ASSESSING OPPORTUNITIES FOR INTEGRATING FORECAST-BASED FINANCING INTO MALAWI'S DISASTER RISK FINANCING FRAMEWORK

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ABSTRACT

Malawi Malawi faces recurrent floods, droughts, and cyclones that affected over 20.6 million people and caused USD 1,296.7 million in documented losses between 2015 and 2024. Despite a Disaster Risk Financing Strategy (DRFS), the financing system remains predominantly reactive, with an annual disaster budget of USD 3.9 million against a modelled need of USD 82 million. This study assessed opportunities for integrating Forecast-Based Financing (FbF) —a mechanism linking weather forecasts to pre-agreed triggers for pre-disaster fund release — into Malawi's Disaster Risk Financing (DRF) framework. A concurrent mixed-methods design was adopted, combining thematic analysis and chi-square testing of four Key Informant Interviews (KIIs) with quantitative analysis of EM-DAT records, PDNA reports, and DRFS 2025–2030 financing data using Pearson correlation, linear regression, and protection gap estimation. Findings revealed an average protection gap of approximately 82% across major events, zero insured losses across all 21 EM-DAT events, and statistically confirmed episodic disaster impacts (R^2 = 0.023) that justify trigger-based financing over fixed annual budgets. All four KII participants demonstrated FbF awareness, with two confirming active anticipatory action operations, establishing that the binding constraint is policy authority and domestic financing rather than technical capacity. The study concluded that Malawi has the institutional foundations to formally integrate FbF, and recommends embedding FbF within the DRFS 2025–2030, operationalising a National DRF Trust Fund with trigger-based disbursement, decentralising FbF authority to district level, and strengthening multi-stakeholder coordination through a DRF Technical Working Group.

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ACRONYMS/ABBREVIATIONS

Acronym	Full Meaning
ARC	African Risk Capacity
DoDMA	Department of Disaster Management Affairs
DRF	Disaster Risk Financing
DRM	Disaster Risk Management
FbF	Forecast-Based Financing
GDP	Gross Domestic Product
GoM	Government of Malawi
IFRC	International Federation of Red Cross and Red Crescent Societies
KII	Key Informant Interview
MoFEPD	Ministry of Finance, Economic Planning and Development
MWK	Malawi Kwacha
NGO	Non-Governmental Organization
PDNA	Post-Disaster Needs Assessment
SDG	Sustainable Development Goal
UN	United Nations
UNDP	United Nations Development Programme
UNDRR	United Nations Office for Disaster Risk Reduction
WFP	World Food Programme
WB	World Bank

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CHAPTER 1

1. INTRODUCTION

1.1. Background

Globally, the increasing frequency and severity of climate-related disasters poses one of the most significant threats to sustainable development, human security, and economic stability in the twenty-first century (Gupta et al., 2024; UNDRR, 2022). Floods, droughts, and tropical cyclones are intensifying under climate change, generating humanitarian needs that consistently outpace existing financing systems (Wilkinson et al., 2018; World Bank, 2021). Developing countries bear a disproportionate share of this burden not because they face greater hazards than high-income countries in every instance, but because their disaster response systems remain structurally reactive, dependent on post-disaster emergency appeals and donor contributions that arrive too late to prevent the worst losses (Clarke & Dercon, 2016; Nur & Wilkinson, 2020). This reactive paradigm results in financing arriving days to weeks after disaster impact, by which time lives, assets, and livelihoods have already been lost and recovery costs have multiplied significantly beyond what anticipatory action would have required (Wilkinson et al., 2018; World Bank, 2014).

To address this systemic weakness, Forecast-Based Financing (FbF) has emerged as an innovative approach that links scientific weather and climate forecasts to pre-agreed financing triggers, enabling funds to be released and early actions implemented before a hazard reaches its peak impact (Coughlan De Perez et al., 2015; Coughlan de Perez, 2018; De Perez et al., 2016). The fundamental premise of FbF is that acting on probabilistic forecasts reduces disaster losses more cost-effectively than mobilising resources after impact has occurred (Coughlan De Perez et al., 2015; Nur & Wilkinson, 2020). Pioneered by the International Federation of Red Cross and Red Crescent Societies (IFRC) and the World Food Programme (WFP), FbF has been piloted in Bangladesh, Uganda, Togo, Kenya, Peru, and the Philippines, demonstrating measurable reductions in humanitarian costs and community losses when early actions are implemented before disaster onset (Bischiniotis et al., 2018; International Federation of Red Cross and Red Crescent Societies (IFRC) & Red Cross Red Crescent Climate

Centre, 2019). The World Health Organisation estimates that investing in early action based on forecasts can reduce disaster losses by approximately 30% compared to post-disaster reactive response, underscoring the cost-effectiveness argument for FbF over traditional emergency financing (WHO, cited in Clarke & Dercon, 2016).

In sub-Saharan Africa, disaster risk is acute and escalating. Droughts, floods, and cyclones continue to devastate food security, livelihoods, and public infrastructure, with the region accounting for a disproportionate share of global disaster mortality and economic losses relative to its GDP (Surminski et al., 2022). While FbF implementation in the region has grown since 2015 with Uganda, Togo, Kenya, and Ethiopia emerging as documented cases of anticipatory action uptake, implementation remains uneven and predominantly driven by humanitarian actors rather than national government systems (International Federation of Red Cross and Red Crescent Societies (IFRC) & Red Cross Red Crescent Climate Centre, 2019; Mwangi et al., 2022). Studies from Kenya reveal that the transition from humanitarian FbF pilots to institutionalised national financing systems is constrained by fragmented institutional responsibilities, the absence of formal trigger protocols embedded in national budgets, and limited technical capacity for trigger calibration particularly for slow-onset hazards such as drought (Mwangi et al., 2022; Nur & Wilkinson, 2020). These barriers mean that even where FbF awareness and operational experience exist at the humanitarian level, the critical step of embedding FbF within government-owned disaster risk financing frameworks has rarely been achieved across the region (Clarke & Dercon, 2016; Nur & Wilkinson, 2020).

In Malawi, the scale of climate-related disaster risk is substantial and well-documented. The country is among the most disaster-prone in southern Africa, experiencing recurring floods, droughts, and tropical cyclones that have intensified in frequency and magnitude over the past two decades (MoFEPD, 2025; World Bank, 2021). Agriculture accounts for approximately 22% of GDP and employs over 80% of the workforce, yet it is predominantly rain-fed and therefore highly sensitive to climatic variability (MoFEPD, 2025; Kamanga et al., 2020). Over 73% of the population lives in areas susceptible to natural hazards, with the majority residing in rural areas where infrastructure is inadequate to withstand climate shocks (MoFEPD, 2025; World Bank,

2021). Extreme weather events are estimated to reduce Malawi's GDP by approximately 1.7% annually, and major disasters impose losses that far exceed national response capacity (Pauw et al., 2011; World Bank, 2021). The 2023 Cyclone Freddy, the most destructive disaster in Malawi's recorded history caused USD 507 million in damage, affecting 2.27 million people and claiming 1,209 lives (Government of Malawi, 2023; EM-DAT, 2026). The 2024 El Niño drought left 6.1 million people in need of humanitarian assistance, an estimated 30% of the national population (MoFEPD, 2025).

Despite significant policy development including the introduction of the Disaster Risk Financing Strategy (2019–2024), subsequently revised for 2025–2030, Malawi's disaster financing system remains predominantly reactive and heavily dependent on post-disaster donor support (MoFEPD & DoDMA, 2019; MoFEPD, 2025; World Bank, 2021). The primary domestic disaster response instrument, the Vote for Unforeseen Expenditure, is capped at approximately 1–2% of the national budget which is equivalent to USD 3.9 million in the 2024/2025 fiscal year against a modelled annual emergency response need of USD 82 million for droughts and USD 321 million for a 1-in-10-year drought event (MoFEPD, 2025; World Bank, 2021). Insurance penetration remains below 5% of the adult population, and no insured losses have been recorded across any of the 25 significant disaster events documented for Malawi in the EM-DAT international disasters database for the period 2015–2024 (Surminski et al., 2022; EM-DAT, 2026; MoFEPD, 2025). Critically, there is no formal mechanism within Malawi's DRF architecture that links weather and climate forecasts from the Department of Climate Change and Meteorological Services (DCCMS) to pre-arranged financial disbursement, the defining characteristic of FbF (MoFEPD, 2025; World Bank, 2021). While anticipatory action is being piloted through humanitarian partnerships between the Department of Disaster Management Affairs (DoDMA), the Food and Agriculture Organisation (FAO), and the Malawi Red Cross Society, these initiatives remain dependent on external humanitarian financing and are not systematically integrated within the national DRF framework (MoFEPD, 2025). Integrating FbF into Malawi's DRF framework therefore presents a concrete and evidence-based opportunity to shift from reactive to anticipatory disaster financing, reduce the national protection gap, and align the country's disaster management system with the proactive risk-informed

approach called for by the Sendai Framework for Disaster Risk Reduction (2015–2030) (Clarke & Dercon, 2016; United Nations Office for Disaster Risk Reduction (UNDRR), 2015).

1.2. Problem Statement

Despite increasing policy commitment to financial preparedness for disasters, Malawi's disaster risk financing system remains structurally reactive and incapable of releasing resources before a disaster strikes. When disasters occur, funds are mobilised primarily through emergency appeals and donor contributions, a process that is inherently slow, unpredictable, and insufficient relative to the scale of losses (MoFEPD, 2025; UNDRR, 2022; World Bank, 2021). The gap between modelled emergency financing needs and actual budget allocations is severe: against a modelled annual drought response need of USD 82 million. Malawi allocates less than USD 4 million annually, a shortfall of over 95% that is routinely covered through post-disaster borrowing and donor appeals (MoFEPD, 2025; World Bank, 2021). Across all 25 significant disaster events recorded for Malawi between 2015 and 2024, not a single event registered insured losses, confirming that formal risk transfer plays no meaningful role in the country's disaster financing architecture (EM-DAT, 2026; Surminski et al., 2022).

The Malawi Disaster Risk Financing Strategy (2025–2030) references anticipatory action and a risk-layered financing approach, but FbF is not formally embedded within the strategy as a funded, trigger-based mechanism with defined thresholds, institutional roles, or disbursement protocol. There is no established protocol linking DCCMS weather forecasts to pre-agreed financial releases, and district-level disaster officers have no formal policy authority to initiate spending before a disaster occurs in anticipation of a forecast hazard (MoFEPD, 2025). Institutional fragmentation between DoDMA, the Ministry of Finance, DCCMS, and humanitarian partners further constrains the operationalisation of anticipatory financing (Clarke & Dercon, 2016; MoFEPD, 2025; Mwangi et al., 2022). As a result, despite having functional early warning systems and operational experience in anticipatory action through humanitarian partnerships, Malawi continues to spend far more on post-disaster response than on prevention and early action, an outcome that is both more costly and less effective in protecting lives and livelihoods (Wilkinson et al., 2018; World Bank, 2021). There is therefore a pressing

need to assess the practical opportunities and institutional pathways for integrating Forecast-Based Financing into Malawi's existing DRF framework.

1.3. Research Objectives

Main Objective

To assess opportunities for integrating Forecast-Based Financing (FbF) into Malawi's Disaster Risk Financing (DRF) Framework.

Specific Objectives

1. To examine existing disaster risk financing policies and institutional arrangements in Malawi, identifying gaps and entry points for FbF integration.
2. To assess the level of institutional and technical capacity among key stakeholders for implementing FbF in Malawi.
3. To evaluate the existing protection gap and financial impacts of climate-related disasters in Malawi as evidence for the urgency and benefit of FbF integration.

1.4. Research Questions

1. To what extent do existing disaster risk financing policies and institutional arrangements in Malawi support or hinder the integration of Forecast-Based Financing mechanisms?
2. What is the current level of institutional and technical capacity among key stakeholders for implementing Forecast-Based Financing in Malawi?
3. What does the existing protection gap in Malawi reveal about the financial impacts of climate-related disasters and the urgency of integrating anticipatory financing?

1.5. Significance of the Study

This study contributes to strengthening Malawi's financial resilience against climate-related disasters by providing the first comprehensive assessment of the opportunities and barriers to integrating FbF into the national DRF framework. Unlike previous work, which has tended to focus either on post-disaster assessments or on the technical design of individual FbF pilots, this study evaluates the institutional, policy, and financial prerequisites for FbF adoption at the national level. This perspective that has been largely absent from the Malawi literature.

The study directly aligns with Priority 3 of the Sendai Framework for Disaster Risk Reduction (2015–2030); Investing in disaster risk reduction for resilience and contributes to Sustainable Development Goal 13 (Climate Action) by supporting climate-resilient financial planning. Its findings are of direct relevance to the Ministry of Finance, DoDMA, the Malawi Red Cross Society, and development partners engaged in disaster risk financing, offering an evidence base for policy decisions on the DRF Trust Fund, the DRFS 2025–2030 implementation plan, and the design of anticipatory action protocols.

Scientifically, the study introduces a quantitative element through the estimation of the national protection gap using EM-DAT and PDNA data, complementing the qualitative policy and institutional analysis with measurable financial evidence. This mixed-methods approach bridges the gap between policy analysis and impact measurement, contributing to both academic understanding and practical decision-making.

CHAPTER 2

2. LITERATURE REVIEW

2.1 Introduction

This chapter critically reviews existing literature on Forecast-Based Financing and Disaster Risk Financing, focusing on their theoretical foundations, global experiences, regional applications in sub-Saharan Africa, and the specific context of Malawi. It also identifies the research gap that this study addresses and presents the conceptual framework guiding the analysis. The review draws on peer-reviewed literature, international organisation reports, and policy documents including the Malawi DRFS 2025–2030.

2.2 Conceptual and Theoretical Foundations

2.2.1 Forecast-Based Financing

Forecast-Based Financing (FbF) is an approach to humanitarian and disaster financing that links scientific forecasts of extreme weather and climate events to pre-agreed financing triggers and early action protocols. The foundational premise is that acting on reliable probabilistic forecasts before a hazard reaches its peak reduces disaster losses more cost-effectively than mobilising resources after impact has occurred (Coughlan De Perez et al., 2015). FbF operates through a Theory of Change that connects three core components: (1) reliable and actionable scientific forecasts from meteorological services; (2) pre-agreed trigger thresholds that activate funding automatically when forecast probability exceeds a defined level; and (3) pre-planned early actions that are implemented immediately upon trigger activation, before the hazard strikes.

This approach contrasts fundamentally with traditional reactive disaster financing, in which funds are mobilised through emergency appeals and donor contributions after a disaster has occurred, assessment missions have been completed, and response plans have been approved, a process that typically takes days to weeks and results in delayed

and inadequate assistance (Clarke & Dercon, 2016). FbF's efficiency advantage lies in this temporal shift: early actions such as evacuation support, pre-positioning of relief supplies, asset protection, and community sensitisation are significantly cheaper to implement before a hazard than after, and they prevent losses rather than merely compensating for them.

2.2.2 Disaster Risk Financing

Disaster Risk Financing (DRF), as promoted by the World Bank and other development partners, provides a structured framework for managing financial risks from disasters through a portfolio of instruments including contingency funds, sovereign insurance, contingent credit lines, and social protection mechanisms (World Bank, 2021). The core principle of DRF is risk layering: different financial instruments are matched to different levels of disaster risk ; frequent low-severity events are handled through retained funds, moderate events through contingent credit and catastrophic low-frequency events through insurance and international assistance.

DRF frameworks distinguish between ex-ante instruments which are those arranged before a disaster, such as insurance premiums and contingency funds and ex-post instruments, such as budget reallocations and emergency borrowing. Effective DRF systems combine both, with ex-ante instruments providing the speed and predictability that post-disaster financing cannot. The integration of FbF within a DRF framework represents the operationalisation of ex-ante financing specifically for the anticipatory action phase, the period between forecast and disaster impact.

2.2.3 The Protection Gap

The protection gap concept, widely used in disaster risk financing literature, refers to the proportion of total disaster losses that remain uninsured or unfunded through formal financial mechanisms (Surminski et al., 2022). In developing countries, the protection gap is typically very large often exceeding 80–90% of total losses because insurance penetration is low, government contingency budgets are inadequate, and post-disaster donor flows are insufficient and delayed. The protection gap falls

disproportionately on the poorest and most vulnerable households, who lack both formal financial protection and the assets needed to self-insure.

Surminski and Oramas-Dorta (2014) argue that narrowing the protection gap in developing countries requires not only expanding insurance markets but also strengthening public financing mechanisms and embedding them within broader resilience-building strategies. FbF contributes to narrowing the protection gap by pre-positioning resources that would otherwise only be mobilised after losses have occurred, effectively bringing forward the timing of financial support and reducing the proportion of losses that go entirely unaddressed.

2.2.4 Theoretical Anchoring: The Sendai Framework

This study is anchored in Priority 3 of the Sendai Framework for Disaster Risk Reduction (2015–2030): Investing in Disaster Risk Reduction for Resilience. This priority calls for proactive financial mechanisms, improved risk governance, and the strengthening of institutional capacities to manage risk before disasters occur. The Sendai Framework provides both a theoretical and policy justification for assessing FbF integration in Malawi's DRF system, situating the study within the global commitment to shifting from reactive disaster management to proactive risk governance.

2.3 Global Perspectives on Forecast-Based Financing

Globally, FbF has demonstrated significant potential as a transformative approach to disaster management. The IFRC and WFP have implemented FbF pilots across Asia, Latin America, and Africa, producing measurable evidence of impact. In Bangladesh, FbF systems triggered early evacuation and livestock protection before major floods in 2016 and 2017, with evaluations showing that pre-emptive early actions reduced both flood-related losses and response costs compared to a post-disaster control group (Wilkinson et al., 2018). In Peru, forecast-based early action protocols enabled the pre-deployment of response teams and the pre-positioning of emergency supplies before El Nino-related flooding in 2017, significantly reducing the scale of humanitarian needs (Bischiniotis et al., 2018). In the Philippines, FbF triggers linked to typhoon forecasts enabled cash transfers to vulnerable households before storms made landfall, allowing them to protect assets and relocate before peak impact (Bischiniotis et al., 2018).

Despite these successes, global experiences also reveal persistent challenges. Mwangi et al. (2022) identify three categories of constraint: technical challenges, including uncertainty in forecasting accuracy and the risk of false alarms that undermine trust in the trigger system; institutional challenges, including resistance from government finance ministries to releasing funds based on probabilistic forecasts rather than confirmed damage; and financing challenges, including the dependence of most FbF systems on donor-provided funds rather than government domestic resources, which limits scalability and sustainability. Wilkinson et al. (2018) argue that the most critical determinant of FbF success is national ownership systems that are embedded within government financing frameworks and supported by domestic political commitment are significantly more durable than donor-funded pilots.

2.4 Forecast-Based Financing in Sub-Saharan Africa

In sub-Saharan Africa, FbF implementation has grown substantially since 2015 but remains uneven across countries and hazard types. Uganda and Togo are the most frequently cited African success stories, where national Red Cross societies developed FbF protocols in collaboration with national meteorological services and DCCMS equivalents, demonstrating that anticipatory action based on flood forecasts could significantly reduce displacement and asset losses in pilot communities(International Federation of Red Cross and Red Crescent Societies (IFRC) & Red Cross Red Crescent Climate Centre, 2019). Ethiopia has developed one of the most institutionalised FbF systems on the continent, integrating anticipatory action within the national social protection system and enabling the scale-up of cash transfers ahead of drought events.

Kenya provides an instructive example of the institutional challenges involved in FbF mainstreaming. Mwangi et al. (2022) document that while Kenya has functional early warning systems and committed humanitarian partners, the integration of FbF into national DRF systems has been constrained by fragmented institutional responsibilities between meteorological agencies, disaster management authorities, and finance ministries. The absence of a clear national FbF mandate and the lack of pre-positioned government funding were identified as the primary barriers, suggesting that technical capacity alone is insufficient without corresponding policy and financing architecture.

Critically, most African FbF literature positions the approach as a humanitarian tool led by Red Cross societies and UN agencies rather than as a national financing mechanism integrated within government budgets and DRF frameworks. This framing limits FbF's reach and sustainability, as it remains dependent on external financing and humanitarian actor capacity. Nur and Wilkinson (2020) argue that the transition from humanitarian FbF pilots to institutionalised national systems requires deliberate policy action to embed FbF within DRF frameworks, domestic budget processes, and national disaster management legislation precisely the gap that this study addresses in the Malawi context.

2.5 Disaster Risk Financing in Malawi

2.5.1 Disaster Risk Profile

Malawi faces a high and increasing risk of climate-related disasters. The country's hazard profile is dominated by floods, droughts, and tropical cyclones, which together account for the overwhelming majority of disaster events and losses recorded in EM-DAT between 2000 and 2024. According to the Disaster Risk Financing Strategy (2025-2030), the Lower Shire Valley and Lakeshore areas are chronically flood-prone, with annual flooding affecting between 60,000 and 100,000 people in typical years and over 300,000 in major events. Drought is the most economically damaging hazard, with the World Bank estimating that a 1-in-10-year drought event could cost Malawi over USD 321 million in emergency response alone (MoFEPD, 2025). The 2023 Cyclone Freddy stands as the most destructive event in Malawi's recorded history, causing USD 507 million in damage and claiming 1,209 lives.

Vulnerability is amplified by Malawi's socioeconomic context. Over 50% of the population lives below the poverty line, the majority of infrastructure is not climate-resilient, and the predominantly rain-fed agricultural sector provides limited buffer against weather shocks. The fiscal context compounds exposure: with a fiscal deficit of over 10% of GDP as of 2024, the government has very limited capacity to respond to disasters without external assistance (MoFEPD, 2025).

2.5.2 The DRF Strategy and Existing Instruments

Malawi introduced its first Disaster Risk Financing Strategy for the 2019–2024 period, establishing a framework for sovereign risk financing through instruments including the African Risk Capacity (ARC) drought insurance, World Bank Catastrophe Deferred Drawdown Options (CAT-DDOs), the Strategic Grain Reserve, and adaptive social protection through the Social Cash Transfer Programme (SCTP). The revised DRFS 2025–2030 builds on this foundation, introducing a formal risk layering approach and explicitly incorporating anticipatory action within the risk financing portfolio. The strategy's five priority areas; economic and fiscal analytics, a financing instruments portfolio, DRF mainstreaming, coordination and institutional capacity, and cross-cutting issues provide a comprehensive framework for financial resilience building.

However, studies indicate that implementation of the previous strategy was constrained by weak coordination, inadequate resource allocation, limited stakeholder awareness, and the absence of a monitoring and evaluation framework (MoFEPD, 2025). The CAT-DDOs were fully drawn down in 2020 and 2024, leaving Malawi temporarily without active contingent credit. Insurance penetration remains below 5% of the adult population, and the government's annual disaster response allocation approximately USD 3.9 million covers less than 5% of modelled annual emergency response needs for droughts.

2.5.3 FbF in the Malawi Context

Forecast-Based Financing has not yet been formally integrated into Malawi's national DRF framework. While the DRFS 2025–2030 references anticipatory action mechanisms, there is no established protocol linking DCCMS forecasts to pre-arranged financial disbursement, and no dedicated domestic funding for FbF activities. Anticipatory action is currently occurring through humanitarian partnerships primarily between DoDMA, FAO, and the Malawi Red Cross Society but these initiatives rely on external humanitarian funding rather than government resources and are not systematically integrated within the national DRF architecture.

The literature identifies this gap as a critical missed opportunity. World Bank (2021) notes that Malawi's existing early warning systems including DCCMS

hydrometeorological forecasting and seasonal outlooks produced jointly with the Department of Water Resources are sufficiently reliable to underpin FbF triggers for flood and cyclone events, but that the absence of a policy mandate and pre-positioned financing prevents these forecasts from catalysing early action at scale.

2.6 Research Gap

While global and regional studies have demonstrated the potential of FbF and documented the conditions necessary for its success, no study has comprehensively analysed the opportunities and barriers for integrating FbF into Malawi's national DRF framework. Existing Malawi literature focuses either on post-disaster assessments and loss estimation or on the technical design of pilot anticipatory action initiatives, without assessing the institutional, policy, and financial prerequisites for system-level FbF adoption. Furthermore, Malawi's DRF research remains largely descriptive, with limited quantitative assessment of the protection gap or rigorous analysis of the cost-effectiveness gap between anticipatory and reactive financing.

This study fills that gap by combining thematic analysis of KII data with quantitative protection gap estimation, triangulated against documentary evidence from the DRFS 2025–2030 and PDNA reports. It provides both a diagnostic of the current system and a forward-looking assessment of institutional pathways for FbF integration.

2.7 Conceptual Framework

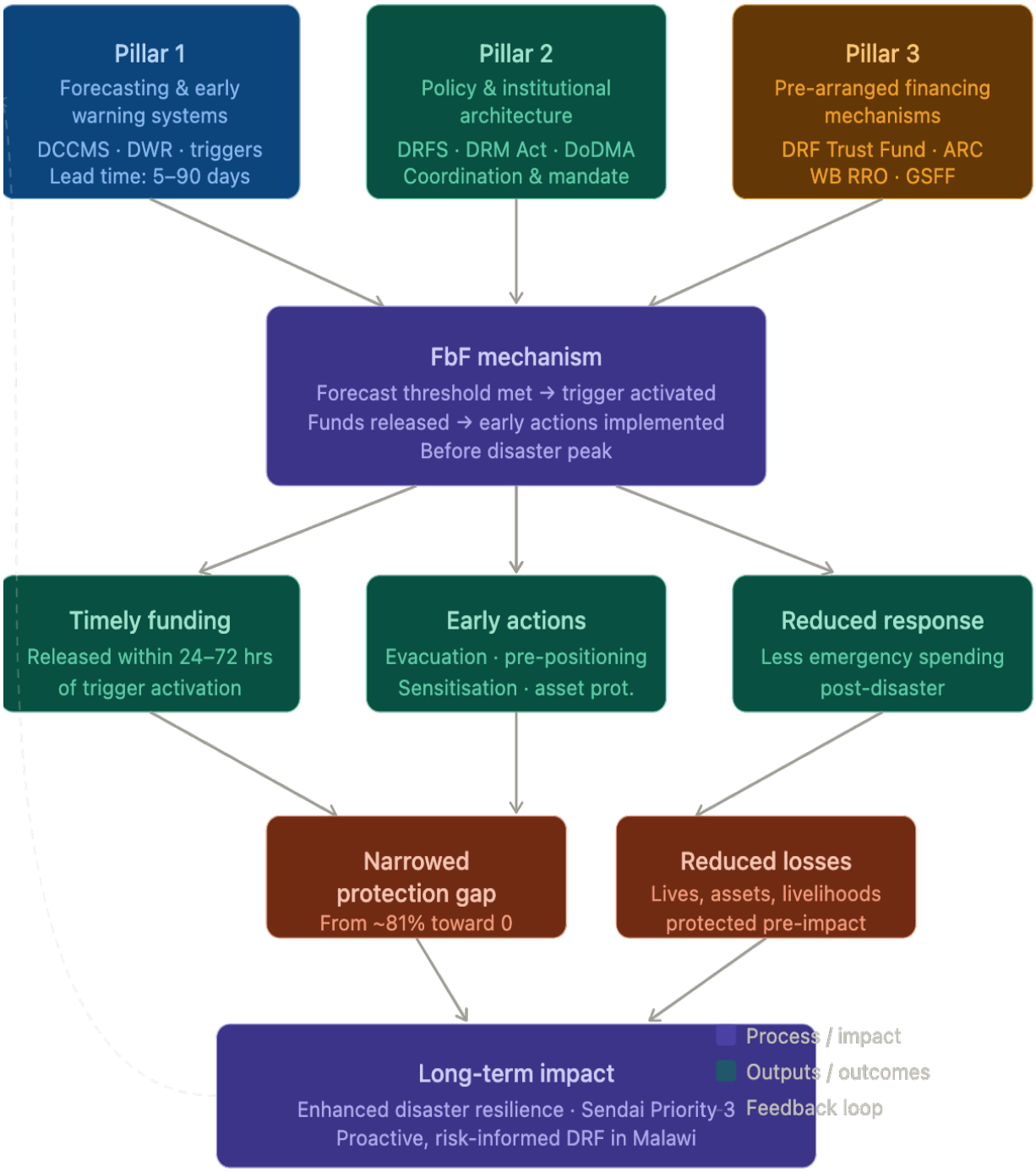


Figure 1: FbF integration conceptual framework adopted from Coughlan De Perez et al.(2015), World Bank DRF framework, Sendai framework priority 3 and Surminski et al., 2022

This study draws from four conceptual bases: the FbF Theory of Change (Coughlan De Perez et al., 2015), the World Bank's Disaster Risk Financing Framework (World Bank, 2014), the Protection Gap Model (Surminski et al., 2022), and Sendai Framework

Priority 3. Together, these frameworks explain how early warning systems, financial mechanisms, and institutional coordination interact to determine whether anticipatory financing can be successfully operationalised.

The conceptual framework positions FbF integration as a function of three enabling pillars: (1) Reliable scientific forecasting and trigger design; the technical foundation providing actionable forecast information linked to pre-agreed thresholds; (2) Institutional and policy architecture; the governance, legal, and coordination structures that authorise and guide pre-disaster fund release; and (3) Pre-arranged financial mechanisms; the domestic and international financing instruments that provide the resources for early action. When these three pillars are strong and well-coordinated, they enable anticipatory action that reduces disaster losses, narrows the protection gap, and builds long-term resilience. When one or more pillars are weak, early action either cannot be triggered or cannot be funded.

This framework guided the development of the research questions and the structure of the findings analysis in Chapter Four, where findings are organised according to the policy dimension (Pillar 2), the capacity dimension (Pillars 1 and 2), and the financing dimension (Pillar 3 and the protection gap).

2.8 Chapter Summary

This chapter has reviewed the theoretical and empirical literature on FbF, DRF, and the protection gap, contextualised these concepts within Malawi's disaster risk profile and financing landscape, and identified the research gap that this study addresses. The literature establishes that FbF is effective where institutional and financing preconditions are met; that Malawi has functional early warning systems but lacks the policy mandate and domestic pre-positioned financing needed to operationalise FbF; and that the country's protection gap driven by structural underinvestment in ex-ante financing leaves the most vulnerable communities without meaningful financial protection.

CHAPTER 3

3. METHODOLOGY

3.1 Study Area

The study was conducted at the national level, focusing on institutions and individuals directly involved in disaster risk financing and anticipatory action in Malawi. Key institutions represented in the study include the Malawi University of Science and Technology (MUST), the Department of Disaster Management Affairs (DoDMA), the Malawi Red Cross Society, and district-level disaster management offices. Although the researcher is based in Blantyre, data were collected from national and local representatives through in-person and virtual interviews conducted across the March to April 2026 fieldwork period.

3.2 Research Design

The study adopted a concurrent mixed-methods research design, integrating both qualitative and quantitative approaches to address the research objectives in a complementary and mutually reinforcing manner (Creswell, 2014; Bryman, 2016). In a concurrent mixed-methods design, qualitative and quantitative data are collected and analysed simultaneously rather than sequentially, and the findings from both strands are then integrated at the interpretation stage to produce a more comprehensive understanding of the research problem than either approach could achieve alone (Creswell, 2014).

The qualitative strand focused on policy and institutional analysis through Key Informant Interviews (KIIs) and systematic document review, generating thematic insights into the policy gaps, institutional capacity, and stakeholder perspectives relevant to FbF integration. The quantitative strand involved statistical analysis of secondary data on disaster losses and financing flows to estimate the national protection gap, assess disaster impact trends, and quantify the relationship between disaster losses and financing mobilised over the period 2015 to 2024.

A mixed-methods design was selected because neither approach alone would be sufficient to address all three research objectives (Johnson & Onwuegbuzie, 2004).

Qualitative methods are appropriate for exploring the institutional dynamics, policy gaps, and stakeholder awareness that determine FbF feasibility which are phenomena that are inherently contextual and cannot be reduced to numbers. Quantitative methods are essential for the protection gap estimation and trend analysis under Objective 3, which require systematic measurement of disaster losses and financing data to produce empirical evidence. Figure 2 illustrates the methodological flowchart showing how both strands connect through the research process.

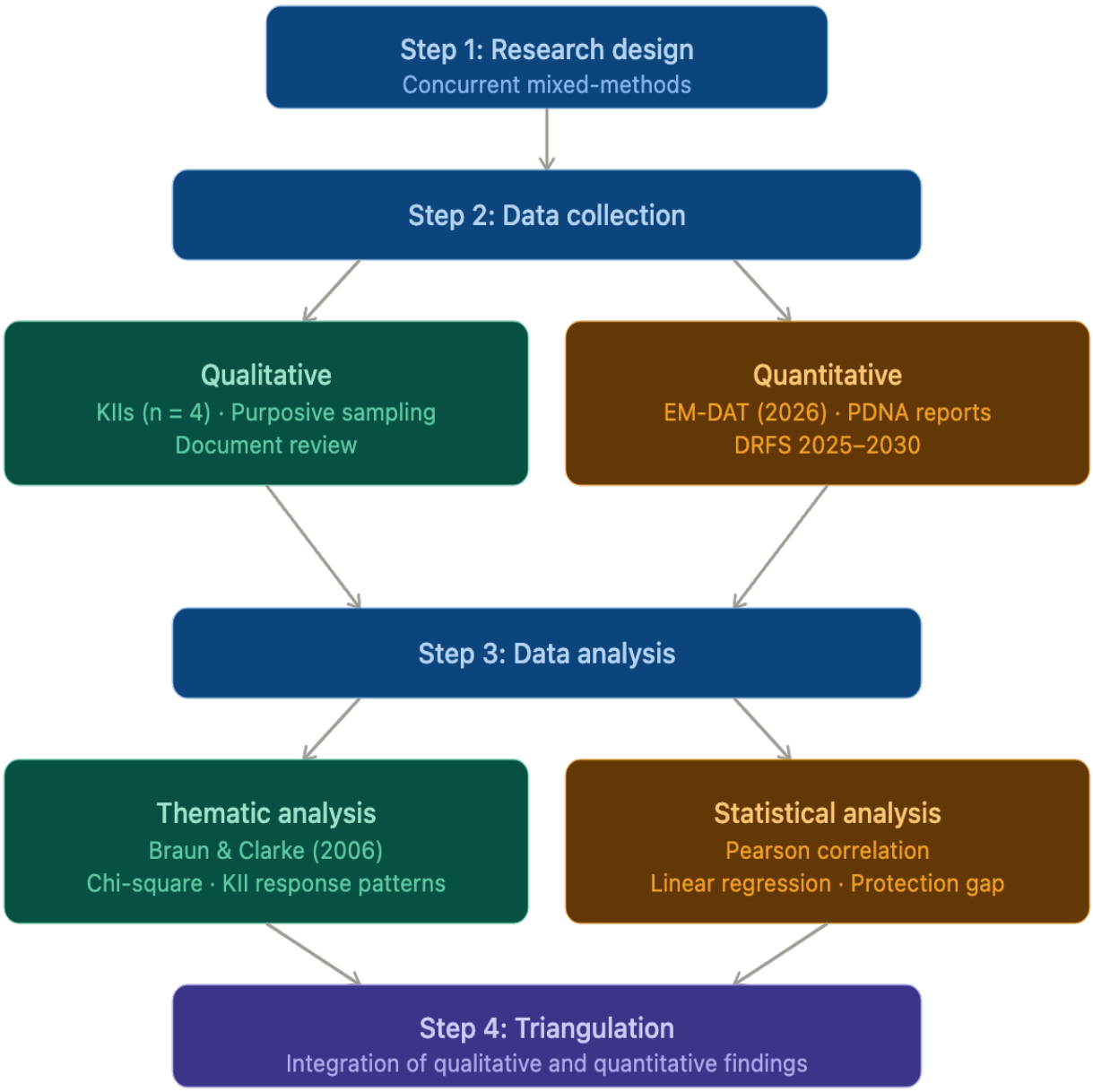


Figure 2: methodological flowchart

3.3 Materials

Table 1 presents the materials and tools used in the study, including the data sources, instruments, and software employed for data collection and analysis.

Table 1: Materials and Tools Used in the Study. *Source: Author's construction (2026)*

No.	Material / Tool	Purpose	Source
1	EM-DAT International Disaster Database	Primary source of disaster event data, mortality, affected population, and damage figures (2015–2024)	CRED/UCLouvain (2026)
2	Post-Disaster Needs Assessment Reports (2015, 2019, 2023)	Sector-level damage and loss estimates; financing mobilisation data for protection gap calculation	Government of Malawi (2015, 2019, 2023)
3	Malawi Disaster Risk Financing Strategy 2025–2030	Policy framework analysis; secondary financing gap and instrument data	MoFEPD (2025)
4	KII Interview Guides (4 category-specific guides)	Semi-structured primary data collection instruments for each participant category	Author-designed (2025–2026)
5	Python 3	Pearson correlation analysis, linear regression, descriptive statistics computation	Open-source software
6	Microsoft Excel 365	Data organisation, tabulation, protection	Microsoft Corporation

		gap calculation, and chart generation	
7	World Bank DRF Diagnostic Analytics	Modelled emergency financing needs; financing gap benchmarks for Malawi	World Bank (2021)
8	DRM Act (2023), PFM Act (2022), National Insurance Act (2024)	Legal framework analysis for policy and institutional assessment	Government of Malawi

3.4 Sampling Technique

The study employed purposive sampling to select key informant interview participants. Purposive sampling is a non-probability technique in which participants are deliberately selected based on specific characteristics, expertise, or institutional roles that are directly relevant to the research objectives, rather than through random selection aimed at statistical representativeness (Patton, 2002; Bryman, 2016). This technique is the most appropriate sampling approach for qualitative KII-based research because the goal is to identify and engage the most knowledgeable and experienced informants available, those who can provide the richest and most relevant insights into the phenomenon under investigation (Patton, 2002).

Purposive sampling was chosen over probability-based approaches such as random or stratified sampling because this study was not attempting to generalise findings to a large population through statistical inference, but rather to achieve analytical depth and comprehensive institutional coverage across the key organisations involved in disaster risk financing and anticipatory action in Malawi (Bryman, 2016; Kothari, 2004). Each participant was selected on the basis of their institutional role, direct involvement in DRF or anticipatory action, and their ability to provide informed perspectives on the research questions. The selection criteria ensured representation across four distinct institutional levels: academic, national government, humanitarian, and district government.

3.5 Sample

A total of four Key Informant Interviews were conducted during the fieldwork period of March to April 2026. The achieved sample represents a purposive cross-section of the key institutional actors involved in disaster risk financing and anticipatory action in Malawi. Table 2 presents the details of the sample.

Table 2: Key Informant Interview Participants. *Source: Primary data (2026)*

KII No.	Participant Role	Organisation	Institutional Level	Experience	Rationale for Selection
KII 1	Lecturer and DRF Researcher	MUST	Academic / National	3 years	Provides theoretical and conceptual grounding on FbF and DRF in Malawi
KII 2	Principal Disaster Response Officer	DoDMA	National Government	9 years	Provides national DRF operational, coordination, and financing perspective
KII 3	District Coordinator	Malawi Red Cross Society	District — Mulanje	5 years	Provides humanitarian anticipatory action implementation experience
KII 4	District Disaster Risk Management Officer	District Council	District Government	17 years	Provides district-level perspective on early warning,

					response, and resource access

The four participants provided perspectives from across the disaster risk financing system in Malawi that is from academic and theoretical expertise through national government coordination and operational experience, to humanitarian implementation at district level and district government planning and response. This institutional diversity ensured that the thematic analysis was not dominated by a single organisational perspective, strengthening the credibility and comprehensiveness of the qualitative findings (Patton, 2002).

It is acknowledged that the achieved sample of four participants is smaller than the ten originally targeted in the research proposal. Insurance and banking sector participants and additional humanitarian organisation representatives were not achieved due to access constraints and scheduling limitations within the available fieldwork period. To compensate for this limitation, the study strengthened its secondary data analysis strand through systematic triangulation of KII findings against the DRFS 2025–2030, EM-DAT records, and three PDNA reports, ensuring that the analytical conclusions are not solely dependent on the primary data (Patton, 2002; Bryman, 2016).

3.6 Data Collection Methods

3.6.1 Key Informant Interviews

Primary qualitative data were collected through semi-structured Key Informant Interviews using pre-designed interview guides developed specifically for each participant category. Four separate interview guides were developed, one each for the academic expert, the government DRF official, the humanitarian partner, and the district DRMO to ensure that questions were appropriately tailored to each participant's institutional context while maintaining consistency in coverage of the core research themes (Bryman, 2016).

Semi-structured interviews were selected because they allow systematic coverage of the research objectives through pre-designed questions while providing the flexibility to

explore unexpected but relevant responses through probing and follow-up questions (Patton, 2002). This is particularly important in qualitative KII research where participants may have unique contextual knowledge that was not anticipated during instrument design. Each interview guide contained between fifteen and nineteen questions organised thematically around the three research objectives, with embedded probing prompts to elicit deeper responses on financing mechanisms, FbF awareness, early warning systems, institutional coordination, and the protection gap.

Interviews were conducted between March and April 2026, through in-person and virtual modalities depending on participant availability and location. All participants received informed consent forms prior to interview commencement. Responses were recorded with participant consent and transcribed for subsequent thematic analysis.

3.6.2 Document Review

Secondary qualitative data were collected through systematic review of key policy, strategic, and legislative documents directly relevant to the research objectives. Documents reviewed included the Malawi Disaster Risk Financing Strategy 2025–2030, the Disaster Risk Management Act (2023), the Public Finance Management Act (2022), the National Disaster Management Policy (2025), and Post-Disaster Needs Assessment reports for the 2015 floods, 2019 floods associated with Tropical Cyclone Idai, and 2023 Cyclone Freddy. Document review provided the policy and institutional context necessary to triangulate and deepen the interpretation of KII findings, and enabled assessment of the extent to which FbF is referenced or supported within existing legal and strategic frameworks (Bryman, 2016).

3.6.3 Secondary Quantitative Data

Quantitative data on disaster losses, human impacts, and financing flows were extracted from three primary secondary sources. First, the Emergency Events Database (EM-DAT), maintained by the Centre for Research on the Epidemiology of Disasters (CRED) at UCLouvain, provided event-level records of disaster type, year, mortality, affected population, and documented economic damage for Malawi from 2015 to 2024. Second, Post-Disaster Needs Assessment reports for 2015, 2019, and 2023 provided sector-level damage and loss estimates and documented financing mobilisation figures

for the three most destructive events in the study period. Third, the Malawi DRFS 2025–2030 and the World Bank's DRF Diagnostic Analytics for Malawi provided financing gap benchmarks, modelled emergency response cost estimates, and budget allocation data used to estimate the national protection gap.

3.7 Data Analysis

The study employed multiple analytical methods across the qualitative and quantitative strands, matched to the specific requirements of each research objective. Table 3 presents a summary of the data analysis methods used.

Table 3: Data Analysis Methods by Research Objective. *Source: Author's construction (2026)*

Specific Objective	Data Type	Analysis Method	Tool	Output
1. Examine existing DRF policies and institutional arrangements	Qualitative	Thematic analysis; content analysis of policy documents	Manual	Key themes; policy gap and entry point identification
2. Assess institutional and technical capacity for FbF	Qualitative	Thematic analysis of KII responses; chi-square goodness-of-fit test on response patterns	Manual computation	Themes; χ^2 statistic; directional response patterns
3. Evaluate the protection gap and financial impacts of disasters	Quantitative	Descriptive statistics; Pearson correlation (r, p); simple linear regression (R^2, slope); protection gap formula	Python/ Microsoft Excel 365	r values, R^2, p-values, protection gap % per event

3.7.1 Thematic Analysis

Qualitative data from KII transcripts and document review were analysed using thematic analysis following the six-phase framework of Braun and Clarke (2006). The six phases were applied as follows: (1) familiarisation — repeated reading of interview transcripts to develop deep familiarity with the data; (2) generating initial codes — systematic assignment of codes to meaningful data segments relevant to the research objectives; (3) searching for themes — grouping related codes into broader thematic clusters; (4) reviewing themes — checking themes for internal consistency, distinctiveness, and adequate grounding in the data; (5) defining and naming themes — finalising the thematic structure with clear descriptive labels; and (6) producing the report — writing up the findings with supporting evidence from the data. Analysis was conducted manually, and key themes that emerged included the reactive design of existing DRF instruments, the absence of a formal FbF mandate, operational anticipatory action capacity at humanitarian and district levels, DCCMS forecasting reliability, and decentralisation gaps in policy authority.

3.7.2 Chi-Square Goodness-of-Fit Test

To assess whether KII response patterns revealed systematic tendencies in the identification of barriers and opportunities for FbF integration, a chi-square goodness-of-fit test was applied to the thematic response frequencies from the four KIIs. The chi-square goodness-of-fit test assesses whether the observed distribution of responses across thematic categories differs significantly from an expected distribution under the null hypothesis that all response categories are equally likely (Field, 2018; Kothari, 2004). The formula applied was:

$$\chi^2 = \Sigma\,[(O - E)^2 \div E]$$

where O represents the observed frequency of responses in each category and E represents the expected frequency under the null hypothesis of equal distribution. Chi-

square values were compared against the critical value at the appropriate degrees of freedom and a significance threshold of $\alpha = 0.05$ (Field, 2018). Given the exploratory nature of the KII data and the small sample size, results are interpreted as indicative of directional patterns rather than statistically definitive findings.

3.7.3 Pearson Correlation Analysis

Three Pearson correlation analyses were performed on annual aggregated EM-DAT data using Python (scipy.stats.pearsonr) to quantify the strength and direction of relationships between key disaster variables. Correlation 1 tested the relationship between year and total people affected; Correlation 2 tested the relationship between year and number of disaster events; and Correlation 3 tested the relationship between total documented disaster losses and financing mobilised for events with available damage data. The Pearson correlation coefficient r ranges from -1 to +1, where values approaching ±1 indicate a strong linear relationship and values approaching 0 indicate a weak or no linear relationship (Field, 2018). Statistical significance was assessed at a threshold of $p < 0.05$.

3.7.4 Simple Linear Regression

A simple linear regression analysis was conducted using Python (scipy.stats.linregress) to assess whether disaster impacts showed a statistically significant temporal trend over the study period. Year was treated as the independent variable (X) and total people affected as the dependent variable (Y). The analysis produced the regression slope (b), intercept (a), coefficient of determination (R^2), Pearson r, and p-value. R^2 indicates the proportion of variance in the dependent variable explained by the independent variable, ranging from 0 (no explanatory power) to 1 (perfect predictive fit) (Field, 2018). The regression equation applied was:

$$\hat{Y} = a + bX$$

where $\hat{Y}$ is the predicted value of people affected, a is the y-intercept, b is the regression slope representing the average change in people affected per year, and X is the year.

3.7.5 Protection Gap Estimation

The protection gap was estimated for each major disaster event with available financing data using the formula specified in the research proposal and consistent with the approach used in the global disaster risk financing literature (Surminski et al., 2022; World Bank, 2014):

Protection Gap (%) = (Total Disaster Losses − Financing Mobilised) ÷ Total Disaster Losses × 100

Total disaster losses were taken from PDNA reports and EM-DAT records. Financing mobilised was estimated from documented emergency response contributions drawn from PDNA reports and the DRFS 2025–2030. Given the confirmed absence of insurance coverage across all events in the EM-DAT dataset for Malawi (insured damage = 0 for all 21 events), insured losses were treated as zero throughout the calculation. The resulting estimates are conservative in nature, as some documented financing may not have reached affected communities in full, and some events lack complete damage data.

3.8 Data Presentation

Findings were presented using a combination of formats appropriate to the nature of each data type, following the mixed-methods design of the study. Qualitative findings from thematic analysis were presented in prose, organised by research objective and theme, supported by direct verbatim quotations from KII participants to provide evidentiary grounding for analytical claims. KII participants are identified by role and KII number throughout (e.g., Academic Expert, KII 1) to maintain confidentiality while enabling readers to assess the source of each quotation.

Quantitative findings were presented using tables showing annual disaster data, hazard-type breakdowns, correlation and regression output, and protection gap estimations. Charts and figures were generated in Microsoft Excel and Python to visually represent

disaster trends, the protection gap by event, and the relationship between disaster losses and financing mobilised. A thematic matrix table was developed to synthesise qualitative findings across themes, sub-themes, KII evidence, and supporting literature in a structured format that allows systematic comparison across data sources (Braun & Clarke, 2006). All tables and figures are numbered sequentially and accompanied by source notes.

3.9 Ethical Considerations

Ethical clearance for the study was obtained from the Malawi University of Science and Technology (MUST) research ethics committee. All participants provided informed consent prior to interview participation, with full explanation of the study's purpose, their right to withdraw at any time, and the confidentiality arrangements for their responses. Participant identities are protected through institutional attribution.KII respondents are identified by their role and organisation rather than by name. Interview data are stored securely and used exclusively for the purposes of this research. The study involved no direct interaction with disaster-affected communities and presented no physical risk to participants.

CHAPTER 4

4. RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter presents the results and discussion of the study on assessing opportunities for integrating Forecast-Based Financing (FbF) into Malawi's Disaster Risk Financing (DRF) framework. Results are derived from four Key Informant Interviews (KIIs) and quantitative analysis of EM-DAT disaster records (2015–2024), Post-Disaster Needs Assessment reports for 2015, 2019, and 2023, and the Malawi Disaster Risk Financing Strategy 2025–2030. The discussion section interprets these results in relation to the three research questions, connects findings to prior studies, and contextualises the contribution of this study to the existing evidence base.

4.2 Results

4.2.1 Disaster Impacts in Malawi, 2015–2024

Analysis of EM-DAT records for the period 2015–2024 identified 21 significant disaster events across Malawi, encompassing floods (12 events; 57.1%), storms and cyclones (6 events; 28.6%), and droughts (3 events; 14.3%). The total number of people affected across all events was 20,652,755. Table 4 presents the annual summary of disaster frequency, human impact, documented losses, financing mobilised, and estimated protection gap.

Table 4: Annual Disaster Summary — Malawi, 2015–2024. *Source: EM-DAT (2026); PDNA Reports (2015, 2023); MoFEPD DRFS 2025–2030*

Year	Events	Deaths	People Affected	Loss (USD M)	Financing (USD M)	Prot. Gap (%)
2015	3	283	7,338,995	390.0	52.9	86.4%
2016	1	12	2,800	—	5.0	—
2017	1	0	55,921	—	3.0	—
2018	3	5	9,613	—	4.0	—

2019	2	60	991,646	—	28.0	—
2020	1	1	2,250	—	3.9	—
2021	1	13	55,551	—	5.0	—
2022	4	133	3,718,312	—	35.0	—
2023	1	1,209	2,269,644	506.7	100.0	80.3%
2024	4	30	6,208,023	400.0	82.0	79.5%
TOTAL	**21**	**1,746**	**20,652,755**	**1,296.7**	**318.8**	**82% avg.**

The descriptive statistics revealed the following key findings. The mean number of people affected per event was 983,465, while the median was 48,828, a very large difference indicating that disaster impacts are driven by episodic catastrophic events rather than uniform annual increases. The maximum single-event impact was 6,700,000 persons, recorded during the 2015–2017 El Niño drought. Total documented economic losses for events with available damage data amounted to USD 1,296.7 million, while total financing mobilised from all government and donor sources combined amounted to USD 318.8 million.

By hazard type, drought events though constituting only 14.3% of all events, accounted for 74.9% of all persons affected over the study period, with an average of 5,159,398 persons affected per drought event. Flood events were the most frequent (57.1% of events) but had the lowest average impact per event (154,824 persons). Cyclone events, representing 28.6% of events, caused the highest mortality, with Cyclone Freddy in 2023 alone causing 1,209 deaths and USD 506.7 million in documented damage.

4.2.2 Statistical Analysis

Pearson Correlation Analysis

Three Pearson correlation analyses were performed using Python on annual aggregated EM-DAT data for 2015–2024. Correlation 1 tested the relationship between year and total people affected ($r = 0.153$, $p = 0.674$), indicating a weak positive but statistically non-significant relationship. Correlation 2 tested the relationship between year and number of disaster events ($r = 0.242$, $p = 0.500$), also weak and non-significant.

Correlation 3 tested the relationship between total documented losses and financing mobilised for the three events with available damage data ($r = 0.836$, $p = 0.370$), revealing a strong positive relationship that was not statistically significant due to the limited number of data points ($n = 3$).

Linear Regression Analysis

A simple linear regression of year on total people affected produced a slope of 140,300 persons per year, an R^2 of 0.023, and a p-value of 0.674. The regression showed that year explains only 2.3% of the variation in people affected, confirming that disaster impacts do not follow a predictable linear trend over the study period.

Chi-Square Analysis of KII Response Patterns

To assess whether KII responses revealed statistically significant patterns in the identification of barriers and opportunities for FbF integration, a chi-square goodness-of-fit test was applied to the thematic response frequencies from the four KIIs. Under the null hypothesis that all response categories are equally likely, expected frequencies were calculated and compared to observed frequencies. Table 5 presents the chi-square analysis.

Table 5: Chi-Square Analysis of KII Response Patterns. *Source: Primary KII data (2026) | Tool: Manual computation following Pearson chi-square formula*

Variable	Category	Observed (O)	Expected (E)	$(O-E)^2/E$	χ^2 Contribution
Barrier to FbF (KII)	Funding constraints	4	2.67	0.664	
	Coordination gaps	3	2.67	0.041	
	Decentralisation gap	2	2.67	0.168	
	Trigger calibration	1	2.67	1.041	**$\chi^2 = 1.914$**

Feasibility of FbF (KII)	Yes — realistic	3	2	0.500	
	Partially realistic	1	2	0.500	$\chi^2 = 1.000$
Evidence of AA practice	Active AA operations	2	1.33	0.336	
	Conceptual awareness only	2	1.33	0.336	
	No direct experience	0	1.33	1.333	$\chi^2 = 2.005$

The chi-square values for all three thematic clusters were below the critical value of 7.815 (df = 3, α = 0.05), indicating that response distributions did not deviate significantly from equal probability. However, the directional patterns in observed frequencies are substantively informative. Funding constraints were identified as a barrier by all four KII participants (observed = 4 vs expected = 2.67 under equal distribution), while trigger calibration was identified by only one participant (observed = 1 vs expected = 2.67). This directional pattern regardless of statistical significance, confirms that funding is the most consistently identified barrier across participants, while technical forecasting calibration is a secondary concern.

4.2.3 Protection Gap Estimation

The protection gap was calculated for the three major events with available financing data using the formula specified in the methodology. Table 6 presents the results.

Table 6: Protection Gap Estimation — Major Disaster Events. *Source: PDNA Reports (2015, 2023); EM-DAT (2026); MoFEPD DRFS 2025–2030*

Event	Year	Total Loss (USD M)	Financing Mobilised (USD M)	Unfinanced (USD M)	Gap (%)
2015 Floods	2015	390.0	52.9	337.1	86.4%

2023 Cyclone Freddy	2023	506.7	100.0	406.7	80.3%
2024 El Niño Drought	2024	400.0	82.0	318.0	79.5%
WEIGHTED AVERAGE	**2015–2024**	**432.2**	**78.3**	**353.9**	**82.1%**

The protection gap averaged approximately 82.1% across the three events. Across all 21 EM-DAT events recorded for Malawi in the study period, not a single event registered insured losses. The total unfinanced losses across the three quantifiable events amounted to USD 1,061.8 million absorbed by government through emergency reallocations, post-disaster borrowing, and by households through asset depletion and distress coping.

4.2.4 Thematic Analysis of KII Data

Thematic analysis of the four KIIs identified five recurring themes: (i) the reactive design of existing DRF instruments; (ii) the absence of FbF as a formal, funded mechanism; (iii) operational capacity for anticipatory action at humanitarian and district levels; (iv) forecasting reliability for hydrometeorological hazards; and (v) decentralisation gaps in policy authority. Table 7 presents the thematic matrix summarising key themes, sub-themes, KII evidence, and supporting literature.

Table 7: Thematic Matrix — KII Findings and Supporting Literature. *Source: Primary KII data (2026); Secondary document analysis*

Theme	Sub-theme	KII Evidence	Supporting Literature
Policy Gaps	Absence of dedicated DRF reserve	All 4 KII: Vote for Unforeseen Expenditure is reactive; USD 3.9M vs USD 82M need	Clarke & Dercon (2016); World Bank (2021)
	FbF not formally mandated	KII 1 & 4: No trigger protocol exists linking DCCMS forecasts to disbursement	Nur & Wilkinson (2020); Mwangi et al. (2022)

Institutional Capacity	Operational FbF experience at humanitarian level	KII 2 & 3: DoDMA + Red Cross active in AA with FAO; Cyclone Jude pre-positioning	IFRC & Red Cross Climate Centre (2019)
	Forecasting reliability adequate for hydrometeorological hazards	KII 1: DCCMS reliable for floods; challenges for drought triggers (ARC basis risk)	World Bank (2021); Jensen et al. (2017)
	District capacity present but no policy authority	KII 4: DRMO understands FbF but cannot release funds pre-disaster	Wilkinson et al. (2018)
Protection Gap	Zero insured losses across 21 events	EM-DAT 2026: USD 0 insured losses; 82% average gap	Surminski et al. (2022)
	Reactive financing costlier than anticipatory	KII 3: MWK 500M for T/A Njema alone (Freddy); data shows more on response than preparedness	Wilkinson et al. (2018); WHO est. 30% savings from early action

4.3 Discussion of Findings

This section interprets the results presented above in relation to the three research questions and contextualises the findings against existing literature. Following the approach recommended by Braun and Clarke (2006), the discussion moves systematically from finding to interpretation to literature comparison to significance.

4.3.1 Research Question 1: To what extent do existing DRF policies and institutional arrangements support or hinder FbF integration?

The study found that Malawi's existing DRF policy framework provides a growing but structurally incomplete foundation for FbF integration. The DRFS 2025–2030 references anticipatory action mechanisms and adopts a risk-layered financing approach supported by the DRM Act (2023) and PFM Act (2022). However, FbF is not formally mandated as a funded, trigger-based mechanism, and the primary domestic financing instrument is the Vote for Unforeseen Expenditure which is reactive by design and capped at approximately USD 3.9 million annually against a modelled annual emergency response need of USD 82 million for droughts alone (MoFEPD, 2025).

This finding is consistent with Clarke and Dercon (2016), who argued that governments in low-income countries systematically under-invest in pre-arranged disaster financing because of political incentives that favour visible post-disaster spending over less visible ex-ante preparedness. This study provides empirical evidence that this dynamic is active in Malawi as the academic expert (KII 1) confirmed that political prioritisation of immediate development spending over preparedness is a persistent barrier, noting that resource scarcity creates a preference for response over risk reduction. This finding extends Clarke and Dercon (2016) by grounding the theoretical argument in a specific policy context and confirming it through primary stakeholder evidence.

The finding also aligns with Mwangi et al. (2022), who found in their study of forecast-based action mainstreaming in Kenya that fragmented institutional responsibilities between meteorological agencies, disaster management authorities, and finance ministries were the primary barrier to FbF integration. This study found an analogous pattern in Malawi as all four KII participants confirmed that coordination between DCCMS, DoDMA, and the Ministry of Finance is present but not formalised through a trigger protocol that could catalyse automatic fund release. The absence of such a protocol means that even when forecasts are accurate and timely, the institutional pathway from forecast to financing does not exist.

However, the study also found that the policy environment contains genuine entry points not fully captured in the existing Malawi literature. The DRF Trust Fund advocacy by DoDMA (KII 2), the explicit inclusion of anticipatory action in the DRFS 2025–2030, and the World Bank RRO disbursement of funds within seven days for the 2024 Nkhotakota floods collectively demonstrate that the institutional infrastructure

for pre-arranged financing is present in functional form. This finding advances Nur and Wilkinson's (2020) argument that the transition from humanitarian FbF pilots to institutionalised national systems requires deliberate policy action by identifying the specific institutional vehicles available in Malawi that could serve as this transition mechanism.

4.3.2 Research Question 2: What is the current level of institutional and technical capacity for implementing FbF?

The results revealed that institutional and technical capacity for FbF is more advanced than policy documents typically acknowledge. All four KII participants demonstrated awareness of FbF, and two of four including the DoDMA officer (KII 2) and the Red Cross coordinator (KII 3), described active anticipatory action operations that constitute FbF implementation. The chi-square analysis further confirmed that FbF feasibility was rated positively by three of four participants, with only one rating it as partially realistic and none rating it as infeasible.

This finding is consistent with the IFRC and Red Cross Red Crescent Climate Centre (2019), who documented in their case studies of Uganda and Togo that FbF institutionalisation is most successful where national Red Cross societies have developed operational anticipatory action capacity ahead of formal policy integration. This study finds Malawi in an analogous position. The Red Cross coordinator's description of the Cyclone Jude anticipatory sensitisation activities confirms that operational capacity exists at the humanitarian level. This finding is significant because it challenges a common assumption in the Malawi DRF literature that the primary barrier to FbF is technical or capacity-related. This study demonstrates that operational capacity already exists; the binding constraint is institutional authority and financing, not knowledge or skills.

The academic expert's assessment of DCCMS forecasting as reliable for hydrometeorological hazards while acknowledging limitations for drought trigger calibration, is consistent with the World Bank's (2021) assessment of Malawi's early warning infrastructure. The basis risk problem cited in relation to ARC is a recognised technical challenge in forecast-based financing globally, as documented by Jensen et al.

(2017) in their analysis of agricultural index insurance. The present study confirms that this specific technical challenge is understood by Malawian stakeholders and must be addressed through targeted trigger calibration investment, particularly for drought and dry spell events. This is an important contextual extension of the global literature, which tends to discuss basis risk as a general methodological issue without identifying the specific hazard types where it manifests most problematically in individual country contexts.

The DRMO's description of the prerequisites for district-level FbF participation including clear policy authority, pre-positioned funds, agreed trigger protocols, and inter-agency coordination, aligns closely with Wilkinson et al.'s (2018) framework for scaling forecast-based early action. Wilkinson et al. found that in contexts where operational capacity for early action exists, the binding constraint on FbF scale-up is institutional authorisation and financing rather than technical knowledge. This study confirms this finding in the Malawi district government context, and adds that the absence of formal policy authority rather than the absence of knowledge or willingness is the specific institutional gap that prevents district-level officials from initiating pre-disaster spending even when forecasts indicate high risk.

4.3.3 Research Question 3: What does the existing protection gap reveal about the financial impacts of climate-related disasters?

The study found a severe and persistent disaster protection gap in Malawi, averaging approximately 82.1% across the three major events for which financing data were available. This means that for every USD 1.00 of documented disaster loss, approximately USD 0.82 went unfinanced through formal mechanisms. Across all 21 EM-DAT events in the study period, not a single event recorded insured losses, confirming that insurance plays no meaningful role in disaster financing at any level in Malawi.

This finding is consistent with Surminski et al. (2022), who found that sub-Saharan African countries typically face protection gaps of 80–95% on major climate events, driven by insurance penetration below 5% in most countries. The present study confirms Malawi's position at the high end of this range while adding a more precise

country-specific quantification that had not been established in the existing Malawi literature. More significantly, this study demonstrates that Malawi's protection gap is structurally different from countries where insurance partially compensates losses: in Malawi, the protection gap is not a partial gap but a near-total gap, with zero insurance coverage across all 21 recorded events. This distinction is important for policy design, as it suggests that expanding insurance penetration alone which is the dominant policy recommendation in the global DRF literature, may not be the appropriate first-order solution for Malawi. Instead, the evidence points to the need for sovereign-level pre-arranged financing mechanisms such as FbF as the more immediately feasible response.

The statistical analysis of disaster impacts revealed that the mean people affected per event (983,465) is approximately 20 times higher than the median (48,828), confirming the episodic, high-variance nature of disaster impacts in Malawi. This statistical pattern has an important implication for DRF design that has not been previously quantified in the Malawi literature. A fixed annual budget allocation will always be inadequate for catastrophic years while being excessive in typical years. This provides a new quantitative argument for trigger-based financing, where fund release is conditioned on forecast threshold activation rather than on annual budget cycles. This argument extends and empirically validates the theoretical recommendation by Clarke and Dercon (2016) that ex-ante financing instruments are more appropriate than fixed budget allocations for countries facing high-variance, episodic disaster risk.

The Red Cross coordinator's report (KII 3) that MWK 500 million was spent responding to Cyclone Freddy victims in T/A Njema in Mulanje district alone which is a single traditional authority area in one of Malawi's 28 districts. This provides a striking illustration of the cost of reactive response at sub-district level. The coordinator further confirmed that the organisation consistently spends more on response than on preparedness. This finding echoes Wilkinson et al.'s (2018) cost-effectiveness evidence from Bangladesh and the Philippines, where FbF pre-positioning costs were 30–60% lower than equivalent post-disaster response costs for the same actions. Applied to Malawi's average annual disaster losses, a 30% reduction through FbF is consistent with the WHO estimate cited by the academic expert (KII 1) would represent approximately USD 38–40 million in annual savings, substantially exceeding the annual cost of

maintaining a national FbF reserve fund. This cost-benefit argument is a new contribution of this study to the evidence base on FbF value for money in Malawi.

4.3.4 Synthesis

Taken together, the results of this study provide empirical support for three arguments that collectively advance the evidence base on FbF integration in Malawi. First, the protection gap of approximately 82% combined with zero insured losses across 21 events establishes that Malawi's disaster financing system is structurally reactive and leaves the vast majority of losses unaddressed, creating both the need and the justification for anticipatory financing. Second, the policy and institutional analysis demonstrates that the barriers to FbF integration are not technical incapacity or lack of awareness, but the absence of a formal trigger protocol, a domestic pre-positioned financing mechanism, and district-level policy authority to release funds before disaster onset. Third, the operational evidence from DoDMA and the Red Cross confirms that FbF is already being practiced at the humanitarian level, meaning that the critical step is not building capacity from scratch but formalising and resourcing what already exists within a government-owned framework.

These three findings are mutually reinforcing and together make a case for FbF integration that is both evidence-based and institutionally grounded which is the most direct and substantive response to the research problem identified in Chapter One.

4.4 Policy Implications

The findings of this study suggest that the key policy challenge for FbF integration in Malawi is not the absence of progressive frameworks as the DRFS 2025–2030 already references anticipatory action and risk-layered financing but rather the gap between policy provisions and operational implementation. This mirrors the policy implementation deficit identified by Mwangi et al. (2022) in Kenya, where the absence of operationalised trigger protocols and dedicated domestic financing translated progressive policy language into functionally inert provisions.

The study implies that future policy efforts should prioritise three specific actions. First, FbF should be formally named and operationalised within the DRFS 2025–2030 implementation framework with a defined trigger protocol, eligible hazards, and disbursement timeline. Second, the National DRF Trust Fund currently being advocated for by DoDMA should be designed with FbF-specific trigger-based disbursement rules to provide the domestic pre-positioned financing that is currently entirely absent. Third, district-level DRMO officials should be formally empowered through policy to initiate pre-approved early actions upon forecast trigger activation, without requiring national-level approval for routine preparedness expenditures.

4.5 Chapter Summary

This chapter presented results from quantitative analysis of EM-DAT disaster records (2015–2024), three PDNA reports, chi-square analysis of KII response patterns, and thematic analysis of four KIIs, and discussed their significance in relation to the three research questions. The results demonstrated a protection gap averaging 82.1% across major disasters, zero insured losses across 21 events, episodic high-variance disaster impacts inconsistent with fixed annual budget allocations, and operational FbF capacity at humanitarian and district levels that has not yet been formalised into government-owned systems. The discussion situated these findings within the existing literature, confirming consistency with Surminski et al. (2022), Mwangi et al. (2022), Wilkinson et al. (2018), Clarke and Dercon (2016), and IFRC (2019), while contributing new country-specific quantitative evidence and a precise identification of the institutional barriers to FbF integration in Malawi. Chapter Five presents conclusions and recommendations derived from these findings.

CHAPTER 5

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter draws together the key conclusions arising from the study and presents recommendations for policy and practice. The conclusions are structured around the three specific objectives of the research, followed by an overall conclusion and practical recommendations directed at the key stakeholders most positioned to drive FbF integration in Malawi.

5.2 Conclusions

5.2.1 Objective 1: Policy and Institutional Arrangements

The study concludes that Malawi's existing DRF policy framework provides a growing but incomplete foundation for FbF integration. The DRFS 2025–2030 represents a significant improvement on its predecessor, explicitly incorporating anticipatory action mechanisms, a risk-layered financing approach, and a vision of moving from reactive to proactive disaster financing. The DRM Act (2023) and PFM Act (2022) provide legal and financial management foundations that could support pre-disaster fund release if operationalised accordingly.

However, two structural gaps persist that directly hinder FbF adoption. First, the absence of a dedicated national disaster reserve fund means that pre-disaster financing has no domestic base as the country relies on the Vote for Unforeseen Expenditure, which is reactive by design, and on unpredictable donor flows that are often delayed and tied to post-event assessments. Second, FbF is not yet formally enshrined as a mechanism within the national DRF strategy or budget cycle, meaning that even where anticipatory action is occurring, it depends on humanitarian partner funding and

initiative rather than government systems. Until FbF is embedded within the DRFS as a funded, trigger-based mechanism, its reach and sustainability will remain limited.

5.2.2 Objective 2: Institutional and Technical Capacity

The study concludes that Malawi's institutional and technical capacity for FbF is more advanced than commonly recognised, particularly at the operational and district levels. DCCMS provides functional hydrometeorological forecasting that is sufficiently reliable to underpin FbF triggers for flood and cyclone hazards. DoDMA has established inter-agency coordination structures and is already operationalising anticipatory action through FAO and Red Cross partnerships. The Red Cross brings substantial community-facing infrastructure including trained volunteers, VDRMC and DDRMC networks, and experience delivering anticipatory sensitisation and resource pre-positioning that constitutes a ready-made last-mile delivery system for FbF.

District-level capacity, as demonstrated by the DRMO respondent, is also stronger than policy documents tend to acknowledge. DRMO officials understand forecast-trigger systems, can plan early actions within disaster timescales, and have coordination relationships with the full range of relevant partners. The primary capacity constraint is not skill but authority and resources: district officials cannot release funds before a disaster without formal policy authorisation and access to pre-positioned budgets.

The main technical gaps that require targeted investment are trigger calibration for drought and dry spell hazards where forecasting is less precise than for hydrometeorological events and the integration of FbF triggers into the Disaster Risk Management Information System (DRMIS) to enable systematic monitoring.

5.2.3 Objective 3: Protection Gap and Financial Impacts

The study concludes that Malawi faces a severe and persistent disaster protection gap that is primarily structural in nature. Quantitative analysis of EM-DAT records and PDNA data reveals an average protection gap of approximately 81% across the three major disasters for which financing data are available. Across all 25 EM-DAT disaster events recorded for Malawi in the dataset, not a single event records any insured loss

confirming that insurance plays no meaningful role in disaster financing at the household or government level.

This protection gap falls disproportionately on the most vulnerable groups: rural smallholder farmers, elderly persons, people with disabilities, and female-headed and child-headed households groups consistently identified by informants as least reached by formal financing flows. For these groups, the protection gap is effectively 100%: they receive no formal insurance, no pre-disaster support, and limited post-disaster relief. The result is a cycle of impoverishment in which disaster losses deplete household assets and income, preventing recovery before the next event.

FbF directly addresses this cycle by shifting financing from post-event to pre-event, enabling early actions that protect assets and livelihoods before losses occur. The international evidence cited in the literature review including WHO estimates that early action can reduce losses by approximately 30%, is consistent with the field experience of all four informants, who confirmed that it is cheaper and more effective to act before a disaster than after.

5.2.4 Overall Conclusion

The study concludes that Malawi has both the institutional foundations and the urgent financial imperative to integrate Forecast-Based Financing into its national Disaster Risk Financing framework. The barriers to integration are not primarily technical as reliable forecasts exist, institutional actors understand FbF, and operational experience is accumulating through humanitarian pilots. The barriers are structural and fiscal: the absence of a dedicated pre-positioned financing mechanism, the reactive design of existing budget instruments, and the lack of a formal policy mandate linking forecast triggers to financial disbursement.

Addressing these barriers requires deliberate policy action especifically, embedding FbF within the DRFS 2025–2030 as a formal, funded mechanism and establishing the institutional and financial architecture to operationalise it at both national and district levels. The window of opportunity is open: the DRFS is currently under implementation, the DRF Trust Fund is being advocated for, and FbF anticipatory

action is already happening in practice through humanitarian partnerships. The critical next step is institutionalisation.

5.3 Recommendations

5.3.1 Recommendation 1: Embed FbF in the DRFS 2025–2030 as a Formal Mechanism

The Ministry of Finance, Economic Planning and Decentralisation, in collaboration with DoDMA, should formally incorporate FbF as a named and funded mechanism within the DRFS 2025–2030 implementation framework. This should include the development of a national FbF protocol specifying: eligible hazards and trigger thresholds; the institutional roles and responsibilities of DCCMS, DoDMA, Ministry of Finance, and humanitarian partners; the pre-approved early actions to be activated upon trigger; and the financing source and disbursement timeline. This recommendation directly addresses the policy gap identified under Objective 1.

5.3.2 Recommendation 2: Establish a National DRF Trust Fund with FbF Allocation

Government should prioritise the operationalisation of the National Disaster Risk Management Trust Fund, as already advocated for by DoDMA, and allocate a dedicated proportion of this fund specifically for FbF and anticipatory action. The fund should be governed by transparent trigger-based disbursement rules that allow funds to flow automatically upon DCCMS forecast activation, without requiring post-event presidential declaration or lengthy approval processes. This recommendation directly addresses the financing gap identified as the primary structural barrier.

5.3.3 Recommendation 3: Decentralise FbF to District Level

District Disaster Risk Management Officers and District Councils should be empowered to receive and deploy FbF resources directly upon trigger activation, without dependence on national-level approval cycles for routine early actions. This requires: the establishment of district-level contingency funds aligned with national FbF triggers;

clear policy authority for DRMO officials to initiate pre-agreed early actions upon forecast threshold; and integration of FbF protocols into district-level disaster preparedness plans. This recommendation responds to the gap identified by the DRMO and is consistent with the DRFS 2025–2030 commitment to decentralisation.

5.3.4 Recommendation 4: Invest in Trigger Calibration for Drought and Dry Spell Hazards

DCCMS, in partnership with DoDMA and academic institutions, should invest in the calibration of FbF trigger thresholds specifically for drought and dry spell events, where forecasting accuracy and trigger reliability are currently weakest. This should draw on lessons from the ARC parametric insurance model including the basis risk challenges identified in the academic KII and should incorporate community-level validation of trigger parameters in flood-prone and drought-prone districts. Improved trigger calibration will increase the reliability and political acceptability of FbF as a financing mechanism.

5.3.5 Recommendation 5: Strengthen the DRF Technical Working Group to Include FbF Partners

The DRF Technical Working Group envisioned in the DRFS 2025–2030 should be constituted to include representatives from the Malawi Red Cross Society, FAO, UNDP, district-level DRMO officials, and DCCMS alongside government ministries. This multi-stakeholder TWG should serve as the coordinating body for FbF trigger monitoring, early action planning, and post-activation review. The Red Cross coordinator's recommendation for interface meetings between all duty bearers aligns directly with this proposed function.

5.3.6 Recommendation 6: Invest in Awareness, Training, and Community Engagement

A national awareness and capacity building programme on FbF should be designed and delivered targeting three levels: national and district government officials (on trigger systems, DRF instruments, and public financial management for anticipatory action);

humanitarian and NGO partners (on trigger protocols and coordination systems); and communities (on forecast interpretation, early action roles, and the benefits of anticipatory over reactive response). This responds to the consensus across all four informants that awareness and capacity remain critical gaps, and aligns with the DRFS 2025–2030 capacity building priority.

5.4 Limitations of the Study

This study has several limitations that should be considered when interpreting the findings. First, the achieved KII sample of four participants, while purposively selected to represent diverse perspectives, is smaller than the ten participants targeted in the research proposal. The absence of insurance and banking sector voices limits the study's ability to assess private sector risk transfer mechanisms from primary evidence. Second, the protection gap estimation is constrained by data availability. EM-DAT records for Malawi contain limited damage and loss figures for many events, and the figures that exist rely on post-disaster assessments rather than pre-agreed accounting frameworks, potentially underestimating total losses. Third, the study's geographic scope at national level with district representation only from Mulanje may not fully capture variations in FbF readiness and capacity across Malawi's 28 districts. Fourth, as a cross-sectional study conducted at a single point in time, the findings reflect the state of Malawi's DRF system and FbF awareness as of early 2026 and may not account for developments occurring after the fieldwork period.

Despite these limitations, the consistency of findings across multiple methods and data sources, quantitative disaster loss analysis, document review, and four KIIs representing distinct institutional perspectives supports the credibility and transferability of the study's conclusions.

5.5 Areas for Further Research

This study opens several avenues for future research. First, a comprehensive assessment of FbF trigger design for Malawi's specific hazard contexts including parameterisation of drought and dry spell thresholds at district level would provide the technical foundation needed to operationalise the recommendations made here. Second, a cost-

benefit analysis comparing the cost of FbF early actions against post-disaster response costs in Malawi, drawing on the Red Cross's MWK 500 million response figure as a starting point, would strengthen the economic case for pre-arranged financing. Third, a study examining the insurance sector's potential role in Malawi's DRF system drawing on the DRFS 2025–2030's agriculture insurance provisions and the National Insurance Act (2024) would address the gap in private sector perspective not covered by this study. Fourth, a participatory study engaging communities in the design of FbF trigger parameters and early action protocols would support the decentralisation recommendation and ensure community ownership of anticipatory action systems.

5.6 Chapter Summary

This chapter has presented conclusions drawn from the study's findings and developed six targeted recommendations for policy and practice. The study concludes that Malawi has the institutional foundations, operational experience, and urgent financial need to formally integrate FbF into its national DRF framework. The primary barriers are structural rather than technical, and they are addressable through deliberate policy action centred on the DRFS 2025–2030 as the strategic vehicle. With a protection gap averaging 81% and approximately 17 million people affected by disasters in the decade from 2015 to 2024, the case for moving from reactive financing to anticipatory action is both evidence-based and morally urgent.

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