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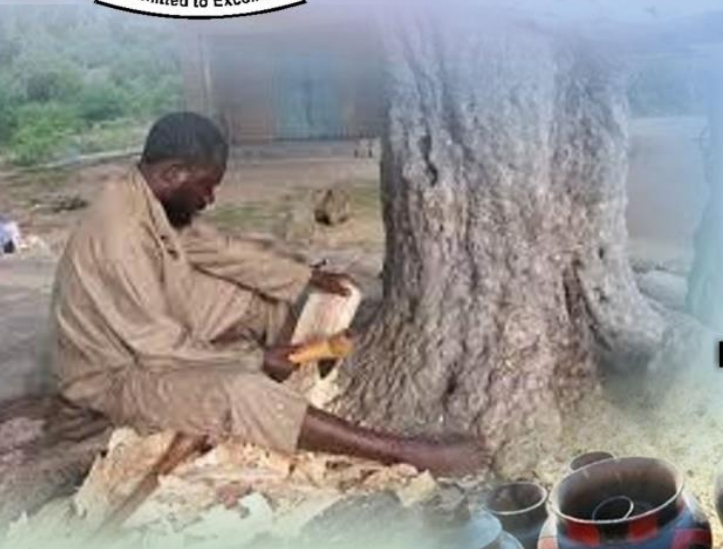
JOURNAL OF DESIGN, INNOVATIVE THINKING AND PRACTICE



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The purpose of the *Kuveza neKuumba - Zimbabwe Ezekiel Guti University Journal of Design, Innovative Thinking and Practice is* to provide a forum for design and innovative solutions to daily challenges in communities.

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The Role of Financial Intelligence Units in Zimbabwe: A Study on Combating Money Laundering Using the Financial Action Task Force Recommendations Implementation Model

JIMU TAFADZWA[1] AND LEDWIN CHIMWAI[2]

Abstract

This quantitative study examines the role of Financial Intelligence Units (FIUs) in Zimbabwe in combating money laundering, using the Financial Action Task Force (FATF) Recommendations Implementation Model. A survey of 40 stakeholders involved in anti-money laundering efforts yielded 38 responses, analysed through regression analysis to identify key factors influencing FIU effectiveness. The findings reveal significant challenges, including regulatory deficiencies such as gaps in legal frameworks and inconsistent enforcement economic instability and inadequate resources, which limit operational capacity. For instance, outdated legislation hinders effective monitoring and reporting of suspicious transactions. The study concludes that strengthening the regulatory framework, enhancing resources and improving international cooperation are critical to FIU effectiveness. A comprehensive model, the Zimbabwe Financial Intelligence Unit Enhancement Model (ZFIUEM), was developed, integrating regulatory enhancements, resource optimisation and international cooperation. The implications for policy-makers and financial institutions are profound: policy-makers should

[1] Department of Research and Development, Zimbabwe Republic Police, Harare, Zimbabwe; Department of Accounting and Finance, ,Zimbabwe Ezekiel Guti University, Bindura, Zimbabwe, https://orcid.org/0009-0005-7716-0816,jimutafadzwa626@gmail.com.

[2] Department of Economics and Finance, Great Zimbabwe University, Masvingo, Zimbabwe, https://orcid.org/0000-0002-8796-2821, lchimwai@gmail.com

prioritise robust regulatory frameworks to keep pace with evolving money laundering techniques, while financial institutions are encouraged to invest in training and resources to enhance compliance capabilities. Strengthening collaboration between FIUs and international bodies will facilitate information sharing and improve responsiveness to global money laundering threats, ultimately fostering a more resilient financial system in Zimbabwe.

Keywords: regulatory framework, technology, security, policy, management

INTRODUCTION

In recent years, the significance of robust financial intelligence units (FIUs) in combating money laundering has become increasingly critical. The global landscape of financial crime has evolved significantly, necessitating the establishment of sophisticated financial intelligence systems to combat money laundering effectively. Money laundering poses a severe threat to the integrity of financial systems worldwide, facilitating various illicit activities, including corruption, human trafficking and terrorism financing. As criminal organisations employ more sophisticated techniques to conceal the origins of illegal funds, there is an urgent need for strong regulatory frameworks and technological solutions.

Countries around the globe are striving to strengthen their anti-money laundering (AML) policies, often in line with the recommendations of the Financial Action Task Force (FATF). This organisation provides a comprehensive framework for preventing money laundering and terrorist financing (FATF, 2022). Financial institutions are mandated to implement stringent AML procedures, such as Know Your Customer (KYC) protocols, transaction monitoring and reporting of suspicious activities. As argued by Jones and Smith (2023), the

effectiveness of AML systems varies widely among countries due to factors such as technological adoption, regulatory compliance and the overall financial ecosystem.

Zimbabwe faces unique economic challenges, including hyperinflation and limited resources, which exacerbate the issues associated with money laundering. The existing financial and regulatory frameworks struggle to keep pace with the growing complexity of financial crimes. It is crucial to explore tailored strategies that leverage the capabilities of financial intelligence units to bolster AML initiatives (Khumalo, 2023). The regulatory framework for AML in Zimbabwe has been evolving, driven by the recognition of the urgency to address this issue. While strides have been made toward aligning national laws with international standards, substantial gaps remain in enforcement and practical application (Ndlovu, 2023).

Zimbabwe's economic instability presents significant challenges for the effective functioning of FIUs. Hyperinflation, coupled with limited financial resources, hinders the government's ability to implement comprehensive AML strategies. As argued by Khumalo (2023), this instability complicates the collaboration between FIUs and financial institutions, ultimately reducing the overall effectiveness of the AML framework. The inability to maintain a stable economic environment creates vulnerabilities that can be exploited by criminal organisations, further complicating efforts to combat money laundering.

The regulatory framework for AML in Zimbabwe, while evolving, suffers from notable deficiencies. Inconsistent enforcement of existing laws and a lack of updated legislation create significant loopholes which criminal organisations can exploit. Ndlovu (2023) emphasises that these regulatory gaps hinder the capacity of FIUs to monitor and report suspicious activities

effectively. The absence of a cohesive legal structure undermines the integrity of the financial system, making it easier for illicit activities to flourish.

The integration of modern financial intelligence technologies has the potential to significantly enhance the identification and reporting of suspicious activities. However, lack of resources and training limits the capacity of FIUs to adopt and implement these technologies effectively (Chikwana, 2023). The slow pace of technological adoption exacerbates existing challenges, as outdated systems fail to keep up with evolving money laundering techniques. Investing in technological solutions is essential for improving the overall efficacy of the AML framework in Zimbabwe, as highlighted by Chikwana (*ibid.*), who notes that advanced analytics can significantly improve the detection of suspicious transactions.

The article aims to critically examine the role of financial intelligence units in Zimbabwe and to propose a model that enhances their effectiveness in combating money laundering. By identifying existing gaps and challenges, the research intends to provide actionable insights for financial institutions and policy-makers to strengthen the country's AML capabilities. Ultimately, this work contributes to the broader discourse on enhancing financial security and integrity in Zimbabwe and beyond.

Zimbabwe faces significant challenges in combating money laundering, stemming from economic volatility, inadequate regulatory frameworks and limited technological infrastructure. As argued by Ndlovu (2023), the efficacy of financial intelligence units is considerably hampered by insufficient resources and enforcement capabilities in current AML measures. Furthermore, Khumalo (2023) emphasises that while there have been attempts to align national regulations with international

standards, such as those set forth by the FATF, actual implementation remains inconsistent and ineffective. The lack of advanced technological tools and real-time data analytics constrains financial institutions' ability to monitor and report suspicious transactions. This issue is exacerbated by the disconnect between financial entities and regulatory bodies, leading to fragmented efforts in the fight against money laundering. Consequently, this problem affects not only the banking sector but also the broader economy and society, as money laundering undermines public trust in financial institutions and hinders economic growth. There underlying hypotheses are as follows:

H1: Regulatory inadequacies significantly impede the effectiveness of financial intelligence units in preventing money laundering in Zimbabwe.
H2: Economic instability adversely affects the operational efficiency of anti-money laundering measures implemented by financial intelligence units.
H3: The incorporation of advanced technological solutions, such as block chain and data analytics, positively improves the effectiveness of financial intelligence units in combating money laundering in Zimbabwe.

LITERATURE REVIEW

The global fight against money laundering has gained significant momentum, prompting many nations to establish robust FIUs as a critical component of their AML strategies. These units play a vital role in analysing and disseminating financial intelligence, which is essential for identifying and combating illicit financial activities. In the context of Zimbabwe, the effectiveness of its FIU is influenced by various factors, including regulatory frameworks, technological advancements and economic conditions.

Countries such as the United States and the United Kingdom have implemented stringent AML laws that underscore the importance of effective information sharing among agencies. For instance, the USA PATRIOT Act and the Bank Secrecy Act mandate financial institutions to report suspicious activities and maintain comprehensive compliance programmes. Similarly, the UK's Proceeds of Crime Act (POCA) requires due diligence in reporting suspicious transactions. These legislative frameworks highlight the necessity for FIUs to operate within a well-defined regulatory environment to effectively combat money laundering (FATF, 2022). This underscores the research objective of identifying regulatory gaps within Zimbabwe's AML framework.

In recent years, countries like Canada and Australia have developed comprehensive AML frameworks that emphasise risk-based strategies and the integration of technology, including data analytics and ML, to enhance the capabilities of their FIUs. These technological advancements enable the identification and prevention of illicit financial activities by analysing transaction patterns and detecting anomalies (Zhou *et al.*, 2023). Such international efforts underscore the need for a coordinated approach to address the complex challenges of money laundering, particularly as criminals continue to evolve their tactics to exploit legal loopholes. This aligns with the research hypothesis that integrating advanced technology can significantly enhance Zimbabwe's FIU effectiveness.

In the European Union, directives aimed at standardising AML laws among member states have been instrumental in addressing money laundering. The Fourth Anti-Money Laundering Directive emphasises the importance of risk assessment and beneficial ownership transparency, which are crucial for closing gaps that criminals may exploit (European Commission, 2021). Countries like Singapore have made

substantial investments in technology, utilising AI and data analytics to enhance their financial intelligence systems, demonstrating the critical role of innovative approaches in detecting suspicious trends and activities (Sullivan, 2022). By examining these international frameworks, this study aims to inform Zimbabwean policies, in line with effective global practices.

In Africa, economic instability, regulatory weaknesses and limited capacity within financial institutions contribute to persistent money laundering challenges. Countries such as Nigeria and Kenya face significant obstacles due to corruption and inadequate enforcement measures, which hinder the effectiveness of their FIUs (Ojo, 2023). The uneven adoption of the FATF guidelines across the continent has left many countries struggling to establish effective regulatory bodies and interagency cooperation (Mugari, 2023). For instance, in South Africa, while there is a relatively sophisticated legal framework, practical enforcement remains challenging, leading to fragmented strategies in preventing money laundering (Moyo, 2022). These observations inform the study's objective of addressing the regulatory and capacity-related challenges specific to Zimbabwe.

In Zimbabwe, the AML landscape is shaped by a combination of regulatory deficiencies and economic hardships. Although efforts have been made to align the country's AML framework with international standards, challenges such as hyperinflation and resource scarcity hinder effective implementation (Chikozho, 2023). The FIU faces difficulties in monitoring financial transactions and enforcing compliance among institutions, exacerbated by limited technological infrastructure (Mugari, 2023). Furthermore, public trust in the AML framework is undermined by perceptions of corruption within regulatory bodies (Moyo, 2022). These issues directly relate to

the study's aim of proposing a model that enhances the regulatory framework and technological integration in Zimbabwe.

Recent initiatives aimed at enhancing technology use in monitoring and reporting suspicious activities have yielded mixed results, highlighting the need for comprehensive training programmes and improved interagency cooperation to bolster the effectiveness of Zimbabwe's financial intelligence systems (Ojo, 2023). Despite these initiatives, significant gaps persist in Zimbabwe's strategy for combating money laundering. Although current financial intelligence systems are operational, their potential is constrained by outdated regulatory processes and a lack of centralised information exchange (Chikozho, 2023). This study addresses these critical gaps, focusing on the need for a unified approach to enhance the legal and technological frameworks.

CONCEPTUAL FRAMEWORK

At the core of this framework are technological advancements which empower FIUs in Zimbabwe to enhance their capabilities in detecting and preventing money laundering. The integration of data analytics and visualisation tools is crucial, as these advanced systems can process and visualise transaction data, allowing FIUs to identify patterns and anomalies indicative of suspicious activities. This capability enables the discovery of hidden relationships within extensive datasets, which traditional methods might miss (Zhou and Wang, 2022). Additionally, the use of predictive analytics allows FIUs to leverage historical data to anticipate potential money laundering activities, enabling them to proactively identify high-risk entities and transactions (Moyo and Chikozho, 2021). By focusing resources on these identified risks, FIUs can better mitigate potential money laundering threats. Furthermore, bolstering cybersecurity measures is essential to shield financial systems

from cybercriminals who may exploit vulnerabilities. Robust cybersecurity protocols not only protect the integrity of sensitive financial data, but also help maintain public confidence in the financial system (Nyoni, 2023).

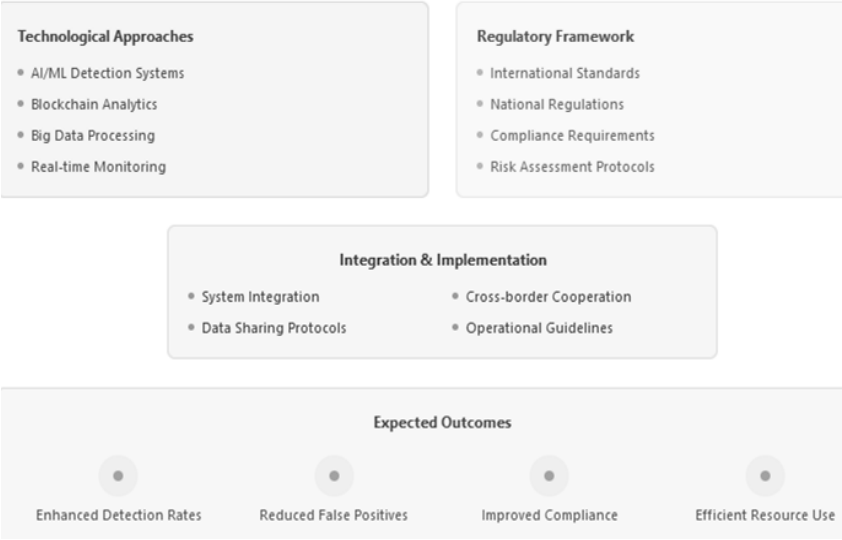

Figure 1: *Conceptual Framework* (Researchers, 2025)

The regulatory framework aspect of this study outlines the essential legal structures and standards that govern the operations of FIUs in Zimbabwe. Compliance with national laws, such as the Money Laundering and Proceeds of Crime Act and international standards set by organisations like FATF, is critical for ensuring a cohesive approach to combating money laundering (Chikova, 2022). This alignment enhances the integrity of Zimbabwe's financial systems and facilitates international cooperation in AML initiatives. Moreover, continuous training and capacity-building initiatives for FIU staff and partner institutions are vital. Such training ensures that personnel are equipped to recognise and report suspicious activities effectively, fostering a culture of compliance within

FIUs and enhancing the overall effectiveness of anti-money laundering measures in Zimbabwe (Gumbo and Nyoni, 2021).

Collaboration is a key component of this framework, emphasising the importance of partnerships among various stakeholders involved in combating money laundering. Interagency cooperation is essential for the effective sharing of intelligence and resources between FIUs, regulatory bodies, law enforcement agencies and financial institutions. Establishing formal partnerships enhances information exchange, leading to improved responsiveness to money laundering threats (Munyoro, 2022). Additionally, public-private partnerships can harness additional resources and expertise, enabling joint initiatives which strengthen the overall fight against money laundering. Collaborative efforts may include shared databases for suspicious activity reports and coordinated responses to emerging financial crimes. By promoting collaboration among diverse stakeholders, the framework fosters a unified approach against money laundering, resulting in more informed decision-making and bolstered public trust in the financial system (Zhou and Wang, 2022). The anticipated outcomes of implementing this conceptual framework are substantial and transformative. Enhanced detection capabilities are expected as FIUs leverage advanced analytics and predictive tools to improve their ability to identify suspicious activities, leading to more effective AML operations (Nyoni, 2023). Additionally, strengthened compliance levels will cultivate a culture of adherence to rigorous regulatory standards, thereby enhancing trust in Zimbabwe's financial institutions. The collaborative approach will facilitate optimal resource allocation, reducing redundancies and maximising the impact of AML initiatives. Improved stakeholder engagement will emerge from fostering cooperation among diverse entities, promoting a cohesive response to money laundering threats (Gumbo and Nyoni, 2021).

THEORETICAL FRAMEWORK

The study is supported by the following theories: Systems Theory and Routine Activity Theory (RAT). The Systems Theory offers a comprehensive framework for understanding the intricate interactions within financial systems, particularly in the context of Zimbabwe's efforts to combat money laundering. This perspective emphasises viewing the AML framework as an interconnected whole, rather than merely a collection of isolated components. The effectiveness of AML measures depends on the interactions among various entities, including financial institutions, regulatory authorities, law enforcement agencies and international partners. Reforms in one sector can have ripple effects throughout the entire system. For example, if regulatory authorities strengthen their oversight capabilities, financial institutions may respond by enhancing their compliance measures, which can subsequently lead to a decrease in money laundering activities. Conversely, economic instability can weaken financial institutions, rendering them more vulnerable to illicit activities. By applying the Systems Theory, this study can identify potential levers for reform, recognising that successful AML strategies require a holistic and integrated approach. Moreover, the theory highlights the significance of feedback loops, where outcomes of one action can influence subsequent actions. This dynamic interaction necessitates ongoing evaluation and adaptation to evolving conditions. The need for collaboration among all stakeholders is essential: effective AML frameworks require coordinated efforts to tackle the multifaceted challenges posed by money laundering. For instance, insufficient reporting of suspicious transactions by financial institutions can create regulatory blind spots, allowing criminal activities to persist. Understanding these systemic relationships is crucial for designing targeted interventions that address the root causes of money laundering in Zimbabwe.

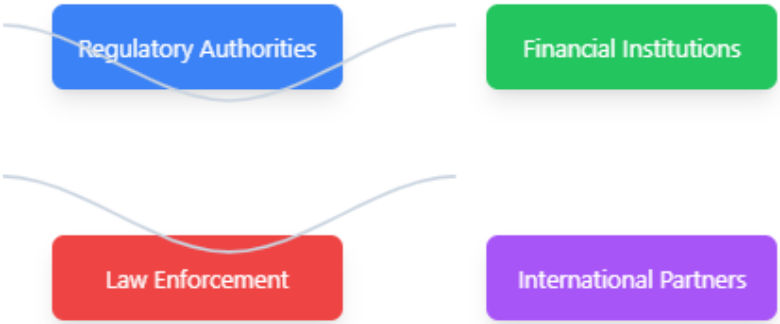

Figure 2: *Systems Theory in AML Framework* (Researchers, 2025)

The Routine Activity Theory is particularly relevant for analysing the mechanisms of money laundering within Zimbabwe's financial system. Proposed by Lawrence Cohen and Marcus Felson, RAT argues how crime occurs when three elements converge: a motivated offender, a suitable target and a lack of capable guardianship. In Zimbabwe, the economic landscape can create conditions where motivated offenders such as organised crime groups identify financial institutions as suitable targets, often due to perceived deficiencies in oversight and enforcement. By examining the routine activities of both offenders and potential victims, this study can pinpoint specific vulnerabilities within the financial system which facilitate money laundering. For example, if financial institutions are inadequately monitoring transactions or if regulatory agencies lack the resources to enforce compliance, the opportunities for laundering illicit funds increase. Applying RAT allows for a focused examination of how the daily operations of financial institutions can either mitigate or exacerbate money laundering risks.

Additionally, RAT underscores the importance of capable guardianship, which refers to the effectiveness of regulatory

frameworks and the vigilance of financial institutions. Strengthening these guardianship measures such as enhancing training for compliance officers, improving transaction monitoring technologies and fostering inter-agency collaboration, can significantly reduce opportunities for money laundering. By addressing the elements of RAT, this study aims to provide practical recommendations for creating a more robust AML environment in Zimbabwe, ultimately contributing to the effectiveness of FIUs in the fight against financial crime.

Figure 3: *Routine Activity Theory in Zimbabwe's AML Context* (Researchers, 2025)

STUDY DESIGN AND METHODOLOGY

This study employs a quantitative research design to develop a comprehensive model for enhancing the role of FIUs in combating money laundering in Zimbabwe. This approach was selected to collect measurable which that would inform the model's development effectively. To determine the appropriate sample size for this study, the following formula was utilised:

$$n = \frac{Z^2 \square p(1-p)}{E^2}$$

Where

- Z = 1.96 (95% confidence level)
- p = 0.5 (maximum variability)
- E = 0.05 (margin of error)

Using this formula, the calculated sample size was 40 respondents.

Table 1: *Sample size determination* (Researchers, 2025)

Parameter	**Value**
Confidence Level (*Z*)	1.96
Estimated Proportion (*p*)	0.5
Margin of Error (*E*)	0.05
Calculated Sample Size (*n*)	40

The target population consisted of stakeholders involved in AML efforts in Harare, the capital city of Zimbabwe. This included:

- Regulatory authorities
- Financial institutions
- Law enforcement agencies
- Technology providers

A stratified random sampling technique was employed to ensure representation across these sectors. Each subgroup was identified and participants were selected based on their roles and expertise in financial intelligence systems.

Table 2: *Participant selection table* (Researchers, 2025)

Sector	**Number of Participants**	**Selection Method**
Regulatory Authorities	10	Random selection
Financial Institutions	15	Random selection
Law Enforcement Agencies	8	Random selection
Technology Providers	5	Random selection
Total	**40**	

Data were collected using structured questionnaires designed to gather insights on perceptions of FIUs and their effectiveness in

combating money laundering. The questionnaire included close-ended questions to facilitate statistical analysis. A pilot study was conducted to ensure the reliability and validity of the instrument.

Ethical considerations are paramount in any research study, particularly when human subjects are involved. Each participant received comprehensive information regarding the study's objectives and parameters before participation. This transparency was essential for building trust and ensuring informed consent. Participants were assured that their confidentiality and identities would be rigorously protected throughout the research process.

Participation in the study was entirely voluntary, emphasising the importance of autonomy in the research process. Participants were informed they could withdraw from the study at any time without facing any repercussions, reinforcing their control over their involvement. This commitment to ethical principles ensured a respectful and dignified research environment.

To further safeguard participant information, all data collected were securely stored in a password-protected system. Implementing strong data security measures not only protects participant privacy, but also enhances the credibility of the study's findings. By prioritising ethical considerations in data management, this study aims to create a responsible and trustworthy research environment.

FINDINGS

This study utilised regression analysis to examine the relationships between various factors affecting the effectiveness of FIUs in combating money laundering. Using mathematical formulae, the analysis aimed to identify significant connections

that could inform the development of a robust model tailored specifically to Zimbabwe's financial landscape.

The findings were contextualised within the existing body of research on financial crime prevention and money laundering. By comparing results with those from previous studies, the research sought to validate its findings and contribute to the broader discourse on effective strategies for combating financial crimes in Zimbabwe.

Furthermore, the knowledge gathered from this research is intended to guide the creation of a comprehensive model that enhances the operational and regulatory frameworks of Zimbabwe's FIUs. By leveraging statistical analysis, along with established theoretical frameworks, this study aims to provide actionable recommendations that strengthen AML initiatives in Zimbabwe, fostering a more transparent and accountable financial sector.

The study achieved a response rate of 95%, with 38 out of 40 respondents completing the survey. This high response rate indicates strong engagement from stakeholders in addressing money laundering issues in Zimbabwe, particularly regarding the role of FIUs).

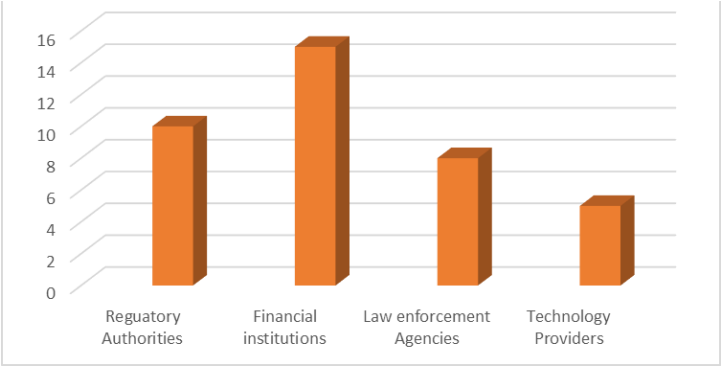

Figure 4: *Respondents demographic distribution* (Researchers, 2025)

The figure provides a breakdown of the 38 participants, categorised into four sectors: regulatory authorities, financial institutions, law enforcement agencies and technology providers. Financial institutions represent the largest segment at 39.5% (15 respondents), followed by regulatory authorities at 26.3% (10 respondents), law enforcement agencies account for 21.1% (8 respondents), while technology providers make up the smallest group at 13.1% (5 respondents). This demographic distribution highlights the varied involvement across sectors and underscores the importance of collaboration among these entities in enhancing the effectiveness of the AML framework in Zimbabwe.

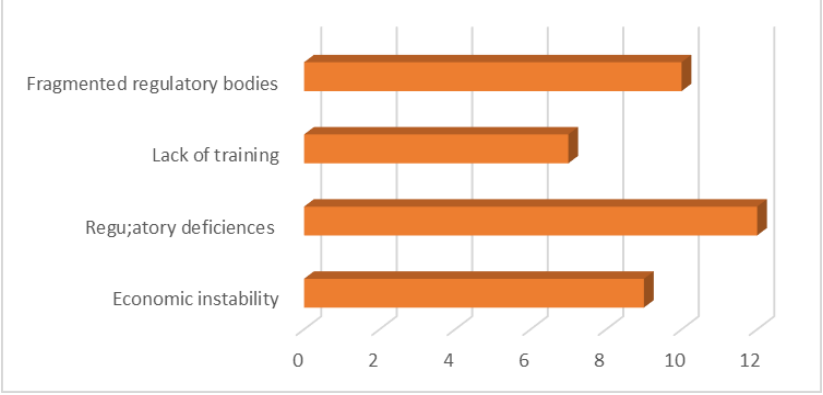

Figure 5: *Challenges facing Zimbabwe's anti-money laundering framework* (Researchers, 2025)

Figure 5 summarises the challenges identified by the 38 respondents, along with their corresponding frequency and percentage. Regulatory deficiencies were cited by respondents as the most significant challenge with 31.6% (12 respondents), indicating serious doubts about the effectiveness of existing laws. Nine respondents (23.7%) highlighted economic instability by (9, while fragmented regulatory bodies were noted by 26.3% (10 respondents). Lack of training was mentioned by 7

respondents (18.4%), pointing to a significant need for skill development within the sector.

The findings reveal critical issues facing Zimbabwe's FIUs and the broader financial sector, particularly regarding insufficient training, economic instability and regulatory shortcomings. Regulatory inefficiencies raise concerns about the effectiveness of current legislation, consistent with earlier studies that demonstrate how these flaws can weaken financial institutions and elevate the likelihood of financial crimes (World Bank, 2024). Economic instability, characterised by high inflation and currency volatility, creates an environment conducive to illicit behaviour (IMF, 2024). Moreover, governance and compliance are hampered by the presence of fragmented regulatory agencies (Heritage Foundation, 2024). Finally, inadequate training hinders the enforcement of regulatory frameworks, indicating a severe need for skill enhancement (World Bank, 2024). To further analyse the relationship between the identified challenges and the effectiveness of FIUs in combating money laundering, a regression analysis was conducted. The mathematical formula used for regression is:

$$Y = \beta_0 - \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 - \beta_4 X_4 + \epsilon$$

Where:

- Y = Effectiveness of FIUs in combating money laundering
- β_0 = Intercept
- β_1 = Coefficient for Economic Instability
- β_2 = Coefficient for Regulatory Deficiencies
- β_3 = Coefficient for Lack of Training
- β_4 = Coefficient for Fragmented Regulatory Bodies
- ϵ = Error term

Table 3: *Regression analysis results* (Researchers, 2025)

Variable	Coefficient	Standard Error	t-Statistic	p-value
Intercept	2.50	0.40	6.25	<0.01
Economic Instability	-0.35	0.10	-3.50	<0.01
Regulatory Deficiencies	-0.45	0.12	-3.75	<0.01
Lack of Training	-0.25	0.08	-3.13	<0.05
Fragmented Regulatory Bodies	-0.30	0.11	-2.73	<0.05

The regression analysis indicates that all identified challenges significantly impact the effectiveness of FIUs in preventing money laundering. Economic instability ($p < 0.01$) and regulatory deficiencies ($p < 0.01$) were found to have the most substantial negative effects. Lack of training and fragmented regulatory bodies also negatively impacted effectiveness but to a lesser extent ($p < 0.05$).

Table 4: *Chi-square test results* (Researchers, 2025)

Variable	x^2 Value	df	p-value
Perception of Regulatory Deficiencies	11.50	3	< 0.01

The Chi-square test results further corroborate the findings, indicating a significant association between stakeholders' perceptions of regulatory deficiencies and their views on the effectiveness of FUIs in combating money laundering. This aligns with the work of Nyoni (2021), who argues that economic instability undermines the effectiveness of regulatory frameworks, leading to increased incidences of money laundering.

To assess the effectiveness of existing financial intelligence systems and their application within financial institutions in

Zimbabwe, a comprehensive analysis was conducted. This included gathering stakeholder perceptions, evaluating the performance of current systems and identifying areas for improvement.

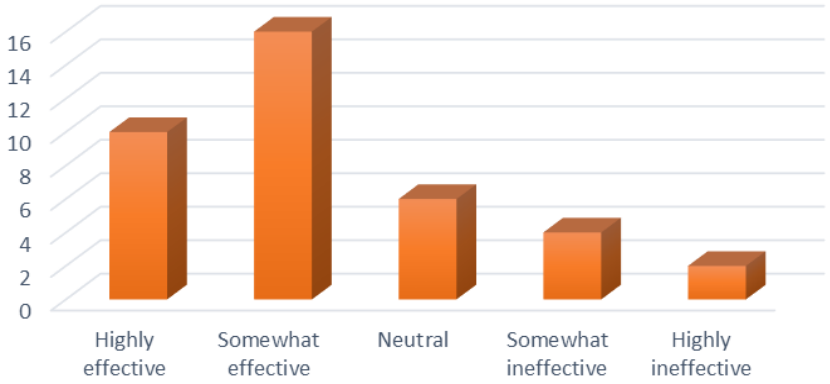

Figure 6: *Effectiveness assessment of financial intelligence systems* (Researchers, 2025)

The figure illustrates the perceived effectiveness of financial intelligence systems among respondents. A majority (42.1%, 16 respondents) rated the systems as "somewhat effective", while 26.3% (10 respondents) considered them "highly effective". However, a notable portion of respondents (15.8%) felt neutral and 15.8% rated the systems as "somewhat ineffective" or "highly ineffective". This distribution indicates a clear need for improvement in the effectiveness of financial intelligence systems in Zimbabwe.

To delve deeper into the effectiveness of these systems, regression analysis was employed to identify relationships between perceived system effectiveness and various factors, including economic instability, regulatory deficiencies, lack of training and fragmented regulatory bodies.

The following regression formula was used:

$$Y = \beta_0 - \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 - \beta_1 X_1 + \epsilon$$

Where:

Y = Effectiveness of financial intelligence systems

β= Intercept

X1 = Economic Instability

X2 = Regulatory Deficiencies

X3 = Lack of Training

X4= Fragmented Regulatory Bodies

ϵ= Error term

Table 5: *Regression analysis results* (Researchers, 2025)

Variable	**Coefficient**	**Standard Error**	**t-Statistic**	**p-value**
Intercept	3.00	0.50	6.00	<0.01
Economic Instability	-0.40	0.11	-3.64	<0.01
Regulatory Deficiencies	-0.55	0.13	-4.23	<0.01
Lack of Training	-0.30	0.09	-3.33	<0.05
Fragmented Regulatory Bodies	-0.35	0.12	-2.92	<0.05

The regression results indicate that all identified challenges significantly impact the effectiveness of financial intelligence systems. Economic instability ($p < 0.01$) and regulatory deficiencies ($p < 0.01$) were found to have the most substantial negative effects. Lack of training and fragmented regulatory bodies also negatively impacted effectiveness but to a lesser extent ($p < 0.05$).

To further validate the findings, a Chi-square test was conducted to assess the association between stakeholders' perceptions of the effectiveness of financial intelligence systems and various influencing factors.

Table 6: *Chi-square test results* (Researchers, 2025)

Variable	x^2 Value	df	p-value
Perception of System Effectiveness	15.25	4	< 0.01

The Chi-square test results indicate a significant association, reinforcing the notion that perceptions of the effectiveness of financial intelligence systems are closely linked to the challenges faced by these units.

The findings from this study reveal significant challenges facing Zimbabwe's AML framework, underscoring the urgent need for reforms in both regulatory and operational aspects. The data collected highlights regulatory deficiencies as the most prominent challenge, cited by 31.6% of respondents. This aligns with existing literature which emphasises how regulatory inefficiencies can severely undermine the effectiveness of financial institutions and elevate the risk of financial crimes (World Bank, 2024). Previous studies have similarly noted that countries with weak regulatory frameworks are more susceptible to money laundering activities, as seen in the analysis of AML systems in various African nations, which highlighted the correlation between regulatory strength and financial crime prevalence (Teichmann and Wittmann, 2022).

Economic instability, identified by 23.7% of respondents, presents another formidable barrier. High inflation and currency volatility create an environment that is ripe for illicit activities, as noted by the IMF (IMF, 2024). This observation is consistent with findings from other studies which have shown how economic turmoil can exacerbate vulnerabilities in financial systems, leading to increased money laundering risks (Cutter, 2017). To enhance the effectiveness of financial

intelligence systems, policy-makers should prioritise economic stabilisation initiatives. Such efforts could involve fiscal reforms aimed at controlling inflation and achieving currency stability, which would foster a more conducive environment for effective AML measures.

The lack of training among FIU personnel and stakeholders in financial institutions, cited by 18.4% of respondents, further complicates the landscape. Inadequate training not only hinders the enforcement of regulatory frameworks, but also diminishes the ability of these units to effectively identify and report suspicious activities. Previous research has indicated that training and capacity-building are critical components in strengthening AML frameworks, as they empower personnel to better understand and combat financial crimes (Nejad, 2022). Therefore, targeted capacity-building programmes are essential. These training initiatives should focus on enhancing skills in data analytics, compliance and the identification of financial irregularities, ensuring that personnel are well-equipped to meet the challenges posed by evolving financial crimes.

Moreover, the fragmentation of regulatory bodies, noted by 26.3% of respondents, indicates a pressing need for improved coordination among various agencies involved in AML efforts. The presence of multiple regulatory bodies can lead to inefficiencies and a lack of coherent strategy. Studies have shown that fragmented regulatory environments can hinder effective AML operations, as seen in the experiences of several countries where coordination among agencies was lacking (Brummer, 2015). Policy-makers should consider streamlining these agencies to promote inter-agency collaboration, thereby enhancing the overall effectiveness of the AML framework. A unified regulatory approach would facilitate better information

sharing and more coordinated responses to emerging financial threats.

The regression analysis results further underscore the importance of addressing these challenges. Economic instability and regulatory deficiencies showed the most substantial negative effects on the effectiveness of FIUs, while the Chi-square test results confirmed a significant association between stakeholders' perceptions of regulatory deficiencies and their views on the effectiveness of FIUs. This reinforces the notion that comprehensive reforms are not just beneficial, but necessary for improving the capacity of these units. Similar findings have been reported in other studies, where the effectiveness of AML frameworks was closely linked to the perceptions of stakeholders regarding regulatory robustness (Sileshi, 2022).

CONCLUSIONS AND RECOMMENDATIONS

To enhance the capacity of financial intelligence units in combating money laundering in Zimbabwe, a comprehensive model is proposed. This model integrates advanced technologies and regulatory enhancements, aiming to address the challenges identified in this study and improve the overall effectiveness of FIUs. One of the core components of the proposed model is the integration of advanced data analytics and machine learning technologies. These tools can significantly enhance the ability of FIUs to detect suspicious activities and identify patterns indicative of money laundering. By analysing large datasets, ML algorithms can identify anomalies and unusual transaction behaviours which human analysts may overlook. Implementing predictive analytics can further assist FIUs in forecasting potential money laundering activities based on historical data, thereby enabling proactive measures.

The adoption of these technologies not only increases the efficiency of data processing, but also allows for continuous learning and improvement of detection methods. As the algorithms are exposed to more data, they can refine their predictions and reduce false positives, ultimately leading to a more effective anti-money laundering strategy. Real-time transaction monitoring is another critical element of the proposed model. By enhancing the capacity to monitor transactions as they occur, FIUs can respond promptly to suspicious activities. Automated systems can be developed to flag unusual transaction patterns for further investigation, ensuring that potentially illicit activities are identified before they escalate. The integration of artificial intelligence into the monitoring process can streamline reviews, thereby reducing the workload on compliance teams. This allows human analysts to focus more on complex cases that require in-depth investigation. By ensuring timely responses, the model aims to create a more agile and responsive framework for addressing money laundering.

Effective collaboration among regulatory authorities, financial institutions and law enforcement agencies is essential in combating money laundering. The proposed model includes the establishment of a secure, centralised platform for sharing intelligence and data related to suspicious activities. This collaborative approach fosters better communication and coordination among stakeholders, improving the overall efficacy of AML efforts. By implementing protocols for timely information exchange, the model aims to enhance collective response efforts, allowing for coordinated actions against identified threats. Such collaboration is crucial in a landscape were financial crimes often cross jurisdictional boundaries, making it imperative for various entities to work together seamlessly.

To ensure that personnel within FIUs and associated institutions are equipped to combat money laundering effectively, enhanced training and capacity-building initiatives are essential. The proposed model emphasises the development of comprehensive training programmes which focus on emerging trends in money laundering and the utilisation of advanced technologies. Workshops and seminars can be organised to promote awareness of regulatory requirements and best practices among stakeholders. By investing in the development of skills and knowledge, this aspect of the model seeks to empower FIU personnel, enabling them to respond more effectively to financial crimes and operational challenges.

Strengthening the regulatory framework governing financial institutions and FIUs is a critical component of the proposed model. This involves reviewing and updating existing laws and regulations to address identified gaps and ensure alignment with international standards. The model advocates for the implementation of stricter compliance requirements and penalties for non-compliance to deter financial crimes. By enhancing the regulatory environment, the model aims to foster a culture of compliance within financial institutions. This not only improves the overall effectiveness of FIUs, but also contributes to building public confidence in the financial system.

The proposed comprehensive model integrates advanced technologies and regulatory enhancements to strengthen the capacity of FIUs in Zimbabwe. By focusing on data analytics, real-time monitoring, collaboration, training and regulatory improvements, this model aims to create a more robust framework for combating money laundering. Implementing these strategies will enhance the effectiveness of FIUs and

contribute to a more transparent and accountable financial system in Zimbabwe.

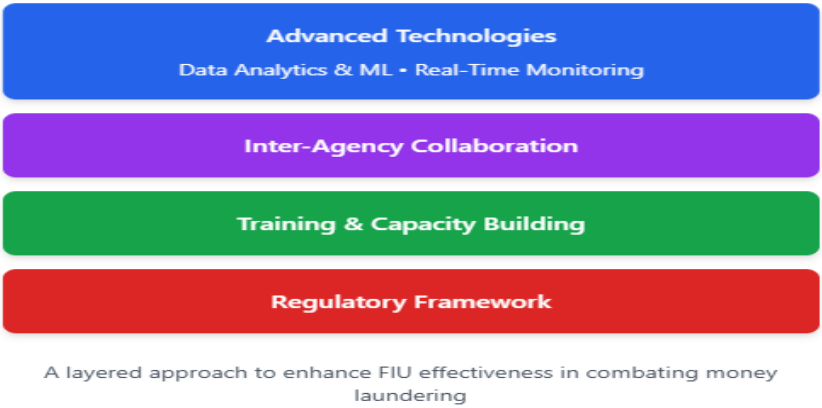

Figure 7: *Comprehensive model Framework for FIUs* (Researchers, 2025)

This study has provided invaluable insights into the critical role of FIUs in Zimbabwe's efforts to combat money laundering, highlighting the complexities and challenges inherent in this endeavour. By employing the FATF Recommendations Implementation Model as a framework for analysis, this research has identified key factors that influence the effectiveness of FIUs in preventing and detecting money laundering activities. The findings of this study unequivocally indicate that regulatory deficiencies, economic instability and inadequate resources are significant challenges which hinder the effectiveness of FIUs in Zimbabwe. These challenges not only undermine the integrity of the financial system, but also perpetuate an environment conducive to money laundering and other illicit financial activities.

In light of these findings, this study concludes that strengthening the regulatory framework, enhancing resources and improving international cooperation are critical to

enhancing the effectiveness of FIUs in combating money laundering. This entails implementing and enforcing robust AML laws and regulations, providing FIUs with adequate resources and capacity-building opportunities, and fostering collaborative relationships with international partners to leverage expertise, share best practices and facilitate the exchange of financial intelligence. To address the challenges and limitations identified in this study, a comprehensive model, the Zimbabwe Financial Intelligence Unit Enhancement Model (ZFIUEM), has been developed. This model integrates regulatory enhancements, resource optimisation and international cooperation to strengthen the capacity of FIUs in Zimbabwe. The ZFIUEM offers a tailored approach to addressing the unique challenges faced by Zimbabwe's FIU, providing a framework for enhancing the effectiveness of AML efforts and promoting a more secure and stable financial environment.

The implications of this study are far-reaching, highlighting the need for a concerted effort by policy-makers, regulators, law enforcement agencies and financial institutions to strengthen Zimbabwe's AML framework. By implementing the recommendations and model proposed in this study, Zimbabwe can take a significant step towards combating money laundering, promoting financial stability and upholding its international commitments to preventing and detecting illicit financial activities. Ultimately, this study demonstrates the importance of continued research and collaboration in the field of AML, highlighting the need for innovative solutions, tailored approaches and sustained efforts to combat this complex and evolving threat. By sharing knowledge, expertise and best practices, stakeholders can work together to promote a more secure, stable and transparent financial environment, both in Zimbabwe and globally.

REFERENCES

Chikozho, C. (2023). Money Laundering in Zimbabwe: Challenges and Prospects. *Journal of Financial Crime, 30*(1), 34-48.

Chikwana, T. (2023). The Role of Technology in Combating Money Laundering in Zimbabwe. *Journal of Money Laundering Control, 26*(2), 147-158.

European Commission (2021). Fourth Anti-Money Laundering Directive. European Union, Brussels.

FATF (2022). International Standards on Combating Money Laundering and the Financing of Terrorism and Proliferation. FATF, Paris.

Jones, A. and Smith, J. (2023). Anti-Money Laundering Regulations: A Global Perspective. *Journal of Financial Regulation and Compliance, 31*(1), 5-18.

Khumalo, K. (2023). The Effectiveness of Zimbabwe's Anti-Money Laundering Framework. *Journal of African Business, 24*(1), 34-47.

Moyo, S. (2022). Money Laundering in South Africa: A Critical Analysis. *Journal of Financial Crime, 29*(3), 549-562.

Mugari, T. (2023). The Challenges of Implementing Anti-Money Laundering Regulations in Zimbabwe. *Journal of Money Laundering Control, 26*(1), 42-53.

Ndlovu, N. (2023). The Role of Financial intelligence Units in Combating Money Laundering in Zimbabwe. *Journal of Financial Intelligence, 4*(1), 1-12.

Ojo, A. (2023). Anti-Money Laundering Efforts in Nigeria: Challenges and Prospects. *Journal of Financial Crime, 30*(2), 267-280.

Sullivan, J. (2022). The Use of Artificial Intelligence in Combating Money Laundering. *Journal of Money Laundering Control, 25*(4), 521-532.

Zhou, W., Li, Q. and Wang, Y. (2023). The Application of Machine Learning in Anti-Money Laundering. *Journal of Financial Intelligence, 4*(2), 1-15.

Climate Change in Africa: Vulnerabilities and Options for Building Resilience

INNOCENT CHIRISA[1]

Abstract

African countries and regions are experiencing extreme weather events and this contributes to socio-economic lagging. The aim of the article is to explore factors which contribute towards the vulnerability of the African region and examine the viable options which may be employed to reduce such vulnerability and thus promote climate change resilience. The motivation for this study is the heavy toll of climate change effects on the continent and thus the study is justified in that it may open some avenues among policy-makers and other stakeholders, which may reduce climate change-related carnage and destruction. As such, the study is desktop research which involving a review of relevant literature. As such, the study confirms that climate change is among the factors contributing towards a slow development pace in Africa. Furthermore, the effects of climate change were found to be fuelled by poor rural and urban planning and a lack of resources, particularly funding. As such, whereas the less economically developed countries of Africa are worse off in combating climate change, countries of the global North are less vulnerable to the climate change vagaries. It is, therefore, recommended that the more vulnerable African countries should partner with better-off countries to allow effective pooling of resources. Furthermore, resilience building against climate change is recommended to include participatory engagement with all stakeholders and a bottom-up decision-making strategy is seen to be effective.

[1] Office of the Vice Chancellor, Zimbabwe Ezekiel Guti University (ZEGU), Zimbabwe; Department of Urban and Regional Planning, University of the Free State, South Africa. https://orcid.org/0000-0002-9485-7616

Keywords: extreme weather events, resilience, innovative thinking, proactive planning, partnership, early warning system

INTRODUCTION

Climate change is an extant global threat to human wellbeing and development. The threat becomes a reality to vulnerable households and communities. This implies that the risks associated with climate change are not uniformly distributed, but heterogeneous (Weber *et al.*, 2018). In other words, the differences to the impact of climate change are determined by various factors and thus the impact is a dynamic phenomenon. Nonetheless, scholars are agreed on the fact that the factors which promote climate change risks and thus vulnerability, may be grouped into two distinctive categories – physical and socio-economic factors (Doodman *et al.*, Guillaumont, 2015; 2009; IPCC, 2023). As such, whereas the social-economic factors may be changed through the alignment of policies to climate change vulnerabilities, the physical factors may not readily be changed as they are mostly exogenous in nature. For example, a locality may be susceptible to the influence of climate change vagaries owing to its location and thus the vulnerability is ever present and can be mitigated only through the implementation of eco-friendly policies. On the other hand, vulnerability, which originates from and is perpetuated by socio-economic factors, may be resolved through policies that promote the wellbeing of people (Tapsell *et al.*, 2010).

From this discourse, it is asserted that whereas climate change vulnerability distribution is not uniform, the vulnerability factor is recognised in various forms. Subsequently, with such vulnerability vicissitudes, building climate change resilience is a significant policy stance for communities at national and international levels. However, it is argued that less economically developed countries and island states are less resilient as their counterparts in the global North. Less resilience implies high

mortality rates for the people (Zhang *et al.*, 2019). For example, in the rural areas of sub-Saharan Africa, farmers who are not resilient to climate change, suffer from low agricultural productivity, tragic losses of crops and livestock, and worsened food insecurity and water scarcity (Ackerl *et al.*, 2023). As such, high vulnerability levels equate to low resilience and this is an apt description for less economically developed countries. However, whereas these countries are inherently prone to be affected by climate change, it does not necessarily signify that they need to be developed countries to be more resilient to climate change. Bikmann *et al.* (2022) argue that promoting progress towards climate resilient development requires not only visions and tools for future development, but also the consideration of pre-existing adaptation gaps revealed when looking through the lens of different levels of vulnerability. Thus, resilience building is a dynamic phenomenon which is of paramount importance for the alleviation of climate change and its effects. It is, therefore, the aim of the article to lay bare the options available for policy-makers in climate change high risk localities.

THEORETICAL FRAMEWORK

According to Scoones (2015:10), the Sustainable Livelihoods Framework (SLF) has gained popularity through its widespread use and application as it "seems livelihoods approaches are now applied to literally everything". In this context, the SLF is used to elaborate on the dynamics of climate change impact on the livelihoods of people. Chambers and Conway (1992:5) point out that a "livelihood in its simplest sense is a means of gaining a living" and a living is deemed sustainable when it can cope with and recover from stress and shocks. among them, climate shocks. These may be described to include extreme weather events such as heatwaves, droughts and floods. Therefore, a livelihood becomes resilient and thus less vulnerable, when people are endowed with capabilities and assets which make

them less vulnerable to the shocks. In this regard, Ye *et al.* (2022) reveal that the Intergovernmental Panel on Climate Change (IPCC) incorporated vulnerability as an essential concept into the SLF, defining it as the degree to which a system is susceptible to, or unable to cope with, adverse effects such as climate change variability and extremes.

Natarajan *et al.* (2022) underscore the practical significance of the SLF in promoting rural development, pointing out that it has: directed the development interventions of governmental, multi-lateral and non-governmental organisations; shaped how scholars and practitioners think about conditions in the rural South; and justified the allocation of billions of dollars of international assistance to livelihoods-focused programmes and projects. However, early proponents of the SLF do not emphasise on environmental sustainability, but are more inclined towards the socio-economic aspects. However, in the wake of climate change, the socio-economic sustainability is eroded in situations where the livelihoods of the people are vulnerable.

Whereas Conway and Chambers (1992) perceive that a resilient livelihood would have little stress on primary productivity and could create new economic and social development opportunities, their intuitive assessment of environmental shocks were superficial and, therefore, the envisaged resilience and sustainability would deteriorate when exposed to recurrent and intensive extreme weather events, for example. This perspective is supported by the IPCC (2018) which argues that increased incidences of extreme weather events have led to deteriorating agricultural productivity, rendering both rural and urban livelihoods unsustainable, as farmers are exposed to the vagaries of climate change. In this regard, Natarajan *et al.* (2022), using a case study of commercial farming in Zimbabwe,

demonstrate the shortcomings of the original SLF in explaining sustainable livelihoods and resilience in the 21st century.

A study carried out by Ackerl *et al.* (2023) in East Africa confirms that climate-induced risks are predicted to be worse in the future, affecting even more farm households and aggravating an already serious situation in terms of crop failures, food insecurity and vulnerability. This situation spells out the need for resilience building to sustain rural livelihoods. In this context, livelihood resilience can be defined as the capacity of livelihoods to protect against stresses and disturbances while maintaining or improving their essential properties and functions (Ye *et al.*, 2022). On the other hand, the International Monetary Fund (IMF) 2022) points out that resilience building requires an integration of measures which include reforms tailored to a country's specific climate change challenges; strong macroeconomic, institutional and structural policies; and measures to ensure food security. In this regard, Natarajan *et al.* (2022) offer a new version of the SLF which incorporates resilience building concepts through modifying the original assets pentagon through narrowing assets to financial and physical and adding two further pentagons: 'relational power' and 'climate and environment context/relations'.

The new SLF is depicted in Figure 1. Whereas the original SLF, whose proponents are Chambers and Conway (1992), assume that the major livelihood assets involve human capital, social capital, physical capital, natural capital and financial capital, the new SLF explicitly includes relational power and climate and environmental relations as factors which influence livelihood vulnerabilities and dynamics. In line with Olsson *et al.* (2014: 819), the 'climate and environmental context/relations' element recognises the need to both elucidate local-level climate and environmental contextual factors and also to do so in a relational sense, understanding how these are

shaped by broader forces and also how they shape rural livelihoods. As such, the new SLF resonates with climate change resilience building strategies at both local and national levels. In other words, the Framework is relevant to the study in that it represents a holistic approach in promoting climate change resilience by including all stakeholders and yet, at the same time, it does not discard the people-centred perspective of the original SLF.

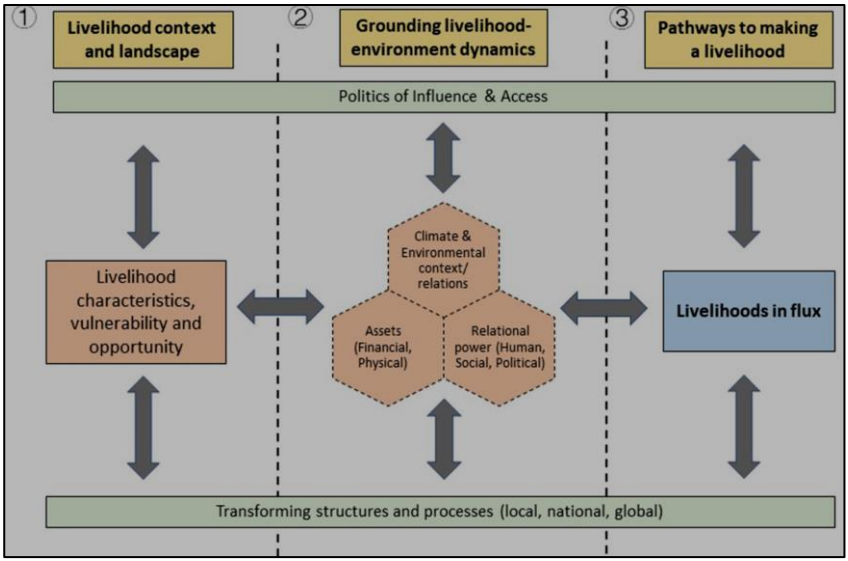

Figure 1: *A sustainable livelihoods framework for the 21st century* (Adopted from Natarajan *et al.*, 2022).

CONCEPTUAL FRAMEWORK

The vagaries of climate change are unpredictable. This implies that a bid to alleviate the effects of climate change is replete with uncertainties. Therefore, instead of a community solving climate change challenges through inflexible and reactive measures, it is more rational to be proactive and flexible. Flexibility in this case implies that community systems can meet service needs under a wide range of climate conditions

and key elements are spatially distributed and can substitute for each other but are functionally linked (Tyler and Moench, 2012). This defines resilience in the sense that policy-makers and all the involved stakeholders are geared to deal with climate change challenges, such as extreme weather events, even before they land within their localities. Such a stance in disaster risk management has its basis in innovative thinking. In this context, innovative thinking denotes thinking outside the box, a departure from conventional thinking, to solve complex issues related to climate change (Yang *et al.*, 2021). For example, the IPCC (2018) points out that achieving the transitions necessary to limit global warming depends on enhanced climate-driven innovation which includes both technological and social innovations. Technological innovation involves technologies such as remote sensing and early warning systems, and social innovation includes shifts in how economies and societies may be managed to reduce vulnerabilities (López-Gunn *et al.*, 2021). In line with innovative thinking, climate change resilience building involves the following aspects: responsiveness, capacity to learn and resourcefulness (Twigg, 2007).

Responsiveness in this case refers to the capacity to organise and reorganise in an opportune fashion; ability to identify climate change problems, anticipate, plan and prepare for a disruptive event such as an extreme weather event and to respond quickly in its aftermath (Tyler and Moench, 2012). From this analysis, the working definition of innovative thinking, within the context of climate change resilience building is: a mode of thinking that dares to break the conventional thinking, emancipate the mind, surpass the old conventions, adapt measures to the current conditions, keep pace with the times and open new situations of work with a new leap of thinking and understanding (Yang *et al.*, 2021:541). As such, in adopting innovative thinking, policy-makers ground their intervention measures on both adaptation and mitigation

measures through innovative strategies. However, for both adaptation and mitigation interventions to have an impact, an assessment of what is on the ground needs to be carried out. Wardekker (2018) argues that systematic resilience assessment is of paramount importance in resilience building.

Figure 2 depicts steps involved in the process resilience assessment. The steps involved underscore the need for making informed decisions and acting upon them systematically.

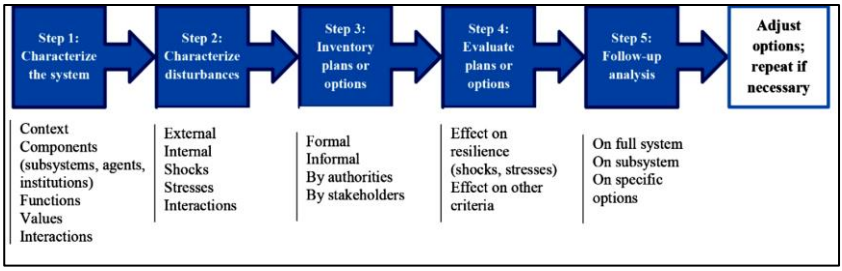

Figure 2: *Resilience assessment of options and plans* (Adopted from Wardekker, 2018)

LITERATURE REVIEW

The concept of climate change is marred by scientific controversy and contention. Todorov (1986:259) argues that the question of climatic change is complex and controversial in the sense that "No strict criteria exist on how many dry years should occur to justify the use of the words 'climatic change'" and this is a bone of contention. Nonetheless, climate change may be regarded as a long-term change in climatic patterns and is witnessed at both local and global levels. In other words, climate change focuses on long-term changes in dynamic meteorological variables such as the surface air temperature or surface pressure (Werndl, 2014). The IPCC (2018) defines climate change as any change in climate over time, whether due to natural variability and/or as a result of human activity. On the other hand, the United Nations Framework Convention on

Climate Change (UNFCCC, 2011) defines climate change as a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods. In general, climate change is characterised based on the comprehensive long-haul temperature and precipitation trends and other components, such as pressure and humidity level in the surrounding environment (Abbass *et al.*, 2022).

As highlighted above, climate change is a result of both natural and anthropogenic factors. The natural causal factors for climate change are generally known to be related to changes in ocean currents, solar activity and volcanic eruptions. On the other hand, the human factors which promote climate change are centralised on such activities which promote global warming. The IPCC (2022) points out that\:

> "Human activities, principally through emissions of greenhouse gases, have unequivocally caused global warming, with global surface temperature reaching 1.1°C above 1850-1900 in 2011-2020".

The emissions are traced to emanate from

> "unsustainable energy use, land use and land-use change, lifestyles and patterns of consumption and production across regions, between and within countries and among individuals".

As such, human factors have led to the rapid and widespread climate change at global levels. This is confirmed by Yakovlev and Belyaev (2023) who submit that:

> "Since the beginning of the 21st century, [the greenhouse effect] impact on the planet has exceeded the influence of solar radiation by [eight] times in intensity".

They note that the greenhouse effect referred herein is because of human activities, such as the rampant use of fossil fuels.
Of concern is that the majority of the countries that are most prone to being affected by climate change have contributed little

to global greenhouse gas (GHG) emissions but still face the major burden of climate change (Birkmann *et al.*, 2022). According to Doodman *et al.* (2009), this reflects profound global inequalities as the countries that have profited from high levels of the emissions are the ones that are least affected by climate change, while countries that have made only minimal contributions to the problem are among the most affected.

Whereas climate change is a global threat, its impact on global development is not uniform, mirroring vulnerability and resilience inequalities. Dodman *et al.* (2009) argue that human-induced climate change is likely to have the heaviest impact on developing states and these countries form a group of 100 nations, with carbon dioxide emissions (excluding South Africa's) accounting for only 3.2%of the global total. Furthermore, long-term changes in climate have been observed and these include changes in arctic temperatures and ice, widespread changes in precipitation amounts, ocean salinity, wind patterns and aspects of extreme weather, including droughts, heavy precipitation, heat waves and the intensity of tropical cyclones (UNFCC, 2011). Owing to such increased climate change risks, the less economically developed countries are overburdened as they are inherently vulnerable. Furthermore, the World Meteorological Organisation (WMO, 2023) notes that many significant heatwaves occurred in various parts of the world during 2023, with some of the most significant witnessed in southern Europe and North Africa, especially in the second half of July where severe and exceptionally persistent heat occurred. Concerning food security, projections indicate that climate change could result in an 11% increase in the number of malnourished children by 2050 in low-income developing countries when compared to a scenario without climate change or perfect mitigation measures in place (Rahal and Elloumi, 2023). However, as noted above, both vulnerability to current climate extremes and historical

contribution to climate change are highly heterogeneous, with many of those who have least contributed to climate change to date being most vulnerable to its impacts (IPCC, 2023).

As aforementioned, climate change vulnerabilities are not uniform. According to the IPCC (2014), climate change vulnerability refers to the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. In other words, such vulnerability is a measure of the extent to which a community is susceptible to be negatively affected by climate change. As such, climate vulnerabilities are context specific, varying by political, economic, demographic, social and environmental factors and these are unique to each population and place. Thomas *et al.* (2019) point out that vulnerability experiences differ across societies, varying by social, political, economic and historical factors operating at multiple scales. For example, Nightingale (2017) argues that climate change policies are implemented through the intervention of stakeholders who may be operating at national levels and the policies themselves may be more effective at such levels rather than at local levels. In other words, a gap in vulnerability policies may be widened owing to the incompatibility of such policies at different vulnerability levels. For example, inadequate legislative authority may hinder local authorities to reduce vulnerability at local levels (Mavhura and Mapuva, 2021). As such, Hunter *et al.* (2021) assert that there is need for policy-makers to devise climate change vulnerability frameworks which take cognisance of context-specific and multi-scalar processes that produce dynamics and differential outcomes of climate susceptibility and vulnerability across spatial and temporal scales. In this vein, it is argued that successful climate change adaptation is dependent upon the provision of high-quality information and authority at scales commensurate with the jurisdictions of

organisations responsible for adaptation policy (Smith *et al.*, 2016).

Recognising that climate change vulnerability and thus resilience, is dynamic and varies according to particular places and populations, the article adopts the hazard of place approach in assessing vulnerability scales (Cutter *et al.*, 2000; Schwerdtle *et al.*, 2020). Such vulnerability assessments at different levels are necessary for building climate change resilience through the implementation of suitable adaptation and mitigation measures. For example, at regional levels, Schneiderbauer *et al.* (2020) argue that there is necessity for the implementation of standardised vulnerability assessment approaches which allow comparability within and between countries to support adaptation planning and monitoring and evaluation of climate change vulnerability. However, Smith *et al.* (2016) point out that there is not yet a universally accepted approach for assessing socio-economic vulnerability to climate change impacts and environmental hazards that may be used to inform regional priorities and decision-making. Nonetheless, in building climate change resilience, multiple scales and hierarchies must be understood as vulnerability is a complex phenomenon. For example, Ahmed *et al.* (2023) reveal the interconnectedness of climate variables, pointing out that local air pollution adds to regional and global air pollution and global climate change may have local effects such as rising sea levels and extreme weather events like heatwaves. This justifies the initiative to look at vulnerability and resilience building holistically. For example, in assessing vulnerability in a built environment, it is rational to systematically assess the vulnerability from a micro level, which is the interior of a building in this case, to the macro-level, which is regionally. Figure 2 illustrates these vulnerability hierarchies and the arrows depict the interconnectedness of the levels. By and large, environmental issues, such as heatwaves, can manifest

differently at different spatial scales, and so to fully comprehend how the hazard promotes vulnerability, studying it from various spatial perspectives is essential (Ahmed *et al.*, 2023).

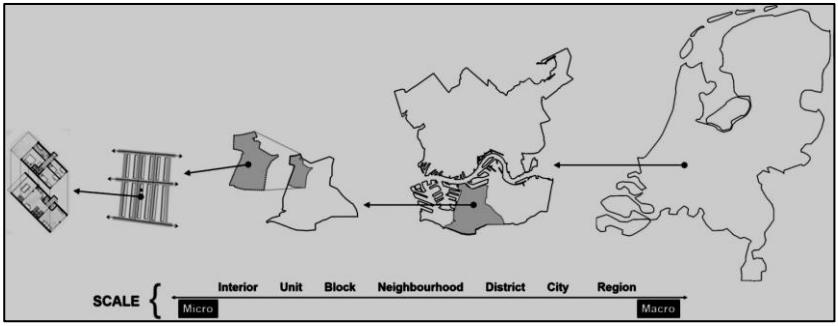

Figure 2: *The spatial distribution of vulnerability in built environment* (Adapted from Erickson and Lloyd-Jones, 2001).

RESEARCH METHODOLOGY

The study is qualitative research which employs a desktop study approach. In this vein, various secondary data sources were collated and reviewed. Specifically, journal papers from various search engines were accessed and were systematically reviewed to come up with some case studies which reinforce the objectives of this study. Subsequently, some case studies from sub-Saharan Africa were thematically analysed to come up with reliable results. In this regard, the research findings reveal the impact of climate change in sub-Saharan Africa and how these may be reduced.

FINDINGS

Africa is among the most climate change vulnerable regions in the world (Coovadia *et al.*, 2022). Studies that assess the future development direction of climatic hazards in different regions show, for example, that there is a high probability that droughts and flash floods, will increase, with Northeastern and Southeastern African areas ranking among the most vulnerable

regions globally (Birkmann *et al.*, 2022). Furthermore, Medinilla *et al.* (2023) point out that Africa is on the front line of climate change, justifying this assertion by revealing that in the African region, there is evidence of low agricultural productivity, increased water insecurity, coastal erosion, flooding, desertification and frequency of extreme weather events. Of concern is that various scholars like Scholes and Biggs (2004) refer to sub-Saharan Africa as the food crisis epicentre of the world and conclude that projected climate change during the first half of the 21st century will make this situation worse (Scholes and Biggs, 2004; Kristjanson *et al.*, 2008) and this projection remains relevant and true today. Torsu and Krönke (2023) point out that the African continent is responsible for less than 3% of global GHG emissions, yet is one of the most vulnerable regions to climate change and is projected to experience some of its most severe impacts. The African Union (2023:03) submits an explanation for such vulnerability as follows:

> "This is due to the continent's biophysical makeup and numerous socio-economic vulnerabilities – including a high dependence on rain-fed agriculture (and natural resource-based sectors broadly), a lack of alternative livelihood support, widespread poverty and inequality, weak adaptive capacity, low levels of education and inequitable access to financial resources, credit, markets and climate information services.

In a bid to explain the differentiated aspects of climate change vulnerability within countries in Africa, it is pointed out that for Zimbabwe, rural vulnerabilities differ in terms of the following reasons: agro-ecological regions where the impact of climate change requires variegated farming systems; political factors in moderating resource access; and the political economy of how different spaces were economically and socially shaped over time (Newsham *et al.*, 2021). Nonetheless, at household levels, a study carried out by the Afrobarometer reveals the gender aspect of climate change vulnerability, pointing out that while African women are, on average, less aware of climate change

than men, researchers have found that they are more likely to adopt climate-resilient crops when they are climate-change aware and know about relevant adaptation options (Torsu and Krönke, 2023). By and large, these factors explain both social and environmental factors in propagating climate change vulnerabilities within the African region. Tapsell *et al.* (2010) points out that identifying such vulnerabilities is the first step towards improving risk reduction and disaster preparedness to natural hazards.

Nonetheless, there are increasing incidences of extreme climate and weather events recorded in Africa. The IMF (2022) points out that:

> "In recent years, the frequency and intensity of droughts, floods and storms - such as cyclones Idai and Kenneth and droughts caused by the El Niño-Southern Oscillation (ENSO) - have grown."

In line with this observation, Mamman *et al.* (2023) observe a rising trend in climate change estimates in Africa, particularly in the inland subtropics and this includes the frequent occurrence of extreme heat events, increasing aridity and changes in rainfall, especially the apparent decrease in Southern Africa and an increase in East Africa. Additionally, Birkmann *et al.* (2022) argue how Northeastern and South Eastern Africa are areas that rank among the most vulnerable regions globally, qualifying that the region of Eastern Africa was exposed to over 200 hazard events (droughts, floods and storms) and faced more than 100 fatalities per event between 2010 and 2019. On the other hand, the most devastating cyclone was recorded in southern Africa in March 2019. Charrua *et al.* (2019) reveal that in Mozambique, Cyclone Idai brought torrential rain (more than 200 mm in 24- hours) and strong winds (up to 220 km/h), causing severe widespread flooding (flood waters rose more than 10m) and affected more than 1.5 million people in Mozambique, resulting in more than 600 deaths while over 1 600 persons were injured.

Furthermore, Serdeczny *et al.* (2017) assert that the continent is experiencing a 4°C warming scenario and this may lead to a one-metre sea-level increase by the end of this century. Han and Kirabaeva (2024) confirm this scenario, revealing that temperatures may rise by 3-6 °C by the end of the 21st century, and sea levels projected to increase by 0.26-0.55 metres even under low-emission scenario. In this regard, addressing climate change in this region is costly and few sub-Saharan African countries have the resources or fiscal space to tackle this challenge without assistance from the international community (IMF, 2023).

Furthermore, climate change has contributed towards increased rural to urban migration in sub-Saharan Africa. With reference to East Africa, a study carried out by Ackerl *et al.* (2023) confirms that climate change risks and vulnerability are complex, interconnected and integrated, and thus decreased crop yields and livestock may cause food insecurity, which may then trigger migration or armed conflict. This confirms a study carried out in South Africa which reveals that homicide was about 22% more likely when temperatures were above 35°C, compared to when temperatures were below 20°C, and the most vulnerable population groups being children (Coovadia *et al.*, 2022). This is in line with the observations by the International Organisation for Migration (IOM, 2019) which reveals that in West and Central African countries, climate change has exacerbated conflict over natural resources threatening peace and security.

PLAAS (2022) explains that in southern Africa, as climate change progresses, it will have a negative impact on rural livelihoods as more poor people could be concentrated in less favourable agricultural lands and areas and inequality and poverty are sharpened, leading to rapid rural-urban migration. Examples of climate-induced rural to urban migration include

migration of fisherfolks from coastal villages in West Africa to cities because of the depletion of fish resources linked to ocean acidification, and nomadic populations in East Africa altering their traditional migration patterns to cope with the impacts of desertification (IOM, 2019). However, such migrations are contributing towards disarticulated development as the urban economies have largely morphed into informality (Ayanlade *et al.*, 2022).

Urban informality further increases climate change vulnerabilities among the poor and this is owed to increased pressure on urban infrastructure, the environment and employment opportunities. This was illustrated in the April 2022 floods in Durban, South Africa, where over informally settled 300 people lost their lives, exposing poor resilience building on the part of the responsible authorities (PLAAS, 2022). Nonetheless, the United Nations (UN) 2022) submits that without concrete climate and development action, up to 32 million people in West Africa could be compelled to move within their countries by 2050, in response to water scarcity, decline in crop and ecosystem productivity and sea level rise, augmented by storm surge. However, at the 2022 United Nations 27th Conference of the Parties (COP27) in Sharmel-Sheikh, Egypt, the UN Secretary-General posited that humanity, without decisive corrective measures, is facing imminent catastrophic consequences of climate change (United Nations Economic Commission for Africa, 2022). Such decisive and collaborative actions are exemplified by the Intra African, Caribbean and Pacific (ACP) Global Climate Change Alliance Plus (GCCA+) programme which was launched in 2019 by the Southern African Development Community (SADC) Secretariat and the European Union (EU) to strengthen the capacity of regional countries to undertake climate change adaptation and mitigation interventions. In this regard, urban resilience building in Africa needs to include the following strategic

elements: a multidimensional approach to risks and contexts; the connection of various systems in policy design and implementation; the inclusion of multiple stakeholders; and the development of resilience capacities (United Nations Development Programme (UNDP) (2023).

Most African urban areas are vulnerable to climate change vagaries. Such vulnerability may be traced back to poor urban planning. For example, a study carried out in the city of Kigali, Rwanda by Mwenje and Kumar (2024) reveals that the city is susceptible to serious climate risks including intensified flooding and public health risks owing to a lack of explicit consideration of climate risks in national and local plans and policies. This has a result of weakening resilience building through a reduction of adaptative capacities of socio-ecological systems. This view is further stressed by the Lagos city, Nigeria, study. The city is affected by recurrent flooding, with the most devastating ones experienced in 2012 and 2020 and rising sea-levels, as the effects of climate change (Schraven *et al.*, 2019; Rigaud *et al.*, 2021). However, the most compelling argument for the recurrence of these incidences is poor reactive urban planning as the city's urban development involved the transformation of biophysically vulnerable spaces to accommodate rapid urbanisation (Kasim *et al.*, 2021).

As such, a study carried out by Ekoh and Teron (2023) concludes that flood risk in Lagos is because of and exacerbated by state actions and inactions related to the provision of necessary urban amenities, infrastructure and enactment of policies that curb flooding, and the urban poor are mostly affected. Such inequalities experienced in urban setups are illustrated by the urban poor in Harare, Zimbabwe, resorting to wetland farming in the Monavale wetlands as a livelihood strategy to cope with climate change effects (Matenga, 2019). However, transformative initiatives may be an

effective panacea to the impasse caused by poor urban planning in the urban cities of Africa. For example, in realising the limited state-led planning initiatives towards addressing climate change, the leadership in the Old Fadama informal settlement in Ghana mobilised the residents to construct gutters to improve drainage networks to reduce flood events in the area (Cobbinah and Finn, 2022). As such, the IPCC (2023) offers that inclusive, integrated and long-term planning at local, municipal, sub-national and national scales, together with effective regulation and monitoring systems and financial and technological resources and capabilities foster urban and rural system transition, necessary for resilience building. Resilience is made on the call that countries in Africa ought to have their resilience strengthened, empowered and enabled if they are to cope with climatic impact (Marion, 2023).

Another direct impact of climate change on the African region is food insecurity and health problems. For example, in 2021, 2.2 billion people were facing moderate or severe food insecurity in the world and of those, 743.5 million were in Africa, with 322 million severely food insecure (UNECA, 2023). Rahal and Elloumi (2023) explain that the African region has faced significant challenges, including severe flooding in West Africa, prolonged and intensified droughts in East Africa, the depletion of equatorial rainforests in the equatorial parts of the continent and issues related to ocean acidification, and these extreme events pose substantial threats to agricultural production, food security and health. On the other hand, Newsham *et al.* (2021) reveal that climate change and variability are already causing problems for tobacco production in Zimbabwe and have, in the past 20 years already been, at times, catastrophic for Zimbabwean agriculture and this is attributed to a drier climate regime since the 1980s. In this regard, Manatsa *et al.* (2020: 03) argue that:

> "The current revision of the [Agricultural Economic Zones] AEZ map acknowledges that while the overall pattern of AEZs in Zimbabwe is

> stable…climate change has led to significant shifts in agricultural practice within the AEZ."

Therefore, it is argued that climate change both directly and indirectly leads to food insecurity, health problems and low agricultural productivity in less economically developed countries.

Additionally, within the African context, climate change results in health problems. For example, owing to climate-related challenges such as excessive rainfall, drought, temperature extremes and humidity fluctuations, and transportation problems, both pre-harvest and post-harvest, food losses in Africa saw 239.1 million individuals grappling with undernourishment in 2018 (World Health Organisation, 2019). In this regard, Coovadia *et al.* (2022:157) point out that:

> "Due to the large subsistence farming dependency in sub-Saharan Africa, children in this region are particularly at risk of undernutrition from increasing temperatures and rainfall variability."

Referring to Eastern and Southern Africa, Musuka and Dzinamarira (2023) submit that communities are more susceptible to a variety of illnesses because of natural catastrophes and extreme weather events brought on by climate change, including raising barriers to access clean water, sanitation and health care facilities. These challenges increase the probabilities of infectious, respiratory and cardiovascular diseases, heat-related morbidity and mortality, malnutrition due to food insecurity, and mental health disorders (Rocque *et al.*, 2021). The study depicts the health challenges, and these are particularly evident in the urban areas of the region. For example, a study carried out in the Johannesburg city of South Africa reveals that high temperatures in early pregnancy increased the risk of severe hypertensive disorders and evidence indicated that there is an

association between heat and increased rates of pre-term birth, low birthweight and stillbirths (Coovadia *et al.*, 2022). As such, climate change as a health threat in sub-Saharan Africa is a reality which cannot be disputed.

Owing to climate change, African countries are obliged to protect the environment among their primary goals towards development. Unlike developing countries in the global North, the industrialisation thrust of less economically developed countries in Africa is now constrained by the urgent need to reduce GHG emissions (African Development Bank, 2023). As such,

> "African countries today must pursue a dual goal of accelerating growth while protecting the environment - or more precisely, accelerating growth while minimising the adverse impact of economic activity on the environment" (UNECA, 2023: 13).

Invariably, less developed countries bear the brunt of global climate change. For example, a report by the IMF (2023) reveals that there is a significant negative impact of climate-related disasters on medium-term growth, especially for sub-Saharan Africa, and this was confirmed by the point that the impact of a drought is about three times larger in this region than in other emerging and developing economies.

Therefore, the developed countries have a moral debt to those who suffer from the debilitating effects of climate change and this justifies the initiatives for climate change vulnerability funding to assist the less developed countries to mitigate the effects and allow them to transition to net-zero economies (Guillaumont, 2015). However, Torsu and Krönke (2023) argue that the global North is yet to mobilise sufficient funding for climate change action in Africa, and thus coordinated interventions from African governments, business, civil society and ordinary citizens are a necessity. Nonetheless, an effective international collaboration to combat climate change effects in

Africa is the Africa Climate-Smart Agriculture Alliance which was launched in to increase the uptake of climate-smart agricultural practices in the most vulnerable rural communities of Africa (United Nations Framework Convention on Climate Change (UNFCCC) (2020). Such measures promote climate resilience through encouraging effective adaptation measures in the agricultural sector.

Awareness campaigns and innovative technological interventions are other initiatives which promote resilience building against climate change effects in Africa (Torsu and Krönke, 2023). Nonetheless, across39 countries across sub-Saharan Africa, an Afrobarometer survey reveals that the awareness of climate change ranges from 22% in Tunisia to 80% in the Seychelles, and is particularly low among economically disadvantaged and less educated citizens, rural residents and women (Torsu and Krönke, 2023). On the other hand, a study carried out by Okunola *et al.* (2022) in Port Harcourt, Nigeria, reveals that socio-economic factors which influenced climate change resilience include the following: education, average monthly income, house type, house ownership and age, with age contributing towards innovative thinking in resilience building. Concerning innovative thinking in the rural areas, a case at hand is the Zimbabwean small-scale farmers who adopted digitalisation in the agriculture sector through partnership with Econet, a mobile network operator in Zimbabwe, and the Zimbabwe Farmers' Union, to access agricultural extension services via unstructured supplementary service data (USSD) and short message service (SMS) and the services accessed promote resilience building (FAO, 2018).

Regarding early warning mechanisms in Africa, there is need to make full use of innovation such as big data technologies which have the potential to improve early warning systems and

identify areas where natural disasters will likely occur (UNDP, 2023). One of the critical components of a resilient society is the existence of efficient early warning systems that ensure timely warnings which can be acted upon by stakeholders as early action initiatives (African Union, 2022). In response to the weak state of multi-hazard early warning and early action in Africa, the AU developed the Africa Multi-Hazard Early Warning and Early Action System Programme (AMHEWAS) and the programme is based on the following four pillars: risk knowledge; observations, monitoring and forecasting; communication and dissemination; and preparedness to respond to warnings (WMO *et al.*, 2023). A study carried out by Maripe *et al.* (2022) reveals that while some form of early warning systems exists in all SADC member states, they are not fully developed, of low quality and are under-resourced to enable them to play a significant role in providing a timely warning. This poses a threat in the southern African region as early action initiatives in the wake of extreme weather events, for example, are disrupted and thus, ineffective.

DISCUSSION

Climate change is a grim reality. As evidenced above, the occurrence and intensity of extreme weather events and incidences is increasing across the African continent. Furthermore, such climate change vagaries are fuelling conflicts, food insecurity and rapid rural-urban migration. Considering these factors, it is argued that climate change is a ubiquitous threat to development in Africa. Nonetheless, whereas climate change affects all nations in the world, the risks associated with it are high in developing countries, particularly in Africa. Nonetheless, the stark reality is that climate change is every nation's responsibility. The actions taken today by one nation will always have a rebound effect into the future. In this regard, recognising that both rural and urban areas of Africa are affected by climate change, becomes a

resilience building strategy to device ways to reduce its effect. Of significance is that resilience-building is an integrative exercise which involves various stakeholders and thus the input of all stakeholders is of great importance towards the successful implementation of effective measures to combat climate change. In some cases, grass-root initiatives and bottom-up decision-making strategies are significant steps towards resilience building as they reduce resilience policy gaps. As an innovative step, proactive rural-urban planning initiatives are necessary for climate change resilience building.

Africais among the most vulnerable regions with regards to the negative impacts of climate change. Although African countries may opt to justify their continued GHG emissions into the atmosphere for economic growth purposes, this will have the direct effect of fuelling the climate change threat. Particularly, since it is unequivocal that the use of fossil fuels during the global North industrialisation era immensely contributed to rapid global warming, and hence climate change, the most suitable resilience pathway the African states can take to mitigate climate change is a just transition of energy use. However, the challenge is that these countries are inherently vulnerable as they do not have the financial capacity to mitigate climate change in such a manner. For example, it is estimated that developing regions, including Africa, would need $1.4 trillion to $2.8 trillion per year up until 2030 just to finance investments in mitigation, compared to developed countries, which need $0.9 trillion to $1.7 trillion per year (Boehm *et al.*, 2023). Therefore, the 'causal responsibility' for climate change financing rests on the global North to bankroll both mitigation and adaptation strategies on climate change in Africa. However, since the developed countries may be reluctant to partner with African countries, it is the responsibility of regional blocs like the AU and SADC to promote resilience building against climate change.

Nonetheless, resilience building is not an overnight strategy which can be employed without systematic planning. It has been noted that climate change effects in Africa, and the world at large, are not uniform. The effects differ among countries and within a particular country. The factors which differentiate the effects are both geographic and socio-economic. However, this comes down to the fact that the less economically endowed locality, or individual, is the most vulnerable. In other words, vulnerability is fuelled by a lack of resources. This is the reason most African countries are vulnerable to climate change as compared to developed countries; and the urban poor are likewise more vulnerable than the urban affluent. Subsequently, resilience building involves taking a resilience assessment and then act proactively and make informed decisions. In this regard, the use of early warning systems for early action initiatives are a necessity in African as they are a form of resilience assessment. In other words, resilience building in climate prompts innovative thinking in the sense that a successful resilience strategy implemented to counter climate change involves assessing the situation, evaluating the best options and then timely implementing them. As such, early time action interventions, as either mitigation or adaptation measures, are necessary to reduce the negative impact of the climate change. Noteworthy is that technological innovations in resilience building Africa are less efficient owing to limited resources and this disrupts early time action initiatives against climate change.

CONCLUSION, OPTIONS AND PRACTICAL RECOMMENDATIONS

Climate change is a global threat which cannot be wished away. Pragmatic measures are needed to be assessed and implemented to resolve the negative effects of climate change. As such, the adage that 'necessity is the mother of invention' becomes a reality in resilience building against climate change. All stakeholders need to explore the most viable options to

counter this global threat to development. As it is a universal phenomenon, it is only prudent for nations to team up and pool resources to fight climate change. As the impact of climate change is heterogenous among nations, an effective climate change funding mechanism needs to be effected at global levels. Developed countries obliged to contribute towards this cause must have the assurance that the allocated funds are used efficiently, with no incidences of fungibility, towards resilience building against climate change. At local levels, responsible authorities need to involve all stakeholders in making decisions which promote resilience building, and proactive rural and urban planning constitutes innovative measures which build up resilience. As such, pathways towards resilience building need to be participatory in nature and must be flexible enough to transform both mitigation and adaptation measures into holistic and integrated pathways of promoting sustainability in the face of climate change. Furthermore, early warning systems are a necessary resilience assessment initiative which contribute towards development by promoting early action against hazards.

REFERENCES

Ackerl, T. *et al.* (2023). Climate Change Risk, Resilience and Adaptation among Rural Farmers in East Africa: A Literature Review. *Regional Sustainability, 4*(2023), 185-193

African Development Bank Group. (2023). A Just Transition to Address Climate Change in the African Context. Climate Change and Green Growth Department, Abidjan

Ahmed, I., Esch, M., and Hoeven, F. (2023). Heatwave Vulnerability across Different Spatial Scales: Insights from the Dutch Built Environment. *Urban Climate, 51*(2023) 101614

Ayanlade, A. *et al. (*2022). 'Chapter 9: Africa'. Intergovernmental Panel on Climate Change (IPCC) WGII Sixth Assessment Report.

Birkmann, J. *et al.* (2022). Understanding Human Vulnerability to Climate Change: A Global Perspective on Index Validation for Adaptation Planning. Science of the Total Environment, 803 (2022) 150065

Boehm, S. *et al.* (2023). *State of Climate Action 2023*, https://doi.org/10.46830/wrirpt.23.00010.

Charrua, A.B. *et al.* (2021). Impacts of the Tropical Cyclone Idai in Mozambique: A Multi-Temporal Landsat Satellite Imagery Analysis. *Remote Sens. 13*(201). https://doi.org/10.3390/rs13020201

Cobbinah, P.B. and Finn, B.M. (2022). Planning and Climate Change in Africa Cities: Informal Urbanization and 'Just' Urban Transformations. *Journal of Planning Literature,* 1-19, doi: 10.1177/08854122221128762

Coovadia, A.H (2022). Climate Change and the Health of Children in Southern Africa – The Time to Act is Now. *Wits Journal of Clinical Medicine, 4(*3), 157-162

Cutter, S. L., Mitchell, J. T. and Scott, M. S. (2000). Revealing the Vulnerability of People and Places: A Case Study of Georgetown County, South Carolina. *Annals of the Association of American Geographers, 90*(4), 713-737.

Dodman, D., Ayers, J. and Huq, S. (2009). Building Resilience, In: *State of the World: Into a Warming World*. The World Watch Institute, www.worldwatch.org/stateoftheworld.

Ebi, K.L., Hess, J.J., Watkiss, P. (2017). Health Risks and Costs of Climate Variability and Change. In: Mock, C.N. *et al.* (eds.) *Injury Prevention and Environmental Health* (3rd Ed.) Washington DC: World Bank.

Ekoh. S.S. and Teron, L., (2023). Vulnerable Spaces, Unequal Responses: Lessons for Transformative Climate Resilience in Lagos. *Front. Sustain. Cities 5*:929121.

Erickson, B., Lloyd-Jones, T. (2001). Design Problems. In: Roberts, M., Greed, C. (eds.), *Approaching Urban Design: The Design Process,* 3-7. Harlow: Longman/Pearson Education.

FAO (2018). How Agrifin Mobile is Assisting Smallholder Farmers in Zimbabwe. Retrieved: March 13, 2020, Http://www.fao.org/e-agriculture/blog/how-agrifin-mobile-assisting-smallholder-farmers-zimbabwe

Guillaumont, P. (2015). Measuring Vulnerability to Climate Change for Allocating Funds for Adaptation, Ferdi Working Paper, No. P136, Fondation Pour Les Études Et Recherches Sur Le Développement International (FERDI), Clermont-Ferrand.

Han, X. and Kirabaeva, K. (2024). The Gambia: Climate Change Vulnerabilities and Strategies. IMF Selected Issues Paper No. 2024/010

IMF. (2022). Sub-Saharan Africa: Building Resilience to Climate-Related Disasters. IMF Working Paper, African Department, WP/22/39

International Organisation for Migration (IOM) (2019). Climate Change and Migration in Vulnerable Countries: A Snapshot of Least Developed Countries, Landlocked Developing Countries and Small Island Developing States, IOM Switzerland

IPCC (2023). Sections. In: Core Writing Team, H. Lee and Romero, J/ (eds.) Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC).

IPCC. (2018). Special Report on Global Warming of 1.5 _C. 2018. Available online: https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/sr15_full_report_low_res.pdf

James, N. (2023). The Effects of Climate Change on Informal Settlements. *Town and Regional Planning,* 82, 1-3.

Kasim, O. F., Wahab, B. and Oweniwe, M. F. (2021). Urban Expansion and Enhanced Flood Risk in Africa: The Example of Lagos. *Environ. Hazards* 21, 137-158. doi: 10.1080/17477891.2021.1932404

López-Gunn, E. *et al.* (2021). Communities of Innovation for Climate Change Adaptation and Disaster Risk Reduction: Niche Creation and Anticipation. *Sustainability, 13*(5180), https://doi.org/10.3390/su13095180

Mamman, S.O., Sohag, K. and Abubakar, A.B. (2023). Climate Change and Inclusive Growth in Africa, *Cogent Economics and Finance, 11*(2), 2282869, DOI: 10.1080/23322 039.2023.2282869

Marion, O. (2023). Climate Adaptation in Kenya: Narratives and Frames Shaping Policy and Practice. NAI Working Papers 1. Uppsala: Nordiska Afrikainstitutet.

Matenga, L. (2019). Placing Climate Change in Wetland Conservation and Urban Agriculture Contestations in Harare, Zimbabwe. In: Cobbinah, P. B. and Addaney, M. *eds.). *the Geography of Climate Change Adaptation in Urban Africa*, 155-81. Cham: Palgrave Macmillan.

Molesa, O. *et al.* (2014). From Local Building Practices to Vulnerability Reduction: Building Resilience through Existing Resources, Knowledge and Know-How. 4th International Conference on Building Resilience, Building Resilience 2014, 8-10 September 2014, Salford Quays, United Kingdom

Musuka, G. and Dzinamarira, T. (2023). *Climate Change and Health Systems in East and Southern Africa: A Rapid Review.* EQUINET Brief, EQUINET, Harare.

Mwenje, E. and Kumar, P. (2024). Challenges for Mainstreaming Climate Adaptation in African Cities. A Case Study of Kigali, Rwanda. *Landscape and Urban Planning, 245*(2024) 105017

Natarajan, N. *et al.* (2022). A Sustainable Livelihoods Framework for the 21st Century. *World Development, 155*(105898),

Newsham, A., Shonhe, T. and Bvute, T. (2021). Commercial Tobacco Production and Climate Change Adaptation in Mazowe, Zimbabwe. Agricultural Policy Research Africa, Working Paper 064.

Nightingale, A. J. (2017). Power and Politics in Climate Change Adaptation Efforts: Struggles Over Authority and Recognition in the Context of Political Instability. *Geoforum*, 84, 11-20.

Okunola, O.H., Simatele, M.D. and Olowoporoku, O. (2022). The Influence of Socioeconomic Factors on Individual and Household Adaptation Strategies to Climate Change Risks in Port Harcourt, Nigeria, *Journal of Integrative Environmental Sciences*, *19*(1), 273-288, doi: 10.1080/1943815x.2022.2143821

PLAAS (2022). Climate Change and Rural Livelihoods in Southern Africa:A Research and Policy Agenda. PLAAS Research Report No. 57, Bellville.

Rahal, I. and Elloumi, A. (2023). Climate Change's Effects on Food Security in Sub-Saharan Africa (SSA). https://mpra.ub.uni-muenchen.de/118569/

Rigaud, K. K *et al.* (2021). Groundswell Africa: Internal Climate Migration in West African Countries. Washington, DC:World Bank. doi: 10.1596/36404

Rocque R.J., Beaudoin, C., Ndjaboue, R *Et Al.* (2021). Health Effects of Climate Change: An Overview of Systematic Reviews, *BMJ Open.* 11:e046333. http://dx.doi.org/ 10.1136/bmjopen-2020-046333.

SADC (Southern African Development Community). (2019). SADC and EU Launch a Programme to Strengthen Capacity of SADC Member States to Undertake Climate Change Adaptation and Mitigation Actions, https://www.sadc.int/ news-events/news/sadc-and-eu-launch-programme-stren gthen-capacity-sadc-member-states-undertake-climatech ange-adaptation-and-mitigation-actions/

Schraven, B. *et al.* (2019). *Human Mobility in the Context of Climate Change in Sub-Saharan Africa: Trends and Basic Recommendations for Development Cooperation.* Bonn: Deutsches Institut Für Entwicklungspolitik (DIE).

Schwerdtle, P. N. *et al.* (2020). Health and Migration in the Context of a Changing Climate: A Systematic Literature Assessment. *Environmental Research Letters*.

Serdeczny, O. *et al.* (2017). Climate Change Impacts in Sub-Saharan Africa: From Physical Changes to their Social Repercussions. *Regional Environmental Change, 17*(6), 1585-1600. https://doi.org/10.1007/S10113-015-0910-2

Smith, E.F. *et al.* (2016. Rapid Regional-scale Assessments of Socio-Economic Vulnerability to Climate Change. *Environ. Res. Lett., 11* (2016) 034016.

Stein, B. A (2024). *Innovation in Climate Adaptation: Harnessing Innovation for Effective Biodiversity and Ecosystem Adaptation*. Washington, DC: National Wildlife Federation.

Tapsell, S. *et al.* (2010): Social Vulnerability and Natural Hazards. Caphaz-Net WP4 Report, Flood Hazard Research Centre – FHRC, Middlesex University, London (Available at: http://caphaz-net.org/outcomes-results/caphaz -net_wp4_ social-vulnerability.pdf).

The World Bank. (2022). *What You Need to Know About Food Security and Climate Change*. https://www.worldbank.org/ en/news/feature/2022/10/17/what-you-need-to-know-about-food-security-and-climate-change.

Thomas, K. *et al.* (2019). Explaining Differential Vulnerability to Climate Change: A Social Science Review. *Wiley Interdisciplinary Reviews: Climate Change, 10*(2), E565.

Todorov, A. V. (1986). Reply. *Journal of Applied Climate and Meteorology, 25*, 258-9.

Torsu, A.K. and Krönke, M. (2023). With Climate Change Making Life Worse, Africans Expect Governments and Other Stakeholders to Step Up. Afrobarometer Dispatch No. 717

Twigg, J. (2007). Characteristics of a Disaster-Resilient Community: A Guidance Note. London: DFID DRR Interagency Coordination Group.

UNDP (2023). Building Climate-resilient and Inclusive Cities. Policy Brief No.2, Geneva

UNECA (2023). Economic Report on Africa 2023: Building Africa's Resilience to Global Economic Shocks, UNECA Publications Section, Addis Ababa

United Nations Framework Convention on Climate Change (UNFCCC) (2020). Innovative Approaches to Accelerating and Scaling Up Climate Technology Implementation for Mitigation and Adaptation. UNFCCC, Bonn

United Nations (2022). Advancing a Rights-based Approach to Climate Change Resilience and Migration in the Sahel, Secretariat of the United Nations.

Weber, T. *et al.* (2018). Analysing Regional Climate Change in Africa in a 1.5, 2 and 3°C Global Warming World. *Earth's Future, 6,* 643-655. https://doi.org/10.1002/2017ef000714

Werndl, C. (2014). On Defining Climate and Climate Change. *The British Journal for the Philosophy of Science,* doi: 10.1093/bjps/axu048

World Health Organisation (2019). The State of Food Security and Nutrition in the World 2019: Safeguarding Against Economic Slowdowns and Downturns (Vol. 2019). Food and Agriculture Org.

WMO, UNDRR, AU, ITU, IFRC. (2023). Multi-Hazard Early Warning for All Action Plan for Africa (2023-2027).

Yang, D., Sun, X., Cao, F. and Qu, F. (2021). Analysis of Innovation, Innovative Thinking and Innovative Methods. *Advances in Social Science, Education and Humanities Research*, 555, 537-542

Ye, W. *et al.* (2022). Understanding Sustainable Livelihoods with a Framework Linking Livelihood Vulnerability and Resilience in the Semiarid Loess Plateau of China. *Land, 11*(1500). https://doi.org/10.3390/land11091500

Zhang, M,, Liu, Z., Van Dijk, M.P. (2019). Measuring Urban Vulnerability to Climate Change Using an Integrated Approach, Assessing Climate Risks in Beijing. *PeerJ* 7:e7018 http://doi.org/10.7717/peerj.7018