism underlines how subjective experience, interpretation, and meaning may be attributed **as** integral parts of phenomena impacting individuals. It provides an understanding of the influence of social, cultural, and environmental components on how each

person uniquely experiences and perceives reality. From the subjective researcher's point of view, it is necessary to look not only at the specific but also at the complexity and possible broadness of human experiences from different points of view and the richness of meanings.

3.2 Research design

The research design that was utilized is descriptive. Kothari (2011) posits that the descriptive research approach is a research methodology that examines the current state of a situation in its existing form. The selection of a descriptive research design was based on the fact that the research aimed to analyze the factors influencing SMEs' coping strategy with climate variability and change. This design was deemed appropriate because it enabled the researcher to obtain information about the current status of the phenomena, i.e., The adaptation strategies, and explain its association with the variables in the study. Regarding the time horizon, the study was conducted cross-sectionally. This design was chosen to analyze the existing phenomena and their association with the variables under study. The cross-sectional approach was used to collect data at a single time.

3.3 Population and sampling

A research target population is the entire group of individuals that is the main focus of a scientific investigation. As of 2021, there are 2,851 registered SMEs in Kajiado County. The research targeted SMEs in Ongata Rongai Sub County. There were 372 registered SMEs in Ongata Rongai according to the records in the sub-county. Due to the limited number, a census of all the SMEs was conducted. The owners of the SMEs were targeted as the respondents.

3.4 Data Collection Methods

The collection of primary data involved the utilization of structured questionnaires that incorporate a series of closed-ended. This approach was intended to optimize the quality and depth of the responses obtained from the participants. According to Kothari (2011), questionnaires are considered a highly appropriate instrument for data collection due to their ability to efficiently gather a substantial amount of information within a relatively brief timeframe. The questionnaire will be divided into two parts. Part 1 captured general information while part 2 captured questions addressing each of the four research objectives in the study.

The assurance of source confidentiality was achieved through the implementation of secrecy measures, while also ensuring adherence to standardized practices. The questionnaires were

distributed and collected through the drop-off and pick-up method, allowing respondents ample time to complete them.

3.5 Data Analysis and Presentation

This study examined different strategies for climate change coping and considered how they may be used together or separately by small and medium-sized enterprises (SMEs). The correlation between the decisions made by SMEs regarding coping strategies and the associated error terms may arise due to the simultaneous or sequential nature of these decisions. The study used a multivariate probit (MVP) specification to account for systematic correlations between choices of different coping strategies. A positive correlation between error terms suggested that coping strategies were likely to work well together, while negative correlations indicate that the strategies were instead likely to be used as alternatives to each other.

Following Ndiritu et al. (2014), the basic model was characterized by a set of binary dependent variables (A_i) specified as follows:

$$A^*_i = \beta_{ij} X_j + \varepsilon_i$$

$$A_i = \{1 \text{ if } A^*_i > 0$$

0 otherwise,

Where i=1…k denotes the type of coping strategies adopted by the SME. Dummy variables will be constructed for the following coping strategies: flood insurance, product innovation, Membership to a business group/association for coping and relocation to safer areas and Xj is the control variable. These were the same for the different coping strategies. β_{ij} is a vector of parameters to be estimated. εi is an error term that may be correlated; otherwise, the univariate probit model was estimated (Greene 2008). Following the climate change coping literature, the variables hypothesized to influence the adoption of coping strategies included awareness and knowledge, resource availability, technology and size of the organization.

3.6 Research Quality

3.6.1 Validity

Validity pertains to the extent to which the data obtained from a tool accurately and meaningfully reflects the underlying theoretical concept, particularly about how the data represents the variables.

When validity is established, the conclusions derived from the data are both precise and meaningful (Mugenda & Mugenda, 2003). Incorporating various sources of evidence improves the credibility of a study (Yin, 2003). The questionnaire was distributed to supervisors, colleagues, and lecturers for testing to evaluate its content validity. The university supervisor analyzed and approved the questions. This assessed the questionnaire's validity.

3.6.2 Reliability

The reliability of a research instrument refers to its ability to produce consistent results or data when used repeatedly (Mugenda and Mugenda, 1999). According to Cortina (1993), an instrument is considered reliable when it accurately measures a variable and consistently yields similar results over time. In this study, the reliability of the data was evaluated using Cronbach's alpha as a measurement. To assess the instrument's reliability, an independent sample pilot test was conducted using the collected data. According to Heir et al. (1998), a Cronbach's alpha reliability value higher than 0.7 is considered appropriate for the study.

3.7 Ethical Considerations

The researcher sought for permission to undertake the study from the Ministry of Education's National Council of Science and Technology, after which a letter describing the goal and nature of the study was obtained from the university. The consent to undertake the study was further sought from the respondents of the study and encouraged free will participation. The purpose and nature of the study were explained to each respondent before they were engaged. The researcher also ascertained the confidentiality of the information shared by the respondents by utilizing the information without mentioning the specific names of the respondents from whom the information was collected from. The researcher finally, ascertained that all the sources of the information used in this study are quoted appropriately and recognized in the body of the study and a list of bibliographies concerning the same, is provided in the reference section.

3.8 Chapter Summary

This chapter looked at the research philosophy that was used, the study adopted ontology positivism design. The researcher used descriptive research design, this design was deemed appropriate because it enabled the researcher to obtain information about the current status of the phenomena i.e. The adaptation strategies and as well explain its association with the variables in the study.

The target population was 372 Small and medium enterprises registered in Ongata Rongai sub-county offices, due to this limited number a census was conducted. The questionnaire was used for data collection. The study used a multivariate probit (MVP) specification to account for systematic correlations between choices of different adaptation strategies

CHAPTER FOUR

PRESENTATION OF RESEARCH FINDINGS

4.0 Introduction

This chapter presents the findings obtained from the SME owners. Here, the descriptive and inferential statistics are presented showing how awareness and knowledge, technology capacity, Resource availability and size of the organization influence SMEs coping strategies to climate variability and change.

4.1 Response Rate

The researcher distributed 372 questionnaires out of which 336 questionnaires were answered to the researchers' expectations and returned. Out of the remaining 36, 20 respondents did not return the questionnaires while 16 respondents were rejected as they did not answer the questions to the expectations of the researcher. Therefore, the data analysis is based on 336 respondents. This translates the response rate to 90.32% which is within the prescribed response rate according to Mugenda and Mugenda (2003).

Table 4.1 Response Rate.

No. of questionnaires Returned	Target No. of respondents	Response Rate (%)
336	372	90.32%

Source: (Researcher, 2023)

4.2 Descriptive Statistics.

The study aimed to find out how awareness and knowledge that is; knowledge of climate change risks, knowledge of adaptation strategies and access to climate information influence SMEs coping strategies.

Table 4.4 shows that 84% of the SMEs have adopted three or more adaptation strategies, the adaptation strategies that had the highest rate of adoption as shown by Table 4.3 are product innovation and flood insurance, while membership to a business group and relocation to safer areas had the lowest adaptation rate respectively.

This study depicts that 63.4% of SME owners were male while 36.6% were female (Table 4.2), this implies that the SME industry in Kajiado County is dominated by males.

Table 4.5, shows the coping strategies for the SME characteristics. The results show that the average age of the respondents is 37 years with the youngest being 24 years.

The results depict that the majority of older SME owners adopted flood insurance compared to other coping strategies, while the young opted for relocation to safer areas.

SME owners' education level was shown by the results to be; 15% had primary level education, 20% secondary level, 30% college level, 35% university level, and most SME owners had college education level and above. Table 4.5 shows that most of the primary education level owners opted for relocation as an adaptation strategy while most of the secondary level owners opted for membership to coping groups and most of the college and university owners opted for product innovation, these results show that education has a significant influence on innovation.

Most SME owners were aware of the effects of climate change, we can further note that 81% of them used this knowledge to relocate to safer areas, most of the SMEs have conducted staff training and capacity building on the climate change risk, these SMEs have adopted product innovation (78%) as a coping mechanism to climate variability and change.

The respondents were asked if they have had previous encounters with climate change risk, the purpose was to understand the previous experience, the results show that the majority of the SMEs have had previous experience and this has influenced most of them to adopt relocation to safer areas as a coping mechanism, majority of the SMEs stated that they had access to climate change information, with this information, there was no much difference between relocation, flood insurance and product innovation, access to information had little influence on membership to coping groups compared to other strategies.

From Table 4.5, we can note that the average availability of relevant technology among SMEs is 76%, this is an indication that most SMEs have access to technology that keeps them updated on climate change, most SMEs with access to technology were more likely to adopt product innovation as a coping strategy, this a clear indication of the role of technology in innovation, they were however indifferent on flood insurance and relocation to safer area, they were less likely to join business groups for coping.

Most of the SMEs noted that technology is an important tool that helps them cope with the changing climatic conditions, 71% stated they heavily rely on forecasting systems to plan for the future, however, most SMEs noted that they face challenges and barriers in accessing the technology, the main barrier being high implementation cost of the technology.

Resource availability has been rated as a critical factor for coping with climate variability and change by SMEs, most of them responded that financial resources and human resources are important for coping with climate change (table 4.5)

From Table 4.5, we can note that SMEs have low access to financial resources, on the same note majority of the respondents indicated that it is easier for them to access NGO support compared to their savings, this indicates that most SMEs don't save enough. Access to financial resources has a significant influence on product innovation, flood insurance and relocation to safer areas, it however has a very low influence on membership to business groups.

Results indicate that it's easy for SMEs to access qualified human resources, this is indicated by a mean of 72%, qualified human resources have a high influence on product innovation and flood insurance, it however has a moderate influence on relocation 56% and low influence on membership to business groups. Most SMEs have indicated that they enhance their human resource and do training and capacity building on matters of climate change to their staff, according to the results major contributors to these trainings are the government and NGOs (table 4.5).

We also factored in the influence of infrastructure on the coping strategies, the results indicate that SMEs in Kajiado have fair access to water, tarmac road and electricity (63%, 64% and 68%) respectively, it is important to note that access to water has a high influence on relocation to safer areas and low influence on flood insurance, access to tarmac road has a high influence on relocation to safer areas and membership to business groups and low influence on flood insurance, while access to electricity has a low influence on all the factors.

Two parameters were used to measure the size of an SME, these are the percentage of revenue allocated to climate change and the number of employees designated to climate change, From table 4.5, we can note that SMEs dedicated only 2% of their revenue to coping with climate change, we can also note that revenue allocation significantly influences flood insurance, product innovation,

and relocation to safer areas, we can however note that the percentage of revenue allocated does not influence group membership 2%.

SMEs have designated an average of 2 employees to deal with climate change-related issues, we can also note that this has a significant influence on flood insurance, product innovation and relocation to safer areas 80%, 78% and 75% respectively, most of the SMEs have an allocated budget for an emergency fund to deal with any unforeseen circumstance caused by the negative impact of climate change.

4.3 Multivariate Probit Model Results.

The likelihood ratio test of the independence of the error terms was calculated. The result was significantly different from zero, (Chi^2 (26) = 49.626; Prob > Chi^2 = 0.0000). Therefore, we reject the null hypothesis that the error terms across the four factors influencing SME'S coping strategies are not correlated. This implies that there is interdependence among the factors influencing SMEs' coping strategies to climate variability and change in Kajiado County and supports the choice of the MVP model for this study. This is further supported by the significance of the pairwise correlation coefficients of error terms in Table 4.6.

The correlation coefficients of error terms are shown in Table 4.6 The results show a positive correlation between the four coping strategies. There is a positive correlation between the adoption of flood insurance and product innovation, flood insurance and membership to a business group, flood insurance and relocation to safer areas, membership to a business group and product innovation, relocation to safer areas and product innovation, relocation and membership to a business group. This indicates a complimentary relationship which implies that coping strategies are likely to work well together.

MVP model results in Table 4.7 show that older SME owners are likely to adopt flood insurance compared to younger owners, there is however no significant relationship between age and membership to a business group for coping, SME owners with more previous experience with climate change effects are more likely to adopt relocation to safer areas as an adaptation strategy compared to those with less previous experience who are likely to adopt membership to business groups for adaptation, there is however no significant relationship between previous experience, flood insurance and product innovation.

On education, owners with primary level are more likely to adopt relocation to safer areas, while those with secondary level are more likely to adopt product innovation and membership to business groups, owners with college-level education are more likely to adopt product innovation and relocation to safer areas, that is an indication that education plays a role in innovation hence SME owners with higher education levels are likely to be more innovative.

SMEs who were aware of the effects of climate change were more like to adopt relocation to safer areas, however, awareness of the effect has no significant relationship with product innovation, membership to business groups and adoption of flood insurance.

SMEs with access to climate change information were more likely to adopt product innovation and relocation as adaptation strategies, they were however less likely to adopt membership to business groups for adaptation and flood insurance and those with access to technology are more likely to adopt product innovation and flood insurance.

From the MVP table, we can note that resource availability has a significant positive influence on product innovation, flood insurance and relocation to safer areas, however, it has no influence on membership to a business group. On financial resources, we can note that it has a significant influence on flood insurance, product innovation and relocation respectively, however, it has no influence on membership to business groups.

The results show that qualified human resources have a significant influence on product innovation and flood insurance but no influence on membership to groups and relocation to safer areas. the results also show that the size of the organization positively and significantly influences flood insurance, relocation to safer areas and product innovation but no significant influence on membership to a business group.

4.4 Correlation Analysis

The study sought to establish the relationship between awareness and knowledge and climate variability and change, Pearson coefficient correlation was used, the Pearson coefficient ranges between -1 which is a perfect negative correlation and +1 which is a perfect positive correlation, the p-value was used to determine the significance level at 95% level of confidence. At 95% level of confidence, a p-value < 0.05 shows that the correlation is statistically significant.

The study found a strong positive correlation (r = 0.813) between awareness and knowledge and SMEs' coping strategies to climate variability and change in Kajiado County, a strong positive correlation (r = 0.796) between technology and coping with climate variability and change among SMEs in Kajiado County, the study found a strong positive correlation (r = 0.921) between resource availability and coping strategies to climate variability and change among SMEs in Kajiado County, the study found a strong positive correlation (r = 0.793) between size of organization and coping strategies to climate variability and change among SMEs in Kajiado County.

Table 4.2 SME owners by gender

Owner Gender	
Male	63.4%
Female	36.6%
Total	**100%**

Table 4.3 Mean of coping strategies

Variable		
Coping strategies by SMEs	**Full sample**	
	Mean	STDEV
Flood Insurance (1=Yes,0=No)	0.637	0.374
Product Innovation (1=Yes, 0=No)	0.69	0.36
Membership to a business group/association for coping (1=Yes,0=No)	0.571	0.25
Relocation to safer areas (1=Yes,0=No)	0.598	0.26

Table 4.4 Number of coping strategies adopted

	Percentage adoption				
No. of coping strategies	**0**	**1**	**2**	**3**	**4**
Full sample	1%	3%	12%	38%	46%

Table 4.5 coping strategies for SME characteristics

			Mean of adoption of coping strategies			
SME characteristics	**Mean**	**stdev**	**Flood Insurance**	**Product innovation**	**Membership to a business group/association for coping**	**Relocation to safer areas**
Age	36.61	10.14	41.03	36.05	35.04	34.31
Education.						
Primary. (1=yes,0=No)	0.15	0.11	0.35	0.10	0.60	0.79
Secondary. (1=yes,0=No)	0.20	0.14	0.54	0.79	0.82	0.25
College. (1=yes,0=No)	0.30	0.48	0.72	0.84	0.78	0.18
University. (1=Yes, 0=No)	0.35	0.37	0.82	0.85	0.75	0.61
Awareness of climate change effect (1=Yes, 0=No)	0.67	0.49	0.71	0.76	0.62	0.81
Staff Training (1=yes 0=No)	0.62	0.44	0.38	0.78	0.67	0.57
Previous experience (1=yes 0=No)	0.61	0.48	0.52	0.63	0.60	0.80
Access to climate change information (1=Yes, 0=No)	0.85	0.44	0.87	0.86	0.68	0.89
Availability of technology (1=Yes, 0=No)	0.76	0.42	0.76	0.88	0.64	0.77
Access to qualified human resource (1=Yes, 0=No)	0.63	0.41	0.68	0.79	0.46	0.56
Access to financial resource (1=Yes, 0=No)	0.42	0.39	0.78	0.81	0.40	0.70
Access to water (1=Yes, 0=No)	0.63	0.37	0.30	0.65	0.60	0.67
Access to tarmac (1=Yes, 0=No)	0.64	0.40	0.45	0.62	0.72	0.75

Access to electricity (1=Yes, 0=No)	0.68	0.41	0.20	0.24	0.10	0.26
Organization size						
percentage of revenue designated to climate change	0.02	0.04	0.80	0.78	0.02	0.75
Number of employees designated to climate change coping	1.67	0.47	1.6	1.77	1.67	1.6

Table 4.6: Correlation Coefficient of Error Terms from MVP model

	Correlation coefficient of error terms	**std error**	**z value**
rho21	0.163	0.009	0.001
rho31	0.219	0.010	0.000
rho41	0.066	0.012	0.175
rho32	0.175	0.009	0.000
rho42	0.088	0.003	0.070
rho 43	0.018	0.008	0.688

The numbers in rho refer to:1=flood Insurance,2=Product innovation, 3= Membership to a business group/association for coping,4=Relocation to safer areas.

Table 4.7: MVP model results

Variables	**Membership to a business group**		**Flood Insurance**		**Product Innovation**		**Relocation to a safer area**	
	Estimate	**Std error**	**Estimate**	**Std error**	**Estimate**	**Std error**	**Estimate**	**Std error**
(Intercept)	0.051	0.776	0.331	0.783	1.011	0.826	0.197	0.794
Age	0.000	0.017	0.043**	0.02	0.034	0.019	0.021	0.017
Primary	0.063	0.227	0.047	0.227	0.221	0.225	0.082***	0.026
Secondary	0.821***	0.347	0.640	0.364	0.712***	0.372	0.421	0.331

College	0.433	0.256	0.332	0.262	0.508**	0.295	0.263***	0.068
Previous experience	0.011**	0.022	0.019	0.023	0.017	0.025	0.046**	0.022
Awareness of climate change effect	0.471	0.259	0.387	0.227	0.473	0.221	0.732**	0.319
Access to climate change information	0.028*	0.043	0.041*	0.047	0.086**	0.051	0.082**	0.044
Resource availability	0.032	0.018	0.074**	0.038	0.770***	0.043	0.064**	0.039
Training and capacity building	0.228	0.312	0.232	0.300	0.710	0.340	0.150	0.268
Qualified human resource	0.234	0.192	0.624**	0.169	0.815***	0.174	0.378	0.182
Financial resource	0.031	0.022	0.081***	0.041	0.080**	0.039	0.079**	0.036
Availability of technology	0.251**	0.144	0.656**	0.331	0.745**	0.375	0.565	0.295
Size of organization	0.508	0.187	0.786***	0.485	0.265**	0.204	0.623***	0.490

Probability value * $p < 0.1$, ** $p < 0.05$ *** $p < 0.01$

4.5 Summary of Findings

From the results, we find that the majority of SMEs (63%) are owned and run by men while less (37%) are run by female, the rate of adoption of the adaptation strategies in Kajiado is very high with more than 83% adopting 3 or more scoping strategies. On average the age of the SME owners was 37 years, the majority of the respondents had a university degree 35%, a college diploma 30%, a secondary level 20% and a primary level 15%.

The most adopted coping strategy is product innovation, flood insurance and relocation to safer areas while the least adopted is membership to the business group for coping, majority of SME owners at primary school level adopted relocation, and those at the secondary level, college and university level adopted product innovation. Most SMEs' indicated that they can access climate change information and have had previous experience with the impact of climate change extreme.

Correlation results reveal that there is a strong positive correlation between awareness and knowledge and coping to climate variability and change in Kajiado county 0.813, between technology and coping to climate variability and change 0.79, between resource availability and

coping to climate variability and change 0.92 and between organization size and coping to climate variability and change in Kajiado county 0.79.

CHAPTER FIVE

DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter discusses the findings in Chapter 4 on the relationship between awareness and knowledge, technology capacity, resource availability, size of the organization and adaptation strategy to climate change.

5.2 Discussions

5.2.1 Influence of awareness and knowledge on coping strategy

SMEs in Kajiado are dominated by males, this match (Angutsa, 2023) who also found that the majority of SMEs in Kajiado are dominated by males, we agree with (Atela et al.,2017) who say that exclusion and underrepresentation of women in key areas such as policy making is the cause of such gap, the SME owners average age is 37 years this shows that young people are engaged in the SME field, the rate of adopting the coping strategies in Kajiado are shown to be very high, more than 84% have adopted more than 3 strategies, this means that the SMEs are well prepared for coping with climate change with the most adopted strategy being product innovation.

Age has been associated with the adoption of flood insurance, (Cannon, C. et al. 2020, Brody et al., 2017) found that older homeowners are more likely to adopt flood insurance, from our MVP results we see that older SME owners are more likely to adopt flood insurance, this shows that they have high experience with climate change effect and that they are keen on the financial safety of their business, younger owners however opted for relocation to safer areas. To increase climate change mitigation and resilience in developing countries, it is important to enhance awareness and knowledge about climate change (Norgaard, 2011). From the results, we note that the majority of the respondents were aware of the effects of climate change, this could have been created by the training and capacity buildings conducted by SMEs and also the high levels of education, this underscores the importance of education and training in SMEs, this finding corroborates with the findings of (Elia 2017) who found that farmers were aware of climate change and this is as a result of training.

Results on education show that most SME owners have a degree level and higher, the level of education has an influence on adopting product innovation because education enhances awareness

and knowledge and makes it easier to understand and comprehend climate change issues, this is the same for training and capacity building, the correlation results show a strong positive relationship between awareness and knowledge and coping strategies (r = 0.813), this findings agree with (Abbasi & Nawaz, 2020) who found a positive and strong association between awareness and climate change adaptation.

5.2.2 Influence of technology on coping strategies.

The study uncovers that most SMEs have access to relevant technology at their disposal, this is an indication that SMEs in Kajiado have access to technology, besides the result shows that technology influences product innovation significantly (86%), this corroborates with (Crick et al., 2018) that technology fosters innovation and enhances adaptation, we also find that most of the SMEs rely on forecasting to plan for the future, despite this importance of technology, most SMEs face challenges such as high implementation cost which reduces resilience of most SMEs (Atela et al.,2017).

The results show a strong positive correlation between technology and coping to climate change (r = 0.796), these findings agree with (Crick et al., 2018) that access to technology encourages adaptation to climate change risk.

MVP model result shows that access to technology positively and significantly influences product innovation and flood insurance, in addition, this has little influence on membership to business groups and no significant influence on relocation to safer areas.

5.2.3 Influence of resource availability on coping strategies.

From the results we find that SMEs ranked two resources as most important, the financial resource is of great importance (87%) followed by human resource (63%), however, the results indicate that most SMEs find it difficult to access financial resources, only 42% can access it, this means that the majority are not able to access financial resources, this finding corroborates with the findings of (Khanal and Wilson 2019) who discovered that over 25% of companies in Africa consider the accessibility and affordability of financial resources to be their primary obstacle, on the same note the results show that most SMEs are not good at savings, data shows that only 31% find it easy to access their savings. According to the results access to financial resources has a significant

influence on strategies like product innovation, flood insurance and relocation, there was no significant influence on membership to the group.

SMEs can easily access qualified human resources, most of the respondents agreed that they can easily access qualified human resources, it is also noted that this has a significant influence on product innovation and flood insurance, most SMEs conduct training and capacity building for their employees to sharpen and enhance their skill, with the help of government and NGO who play a significant role in these trainings.

Resource availability plays a significant role in SMEs' strategy for coping with climate change, there is a strong positive correlation between resource availability and coping with climate variability and change ($r = 0.921$) this finding agrees with (Abraham and Fonta 2018) that exposure to climate change and the need for financial access are highly correlated and (Crick et al., 2018) that access to finance determines the kind of adaptation strategy adopted.

MVP model result shows that financial resource has a significant positive influence on flood insurance, product innovation and relocation while qualified human resource has a significant positive influence on product innovation and flood insurance.

5.2.4 Influence of organization size on coping strategy

In terms of the amount dedicated to climate change, the results show that SMEs have dedicated only 2% of their revenue to climate change, most SMEs have sighted that the most experienced climate adversity in the region is flood, which has been found by (Wedawatta et al., 2014) to have a devastating impact in terms of hiked costs and losses to SMEs, we note that the SMEs in Kajiado are not well prepared for climate change in terms of revenue allocation. We can note that revenue allocation significantly influences flood insurance, high allocations mean that SMEs can comfortably subscribe to flood insurance but with little allocation, going for flood insurance is not easy, in terms of the number of employees dedicated to climate change, the result shows that SMEs have set aside two employees to deal with climate change issues, we can note that these employees have helped organization to majorly adopt flood insurance and product innovation to a greater extent.

The results show that there is a strong positive correlation (r = 0.793) between the size of the organization and coping with climate change, this finding agrees with (Crick et al., 2018) that organization size may affect their ability to adapt to the sustainability or unsustainable strategy

MVP results show that the size of the organization significantly and positively influences flood insurance and relocation to safer areas with little positive influence on product innovation and no significant influence on membership to business groups for coping.

5.3 Conclusion

The study concludes that there is a complimentary relationship between adopting flood insurance, product innovation, membership to business groups and relocation to safer areas, this means that these strategies can be adopted together without causing inconvenience to the SMEs or competing with each other.

The study also concludes that awareness and knowledge, technology capacity, resource availability and size of the organization have a strong positive influence on SMEs' choice of coping strategy.

5.4 Recommendations

Education and training have a direct influence on innovation and coping with climate change, it is therefore important that training and capacity building be encouraged for SME owners with low education levels, its notable that they lack training on innovation and this is why they have low levels of innovation, on the same note dissemination of climate change related information should be done accurately and in good time because the SMEs rely on this information to plan for the future and choose the best coping strategy.

Resource availability encourages innovation and enhances coping to climate change; however, it is very hard for SMEs in Kajiado to access financial resources, it is therefore imperative that legislation for friendly and affordable financial services be put in place to enhance access to finance.

Access to technology is an important factor in coping to climate change, however there are barriers and limitations that most SMEs in Kajiado have put across as limiting factors for them to use advanced technology apart from mobile phones, the main barrier is high implementation cost, the study therefore recommends that access to technology should be made affordable to SME owners

in vulnerable areas, there is need to empower women and encourage them to do small businesses in the area, this can be done by the government in collaboration with other NGOs.

5.5 Suggestions for further studies

This study focused on how awareness and knowledge, technology capacity, availability of resources and size of the organization influence flood insurance, product innovation, and membership to business groups for coping and relocation to safer areas among SMEs in Kajiado County, further studies can be done in other counties and also a further focus on other strategies that are not mentioned here, finally an additional study can be done on bigger businesses that are not SME in nature.

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Appendix 1 Questionnaire

This questionnaire is part of academic research to understand the factors influencing SMEs coping strategies to climate variability and change. Your sincere responses will help me understand this issue and your decision to participate is completely voluntary.

If you consent to participate, the questionnaire should take approximately 10 minutes to complete. Please answer the questions in the spaces provided. I assure you that the information provided will only be used for the intended academic purpose and will be treated with total confidence.

Your responses together with other participants will be used as the main data set for the research project for my Master of Science in Development Finance (MDF) at Strathmore Business School.

If you want any further clarifications, you can reach me on 0718207030.

Thank you

Galgalo Dida

PART 1

SECTION A: GENERAL INFORMATION

1) Gender
   Male [ ] Female [ ]
2) Indicate the number of years you have worked in your present organization. ……
3) Level of Education ……
4) What is the category of your SME? ……
5) Are you aware of climate change?
   Yes [ ] No [ ]
6) Are you aware of the effects of climate change on SMEs?
   Yes [ ] No [ ]
7) Has your SME suffered from the negative impact of climate change?
   Yes [ ] No [ ]

8) which of the following natural disasters is common with the hardest impact on your SME. Rank as 1=Most Common. 2=Common. 3= Not Common.

Natural disaster	1	2	3
Drought			
floods			
Fire			
Earthquake			

PART TWO

SECTION B: AWARENESS AND KNOWLEDGE

i. Knowledge on Climate change risk

1) Are you aware of climate change risk?

Yes [ ] No [ ]

2) Has your business undertaken any staff training and capacity building on climate change risk?

Yes [ ] No [ ]

3) If yes how many have been trained?.....

4) Has your business had a prior encounter with climate change risk? Tick appropriately

Yes [ ] No [ ]

5) If yes in (4) above which of the following risks has your business encountered due to climate change? Kindly tick appropriately, you can choose more than one.

a) Loss of revenue due to low demand ☐
b) fluctuation in supply and price of raw material ☐
c) Disruption in the transportation of goods ☐
d) Business premises directly affected by disaster ☐
e) Others ☐ Kindly Specify ……...……

ii. Knowledge of coping strategy

1) Has your business undertaken any staff training and knowledge building to help adapt to the effects of climate change?

   Yes [ ] No [ ]

2) If yes how many staff members have been trained?.....

3) Has your business had prior experience of climate change coping?

   Yes [ ] No [ ]

4) If Yes in (3) above, what measure did you put in place to adapt to the effects of climate change? Tick appropriately.

   a) Flood Insurance. ☐
   b) Membership to a business group/association for coping. ☐
   c) Product Innovation. ☐
   d) Relocation to safer areas. ☐
   e) Others. ☐ Kindly Specify…….

iii. Access to climate information

1) Does your organization have access to climate-related information? Tick appropriately.

   Yes [ ] No [ ]

2) How frequently do you access climate-related information?

   a) Never ☐
   b) Rare ☐
   c) sometimes ☐
   d) Always ☐

3) who/what is your source of information? Tick appropriately.

   a) government agencies ☐
   b) climate-related NGOs. ☐
   c) Social media ☐
   d) Business groups/associations for coping ☐
   e) Others ☐ kindly specify ……

4) Do you trust the information provided?

   Yes [ ] No [ ]

5) How would you rate the quality of climate change-related information that your business access? Tick appropriately

a) Poor ☐

b) Fair ☐

c) Good ☐

d) Very Good ☐

e) Excellent ☐

6) Are there any challenges or barriers you face in accessing climate-related information for your business? Tick appropriately

Yes [ ] No [ ]

7) If yes in (6) above, kindly tick the challenge(s) you face in accessing the information.

a) Low accessibility to climate-related information ☐

b) Inadequate information on seasonal forecast ☐

c) Lack of relevant technology ☐

d) Illiteracy ☐

e) A mismatch between weather forecast and the actual weather ☐

SECTION C: TECHNOLOGY

i. Availability of relevant technology

1) Do you have relevant technology within your SME that helps to address coping to climate variability and change? Tick appropriately.

Yes [ ] No [ ]

2) If yes in (1) above, how many years have you used the technology? Tick appropriately.

a) 1-5 ☐

b) 5-10 ☐

c) Above 10 ☐

3) Does having the relevant technology within your SME help to address climate variability and change challenges? Tick appropriately.

Yes [ ] No [ ]

4) Does your SME rely on weather monitoring or forecasting systems to plan for future coping with climate change?

Yes [ ] No [ ]

5) Has your SME encountered challenges in using technology to adapt and cope with climate variability and change? Tick appropriately.

   Yes [ ] No [ ]

6) If yes in (5) above what are the challenges? Tick appropriately.

   a) High cost of implementation ☐
   b) Lack of Knowledge ☐
   c) Lack of motivation ☐

ii. Promote energy-efficient measures

1) Does your SME promote energy-efficient measures?

   Yes [ ] No [ ]

2) If yes in (1) above what are the energy-efficient measure(s) used?

   a) Solar energy ☐
   b) Biomass Energy ☐
   c) Use of energy-friendly bulbs ☐
   d) Switching off the lights when not in use ☐

3) How many years have you used the technology? Tick appropriately.

   a) 1-5 ☐
   b) 5-10 ☐
   c) Above 10 ☐

SECTION D: RESOURCE AVAILABILITY

i. Financial resource

1) Does availability of financial resources within the SME influences how to address climate variability and change. Tick appropriately.

   Yes [ ] No [ ]

2) What is the major source of funding for climate change coping for your business? Tick appropriately.

   a) Savings ☐
   b) Loan ☐
   c) Family contribution ☐
   d) Government grants ☐
   e) Climate Change NGO ☐

3) What is the ease of access to the following source of funding for climate change coping? Rank as 1=Very Easy. 2=Easy. 3= Hard. 4=Very Hard

Source of Funding	**1**	**2**	**3**	**4**
Savings				
Loan				
Family contribution				
Government Grants				
Climate-related NGO support				

ii. Human Resource

1) Is it easy for your business to access qualified human resource on matters climate change and coping? Tick appropriately.

   Yes [ ] No [ ]

2) Has your business provided training and capacity building programs to the employees regarding the climate change coping strategies?

   Yes [ ] No [ ]

3) If yes in (2) above, how long was the training (in months) …….

4) Has any of the following helped your SME in training and capacity building on climate change and how to adapt?

   a) Government Yes [ ] No [ ]
   b) Climate-related NGO Yes [ ] No [ ]

iii. Infrastructure

1) Do you have access to the following infrastructure?

   a) Water Yes [ ] No [ ]
   b) Tarmac Road Yes [ ] No [ ]
   c) Electricity Yes [ ] No [ ]

2) What is the distance between your business and the main water center? Kindly state the distance in meters/kilometers…….

3) Is water an important factor in helping your business adapt to climate variability and change?
   Yes [ ] No [ ]
4) What is the distance between your business and the tarmac road? Kindly state the distance in meters/kilometers…….
5) Is tarmac road an important factor in helping your business adapt to climate variability and change?
   Yes [ ] No [ ]
6) Is the electricity reliable? Yes [ ] No [ ]
7) Kindly state the average number of hours that you have access to electricity in a day …….
8) Is electricity an important factor in helping your business adapt to climate change?
   Yes [ ] No [ ]
9) Out of the following infrastructure, kindly rank the most important infrastructure for coping and adopting to climate variability and change using the following parameters where 1=Very important. 2= important and 3= not important

Infrastructure	**1**	**2**	**3**
a) Water			
b) Tarmac Road			
c) Electricity			

SECTION E: SIZE OF THE ORGANIZATION

iv. Revenue

1) Do you have an allocated budget/emergency fund for climate change coping and coping strategy in proportion to your revenue? Tick appropriately
   Yes [ ] No [ ]
2) If yes in (1) above, what percentage of your revenue goes to the emergency fund?
   a) 1%-10% ☐

b) 11%-20% ☐

c) 21%-30% ☐

d) 31%-40% ☐

e) 41%-50% ☐

f) Above 50% ☐

v. Number of employees

1) Does the organization have designated team or personnel responsible for climate change coping strategies? Tick appropriately

Yes [ ] No [ ]

2) If yes, do you think the team helps the business to adapt to climate change?

Yes [ ] No [ ]

3) If yes in (1) above, how many employees? Tick appropriately.

a) 1-5 ☐

b) 6-10 ☐

c) 11-15 ☐

d) above15 ☐

vi. Market share

1) Do you think that the percentage of market share influences the approach to climate change coping strategies?

Yes [ ] No [ ]

2) If yes in (1) above, to what extent do you think the percentage of market share influences the approach to climate change coping strategies? where:4 = large extent, **3**= Medium extent, 2= Small extent and **1** = No extent

Market share percentage	Influence on coping and coping strategy			
	1	2	3	4
1%-5%				
6%-10%				
11%-15%				
16%-20%				

Above 20%				

SECTION F: COPING STRATEGIES

1) Have you adopted any of the following coping strategies?

a) Flood Insurance. Yes [ ] No [ ]

b) Product Innovation. Yes [ ] No [ ]

c) Membership to a business group/association for coping. Yes [ ] No [ ]

d) Relocation to safer areas. Yes [ ] No [ ]

Appendix 11 Introduction Letter.

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Strathmore UNIVERSITY
BUSINESS SCHOOL

25th January 2024

Director General,
National Commission for Science Technology and Innovation, P.
O. Box 30623, 00100 Nairobi.

Dear Sir,

RE: FACILITATION OF RESEARCH – HALAKE, GALGALO DIDA

This is to introduce Halake, Galgalo Dida who is a Master of Science in Development Finance (MDF) Student at Strathmore University Business School, admission number MDF/124073/19. As part of our MDF Program, Dida is expected to do applied research and undertake a project. This is in partial fulfilment of the requirements of the MDF course.

Dida is undertaking a research paper on **"Factors Influencing SME's Adaptation and Coping Strategies to Climate Variability and Change in Kajiado County."** The information obtained shall be treated confidentially and shall be used for academic purposes only.

Our MDF seeks to establish links with industry, and one of these ways is by directing our research to areas that would be of direct use to industry. We would be glad to share our findings with you after the research.

We appreciate your support and shall be willing to provide any further information if required.

Yours sincerely,

Alois Njenga
Manager - Graduate Programmes.

Appendix 111. NACOSTI Research License.

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE.TECHNOLOGY & INNOVATION

Ref No: **748247**

Date of Issue:**06/February2024**

RESEARCH LICENSE

This is to Certify that Mr.. Galgalo Dida Halake of Strathmore University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Kajiado on the topic: Factors Influencing SMEs coping strategies to climate variability and change in Kajiado County for the period ending : 06/February/2025.

License No:**NACOSTI/P/24/32836**

748247

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE.TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

See overleaf for conditions

Appendix 1V. Ethical Approval

Strathmore UNIVERSITY

23rd January 2024

Mr Dida Galgalo,
dida.galgalo@strathmore.edu

Dear Mr Dida,

RE: Factors Influencing SME's Coping Strategies to Climate Variability and Change in Kajiado County

This is to inform you that SU-ISERC has reviewed and **approved** your above **SU-masters** research proposal. Your application reference number is **SU-ISERC1959/24**. The approval period is from **23rd January 2024 to 22nd January 2025.**
This approval is subject to compliance with the following requirements:

i. Only approved documents including (informed consents, study instruments, MTA) will be used.
ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by SU-ISERC.
iii. Death and life-threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to SU-ISERC within 72 hours of notification.
iv. Any changes anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to SU-ISERC within 72 hours.
v. Clearance for the export of biological specimens must be obtained from relevant institutions.
vi. Submission of a request for renewal of approval at least 60 days prior to the expiry of the approval period. Attach a comprehensive progress report to support the renewal.
vii. Submission of an executive summary report within 90 days of completion of the study to SU-ISERC.

Before commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology, and Innovation (NACOSTI) https://research-portal.nacosti.go.ke/ and obtain other clearances needed.

Yours sincerely,

Mr Ambrose Rachier,
Chairperson; SU-ISERC

STRATHMORE UNIVERSITY INSTITUTIONAL SCIENTIFIC AND ETHICAL REVIEW COMMITTEE
(SU-ISERC)
23-Jan-2024
Email:ethicsreview@strathmore.edu
P.O BOX 59857-00200
NAIROBI-KENYA

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