



**MOBILE PHONES AND THE DISSEMINATION OF CLIMATE AND
DISASTER INFORMATION IN NSANJE DISTRICT.**

**MASTER OF ARTS (THEATRE AND MEDIA COMMUNICATIONS IN
DEVELOPMENT) THESIS**

BY

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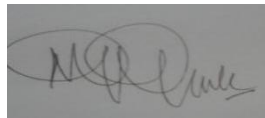
JULY 2025

DECLARATION

This dissertation is my own, unaided work except where due reference is made. I submit this work in partial fulfilment of the requirements for the degree of Master of Arts in Theatre and Media Communication for Development at the University of Malawi. It has not been submitted before for any degree or examination at any other academic institution.

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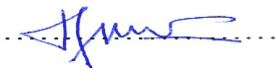
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I declare that this dissertation is from the student's work effort. Where he has used other sources of information, he has duly acknowledged the source. This dissertation is submitted with my approval.

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DEDICATION

To the only Dear Mother and Father... *Lonney Muleso Matiki* and *Isaac D Matiki*. I know you are smiling down upon me from heaven.

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To my family, especially my kids for being a source of courage and inspiration during my study; and my Supervisors for forever following up with me. More importantly, I thank God for taking me through this important stage of my scholarly life.

ABSTRACT

This thesis presents an assessment of Mobile Phones and the Dissemination of Climate and Disaster Information in the Southern Malawi district of Nsanje. Due to climate change, Malawi continues to experience disasters such as floods and droughts. As such the use of mobile phones has become part of the communication approaches in disseminating climate and disaster information, to which, on observation, studies have not explicitly indicated how the usage of the phones has contributed to reducing the severity of disasters such as floods in disaster-prone areas in Malawi. Thus, this qualitative study employed a technological-led theoretical framework informed by *E-Agri Theory*. Data was collected using focus group discussions and in-depth interviews, and similarly, data was analysed using *Thematic Analysis*. The study revealed that while mobile phones are used for climate and disaster information, they as a resource for communicating the interventions are not evenly distributed, demotivating active participation among community members tasked with disaster issues. Further, lack of capacity and skills to use the phones, and poor ICT infrastructure were challenges affecting the use of mobile phones in the dissemination of climate and disaster information. The ‘*Digital Divide*’ seems to be a major pitfall in the utilisation of ICT and Communication in development in Malawi. ICT infrastructure development and policy direction are recommended to enhance technological innovations that spur desired change among rural communities in disaster-prone areas such as Nsanje. The findings reflected the aim and specific objectives of the study as the aim of the study was to assess the utilisation of mobile phones in the sharing of climate and disaster information in Nsanje district.

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ABBREVIATIONS AND KEYWORDS

ACPCs:	Area Civil Protection Committees
CARD:	Churches Action in Relief and Development
CBA	Community-Based Adaptation
CBEWS:	Community-based Early Warning Systems
COOPI:	Cooperazione Internazionale
DCPC:	District Civil Protection Committee
DIPECHO:	Disaster Preparedness ECHO- project
DoDMA:	Department of Disaster Management Affairs
DRR:	Disaster Risk Reduction
IK:	Indigenous Knowledge- <i>Locally generated pearls of wisdom</i>
MAppERS:	Mobile Applications for Emergency Response and Support
MDCCMS:	Malawi Department for Climate Change and Meteorological Services
PSP:	Participatory Scenario Planning
SHEAR:	Science for Humanitarian Emergencies and Resilience
VCPCs:	Village Civil Protection Committees

CHAPTER ONE

INTRODUCTION AND BACKGROUND

1.1 Introduction

This chapter justifies the study by giving indicators of the research problem with the background and context for the study. It also provides a review of literature that informed the study as a way of appreciating phenomena across the globe. This chapter also provides, the methodology used in this research process as well as the theoretical framework as a way to inform data collection and analysis. In other words, the chapter provides the problem of the study, research aim, specific objectives, literature review, research design (also referred to as research methodology), theoretical framework, research credibility, study limitations, and ethical considerations.

1.2 Background

Malawi is a Least Developed Country, ranking 170th in the world on the Human Development Index (UNDP, 2016). The country's economy is largely agrarian, with 80 percent of the Malawian population of about 18 million (MPHC, 2018) relying on small-scale, rain-fed agriculture as their primary livelihood activity. However, climate change has contributed to growing food insecurity and increasing instances of community displacements across Malawi (UNDP, 2016; Care, 2017). In Malawi, in the last decade, nonetheless, probably as a consequence of climate change, the most severe types of hazards affecting the country (by number of deaths) have been floods and storms, that is, weather-related hazards, which caused 440 deaths of the 465 in total that

occurred during that period, including those occurred in Nsanje District (World Bank, 2019).

Additionally, according to International Federation of Red Cross and Red Cross Crescent Societies (IFRC). International Disaster Response Law (ISRL) in Malawi posits that Malawi is exposed to a range of different hazards, including floods, heavy storms, droughts, dry spells, strong winds, epidemics, fires, landslides, and earthquakes. The most common, nonetheless, are weather-related hazards, which are becoming more frequent and less predictable as a result of climate change. Between 1940 and 2020, Malawi has experienced 75 disasters produced by natural hazards, with floods being the most common type (42), followed by epidemics (15), and droughts (8). These disasters have caused the death of 3,244 people in total, nearly half as a consequence of epidemics, and almost 1,000 because of floods (29.2%). Of the more than 2,500 people injured as a result of such events, around 1,300 have ended up in that situation because of floods. Of the more than 32 million people affected overall, nearly 87% were affected as a consequence of droughts (NETP, 2023).

Community-based Early Warning Systems (CBEWS) projects are ongoing in several communities across Malawi, mostly implemented by Non-Governmental Organisations (NGOs). CBEWSs have been successful by disseminating information from upstream to downstream communities, through school and faith communities, and using locally relevant communication methods. Other international organisations, (including the World Bank, the World Meteorological Organization (WMO), and the United Nations Development Programme-UNDP) through its Least Developed Country Fund (LDCF)-funded the EWS project in Malawi, which focused on building forecasting

infrastructure and piloting technology through the use of Information and Communications Technology (ICT) in information dissemination. Among the districts with such initiatives is Nsanje, one of the high-risk areas affected by droughts and floods due to climate change. For instance, in January 2015, floods led to the loss of over 100 lives as well as livestock. Crop losses in the Southern Region of Malawi including Nsanje District, consequently led to severe food shortages in 2016, which prompted the declaration of a nationwide state of emergency on food shortage in Malawi (Care, 2017).

Further, the assessment report on mainstreaming and implementing disaster risk reduction measures in Malawi (UN-ECA, 2015) acknowledges and targets Nsanje district as one of the fifteen priority flood and drought-prone districts in Malawi alongside *Balaka, Blantyre, Chikhwawa, Dedza, Karonga, Machinga, Mangochi, Nkhatabay, Nkhotakota, Phalombe, Rumphi, Salima, Ncheu* and *Zomba* districts. The National Adaptation Programmes of Action (NAPA) which evaluated the impacts of adverse climatic conditions in eight important sectors of economic growth, ranked the identified actions using multicriteria analysis to arrive at urgent and immediate priority needs for adaptation. Some of the initiatives proposed under NAPA were meant, among others to boost Malawi's preparedness to cope with droughts and floods; to improve climate monitoring in order to enhance Malawi's early warning capability, decision-making, and sustainable utilisation of Lake Malawi and lakeshore areas resources.

The sectors analysed were agriculture, water, human health, energy, fisheries, wildlife, forestry, and gender. Historically some of the severe flood disasters experienced in Malawi occurred in Zomba in 1946, Lower Shire Valley in 1956 and 1989, *Nkhata Bay* in 1957, *Phalombe*, in 1991, *Karonga* in 2001, *Nsanje* in 2012 and recently in *Karonga*,

Nkhatabay, Chikwawa, Zomba, Mangochi and Phalombe in 2013 (Nilsson et al., 2010; DoDMA, 2013).

Further, Nsanje district received heavy rains from 3rd March 2019 up to 7th March 2019 as forecasted by the Meteorological Services Department. Following the heavy rains in *Nsanje* and upper district of Nsanje like *Mulanje, Blantyre, Thyolo* and *Mwanza*, the district experienced flooding in all 9 Traditional Authorities T/As. The most affected T/As were *Mlolo, Mbenje, Tengani, Malemia, Chimombo, Ndamera* and *Nyachikadza*. A total number of 10,125 households were affected by the heavy rains and floods. Further, due to prolong rains, the VCPC also registered a huge number of houses collapsed due to moisture and will require support to reconstruct once the rains stop. During the floods in 2019, the challenges experienced include: Delayed detailed assessment due to accessibility in most of the affected areas (T/As) and there was no power supply due to load shedding which has made communication difficult with Civil Protection Committees-CPCs and other stakeholders according to Nsanje District Council Initial Assessment Report (2019) produced after floods of 2019. This is the same area that I conducted my study. For instance, my research study was conducted in Nsanje District, in TAs of *Makoko, Tengani, Mbenje* and *Chimimbo*. These floods affect agricultural productivity which is the main economic activity in *Nsanje* district and the Malawi nation in general.

Additionally, according to an impact assessment report on climate information services for community-based adaptation, climate change is expected to increase the frequency and severity of such extreme weather events, thereby jeopardizing the livelihoods of Malawian small-scale farmers. Prior Climate Information as a precautionary activity capacities individuals and communities to adapt their agricultural practices to the

predicted climatic conditions, which reduces the negative impacts of climate change (Care, 2017). While the Malawi Department for Climate Change and Meteorological Services (DCCMS) disseminates seasonal weather forecasts, the effective communication of such climate information has historically been challenging, particularly to remote rural communities as the forecasts are often technical and not easily explained to non-scientists (Care, 2017). To address these challenges, CARE-Malawi (an NGO) developed the Participatory Scenario Planning (PSP) process. This is an approach to Climate Information Services (CIS) grounded in Community-Based Adaptation (CBA). The PSP process enables technical experts to collaborate with community members to interpret climate forecasts and develop an advisory that is evidence-based and appropriate to local conditions (Care, 2017).

The process of managing disasters also includes Disaster Management Affairs in the Department of Disaster Management Affairs (DoDMA), a Government agency, mandated to coordinate and oversee disaster risk management programs and projects by various stakeholders in the country with the aim of building and improving the resilience of households, communities, and the nation to disaster risks established in 1994 by the Department of Preparedness and Relief following the enactment Disaster Preparedness and Relief (DPR) Act of 1991 (Laws Africa, 2014). Therefore, Disaster Risk Management comprises of the Secretary and Commissioner, the National Disaster Preparedness and Relief Committee (NDPRC), and Civil Protection Committees (CPCs).

DoDMA acts as the mouthpiece through which weather-related early warning messages are announced by the Department of Water Resources (DWR) and the Department for Climate Change and Meteorological Services (DCCMS). Further, The NDPRC

provides policy-level guidance to DoDMA and is responsible for coordinating the implementation of measures to alleviate disasters and the Civil Protection Committees constitute the frontline decentralized institutions at the Area and Village levels (ACPC and VCPC), providing community-level coordination of preliminary disaster impact assessments in the affected communities before any relief operations are initiated. These institutions also serve as entry points for any dissemination of disaster early warning information at the community level (*DPR Act, 1991*) cited in Laws Africa (2014).

In addition, DIPECHO (Disaster Preparedness ECHO) project was implemented by Cooperazione Internazionale (COOPI) in consortium with Christian Aid Malawi and GOAL Malawi. Goal Malawi alongside Christian Aid, first established in 1977 has a history spanning more than four decades of humanitarian response in some of the most challenging and difficult contexts around the world (COOPI, 2014). In *Nsanje and Chikwawa* the project was led by Goal Malawi. Within the DIPECHO programming, ‘river alliances’ were created in the target communities along the two main river basins in Malawi: namely the Shire River basin and the *Kachitsa* River basin. The ‘river alliances’ were established across the target communities to coordinate the preparedness, response, and mitigation activities between communities downstream and upstream along the Shire and *Kachitsa* River Basins, and several river gauges were established in the selected areas to monitor the water level in each river. The ‘river alliance team is equipped with communication means (cell phones, megaphones) and transportation means (bicycles), and is supported with several training events, such as river-gauge management, GPS, advocacy training, etc. (COOPI, 2014).

Although members of ‘river alliances’ use mobile phones to communicate when there are risks of floods, in many cases have inadequate air time to spread the text message across the communities, or there are no easy-to-access electricity sources to simply recharge the phones (in some cases, people have to travel a long distance to charge the phones). Through the examination of recent reports and studies (COOPI, 2014; Care, 2017) on climate impacts in Malawi, as well as reviewing the current state of early warning systems and associated projects, this assessment has identified clear gaps in current information availability and dissemination. While communicating climate information in Malawi shows innovation in the use of information and communication technology (ICT), the current dissemination of weather advisories does not reach all potential users.

Additionally, according to the National Emergency Telecommunication Plan’s (NETP) whose goal was to set the strategy that would enable and ensure that communication is available during the phases of disaster risk management (DRM), namely: Mitigation, Preparedness, Response, and Recovery . This goal is achieved by promoting coordination across all levels of government, between both public and private organizations, and within the communities at risk. The NETP considers the definition of policies, the organizational structure, and the methods of coordination between the different actors during all four phases of DRM in Malawi. It also establishes the principles that guide the allocation of resources and responsibilities for the achievement of the proposed objectives, including the expected telecommunications, information, and communication technologies (telecom/ICT) response times, tasks and processes (NETP, 2023).

For instance, according to Digital Skills Ecosystem and Gap Assessment in Malawi Final Report (2021) indicates that Network Readiness Index 2019, ranks Malawi 117th among the 121 countries studied on the application and impact of ICT in economies around the world. The indicators also suggest a low rate of user adoption of smartphones and their mobile apps (social network and business apps), which equally affects Nsanje District. It is also ranked 121 on indicator measuring mobile app development ecosystem. Additionally, more than half of households in Malawi had a mobile phone while 16.4% had access to the Internet. Access to the internet was highest in the Southern region (23.2%) including *Nsanje* district where the study was conducted while a higher percentage of households in the northern region had mobile phones. More also the internet penetration stands very low at 15% (approximately 2.81 million users) as of Currently, 45% of the population has obtained mobile phone connections with close to 8.58 million users (Digital, 2020).

Furthermore, internet and mobile phone connection in Malawi have witnessed a 10% and 12% increase in 2020 as compared to 2019 (Digital, 2020). Iganza (2015) notes that low penetration of internet and mobile connections is a challenge that is further intensified by lack of affordability of internet and ICT infrastructure and tools. Network Readiness Index- NRI 2019 ranked Malawi 118th on the affordability of mobile tariffs, being one of the most expensive countries with respect to the cost of mobile services. In Malawi, mobile phone expenses in a month account for almost half of an individual's average monthly salary (Digital, 2020).

1.3 Climate and Disaster Information Flow in Nsanje District

Climate and Disaster information in Nsanje District emanates from the Malawi Department for Climate Change and Meteorological Services (DCCMS) through to the Village Civil Protection Committee. The DCCMS generates weather forecasts about

the weather and passes them to the Department of Disaster and Management at the national level who passes the information to DoDMA at the district level. From there the information passes to Area Civil Protection Committees at the TA level and finally reaches the bottom, which is the Village Civil Protection Committees. Similarly, the communities also give feedback about climate and disaster information in the form of indigenous knowledge, which is a form of local experiences indicating patterns of disaster predictions.

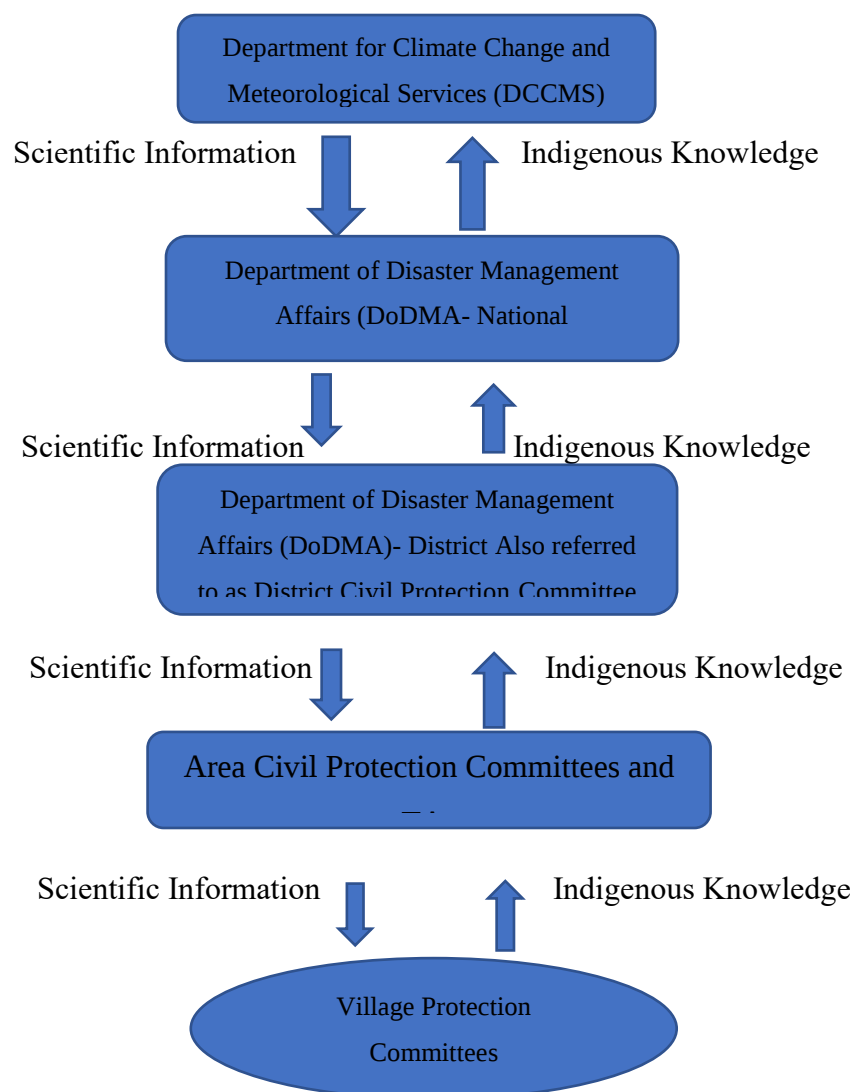


Figure 1: Conceptual flow of Information

Available information on the current impact and status of Participatory Scenario Planning (PSP) in Malawi, was obtained from remote KIIs/experts, while *On-the-ground users*, such as farmers and community members, were not reachable during the study. As a result, there is limited user feedback, and information is largely restricted to expert opinions (Care, 2017). Therefore, the benefit of PSP advisories to on-the-ground users remains largely uncertain. Furthermore, the impact assessment took place only three years after the first PSP workshops were held in Malawi in 2014, and, as a result, there is little information available on the sustainability or scalability of PSPs in the country (Care, 2017). In addition, according to the report (Care, 2017) radio broadcasts, extension workers, and mobile phones have also been used to disseminate climate and disaster information. Its usefulness, however, is scantily documented.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This section presents scholarly works conducted across the globe related to this research. It focuses on the usage of mobile phones in the dissemination of climate and disaster information. It also aligns the study with existing studies conducted as a point of departure. It further explores the theories that have been employed, apart from empirical literature.

Mobile connectivity has enabled communities in developing countries to connect and address their social challenges. Mobile services have the potential to positively affect sustainable development, acting as a tool to decrease information gaps and empower individuals (Aker and Mbiti, 2010). Beyond basic connectivity, the technology allows for overcoming the lack of physical infrastructure such as roads and landlines (Hartman, 2013). Mobile services can empower people by reaching out to those geographically or socially isolated from information (Bhavnani et al, 2008; Kangethe, 2016). Not only do more people have access to information, but it is also accessible around the clock. In this way, the increase of availability and accessibility of mobile technology aligns with ‘the leave no-one behind’, ideal for sustainable development (ITU, 2016).

Budimir, Bee, and Paul (2021) report that by the end of 2019, more than 3.7 billion people were connected to the mobile internet. Further, it stated that there was increased mobile phone coverage, ownership, and use, which improved communications access

to more people and vulnerable communities than ever before. Such access presented new opportunities for reducing risks from disasters. Additionally, the report states that disasters related to natural hazards have killed 1.35 million people in the last 20 years, 90% of which were in low-and-middle-income countries. Additionally, Le Coadic (2000) stated that within contemporary society, there is a fast change in some paradigms such as the movement from industrial society to information society, which is a knowledge-based society. Raising this issue, he states that many research studies raised the question: is there a contradiction between information and knowledge? Answering in negative, he thought there was not, but that knowledge is a bigger concept, which includes information as well. He goes on to say that a “knowledge-based society has always existed: “what is new now is the speed at which knowledge expands and innovates” (Le Coadic, 2000)). The volume of knowledge that we have at our disposal currently doubles every five years.

Another study done by Mioara (2012) stated that at the European level, developed states were the first to launch and support special programs in the 1990s so that information technologies might be accessible to as many people as possible. Illustrating his case in point, he brought in the Europe Programme launched in 1999 after measures had been taken to liberalise telecommunications, establish a clear legal framework for eCommerce, and support research and development. Nonetheless, the fast development of technology and markets led to the propelling of certain development directions of the information society. Viewing the objectives of the eEurope program, he brought up the inclusion of: bringing all citizens, schools, companies, and administrations into the digital era (especially the youth, before graduating) and developing eHealth and eGovernment. Mioara (2010) reports that the Lisbon Agenda established the transformation of Europe’s economy into the most dynamic economy based on

knowledge. As such a sequence of initiatives were implemented to accelerate internet accessibility and connectivity for each European Union citizen by 2010.

Gething and Tatem (2011) observe that mobile technologies have been used throughout the disaster risk management (DRM) cycle, since the early 2000s, and are active before, during, and after a disaster. Much attention has been paid to the tangible and highly visible role of mobile phones in emergency response, increasingly seen as a means to chronicle events being witnessed and/or experienced personally. They are also commonly used to disseminate information and educate and inform the public and emergency services. By harnessing the viral capacity of such technologies, emergency response teams can alert and locate those in danger more swiftly than via traditional broadcast media or telecommunications methods (Laituri & Kodrich, 2008).

Furthermore, Pandeya et al. (2020), note that the potential of mobiles in the DRR realm has only recently been recognized and documented: a process that has been accelerated by the proliferation of context-specific DRR mobile applications (apps). Nevertheless, there exists a spectrum of different technologies that could usefully be exploited for DRR. In areas of poor Internet provision and/or depressed smartphone ownership, voice calls and SMS messaging are used to target broad swathes of the population. For instance, in Nepal and India, monsoon flood alerts for certain rivers are sent by each respective country's governmental water establishments.

For Internet-connected smartphones, social media platforms such as Twitter and Facebook, as well as messaging services like WhatsApp, while commonly associated with emergency response, also offer an important channel for official hazard warning communications, and may also augment social capital (Kaigo, 2012; Agahari et al.,

2018). Similarly, Geographic Information System (GIS)-based technologies represent another (spatial) means of risk communication. Google Maps, for instance, has been used to develop a user-led disaster management system in Bangladesh (Sonwane, 2014). OpenStreetMap (OSM), an open-source and collaborative GIS platform, has also been used to develop similar systems (Rahman et al., 2012), or to allow affected communities to generate local landslide hazard, risk, and vulnerability maps dynamically (Parajuli et al., 2020). However, the most commonly utilized mobile technology in DRR are apps: they provide a user-friendly means of feeding raw data into hazard early-warning systems (EWS), whose output is then disseminated in visually appealing form back to users (Paul et al., 2018). What is more, there are two country, natural hazard-specific examples such as MAppERS (Mobile Applications for Emergency Response and Support), which aims to reduce flood risk in Denmark by allowing users to share geospatial data such as geotagged images of flood extent with basin authorities (Frigerio et al., 2018). Secondly MyShake is a global seismic platform that exploits users' smartphones to detect earthquakes and record the magnitude of ground shaking (Rochford et al., 2018).

Elsewhere, other apps have been developed with the specific purpose of indirectly enhancing DRR by growing the observational database, which is often too sparse to generate accurate or timely warnings or alerts (Seibert et al., 2019). Mobile technologies have rich potential in ensuring more equitable resilience by mobilizing marginalized actors who might otherwise have been bypassed by more traditional knowledge-generation practices. These include people with disabilities, who are four times more likely to die when a disaster strikes; or women, who are more vulnerable in disaster situations (Craig et al., 2019).

It was also noted that about 90 percent of South East Asia, such as Indonesia, Vietnam, and Philippines use mobile phones to share information with friends and relatives regarding floods and cyclones (Lai, Chib & Ling, 2018) , improving communications for those involved in disaster, aid, and allied voluntary services in remote areas mostly affected by disasters stemming from natural hazards (Weru, 2012). Wood (1996) notes that most NGO workers express a preference for voice communications using the phone as it gives two-way ‘live-as-it-happens’ conversations. Through the phone, problems can be discussed and many alternative ideas brainstormed in one conversation. It also has the advantage that the caller has the psychological assurance that the person he wanted has heard and understood the meaning of the message.

Many studies examined the emergence of mobile phones in the developing world. For example, Donner (2008) provides a comprehensive literature review of 231 studies of cell phone use in the developing world, but none of these studies considered cell phone use in the context of natural disasters. However, there are other studies on the role of what is referred to as “old technology”, which includes the use of sirens, radio communications, and the like to disseminate warnings and disaster information (Donner, 2008). In industrialized countries, where landline telephone communications have been in place for decades, local authorities have put in place emergency calls through “reverse 911” dispatch technologies. However, the emergence of mobile phones and the internet over the last two decades presents new potential for sharing disaster warning information, as well as communicating in the aftermath of disasters (Donner, 2008).

While mobile phones and the Internet on their own can enable communication before and during crises, effectiveness is enhanced when authorities develop systems to

communicate warnings that are integrated with ICT. Samarajiva and Waidyanatha (2008) evaluated mobile phone technologies in Sri Lanka, concluding that “mobile phones as the reliable, effective, and affordable solutions for alerting last-mile communities. Disaster risk reduction can be improved using the mobile application and leverage the explosive diffusion of the technology even among the poor in developing countries” (p.58). Jagtman (2014) also evaluated the challenges and opportunities of using mobile phones as part of early warning systems in the Netherlands. Some of the challenges she highlighted include the proper identification of those who truly need to be warned, the use of appropriate messaging language, and the risks of unauthorised information being messaged.

Wang, et al. (2016) examined the use of social media in emergency response in China during the 2012 Beijing rainstorm. It was revealed that throughout the emergency events, social media text streams have a lot of emergency information at different spatio-temporal scales and about different topics. By examining the vast amounts of social media text streams, it is conceivable to attain emergency information regarding event scenes, the status of rescues, and the influence of the event. Further, by analyzing the changing trends over time about the number of social media text streams being sent out, it can reveal the developmental trend of events, as well as people’s concerns during the different phases of the events. It is noted that emergency information on the spatial distribution pattern of events can be extracted, and spatial clusters of text messages about the emergency can be detected using geographic attributes of social media text streams.

A study by Khalafzai and Nirupama (2008) investigated how Pakistani women are empowered by ICT, thus, improving disaster resilience. Within an industrialized

country context, Vieweg, et al. (2010) highlighted the use of microblogging from social media tools such as Twitter to improve situational awareness during disasters. However, not all researchers have concluded that the use of mobile phones is the most cost-effective means of disseminating disaster warning information. For example, Collin and Kapucu (2008) reviewed the literature on tornado warning mechanisms and concluded that local government use of weather radio warning systems is the most cost-effective means of sharing tornado warning information. Quarentelli (1997) offered an assessment of potential problems of the ICT revolution for disaster planning and management. Of greatest relevance is the concern about ICT system failures, which can generate enormous costs for society.

Toya and Skidmore's (2015) "Information/communication technology and natural disaster vulnerability" used data on natural disaster fatalities from many countries over the 1980–2013 period, revealing a strong negative relationship between the emergence of ICT and disaster-induced fatalities. The study concluded that while mobile phones and the Internet on their own can enable communication before and during crises, effectiveness is enhanced when authorities develop systems to communicate warnings that are integrated with ICT. Furthermore, that mobile phones, as opposed to internet access, are the dominant technology that helped to save lives during crises, but have a stronger presence of human capital based ICT in reducing fatalities. The present work expands on this analysis by offering a more detailed discussion and examination, focusing attention on the role of mobile phones in reducing fatalities for various types of disasters in developing and industrialized countries.

Specifically, Toya and Skidmore (2015) only considered a single aggregate disaster variable, whereas the present study considered geologic and climatic disasters, as well as specific disaster types such as earthquakes, volcanoes, mass movements, floods, and

storms. Toya and Skidmore (2015) emphasized the role of human capital, whereas the present study focuses on key interactions between cell phone availability and the level of development. The study also examined the robustness of the empirical results using techniques to address both serial correlations of error and spatial correlation.

Onywere (2005) also notes that historically, disaster management in Kenya was not viewed as an integral part of development planning but this is changing with greater recognition of the importance of reducing the impacts of natural and manmade disasters, planning, preparation, and ever-improved resilience. This was possible as mobile phones provided a technology that proved invaluable in the gathering of disaster data. In South Africa, Bhavnani et al. (2008) noted that the University of Cape Town, South Africa, operated a disaster information management system, using technological innovations like mobile phones, which focused on documenting the incidence of small, recurrent, and localized disaster incidents that are often not covered internationally but have serious effects on marginalized communities.

Similarly, the use of mobile phones was reviewed in Iraq. It was noted that since the invasion of 2003, Iraq has suffered continued conflict and political instability, making it a challenging place for mobile operators to function. As a result, the mobile technology sector has struggled to develop. Natural disasters are not a major hazard in Iraq. However, the country had suffered 12 natural disasters in the 30 years that had passed, with an average of three people dying due to natural disasters per year (GSMA, 2015).

In Malawi, the impact assessment on climate information services for community-based adaptation to climate change- Malawi Country Brief (Care, 2017) indicates that

Developing Innovative Solutions with Communities to Overcome Vulnerability through Enhanced Resilience (DISCOVER) and Disaster Preparedness ECHO DIPECHO projects initiated by NGOs had used mobile phone in disseminating climate and disaster information in flood-prone areas including such as *Nsanje*. These NGOs work with local partners to deliver interventions that include early-warning systems, disaster risk management, and climate-smart agriculture. During the January 2015 floods, DISCOVER early-warning systems reported several successes in avoiding damages and loss of life, however, the assessment indicated that there was no feedback from users of phones of its utility value. These initiatives also corresponded to Vision 2013., *Pillar No. 3: Agricultural Productivity and Commercialisation*, which emphasized the use of technology to advance smart and green agriculture.

2.2 Problem Statement

Nsanje District is a disaster-prone area as there are common occurrences of flood-related natural disasters every year which are very devastating. During such disasters, mobile phones play a significant role in averting or lessening the impact of such disasters by facilitating the sharing of information among stakeholders and victims. However, there is still limited knowledge of how effective mobile phones play this role and its associated challenges, as a result, there is limited user feedback, and information is largely restricted to expert opinions (Care, 2017). This study specifically intends to investigate how mobile phones are utilised in disseminating climate change and disaster information in *Nsanje* District. There have not been any scholarly works so far that have delved in this area on Malawi and this research study aims to fill that gap.

2.3 Objectives

2.3.1 Main Objective

To assess the usage of mobile phones in the dissemination of climate and disaster information in Nsanje District.

2.3.2 Specific Objectives

This study will be guided by the following specific objectives:

- a. To explore the nature of the use of mobile phones in communicating disasters
- b. To investigate the availability and ownership of mobile phones used for sharing climate and disaster information in *Nsanje District*
- c. To review challenges associated with sharing information using mobile phones during disasters, especially floods

2.4 Research Design and Methodology

This section outlines the research methodology and design that was used in the study. It gives a justification of the methodology used and selected informants. It further gives an account of how the data was analysed and presented.

2.4.1 Research Design

The study used a qualitative approach, describing how people feel or what they think about a particular subject, situation, or phenomenon. Qualitative approaches are specific procedures or techniques used to identify, select, process, and analyse information about a specific topic (Libguides, Wits 2020). In this case, interviews, focus group discussions, and document reviews were used in the data collection process to explore and examine the utilization of mobile phones in the dissemination of climate and disaster information.

2.5 Sample

The study was conducted in Nsanje District, one of the disaster-prone areas especially floods as well as one of the impact areas where GOAL Malawi had provided Mobile phones for climate and disaster communication and information in the TAs of Mbenje, Tengani, Chimombo, and Makoko. Therefore, the unit of the study was Village Civil Protection Committees due to their prior exposure to DIPECHO and DISCOVERY projects. The study was conducted in 10 villages (ACPC) in TAs of Mbenje and Tengani, which have Area and village civil protection committees. The justification behind the sampling is elucidated in the following section.

2.6 Sampling Techniques

The study used purposive sampling techniques. The research employed the purposive sampling technique. According to Babbie (2007), purposive or judgmental sampling allows the researcher to select the sample based on knowledge of the population, its elements, and the purpose of the study. Further, purposive sampling's goal was to collect data from participants with rich and comprehensive information.

2.7 Data Analysis

This study used thematic analysis in analysing the data. Thematic analysis can be made in both deductive (top-down) and inductive (bottom-up) ways (Braun & Clarke, 2006). In the inductive data analysis, patterns, categories, and themes were constructed from the bottom up, by organizing the data into progressively more abstract components of information.

2.8 Ethical Considerations

This research employed the beneficence principle of ethics (Cassel, 2000), whose main principle holds that the subjects of research be protected from harm and that the research should bring tangible benefits to society. Participation in the study was

voluntary and consented to by respondents. Respondents to the study were booked well in advance and informed about the time of the interviews. Further, respondents' personal information was kept private and confidential. More importantly, the findings of the research are for academic purposes only. In addition, the study ensured that biases were avoided to maximize the usefulness of the study to the scholarly community as well as the nation in general. All this was made in consideration of the Malawi Research Ethics Committee (UNIMAREC) guidelines, which consequently approved the study.

2.9 Study Limitations

Time was the main limitation of this study. The research had time constraints as any business entity has complex stakeholders with multiple expectations to be assessed within a tight schedule to complete the study on time as scholarly expected. However, the findings in the research are credible as triangulation was the strategy that was used in data collection to validate the findings within the limited time available. In addition, the study was qualitative, and context matters, as such findings are not sweepingly generalized. Furthermore, the *sampling is non-probability* and is challenged in the sense that when one is setting a goal of sampling "information-rich informants", the range of variation assumes one knows that range of variation. Consequently, an iterative approach of sampling and resampling to draw an appropriate sample was adopted to make certain that theoretical saturation occurred (Miles and Huberman, 1994).

2.10 Theoretical Framework

Studies of mobile media and communication in developing countries relate to media and communication more broadly. Studying people's use of mobiles in developing countries permits to challenge the "pre-existing structures in society and pre-existing notions of how interaction should take place" (Ling & Horst, 2011, p. 365). This study used E-Agri Theory to analyse the data collected on use of mobile phones during disasters. While E-Agri Theory points its usability for agriculture, the principles of

assessing use of mobile phones in such a sector appears applicable to use of mobile phones in disaster information sharing and exchange between intervention agencies and affected people in disaster areas. This theory is ideal for the study as many ICT studies as Heeks, (2006) has used it to illuminate the impact of mobile phones on social and economic development. In other words, this theory in principle, provides an understanding of the role of mobile phones in facilitating the sharing of information on social and development issues. As such, I used it to analyse how mobile phones are utilised in disseminating climate and information in the Nsanje district to avert the impact of floods that currently occur yearly.

Heeks (2006) provides an understanding of the linkages between the needs' assessment, the adoption of ICT in various fields, and the impact of these technological innovations on society. In his review, Heeks (2006) provides interconnected parameters in the life cycle models of the agricultural business cycle and disaster management cycle. Therefore, the study adopts principles such as; i) *Adoption & Needs* (Singhal et al., 2011); ii) *Diffusion and extension* (Abdulai & Huffman 2005), iii) *Output & Impact* (Kashem, 2010), and finally iv) *Sustainability and Foresight analysis* (Heeks, 2006). "*Needs and Adoption*" as a principle aims to understand why technology, like mobile phones, was adopted. Another principle is *Diffusion and Extension* (Abdulai & Huffman 2005, which aims to discuss how some technologies like mobile phones have spread across communities that are prone to disasters. This entails the availability and ownership of mobile phones in the communities that are used to share climate and climate information (Hosman 2010).

Thirdly, the other principle is *Output and Impact*. This involves the identification and measurement of the tangible costs and benefits of the use of technology such as mobile

phones in the provision of information about climate and disaster. For instance, appreciating the kind of information spread and expected behaviours following exposure to messages received on mobile phones. The fourth and last principle for the study is *Sustainability and Foresight analysis*, which covers the future trends and the expected outcomes of using mobile phones in the dissemination of climate and disaster information. It draws scenarios of potential challenges and benefits to be recognised in the future (Heeks, 2006).

2.11 Study Rationale

This study is very important as it generated new insights that will draw a starting point for future scholars who may wish to carry out studies on the usage of mobile phones in climate and disaster communication. Furthermore, digital communication has changed every way of life, making it important as an area for research and as a key determinant in social and economic developments. More importantly, there is very little documentation on the utilization of mobile phones in climate and disaster communication in Malawi. More importantly Nsanje District continues to experience floods due to climate change.

2.12 Chapters Outline:

This thesis has five chapters namely: Chapter One-*Introduction*; Chapter Two-*Objective One*; Chapter Three- *Objective Two*; Chapter Four-*Objective Three*; and Chapter Five- *Conclusion*

Chapter One-Introduction

The first chapter introduces the study by providing background, literature review, methodology, and theoretical framework. The main objective and specific objectives are also presented in this chapter.

Chapter Two- Findings

This chapter presents findings on *the nature of the use of mobile phones in disseminating climate and disaster information* in the Nsanje district. Additionally, this chapter presents a critical discussion using the theoretical framework provided and finally presents a summary of the findings.

Chapter Three

This chapter presents results on the *availability and ownership of mobile phones used for the dissemination of climate and disaster information* in the Nsanje District. Additionally, this chapter presents a critical discussion using the theoretical framework provided, alongside the summary of the findings.

Chapter Four

This chapter presents findings on *challenges and solutions associated with the use of mobile phones* in the Nsanje District. Further, this chapter presents a critical discussion using the theoretical framework provided alongside the summary of the findings.

Chapter Five

In chapter five the study provides conclusions based on the key findings of this study, which explored the use of mobile phones in sharing climate and disaster information in the *Nsanje* District.

CHAPTER THREE

FINDINGS AND DISCUSSION

3.1 Introduction

This chapter presents findings on the utilisation of mobile phones in disseminating climate and disaster information in the *Nsanje* district. This study was informed by E-Agri Theory which is technological-led communication theory. The principles underpinning this theory include: “*adoption and needs*” (Singhal et al., 2011); “*diffusion and extension*” (Abdulai & Huffman 2005); “*output and impact*” (Kashem, 2010), and finally “*sustainability and foresight analysis*” (Heeks, 2006). This theory is ideal for the study as it advances principles that provide the basis for analysing the usage of mobile phones in development initiatives including dissemination of climate and disaster information to mitigate the impact of disasters on agriculture which is the source of livelihood among communities in Nsanje district- a disaster-prone area.

More importantly, the framework illuminates the uses and benefits of mobile phones, accounts for social uses and consequences, as well as the future trends and the expected outcomes of using mobile phones in the dissemination of climate and disaster information especially drawing scenarios of potential challenges on psychological variables, needs, values, and beliefs on utilisation of mobile phones that all relate to the particular fulfillment pattern used by the audience in this civil protection committees in Nsanje District. As such the framework confirms the use of mobile phones in disseminating climate and disaster information.

Respondents to the study included: Village Civil Protection Committee Members (VCPC) who are contacted for community members; Area Civil Protection Committee Members (who coordinate disaster issues at Traditional Authority) Level, Local Chiefs, DODMA district officials, and Development partners (NGOs- COOOPI and Churches Action in Relief and Development-CARD). More importantly, the study investigated how mobile phones are utilised in disseminating climate change and disaster information in *Nsanje* District.

3.2 Uses of Mobile Phones in Disasters

3.2.1 Uses of Mobile Phones Before Floods

The investigation on the use of mobile phones before the floods revealed that they are used, according to respondents, in a number of ways. Firstly, messages that come through are mostly about climate change and how it will affect ordinary people. Chair Lady for Area Civil protection Committee in TA Makoko said that...

Timalandila mauthenga adzakusinthu kwanyengo, amachanjezo.... ndi mmene tingakonzekere za madzi osefukira... komanso kuuza anzathu akuboma zizindikiro zomwe anthu akuona mmidzimu” (We receive messages about climate change and the messages provide early warning systems which tips on preparedness for floods... similarly we share with district DoDMA officials about local early warnings based on indigenous knowledge, like sightings of hippopotamus) (Chair, Makoko Area, KII-14-09-2022).

Secondly, the study revealed that mobile phones are used for disseminating information. Talking to the Local Chief, she said:

We receive information on weather forecasts for daily, weekly, monthly, seasonal, or annual; dissemination of early warning systems. Apart from that we also receive information on levels of river gauges placed along river banks of Shire River which warn people in the lower stream of possible floods... (VGH- Khamu Village-Mbenje-14/09/2022)

Taking it further on the exchange of information between intervention agencies and people on the ground, she said:

We also share ways in which we traditionally determine on whether there will be floods or not. For example, from our experiences here, when hippos come out of rivers and move into villages, which are well adapted to aquatic life, warn farmers and communities to start preparing for floods. To us this signifies that there will be floods. In addition, the presence of such birds as Natchengwa whose behaviour is used by people to predict floods. For instance, the height of the nests of the Natchengwa bird is used to predict floods. When floods are likely to occur, the nesting of the Natchengwa is very high up the trees next to the river and when floods are unlikely to occur the nests are in the lower part of a tree. When we see a large population of ants, particularly close to the rainy season, we know that we should brace for heavy rains and floods. The other sign that we are likely to have floods is when there is an explosion of millipedes. Like ants, millipedes give us the cue that we should expect heavy rainfall and floods. These are signs that we have used to prepare for natural disasters in our areas” (X farmer - Sam Village- Mbenje: 14-09-2022)

Apart from the above, mobile phones also help to send messages, through platforms such as Facebook and WhatsApp,. Talking about this, Chairlady said:

We also receive early warnings as presented by the department for climate change and meteorological services from the district through Senior Chiefs, Group Village, and Village levels, and provide space for climate and disaster discussions daily on platforms such as WhatsApp or Facebook; disseminate information about water levels in the Shire River; and general communication between communities and district disaster management officials (Area Civil Protection Committee Chairlady, TA Makoko: 14//09/20).

The second way in which mobile phones are used prior to the floods is to disseminate weather forecasts for daily, weekly, monthly, seasonal, or annual; dissemination of early warning systems, such as information on levels of river gauges placed along river banks of shire river; dissemination of indigenous knowledge to the DoDMA district office as experienced and informed by such circumstances as the behaviour of hippos, the availability of certain birds, nests, and ants; receiving early warnings as presented by the department for climate change and meteorological services from the district through ta, group, and village levels; provide space for climate and disaster discussions daily on platforms such as Whatsapp or Facebook; disseminate information about water levels in the Shire River; and general communication between communities and district disaster management officials.

When I spoke to the COOPI-Project Officer, one of the development communication agencies working in Nsanje Boma District affirmed the same in this way:

Ndingopereka chitsanzo kuti panthawi imene ngozi isanachitike imene imakhala nthawi imene tikukonzekera ngozi zoza ndii madzi osefukira. Mwachintsanzo ngatipano tili mu nthawi imene a MET department atipatsa seasonal forecast, atiuuza mmene nyengo ikhalire kutsogoloku... *(Let me give an example that before disasters MET shares weather forecasts as the case now, and sends messages on the same...)* (Card- Development Partner Official- 15/09/2022)

3.2.2 Use of Mobile Phones During and After Floods

During and after floods mobile phones become very useful. When I talked to officers of DoDMA at the District level, they added:

During the rainy season and disasters mobile phones are used in exchanging information on the assessment of victims and property hit by floods; sharing information about water levels between the upper and lower land of Shire Valley; disseminating information about damages that occurred from communities to the district office of DoDMA; and updating the general public in disaster-prone areas on extreme weather such as strong winds and floods as experienced in real-time and information about disaster situations. Similarly, mobile phones facilitate sharing of information during rescue and recovery phases of the disaster management. (DoDMA, District Officials: 15/09/2022)

In a separate interview with one of development partners working in Nsanje district, on disaster management, he said:

Panthawi yomwe madzi asefulira ndipo akubwera mafoni amathandiza kugawana mauthenga munjira ziwiri; njira yoyamba anthu aku mtunda pachingerezi upstream amatumiza mauthenga a chenjedzo potsatira kuwerenga ma floods warning systems kapena titi maruler kapena ma river gauges omwe amadziwitsa kuchuchuluka kwa madzi mu msinje koanso kudziwitsa zoti madzi akubwera kuti anthu athe kuthawa madziwo asanafike.... Komanso amatha kutumizirana zithunzi kudzera ma smartphone zomwe zimaonetsa mmene zinthu zikuchititikira munthawi yake mwachangu...” *(during floods mobile phones are used in two ways, firstly members in the community in the upper stream of Shire River, send messages to members of the community in the lower stream of the river warning people to run to upper after reading water levers through river gauges. Secondly, people with smart also send images showing the real situation of the floods in real time” (Project Officer for Churches Action in Relief and Development-CARD- 15-09-2022)*

3.3 Specific Messages Received on Mobile Phones

Specifically, messages disseminated include; Weather forecasts for days, weeks, and months; Early warning systems, both scientific and local based as generated by the Department for Climate Change and Meteorological Services as well as Local Indigenous Knowledge, which are locally generated early warning systems.

When I spoke to the Nsanje District DoDMA official, he affirmed the same in this way:

Some of the messages that are communicated through mobile phones include disaster preparedness tips, search and rescue simulation;

environmental conservation practices; early warning systems and, and information on the audit of damages and loss of lives that occurred during past disasters. (DoDMA Official- Nsanje District-15/09/2022)

3.4 Other Messages Received on Mobile Phones

When I talked to one of the local leaders in the area of Traditional Authority *Tengani*, about other messages received on mobile phones, she said:

Apart from messages on climate and disaster, mobile phones also exchange Information about cash transfers (Mtukula Pakhomo) and village banking. We also receive information about agriculture subsidy programs, as well as information about health issues like WASH especially about cholera. Also, we receive information about education. For example, we receive messages about girl child education; and general personal messages about community funerals, messages about sicknesses of some members of the community, weddings, and related events in the communities. (VG Chisi 2- TA Tengani -13/09/2022)

3.5 Actions Expected Upon Receiving Messages

Upon exposure to messages about climate and disaster information, the communities are expected to change their perception of disaster prevention efforts and proper preparedness for possible disasters; internalization of environmental conservation practices as a way of mitigating the impact of climate change which results in disasters like floods; honing preparedness and survival skills and prioritising saving lives of people during disasters.

Additionally, DoDMA officials added that:

When they receive warning messages, communities in disaster-prone areas are expected to move away from their river banks-based homes to the upper land; move belongings or valuables from lower land to the upland; construct and maintain structures such as houses and livestock pens that withstand floods and strong winds. Further, once communities receive warning messages are expected to ensure safety for vulnerable groups such as kids, the disabled, and the elderly. It is also expected that messages sent create awareness of the current weather forecast and early warnings such as indigenous knowledge warnings as well as share skills for preparedness and rescue missions, which help in preparing for rescue backup for the kids, women, disabled, and elderly. (Nsanje District *DoDMA Official*- 15-09/2022).

From the findings it seems there is still some grain of resistance to adapting to practices consistent to mitigation efforts towards climate change. For instance, Malawi National Emergency Telecommunication Plan, NETP (2023), provides that during mitigation phase seeks to carry out actions that aim to prevent an emergency, reduce the probability of its occurrence, and limit the negative effects of unavoidable threats. This phase includes such activities as identifying existing hazards and risks, conducting vulnerability assessments, the construction or maintenance of critical telecommunications infrastructure, and the development of written plans and procedures, such as the NETP.

Further, during this phase, the role of telecom/ICTs is to help analyse the risk of potential disasters, disseminate information about impending hazards and how to mitigate their impacts, so those hazards do not lead to disasters, identify communities

at risk, and help implement strategies, technologies, and processes that can reduce their negative effects. Activities carried out during the mitigation phase include establishing legal and regulatory frameworks that support the use of emergency telecom/ICTs, conducting risk analyses of the critical telecom/ICT infrastructure, taking steps to reduce the vulnerability of telecommunications networks and improve their capacity for recovery, and assess vulnerabilities to develop multi-hazard early warning systems that have the appropriate technology for each case. These strategies should be implemented both before and after the emergency (NETP, 2023). This is similar in the manner mobile phones are utilized in Nsanje District before disasters such as floods. The communities receive messages on environmental restoration and disaster preparedness, response and disaster recovery.

3.6 Critical Discussion Using E-Agri Theory

This study adopted E-Agri Theory which is a technological-led communication theory with the following principles: “*adoption and needs*” (Singhal et al., 2011); “*diffusion and extension*” (Abdulai & Huffman 2005); “*output and impact*” (Kashem, 2010), and finally “*sustainability and foresight analysis*” (Heeks, 2006).

3.6.1 Adoption and Needs

“Adoption and needs” as a theoretical principle of E-Agri Theory illuminates the reasons technology, such as (mobile phones) was adopted in Nsanje District. For instance, the utilisation of mobile phones was motivated by the need for poor households and communities to use mobile phones as ICT for development initiatives for the sharing of climate and disaster information (Singhal et al., 2011), which affects agricultural activities which is the main source of livelihood in Malawi (Nsanje District), and other developing countries. More precisely, innovations such as mobile

phones have both social values and individual payoffs and they facilitate the dissemination of development information. For example, in the findings above indicate apart from sharing climate and disaster information, mobile phones are also used to disseminate messages about cash transfers (*Mtukula Pakhomo*); village banking; receive information about agriculture, such as subsidy programs; information about health such WASH; information about education. i.e. girl child education; and general personal messages about funeral sicknesses weddings, and related events in the communities.

3.6.2 Diffusion and Extension

The study revealed that apart from using mobile phones to share climate and disaster information, mobile phones are also used to share information about WASH, the Agriculture Subsidy Programme, *Mtukula Pakhomo* - a social cashier transfer programme and other community engagement. Such findings confirm the theory used, which E-Agri Theory. Hosman (2010) argues that to successfully use mobile technology in aiding development efforts there is a need to fully understand the impact of mobile phone diffusion, adoption, perceived impacts, uses, and reinvention of uses.

3.6.3 Output And Impact: Benefits and Expected Behaviour

The study established that the effects of using mobile phones in dissemination of climate and disaster information is manifested through mitigation efforts such as restoration of the environment through tree replanting; Preparedness' efforts such as construction of home structures that could withstand floods; and timely efforts on response and recovery characterized by minimal loss of life and property during floods. For instance, in Nsanje district, evacuation centres are identified way before disasters and *response* and *recovery* resources such safety boots, ropes, torches e.t.c are kept at

designated places within communities and among civil protection committees members. More importantly, the findings reveal paybacks and effects of the use of mobile phones in the dissemination of climate and disaster information through the illumination of one the principles of the theoretical framework employed namely, the “*Output and Impact*” of E-Agri theory. The principle entails benefits and expected behaviors among community members upon exposure to mobile phones and messages disseminated (Kashem, 2010).

The findings also confirm the study by Samarajiva and Waidyanatha (2008) who evaluated mobile phone technologies in Sri Lanka and concluded that mobile phones are reliable, effective, and affordable solutions for alerting last-mile communities. Samarajiva and Waidyanatha (2008) posit that disaster risk reduction can be improved using mobile applications and leverage the explosive diffusion of technology even among the poor in developing countries. Similarly, a large body of research has examined the emergence of mobile phones in the developing world as well as their impact on various aspects of economic activity. For example, researchers have examined the use of mobile phones in developing countries to assist farmers’ marketing decisions (Tadesse and Bahiigwa, 2015) Muto and Yamano (2009), mobile banking (Donner and Tellez, 2008), and the adoption of agricultural technology (Kiiza and Pederson, 2012).

The results of this research are also consistent with conclusions made in the study by Mittal et al (2010), conducted on the impact of mobile phones on the crop sector and particularly on small farmers in India. The study revealed that mobile phones can act as a catalyst to rejuvenate the collapsing extension services in the country. In other words, E-agriculture initiatives connect the farmer and other stakeholders effectively in

the value chain, to strengthen the local agricultural system and improve productivity for everyone in the agriculture value chain including small farmers. It provides a unique opportunity to support small farmers in developing countries and potentially increase food security, create jobs, and support long-term economic growth. Similarly, mobile phones are used in Nsanje District to share information about climate and disaster information to avert the effects of floods recurrent in the district, which adversely impact agriculture, which is a main source of livelihood among small-holder farmers.

Further, the theoretical framework adopted corresponds to the pattern of the “information needs” required in the disaster management cycle, which is considered a recurring event with four phases, namely: *Mitigation, Preparedness, Response, and Recovery*. In other words, E-Agri Theory which was applied in the agriculture business model has a cycle or phases similar to disaster management (Mittal et.al, 2010; p5). More also, Malawi’s economy is agriculture based and floods that *Nsanje* District experiences, impact negatively on the livelihoods of the community members.

3.7 Chapter Summary

The study investigated how mobile phones are utilised in disseminating climate change and disaster information as a way of mitigating the impact associated with floods experienced in lakeshore and lower shire districts, specifically in *Nsanje* District. The study established that apart from sharing messages about climate change and disasters mobile phones are also used to exchange other development messages on education, agriculture, health, and governance issues, just to mention but a few.

CHAPTER FOUR

AVAILABILITY AND OWNERSHIP OF MOBILE PHONES FOR THE DISSEMINATION OF CLIMATE AND DISASTER INFORMATION IN NSANJE DISTRICT

4.1 Introduction

In this chapter, I present findings relating to the availability and ownership of mobile phones for disaster information. I will report on three areas; namely availability and ownership of phones by ordinary villagers; the availability and ownership of phones by local officials, and the availability and ownership by people from the different intervention agencies. This study adopted E-Agri Theory which is technological-led communication theory with principles such as: “*adoption and needs*” (Singhal et al., 2011); “*diffusion and extension*” (Abdulai & Huffman 2005); “*output and impact*” (Kashem, 2010), and finally “*sustainability and foresight analysis*” (Heeks, 2006). The aim of the study was to investigate the utilisation of mobile phones in sharing climate change and disaster information in Nsanje District.

4.2 Availability and Ownership of Phones By Ordinary Villagers

In the investigation of the availability and access to mobile phones that are used to share climate and disaster information in Nsanje District, a number of interesting responses came about. For instance, a member of the Village Civil Protection Committee Members said:

Many households have mobile phones that they bought after selling their farm produce. Mobile phones that are used for the dissemination of

climate and disaster information are owned by Village Civil Protection Committee members, River gauge readers, Area Civil Protection Members, Village headmen, Group Headmen , and Traditional Authorities. These are the community members who coordinate the sharing of climate and disaster information. (ACPC Secretary, TA Makoko- 13/09/2022)

The same was confirmed by Gauge Reader from TA Tengani, who said:

As River Gauge Readers we also have mobile phones that we use to disseminate information about water levels in the Shire River and send messages to our fellow river gauge readers in the lower Shire. Apart from River Gauge Readers, local chiefs, VCPC members traditional authorities are some of the members that are part of Civil Protection Committee members that have mobile phones that receive information about climate and disaster information, especially, early warning signs. (River Gauge Reader- *Hydrologist*: Chisi Vg 2- TA Tengani- 13/09/2022)

It is clear that while villagers do have their own mobile phones, the job of disseminating information on floods seems to fall squarely on the official phones provided for the purpose, in the main.

4.3 Availability and Ownership of Phones By Local Officials

Further, commenting on the availability and ownership of mobile phones, ACPC Chair Lady said:

All Civil Protection Committee members own mobile phones that they use to share information about weather forecasts, and early warning

systems. For instance, once MET department sends messages through the District Civil Protection Committee which, sends such messages to Area Civil Protection Committees, who in turn pass such information to Village Civil Protection Committee members who finally share it with the rest of the members in the villages through Group and Village Headmen. Similarly, feedback from local communities passes through the village, area, and finally to the district council protection committees. (ACPC Chairlady- TA Makoko- 14-09/2022)

Similarly, one member of the development partners involved in the floods and disasters management on the availability and ownership of mobile phones said:

Phones that are used for the dissemination of climate and disaster information are owned by Village Civil Protection Committee members, River gauge readers, Area Civil Protection Members, Village headmen, Group Headmen, and Traditional Authorities. These local leaders are the ones who have the responsibility of sharing climate and disaster from one level to another including village level, traditional, and district levels. (Churches Action in Relief and Development-CARD *Official*- 15/09/2022)

4.4 Availability and Ownership of Phones By Officials From Agencies

Further search indicated more insights on the availability and ownership of phones by officials from development partners themselves:

Our organisations provide such phones specifically for sharing climate and disaster information that are used before, during, and after floods. These institutions are the ones that had or have interventions in disaster

management in Nsanje. These include, Goal Malawi (which winded up their project on floods in Nsanje), CARD, COOPI, and Red Cross. (COOPI, Project Officer5/09/2022)

4.5 Sources Of Mobile Phones And The Kinds Of Phones

But taking the debate further, the study turned to investigate more on sources and kinds of phones that were available during disasters.

4.5.1 Source 1 of Mobile Phones

Talking to one of the River Gauge Readers from *Chisi* Village Civil Protection Committee in TA Tengani, Nsanje District said:

Mafoni Ambiri Omwe Tikugwiritsa Ntchito Tinagula Tokha Ndi Ndalama Zathu Zochokera Muulimi. Ndipo Simafoni Amakono, Pakanakhala Mwayi Wamafoni Amakonowa, Smartphone) Ndiye Bwenzi Ziri Bwino Chifukwa Utha Kumangotumiza Zithunzi Anthu Ndikuona Okha... *(Most of the phones that we use as village civil protection committee members were bought by ourselves through the money we get through farming and other businesses. They are not ideal as we normally use keypad-based phones. We prefer smartphones as they can send images that are easy to interpret and they also motivate action during floods).* (River Gauge Readers, *Chisi* Village Civil Protection Committee in TA Tengani, Nsanje District- 13/09/2022)

Commenting on the source of the phones used ACPC secretary for TA Tengani said:

Mostly our local people who coordinate the sharing of climate and disaster information buy their own phones after selling their farming

produce as Nsanje is very fertile and agribusiness is very common, No wonder we are troubled with losses of lives and property as farming along Shire River is the main economic activity among households... (ACPC secretary for TA Tengani-13-09-2022)

While this points to the fact that local people use their own phones, it was established that village civil protection committees, and traditional leaders received *Smartphones* from development partners such as COOPI, Goal Malawi and CARD especially area and district civil protection committees' members who coordinate the dissemination of information at the district and traditional authority level (TAs). This was confirmed by COOPI project Officer that I talked to who said:

Like in the districts of Nsanje and Chikhwawa most people buy their phones and some receive the phones from development partners that are implementing interventions on disaster management and some receive these phones from DoDMA which is a government agency responsible for disaster management. (COOPI Project Officer, Nsanje-15/09/2022)

Further, when I interviewed the District Civil Protection Committee member, he said:

These phones are given to a few members of ACPC and VCPC by our development partners such as Red Cross, CARD, and COOPI who support these community structures that are formed to respond to issues of climate change and disasters and these phones are usually meant to be used as a community resource not individual... (DCPC, Nsanje-15-09-2022)

So, on sources of the phones, it is clear that people source them from their own resources, apart from the leaders being given smartphones meant for the project from

project partners. But also from the above, it can be safely said that there are two major types or kinds of phones: *Smartphones* and *Keypad-based* phones (non-smartphones).

4.6 Critical Discussion

This study was informed by E-Agri Theory which is a technological-led communication theory. The principles underpinning this theory include: “*adoption and needs*” (Singhal et al., 2011); “*diffusion and extension*” (Abdulai & Huffman 2005); “*output and impact*” (Kashem, 2010), and finally “*sustainability and foresight analysis*” (Heeks, 2006).

4.6.1 Diffusion and Extension

The process of dissemination of climate and disaster information such as floods requires availability of the mobile phones as a resource in the Nsanje district. This involves understanding how some technologies like mobile phones have spread across communities that are prone to disasters. For instance, in Nsanje District mobile phones are available and owned by civil protection committees that are used in sharing disaster information during floods such as rescue missions and audits about losses during floods. Hosman (2010) argues that to successfully use mobile technology in aiding development efforts there is a need to fully understand the impact of mobile phone diffusion, adoption, perceived impacts, uses, and reinvention of uses.

For instance, Digital Malawi (2021), reveals that there were 8.27 million mobile connections in Malawi in January 2021. Further, the number of mobile connections in Malawi increased by 74 thousand (+0.9%) between January 2020 and January 2021. The number of mobile connections in Malawi in January 2021 was equivalent to 42.7% of the total population. As many people have more than one mobile connection, figures

for mobile connections may exceed 100% of the total population. This entails access to innovations such as mobile phones that are utilized in the dissemination of climate and disaster information in Nsanje District, one of the disaster-prone areas, which currently has two Cellular Networks operating within Nsanje District namely; Airtel Malawi and Telekom Networks Malawi (TNM). Together they cover 70% of the District according to Malawi Government: Nsanje District Council Socio-Economic Profile 2017 – 2022. And by 2018 the population in Nsanje was about 299, 168 and mobile phone access was about 51% at the household level entailing that about 150,000 people had had ownership and access to mobile phone usage (PHC, 2018).

These findings are also consistent with the theoretical framework used. For instance, one of the principles of E-Agri Theory: “*diffusion and extension*” (Abdulai & Huffman 2005) posits that the availability of mobile phones in communities in developing countries enhances “connectedness” for a common purpose. For example, civil protection committee members that coordinate the sharing of climate and disaster information use mobile phones to share information about climate change and disasters such as floods that are common in Nsanje district. Further, the discovery that there is an inconsistent supply of resources among civil protection committee members such as uneven distribution of mobile phones and ownership; as well as the lack of social support (such as training for ICT skills for mobile phones for the dissemination of climate and disaster information) reflects this principle of the study’s theoretical framework which discusses “access and ownership” as equally fundamental in the dissemination of climate and disaster information (Heeks,2006).

For instance, According to Digital Skills Ecosystem and Gap Assessment in Malawi Final Report (2021) indicates that Network Readiness Index 2019, ranks Malawi 117th

among the 121 countries studied on the application and impact of ICT in economies around the world. The indicators also suggest a low rate of user adoption of smartphones and their mobile apps (social network and business apps), which equally affects Nsanje District. It is ranked 121 on indicator measuring mobile app development ecosystem.

Additionally, more than half of households in Malawi had a mobile phone while 16.4% had access to the Internet. Access to the internet was highest in the Southern region (23.2%) including Nsanje district where the study was conducted while a higher percentage of households in the northern region had mobile phones. More also the internet penetration stands very low at 15% (approximately 2.81 million users) as of Currently, 45% of the population has obtained mobile phone connections with close to 8.58 million users (Digital, 2020). Internet and mobile phone connection in Malawi have witnessed a 10% and 12% increase in 2020 as compared to 2019 (Digital, 2020). Igunza (2015) notes that low penetration of internet and mobile connections is a challenge that is further intensified by lack of affordability of internet and ICT infrastructure and tools. NRI 2019 ranked Malawi 118th on the affordability of mobile tariffs, being one of the most expensive countries with respect to the cost of mobile services. In Malawi, mobile phone expenses in a month account for almost half of an individual's average monthly salary.

4.6.2 Output and impact

Availability and access to disaster information through mobile phones mitigate the impact of climate change on the growth of agricultural productivity in the Nsanje district and the rapid growth of mobile phones and mobile-enabled information services provides a means to overcome existing information unevenness, and also partially

bridges the gap between the delivery and availability of climate and disaster information (Mittal et.al 2010). For instance, in *Nsanje* District findings revealed that mobile phones are possessed by Civil protection committees at village, traditional authority, and district levels provide information about early warning signs before and during floods to inform preparedness and rescue missions. This is consistent with one of the principles E-Agri Theory “*Output and Impact*” which the study adopted and entails the benefits of mobile phones in developmental efforts including disaster management (Kashem, 2010), as it is the case in *Nsanje* district where phones are being used because of their benefits in sharing information including that of climate and disasters. Such benefits include real time, imagery appeal that influence timely response during floods.

4.6.3 Sustainability and Foresight Analysis

The use of mobile phones in the dissemination of climate and disaster information is also associated with preference and efficiency issues. For instance, mobile phone users in *Nsanje* district prefer using smartphones instead of non-smart mobile phones because of the facilities in smartphones that send appealing messages including images when sharing climate and disaster information. Additionally, mobile phones fail to function during floods due to power failures. Such findings are consistent with E-Agri Theory used as one of its principles is “*Sustainability and Foresight analysis*”, which provides an understanding of the future trends and the expected outcomes of using mobile phones in development efforts (Heeks, 2006).

4.7 Summary

While there is this positive trend in mobile phone ownership, however, there is an uneven distribution of mobile phones for sharing climate and disaster information in *Nsanje* district. For instance, it was discovered that some use *Key-Pad Mobile Phones*, which are basic and old versions, while others use *Smart Phones*. This disparity, thus,

creates dissatisfaction, poor governance, and poor cohesion in the participation of all key stakeholders in the dissemination of the climate and disaster information as *Village Civil Protection Members* that do not receive donated smartphones are demotivated. The users hinted that they preferred using smartphones because of the imagery appeal, however, the most commonly available are key-pad-based mobile phones which only use voice calls and text-based messages.

CHAPTER FIVE

CHALLENGES AND SOLUTIONS

5.1 Introduction

In this chapter, I will present the challenges associated with the use of mobile phones in the dissemination of climate and disaster information before and during disasters. And as a practice, I will evaluate findings on this objective using the E-Agri Theory, as stated above, with principles of “*adoption and needs*” (Singhal et al., 2011); “*diffusion and extension*” (Abdulai & Huffman 2005); “*output and impact*” (Kashem, 2010), and finally “*sustainability and foresight analysis*” (Heeks, 2006). The aim of the study was to investigate how mobile phones are utilised in the sharing of climate and disaster information.

5.2 Challenges Before Disasters

When I interviewed DCPC members, one of them said that one of challenges is that communities continue sticking to old ways and ignoring early warning systems provided by DoDMA and Weather Centers. For instance, people still construct homes in areas that continuously experience floods. Another challenge is that only a few members of the community receive the ideal phones (Smartphones) for climate and disaster information dissemination.

Similarly, when I talked to the development partner official he added that some members that receive MET messages fail to interpret technical weather forecasts by local-village protection committee members as such some warning messages are not correctly disseminated. There is also lack of ownership and good governance in the

utilization of information centers and gadgets distributed such as phones to support information dissemination. Further, leadership changes in CPCs disturb information dissemination structures as community resources such as mobile phones are not properly accounted for and ended up being used as personal belonging not as community as intended. What is more, one of the local leaders at the area CPC said:

Lack of proper orientation on the effective use of smartphones; Power outages that affect the charging of mobile phones' batteries in communities that utilize community power sources like those found at trading and growth centers; Network challenges due to limited towers for connectivity; and Lack of sustainable support to Civil Protection Committees to properly use mobile phones, provision of airtime are some of the major challenges... (ACPC Secretary, Tengani Extension Area- 13/09/2022)

It can therefore be safely said that before the floods, three challenges stood out, namely: sticking to old ways by local communities, failure to interpret MET messages, and lack of proper orientation of the effective usage of smartphones provided for the purpose of dissemination and receiving of information of floods before disasters.

5.3 Challenges During Floods

During disasters, the use of mobile phones in the dissemination of the situation at hand is also associated with challenges. When I talked to members of DCPC they indicated:

During disasters there is a total breakdown of mobile phone networks due to damaged telecommunication infrastructures; secondly, mobile phones are not functional due to damaged charging sources in trading centers which are mostly used by members of the community. Further,

rescue and safety materials such as life jackets, safety shoes, ropes, etc., are used for personal uses at the expense of the communities to be served; and the transport infrastructure is damaged which affects search and rescue missions.

Similarly, when I talked to COOPI Project Officer, he said:

Some members who receive mobile phones for the task, end up selling them and even going away with them for personal use after being removed from civil protection committees at the end of their tenure as such these phones are not accessible in times of need, compromising the purpose of using these phone during disaster... (COOPI, Nsanje District- 15/09/2022)

What the investigation into challenges of using mobile phones during disasters revealed is the breaking down of the phones, and that at times, the phones were not available because some of the officials would have sold them; secondly, mobile phones are not functional due to damaged charging sources in trading centers which are mostly used by members of the community. This is the case, due to damaged telecommunication and electricity supply infrastructures such as mobile telecommunication towers and ESCOM poles. Further, lack of good governance leads to abuse of community resources meant for mitigation and response causes in the management of disaster such as donated mobile phones and rescues materials like ropes, torches, safety boots e,t.c

5.4 Solutions to Challenges

Respondents suggested solutions to challenges associated with the use of mobile phones, before and during disasters. Some of solutions include that there should be a sufficient supply of mobile phones to all village civil protection committee members.

Additionally, CPC community members must be supplied with smartphones and backup energy sources such as ideal solar panels as power sources. While many local Civil Protection Committee members use Keypad- Based mobile Phones, however, smartphones are more placed for disseminating climate (weather forecasts) and disaster information because of their appeal to reality in real time. Further, weather forecasts should be localized by translating technical weather information into local languages and be shared on communication platforms in simplified versions. Additionally, other technologies such as **drones** should be used alongside mobile phones as they can access unreachable places during disasters for assessment.

When I interviewed Chairlady for Makoko ACPC she said:

I also propose the training of community civil protection committee members on basic operations and apps for smartphones relevant to climate and disaster information dissemination; Orientation on the interpretation of climate and weather information; Training of communities in prone floods in rescue and search missions; Civic education community on disaster preparedness; search and rescue; governance and community participation. Additionally, communities in the lower shire should be encouraged to have permanent homes in the upper land as well as temporary settlements along banks supporting their agricultural activities. (Makoko ACPC Chairlady- 14/09/2022)

COOPI project officer added that:

Government and other development should be decisive in investing heavily in agricultural endeavors because of the abundance of water and fertile soils that are ideal for agricultural activities. Such initiatives could

reduce risk and subsistence agricultural activities common in flood-prone areas, which are not sustainable (cost-benefit analysis). Furthermore resources should be invested to improve robust preparedness which is timely and responsive to disaster there is a need to intensify civic education which emphasizes “preventive measures” through preparedness, integrating indigenous knowledge and early warning systems; Holding community mobilization campaigns, which are branded to emphasise “life first” as a value during disasters; and Conduct community awareness emphasizing community participation and good governance in managing village civil protection committees. (COOPI, Project Officer, Nsanje- 15/09/2022)

5.5 Critical Discussion

5.5.1 Output and Impact: Behaviors and Benefits

The study revealed that upon exposure to messages on disaster preparedness or mitigation, community members are supposed to change their behaviors to mitigate the effects of climate change. For instance, community members are supposed to relocate to the upper land or construct infrastructures that withstand floods when weather forecasts predict floods in disaster-prone areas like Nsanje District. Such findings illuminate the impact of using mobile phones in terms of behavioral change and social benefits. The findings are consistent with “*Output and Impact*” one of the principles of the E-Agri Theory used in this study, which entails the effects of using mobile phones (Kashem, 2010), including expected behaviors after exposure to information about climate change and disasters.

5.5.2 Sustainability and Foresight Analysis: Challenges and Solutions

The study also revealed that the use of mobile phones in the sharing of climate and disaster information is also associated with challenges. For instance, in Nsanje District the use of mobile phones for climate and disaster information is also rocked with challenges (such as poor connectivity, high tariffs, etc.). Such revelations tip stakeholders' future decisions on mobile technology and communication development initiatives in developing countries like Malawi. The findings are consistent with E-Agri Theory used as one of its principles is "*Sustainability and Foresight analysis*", which provides an understanding of the future trends and the expected outcomes of using mobile phones in the dissemination of climate and disaster information. It draws scenarios of potential challenges and benefits due in the future (Heeks, 2006).

Additionally, the study by Harding (2019) titled "Use of Mobile Telephones: Experiences of First Responders in Rural African Communities" highlights some of the challenges encountered with the use of mobile telephones during emergencies. The challenges reiterated as the key impediments to the efficient use of mobile telephones in disaster response in rural African communities included; Inadequate network coverage or weak signals is a significant problem to the use of mobile telephones, as most rural areas do not have robust network coverage, hence mobile phones could not be used in rural areas with the limited or weak network coverage. For instance, Paul et al. (2018) noted that before exploring outstanding challenges and proposing a set of best-practice guidelines, first identify areas where mobile technologies have already been successfully leveraged in DRR. In common with all resilience-building programs, mobiles enable rapid and reliable dissemination of data and information, enabling a more distributed and decentralized web of conversations and information flow. This sits well with a devolved, polycentric approach to DRR.

Moreover, there is sizeable potential for the generation of new social capital by reducing the gap between different communities and bringing together different actors (such as farmers, NGOs, and government organizations) to discuss data collection and capacity-building issues. However, fitting a technology or app to a particular local context is a challenging task; Internet/smartphone access is often variable and costly, which excludes some of the most vulnerable community members (such as women, those with disabilities, and the elderly), who are often the most affected by disasters. The most profound and seemingly intractable bottlenecks revolve around participation. Therefore, consider the most effective strategies for user engagement that support the uptake and enhance the sustainable use of a new app or platform and similarly consider the ethics of data collection and intellectual property rights-IPR (who owns the app, content, data, and generated information?)

Further, according to National Emergency Telecommunications Plan (2023), which stipulates that during the recovery phase, the damage caused to any telecom/ICT networks should be evaluated as a precursor to timely reconstruction and improvement of the damaged infrastructure. This reconstruction should seek, at a minimum, to restore communications to the same condition as they were before the disaster. However, preferably, the ICT infrastructure should be rebuilt using the principle of “building back better”, that is, reconstructing a more resilient infrastructure that can withstand future disasters even better. In other words, It is necessary to maintain the availability of a minimum level of communications for those who carry out damage assessment and reconstruction activities and also establish communication priorities in order to manage available communications resources successfully. Further, the plan alludes that Telecom/ICTs must have the capacity to support the recovery activities in the affected

area after the disaster. These include continuing to transmit relevant information for, among other objectives, updating the public on the emergency on topics like health services, shelter, food, or family reunification.

For instance, according to the initial assessment during the floods in 2019, the challenges experienced related to floods and communication include: delayed detailed assessment due to accessibility in most of the affected areas (in the T/As; *Mlolo, Mbenje, Tengani, Malemia, Chimombo, Ndamera* and *Nyachikadza*, where a total number of 10,125 households were affected by the heavy rains and floods); and additionally, there was no power supply due to load shedding which has made communication difficult with Civil Protection Committees -CPCs and other stakeholders (Nsanje District Council Initial Assessment Report (2019) . This is the same area that I conducted my study as my research study was conducted , in TAs of *Makoko, Tengani, Mbenje* and *Chimombo* in Nsanje District.

5.5.3 Adoption and Needs

The study suggested the use of **drones** during floods as one of the solutions to deal with challenges of communication and accessibility to affected people and areas in the Nsanje district. Thus, the use of drones would help audit damages and lead rescue missions in locations that are not accessible during floods. These findings are consistent with one of the principles of the theoretical framework used, “*Adoption and Needs*” which entails that the adoption of any ICT innovation is motivated by need (Singhal et al., 2011).

5.6 Chapter Summary

Apart from sticking to old ways, failure to interpret MET messages, and lack of proper orientation of the effective usage of mobile phones by local communities, the challenges also expose the "digital divide" between developed countries and developing countries or the south as most of the challenges are rooted in capacity, access, and ICT infrastructures in developing countries.

CHAPTER SIX

CONCLUSION

6.1 Introduction

The main objective of this study was to assess the utilisation of mobile phones in sharing climate and disaster information in Nsanje district since mobile phones have been used to disseminate climate and disaster information in Nsanje District. What motivated this study were the reports that have acknowledged the use of mobile phones in the dissemination of climate and disaster information, however, these reports have not explicitly indicated the mitigation factor that the usage of phones has contributed to reducing the severity of disasters in floods prone areas such as Nsanje. Therefore, the study also investigated the availability and ownership of mobile phones designated for climate and disaster information and finally, challenges associated with the use of mobile phones in the dissemination of climate and disaster information in Nsanje District.

6.2 Use of Mobile Phones

The study explored the way mobile phones are utilised in communicating climate and disaster information. The study revealed that mobile phones are used to disseminate climate and disaster information in the district of *Nsanje*, a flood-prone area. Nsanje District is located in the lower part of the Shire River (an outlet of Lake Malawi, and an inlet of other rivers such as Ruo from Shire Highlands). Before floods, mobile phones disseminate messages on *Disaster Preparedness* through the provision of weather forecasts, early warning systems. Upon exposure on messages the communities

are supposed to carry corrective measures on mitigation, preparedness, response, and recovery. For instance, moving to upper land, and constructing infrastructures that can withstand disasters such as floods as provided in climate advisories. Similarly, putting a response plan in place, in preparation for disaster response and recovery. Further, the communities are expected to prioritise life first during disasters such as floods as cases have been registered where some members of the communities in Nsanje district lost their lives trying to rescue property during floods.

The study also investigated other uses of mobile phones, besides climate and disaster information dissemination. The study revealed that mobile phones also disseminate information about other developmental issues and general social interests of the communities such as weddings, initiation ceremonies, Water, Sanitation and Health- (WASH), education, and Agriculture (subsidy program). Based on this finding it can be concluded that mobile phones are utilised during disasters such as floods. Hence the study investigated the utilisation of mobile phones in the dissemination of climate change and disaster information in *Nsanje* district.

6.3 Availability and Ownership of Mobile Phones during Disasters

The study also investigated the availability and ownership of mobile phones used to share climate and disaster information in *Nsanje*. The study revealed that mobile phones are utilised to disseminate climate and disaster information in the communities of *Nsanje* District. While there is this positive trend in mobile phone ownership, however, there is an uneven distribution of mobile phones for the dissemination of climate and disaster information. For instance, it was discovered that *Key-Pad Mobile Phones*, which are basic and old versions, are personally owned and used by *Village Civil Protection Committee Members*, while, *smartphones*, which are preferred are

mostly used by *Areas Civil Protection Committee Members* (at Traditional Authority Level) and District Civil Protection Committee members and are donated by organisations such as CARD, COOPI, GOAL Malawi, RED CROSS, etc. This disparity, thus, creates dissatisfaction, among key stakeholders in the dissemination of the climate and disaster information as *Village Civil Protection Committee Members* do not receive donated smartphones.

6.4 Challenges and Solutions

The study also assessed the challenges associated with mobile phone usage in the dissemination of climate and disaster information and possible solutions to the challenges. The main findings revealed that connectivity lapses, power outages, destruction of transport infrastructure during disasters disturbing search and rescue missions during disasters, ICT knowledge gaps, and bad governance that discourage participation and consequently affect the sustainability of interventions as major challenges. The respondents suggested capacity challenges can be resolved by the upgrading and expansion of ICT infrastructures, like the expansion of network coverage. Further, suggested that power outages could be resolved by using alternative power sources such as access to solar system power sources.

Appreciation of the findings indicate digital divide among developing countries like Malawi. Further, response and rescue missions are marred by insufficient resources resulting in loss of lives and property during disasters. As such the use of other technological innovations such as drones could be explored and used in the dissemination of climate and disaster information because of their attributes such as the ability to access places that humans can not physically reach during a disaster while remotely controlled where land transport cannot be used as a result of damaged road

systems due to floods. Orientation on ICT innovations usage (mobile phones), orientation on the interpretation of weather forecasts, civic education on disaster preparedness, orientation on good governance, and training on search and rescue missions could also improve the effectiveness and efficiency of using mobile phones in the exchange of climate and disaster information.

6.5 Summary

The study investigated how mobile phones are utilised in disseminating climate change and disaster information as a way of mitigating the impact associated with floods experienced in lakeshore and lower shire districts, specifically in *Nsanje* District. The study established that apart from sharing messages about climate change and disasters mobile phones are also used to exchange other development messages on education, agriculture, health, and governance issues, just to mention but a few. The users hinted that they preferred using smartphones because of the imagery appeal, however, the most commonly available are key-pad-based mobile phones which only use voice calls and text-based messages. The study also established that the effect of using mobile phones in the dissemination of climate and disaster information is manifested through actions carried out by community members in disaster-prone areas on disaster mitigation, preparedness, response, and recovery. The study also revealed some of the challenges associated with the use of mobile phones for various development initiatives, (for poverty alleviation and reduction initiatives). The challenges expose the "digital divide" between developed countries and developing countries or the south as most of the challenges are rooted in capacity, access, and ICT infrastructures in developing countries.

The main thesis for this study therefore, is answering the main study question: *what* and *how* are mobile phones used in disaster-prone areas such as *Nsanje*, and the answer is

that the new technology gets employed during disasters such as floods, even though there are few areas that limit full effectiveness in their utilization such as ownership, types of phones available to most community members and challenges of breaking down of the phones and charging problems.

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APPENDICES

Appendix 1: Data Collection Tools



Interview Guide

Research Title: Mobile Phones and Dissemination of Climate and Disaster Information in *Nsanje* District'

My name is *Mafumu Aubrey Matiki* (a Student) MA in TMCD at the University of Malawi in the (Department of Fine and Performing Arts, Faculty of Humanity). As a student, I am conducting research to investigate mobile phones and the dissemination of Climate and Disaster Information.

Your participation is voluntary and any information you provide during the research will not be attributed to you as an individual and it will be treated as confidential and for academic purposes only. If you agree to respond to the study, then we can proceed with the interview.

A. BIODATA

1. Gender (*Tick*) Male ☐ Female ☐
2. Age
3. Source of livelihood
.....
4. Marital Status (*Tick*) Single ☐ Married ☐ Widowed ☐

Divorced ☐

5. Education Level (*Tick*) Primary ☐ Secondary ☐ University ☐
Adult Learning Education ☐

Objective 1: To examine the way mobile phones are utilized in communicating disasters

Respondents:

- ✓ Civil Protection Committees (District, Area, and Village levels)
- ✓ Local Leaders and Community Members

Questions:

- Explain how mobile phones are used in the dissemination of climate and disaster information in your area.
Explain how mobile phones are used during disasters (such as floods or in extreme weather) in your area.
- Explain specific messages that you receive on your mobile phones about climate and disaster communication.
- What actions are you expected to carry out from the messages that you receive from mobile phones about climate change and disaster information?
- Apart from receiving messages about climate and disaster messages, what other uses do you utilize your mobile phone for?

Objective 2: To investigate the availability and ownership of mobile phones District used for sharing climate and disaster information in *Nsanje*

Respondents:

- ✓ Development Communication Agencies (NGOs)
- ✓ Department of Disaster Management Authority- (DoDMA officers)
- ✓ Civil Protection Committees (District, Area and Village levels)
- ✓ Local Leaders and Community Members

Questions-

- Who owns mobile phones in your area that you use to receive or send climate change and disaster information (Probe)?
- Where do you get the phones that you use to get messages about climate change and disaster information, like floods (Probe)?
- Explain the kind of mobile phones used in the area in the dissemination of climate change and disasters (Probe).

Objective 3: To review challenges associated with sharing information using mobile phones during disasters, especially floods.

Respondents:

- ✓ Development Communication Agencies (NGOs)
- ✓ Department of Disaster Management Authority- (DoDMA officers)
- ✓ Civil Protection Committees (District, Area, and Village levels)
- ✓ Local Leaders and Community Members

Questions:

- What are some of the challenges that you face using mobile phones in the dissemination of climate change and disaster information (Probe)?
- What are some of the challenges that you face using mobile phones during disasters, especially floods?
- In view of the challenges, provide suggestions on how best mobile phones can be utilized in the dissemination of climate and disaster information in the area.

Thank you very much for your responses!



Appendix 2: Interview Guide- Chichewa Version

Research Title: Mobile Phones and Dissemination of Climate and Disaster Information in *Nsanje* District'

INTRODUCTION

My name is *Mafumu Aubrey Matiki* (a Student) MA in TMCD at the University of Malawi in the (Department of Fine and Performing Arts, Faculty of Humanity). As a student, I am conducting research to investigate mobile phones and the dissemination of Climate and Disaster Information.

Your participation is voluntary and any information you provide during the research will not be attributed to you as an individual and it will be treated as confidential and for academic purposes only. If you agree to respond to the study, then we can proceed with the interview.

A. BIO-DATA

1. Gender (*Tick*) Male ☐ Female ☐

2. Age

3. Source of livelihood

.....

4. Marital Status (*Tick*) Single ☐ Married ☐ Widowed ☐
Divorced ☐

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5. Education Level (*Tick*) Primary ☐ Secondary ☐ University ☐
Adult Learning Education ☐

Objective 1- To examine the way mobile phones are utilized in communicating disasters

Respondents:

- ✓ Development Communication Agencies (NGOs)
- ✓ Department of Disaster Management Authority- (DoDMA officers)
- ✓ Civil Protection Committees (District, Area and Village levels)
- ✓ Local Leaders and Community Members

Questions:

- Longosolani mmene mafoni a mmanja akugwiritsiridwa ntchito pogawana mauthenga a zakusintha kwa zanyengo komanso ngozi zogwa mwadzidzidzi, monga kusekukira kwa madzi ndi mphepo zamkhuntho.
-Explain how mobile phones are used in the dissemination of climate and disaster information in your area.
- Longosolani mmene mafoni ammanja amagwiritsiridwa ntchito nthawi yangozi zogwa mwadzidzidzi, monga kusefukira kwa madzi komanso mphepo zamkuntho.
-Explain how mobile phones are used during disasters (such as floods or in extreme weather) in your area.
- Tchulani kapena longosolani tsatanetsatane wamauthenga omwe mumalandira ndikugawana pamafoni anu a mmanja pogawana okhuza kusintha kwa nyengo komanso ngozi zogwa mwadzidzidzi chifukwa chakusintha kwanyengo, monga kusefukira kwa madzi?
-Explain specific messages that you receive on your mobile phones about climate change and disaster information.
- Nanga mauthenga mumalandilawo (okhuza kusintha kwa nyengo ndi ngozi zobwera mwadzidzidzi) amafuna kuti inu muchitepo chani?

-What actions are you expected to carry out from the messages that you receive from mobile phones about climate change and disaster information?

- Kupatulapo kutumiza kapena kulandira mauthenga okhuza kusintha kwa nyengo ndi ngozi zogwa mwa dzidzidziwa, ndi ntchito zina ziti zomwe mumagwiritsa pa foni yanu ya mmanja?

- Apart from receiving messages about climate and disaster messages, what other uses do you utilize your mobile phone for?

Objective 2: To investigate the availability and ownership of mobile phones District used for sharing climate and disaster information in *Nsanje*

Respondents:

- ✓ Development Communication Agencies (NGOs)
- ✓ Department of Disaster Management Authority- (DoDMA officers)
- ✓ Civil Protection Committees (District, Area, and Village levels)
- ✓ Local Leaders and Community Members

Questions-

- Longosolani kuti ndindani ali ndi foni yammanja mudela lino yomwe mumatha kulandira komanso kutumiza uthenga okhuza zanyengo koamnso ngozi zobwera mwadzidzidzi chifukwa chakusintha kwa nyengo (Probe).

-Who owns mobile phones that you use to receive or send climate change and disaster information in your area (Probe)?

- Nanga mafoni a mmanja omwe amagwiritsidwa ntchito pogawana mauthenga akusintha kwanyengo komanso ngozi zobwera mwadzidzidzi chifukwa chakusintha kwa zanyengo, amatengedwa kuti (Probe)?

-Where do they get the phones that you use to get messages about climate change and disaster information, like floods (Probe)?

- Ndimafoni otani omwe amagwiritsidwa ntchito mmdela lino pogawana mauthenga a kusintha kwanyengo ndi ngozi zogwa mwadzidzidzi, monga kusefukira kwa madzi (Probe).

-Explain the kind of mobile phones used in your area in the dissemination of climate change and disasters (Probe).

Objective 3: To review challenges associated with sharing information using mobile phones during disasters, especially floods.

Respondents:

- ✓ Development Communication Agencies (NGOs)
- ✓ Department of Disaster Management Authority- (DoDMA officers)
- ✓ Civil Protection Committees (District, Area, and Village levels)
- ✓ Local Leaders and Community Members

Questions:

- Ndimavuto ati omwe mukukumana nawo pogwiritsa ntchito mafoni a mmanja pogawana mauthenga a kusintha kwanyengo ndi ngozi zogwa mwadzidzidzi, monga kusefukira kwa madzi (Probe).
-What are some of the challenges that you face using mobile phones in the dissemination of climate change and disaster communication (Probe)?
- Komanso Ndimavuto ati omwe mukukumana nawo pogwiritsa ntchito mafoni a mmanja pogawana mauthenga mu nthawi ya ngozi zogwa mwadzidzidzi, monga kusefukira kwa madzi (Probe)?
-What are some of the challenges that you face using mobile phones during disasters, especially floods?
- Polingalira mavuto omwe tikukumana nawo pogwiritsa ntchito mafoni a mmaja pogawana mauthenga adzaku kusintha kwa nyengo komanso ngozi zogwa mwadzidzi... maganizo anu ndiotani kuti mafoni ammanja akhale odalirika/aphindu pogwira ntchito imeneyi mdela lino?
-In view of the challenges, provide suggestions on how best mobile phones can be utilized in the dissemination of climate and disaster information in the area (probe).

Thank you very much for your responses!