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Enhancing community flood resilience in Lusaka's unplanned settlements

A case study of multi-stakeholder perspectives

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Abstract

In Lusaka, 70% of the residents live in unplanned settlements. Here, they are regularly exposed to flooding events which exacerbate existing development challenges and have adverse social and economic impacts. Climate change will likely increase the frequency, magnitude, and variability at which such flooding events occur. Therefore, Lusaka City Council has declared the building of community flood resilience (CFR) in the unplanned settlements a priority. Building CFR needs to be a multistakeholder effort. However, to date, a research gap remains around how different stakeholders 1) define flood resilience and 2) think it could be enhanced. Hence, this research asked 1) *'how do different stakeholders in Lusaka define flood resilience, in terms of a desirable state to be achieved?'*, and 2) *'how could community flood resilience in Kanyama and George be enhanced according to stakeholders?'*. A qualitative multi-method case study was designed to answer these questions and capture multi-stakeholder perspectives. Data was collected by means of nine key informant interviews, a stakeholder workshop with 24 participants, and through participant observation in Lusaka. Secondary data from a community flood experience survey was also analysed. Stakeholders were found to have varying definitions of community flood resilience, some of which align with one or more of the 'three capacities for resilience'. These include the community's 'capacity to resist', 'capacity to absorb and recover' and 'capacity to adapt and transform' in the face of flooding events. The definitions have implications for the types of measures which should be prioritised to enhance CFR in the future, given that financial resources are limited. Community members and stakeholders alike believe that a combination of governance and other measures will be key to enhancing CFR in Lusaka. At the governance level, a shift towards more adaptive governance could help to increase community involvement in the decision-making processes that affect their ability to become more resilient. The community members and stakeholders who were involved in the research are recommended to come together to formulate a common definition of CFR to work towards, and to prioritise measures and changes at the governance level that align with the intended outcomes.

Keywords: Community flood resilience; multi-stakeholder perspective; unplanned settlements; Lusaka; pluvial flooding

Executive Summary

1. Problem definition and research questions

In Lusaka, Zambia's capital city and economic hub, 70% of the population of over 2.5 million inhabitants live in unplanned settlements or 'compounds'. Here, residents are particularly vulnerable to the impacts of floods which are caused by heavy rainfall. This is in part due to the structural inequalities that have pushed them to live in flood-prone settlements where basic services such as safe drinking water and adequate sanitation facilities are lacking. The floods have devastating effects on people's livelihoods because they cause social and economic losses and aggravate health risks, while exacerbating existing development challenges. As climate change intensifies, floods are expected to further increase in variability, frequency, and magnitude. In line with the nationwide goal to become a prosperous and climate-resilient country by 2030, Lusaka City Council (LCC) has, therefore, made it a priority to increase the flood resilience of the communities living in the flood-prone compounds. Yet, research on how the flood resilience of Africa's urban poor can be enhanced amidst a rapidly changing climate remains scarce. One thing, however, is clear. Given that the topic of flood resilience cuts across multiple disciplines and stakeholder mandates, the problem can only be tackled through multi-stakeholder collaboration that includes the affected communities.

Now that flood resilience is rising on the agenda in Lusaka, two significant ambiguities need to be addressed. First, there is a gap in research on what different stakeholders understand by flood resilience. It is important to find out how stakeholders define a resilient system, because these definitions will set the agenda for strategies that need to be implemented to increase CFR. To date, resilience remains a vague concept that researchers and practitioners define in more than 70 different ways in the literature. Second, to work towards implementation, it is important to find out how stakeholders in Lusaka think flood resilience could be enhanced in the unplanned settlements. Literature on the topic has demonstrated that resilience can be increased through structural measures (engineered solutions such as drainage systems), non-structural measures (non-engineered solutions such as early warning SMS systems), and changes at the governance level that support the design and implementation of such solutions.

This thesis aims to address the outlined research gaps by generating context-specific knowledge on how community flood resilience in Lusaka's unplanned settlements is perceived and could be enhanced by capturing multi-stakeholder perspectives on the matter. Two research questions were asked:

1. How do different stakeholders in Lusaka define flood resilience, in terms of a desirable state to be achieved?
2. How could community flood resilience in Kanyama and George be enhanced according to stakeholders?
    a. How could resilience to flood events in Kanyama and George in Lusaka be enhanced in the view of community members?
    b. What governance and other measures could enhance community flood resilience in Lusaka according to other stakeholders?

Additionally, a specific objective of the research was to capture some of the structural inequalities and development challenges that heighten the community's vulnerability to flooding events; as thoroughly understanding these is a crucial step towards enhancing community flood resilience. A flood vulnerability framework for African cities was included in the study to help achieve this objective.

2. Methodology

A qualitative case study of two flood-prone compounds, Kanyama and George, was conducted to answer these questions and address the objective. Data was collected by means of nine semi-structured key informant interviews, a stakeholder discussion session in Lusaka with 24 attendees, and participant observation in Lusaka. The stakeholders included in the research represented six different categories of stakeholders whose involvement in multi-stakeholder adaptation processes and flood resilience building efforts is deemed essential. These included the local government (Lusaka City Council), ministerial departments of the national government (Disaster Mitigation and Management Unit and Zambia Meteorological Department), civil society organisations (People's Process on Housing and Poverty in Zambia and Zambia Homeless and Poor People's Federation), an NGO (Lusaka Water Security Initiative), an international development organisation (German Development Agency) and water service providers (National Water Supply and Sanitation Council and Lusaka Water Supply and Sanitation Company). To include the views of community members from Kanyama and George, secondary data was analysed from a flood experience survey that was conducted among residents of the compounds. The collected data was analysed using a thematic content analysis in the software programme 'NVivo', for which deductive-inductive coding was conducted.

Research question 1 was answered by analysing 24 flood resilience definitions which were collected during the stakeholder discussion. This analysis was informed by the concept of 'capacities of resilience', which originates from social-ecological systems theory. These three capacities describe a community's capacity to 1) resist, 2) absorb and recover, and 3) adapt and transform from a flood.

To answer research question 2, the survey results and key informant interviews were analysed. The findings were organised according to the 'five pillars of urban flood resilience', which this thesis adapted from an existing assessment tool for urban resilience in African cities. The five pillars are 1) community, 2) governance and economy, 3) urban planning, housing, and environment, 4) resilient infrastructure and basic service provision, and 5) disaster risk management. The theories that guided the analysis were 1) the four principles of adaptive governance for resilience (which are a) participation and collaboration, b) polycentric and multi-layered institutions, c) learning and innovation, and d) self-organisation and networks), and 2) the ladder of community participation in decision-making processes. To clearly highlight the community perspective, the community results were presented separately from those of the other stakeholders.

3. Key findings

Stakeholders in Lusaka were found to define flood resilience in a multitude of different ways. Most stakeholders defined flood resilience as the ability of an affected community to deal with a flood before, during, and after it has happened. The definitions indicated that altogether, the stakeholders consider a flood resilient community to have some characteristics of each of the three capacities. In line with the 'capacity to resist', several stakeholders defined a flood resilient community as one that can withstand floods and undertake actions to be less affected by them. In line with the 'capacity to absorb and recover', several stakeholders stressed the importance of communities being able to respond to and recover (quickly) from a flood. Quite a few definitions were centred around the 'capacity to adapt and transform', stressing that a flood-resilient community is one which can cope with floods and harness opportunities that may arise. In the long(er) term, a flood-resilient community can adapt to the impacts of floods and transform, so that community members become less vulnerable to flood impacts.

The wide range of proposed definitions also led to a wide variety of actions being suggested by community members and the other stakeholders. These actions include the implementation of

structural and non-structural measures and the implementation of changes at the governance level. Research question 2a demonstrated that community members from Kanyama and George believe that changes in the domains of all five flood resilience pillars could strengthen their flood resilience. In particular, the community members would like to be more empowered and receive trainings on how to deal with the floods. The community members foresee an active role for Lusaka City Council and other stakeholders to provide more assistance, especially when providing financial help to prepare for, and recover from the floods. Both Kanyama and George are in flood-prone areas that were initially not meant to be inhabited, therefore residents would welcome help with the flood-proofing of their homes, and some would like to be relocated to less flood-prone areas. Almost all community members highlighted the need for stormwater drainage systems to be constructed, as these are mostly lacking in the compounds. Drainage systems also need to be managed better: the few existing drainages are congested with solid waste, which is not consistently being collected. Here, the respondents also foresee an active role for the community in improving solid waste management. Water and sanitation infrastructure should be further improved and flood-proofed to reduce the occurrence of water contamination, which frequently causes waterborne disease outbreaks such as cholera. These outbreaks cause illness and loss of life. Lastly, disaster risk management practices such as early warning systems could be improved by providing community members with timely, easy-to-understand information, along with constructive tips on how to prepare for and deal with floods.

Regarding research question 2b, quite some overlap between the actions that the stakeholders and the community members proposed for the urban flood resilience pillars three, four and five. However, several of the interviewed stakeholders stressed that the key to enhancing CFR lies in further strengthening the community's capacity for self-organisation and strengthening of their relationships with other stakeholders. This would namely enable the community to better communicate their priorities and needs and ensure that they are met. Most interviewees were also confident that changes at the governance level could make a critical contribution to enhancing CFR. These suggested changes align very well with the four key characteristics of adaptive governance. Therefore, a key finding of the thesis is that moving towards more adaptive governance in Lusaka could help to enhance CFR in Lusaka's unplanned settlements. It would also be an important step in the direction of strengthening the community's 'capacity for adaptation and transformation', which multiple stakeholders had alluded to in their definitions of flood resilience under research question 1.

At the governance level, the most crucial change that needs to happen is the strengthening of processes around participation and collaboration. Community involvement in higher-up decision-making processes should be increased and needs to become more genuine. Stakeholder collaboration could also be increased to improve the coordination of actions and more transparent knowledge sharing. The Ward Development Committees, which are the lowest governance structure in Zambia's decentralised governance system, should be strengthened financially and politically because they play a key role in designing and executing plans at the compound level.

4. Conclusions and recommendations

Enhancing CFR in the unplanned settlements of Lusaka is an urgent yet complex challenge, especially given the social vulnerability and structural inequalities which exacerbate residents' exposure to floods. Until now, it was unclear how the affected communities and the different stakeholders who will need to collaborate to enhance CFR define flood resilience, let alone how they think it should or could be implemented. This thesis has offered both an academic and a practical contribution by addressing these research gaps. The findings illustrate that the community members and other stakeholders in Lusaka have nuanced ideas on how CFR could

be enhanced, namely through the implementation of structural and non-structural measures as well as changes at the governance level. A wide range of flood resilience definitions opens the door to achieving different types of flood-resilient futures. It is recommended that the stakeholders who participated in this research come together to work towards a common definition of flood resilience in the future. This will help them to identify what kind of flood-resilient future they would like to work towards. It seems like there is a strong case for achieving a future in which communities can adapt and transform to become more resilient to flood events. A shift towards more adaptive governance in Lusaka could help achieve such adaptation and transformation. The top priority should be to make decision-making processes around CFR-enhancing actions more inclusive for community members, so that they can play a more active role in shaping their flood-resilient future.

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Abbreviations

8NDP	Eighth National Development Plan
AG	Adaptive Governance
CFR	Community Flood Resilience
CRD	Climate Resilient Development
DMMU	Disaster Management and Mitigation Unit
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
FRACTAL	Future Resilience for African Cities and Lands
FRACTAL+	FRACTAL-PLUS (Future Resilience for African Cities and Lands - Participatory climate information distillation for urban flood resilience in Lusaka)
FRG	Flood Risk Governance
FRM	Flood Risk Management
GIZ	German Development Agency
HP	Health Professional
IPCC	Intergovernmental Panel on Climate Change
LCC	Lusaka City Council
LuWSI	Lusaka Water Security Initiative
Met Office	UK Meteorological Office
NBS	Nature-Based Solutions
NPCC	National Policy on Climate Change
NWASCO	National Water and Sanitation Council
SEI	Stockholm Environment Institute
SES	Social-ecological system
UK FCDO	United Kingdom Foreign, Commonwealth & Development Office
UN	United Nations
V2030	Vision 2030
WASH	Water, sanitation, and hygiene
WDC	Ward Development Committee
WGII 6AR	Working Group II 6th Assessment Report
ZMD	Zambia Meteorological Department

1 Introduction

The countries on the African continent have historically contributed only three percent of all global greenhouse gas emissions (Ritchie, 2019; UNEP, 2022). However, despite making a negligible contribution to the causes of the climate crisis, African countries will be disproportionately hard-hit by the impacts of anthropogenic climate change as sub-Saharan Africa is one of the most vulnerable regions to the impacts of climate change (Ruocco et al., 2015; Trisos et al., 2022; UNEP, 2022; United Nations, 2006). Here, high levels of existing vulnerability and low adaptive capacity are being met by increasing levels of exposure to climate change impacts (Dodman et al., 2022; Rawlins & Kalaba, 2020). As the Intergovernmental Panel on Climate Change's (IPCC) recently published Working Group II Sixth Assessment Report (WGII 6AR) highlights, "exposure and vulnerability to climate change in Africa are multi-dimensional with socioeconomic, political and environmental factors intersecting" (Trisos et al., 2022, p.4). Many Southern African countries face a multitude of socioeconomic development and environmental challenges (Rawlins & Kalaba, 2020). These include, but are not limited to, rapid population growth and uncontrolled urbanisation, high levels of poverty and inequality, "regional migration, significant infrastructure deficits, low levels of access to clean water and sanitation, and inefficient food, and energy systems" (Rawlins & Kalaba, 2020, p.2028). Additionally, there is often insufficient (financial) capacity to deal with these problems (Taylor et al., 2021a).

Climate change is amplifying many of these challenges, which are particularly present and concentrated in cities (Rawlins & Kalaba, 2020; Taylor et al., 2021a). Worldwide, there has been a trend towards urbanisation, especially in low- and middle-income countries. By 2050, 70% of the world's population will be living in cities (Beyer et al., 2016; Lupale & Hampwaye, 2019). In sub-Saharan Africa, an estimated 61% of all urban dwellers, constituting roughly 238 million people, currently reside in informal or unplanned settlements (Beyer et al., 2016; United Nations, 2021). Informal settlements are usually densely populated and often contain "houses which are unfit for habitation" (Salami et al., 2017, p.1). These houses are commonly located on dangerous land where security of tenure is lacking, infrastructure is inadequate, and essential services are not supplied (Salami et al., 2017). It is in these settlements that the "vulnerability of urban populations to climate hazards" is amplified (Trisos et al., 2022, p.4), and that climate change impacts interact with- and exacerbate existing development challenges (Seeliger & Turok, 2013; Vincent & Colenbrander, 2018). Therefore, addressing the vulnerability of urban communities to climate change in African cities and especially in unplanned settlements is imperative. This is also reflected by UN Sustainable Development Goal 11, which strives to "make cities and human settlements inclusive, safe, resilient and sustainable" by 2030 (Butterfield et al., 2017, p.19).

The concepts of 'resilience' and 'climate resilient development' (CRD) have gained more attention amidst the increasing awareness that climate change severely hampers sustainable development efforts and the urgent need to future-proof African cities and reduce the vulnerability of those inhabiting them to climate hazards (Dobson et al., 2015; Rodina, 2019; Schipper et al., 2022; Schipper & Pelling, 2006; Seeliger & Turok, 2013; Ziervogel et al., 2017). While resilience can be defined in many ways, the IPCC defines it as "the capacity of social, economic and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganising in ways that maintain their essential function, identity and structure while also maintaining the capacity for adaptation, learning and transformation" (Ara Begum et al., 2022, p.19). CRD leverages the interdependencies that exist between sustainable development and climate action (Schipper et al., 2022).

One African country that has enshrined its ambition of becoming climate resilient in several national policies and plans is the Republic of Zambia, hereinafter referred to as Zambia. The goal

of becoming climate-resilient has been anchored in the National Long-Term Vision for 2030 (V2030), the Eighth National Development Plan (8NDP), and the National Policy on Climate Change (NPCC) (Ministry of Finance and National Planning, 2022; Ministry of National Development Planning & Ministry of Lands, Natural Resources and Environmental Protection, 2016; Republic of Zambia, 2006). By 2030, Zambia aspires to become "a strong, dynamic, competitive and self-sustaining middle-income industrial nation, which is *resilient* to external shocks and provides opportunities for improving the wellbeing of all" (Ministry of Finance and National Planning, 2022, p.28).

One of the 'external shocks' that Zambia needs to become more resilient to is the natural hazard of flooding, specifically pluvial flooding (Nchito, 2007). Pluvial floods are caused by rainfall events that release too much water for a system's natural and/or engineered drainage systems to take up in a short amount of time (Dodman et al., 2022; Lucas, 2020; Rosenzweig et al., 2018). Across Southern Africa, Zambia included, the IPCC expects with high confidence that the "frequency and intensity of heavy rainfall events will increase", which will cause the risk and intensity of pluvial flooding events to increase (Trisos et al., 2022, p.6). Already today, floods account for 43% of global natural disasters and affect more people than any other natural hazard (Mehryar & Surminski, 2021; Wang et al., 2021). Between 1995 to 2005, 2.3 billion people were affected by floods, which is almost one third of the world's population (Fu et al., 2020). These floods caused more than 662 billion US dollars in economic losses, negatively impacting livelihoods around the globe (Fu et al., 2020; Hochrainer-Stigler et al., 2021).

Within Zambia, the capital city of Lusaka deserves special attention when it comes to pluvial flooding (FCFA, 2016). In Lusaka pluvial flooding already occurs quite regularly at present, mainly in the rainy season which lasts from November to April (Nchito, 2007; Pilli-Sihvola & Väätäinen-Chimpuku, 2016). Climate scientists have recently been able to make more localised predictions for Lusaka, which are supposed to provide a more accurate prediction of future climate change impacts and climate risks than global and national-level climate models (Jack et al., 2016; Jack, 2022). These predictions indicate a likely increase in pluvial flood risk in the future because heavy rainfall events are predicted to increase in variability, frequency, and intensity as the impacts of climate change worsen[1] (FCFA, 2016; Nchito, 2007; Nchito et al., 2018). The models also demonstrated "that flooding will be an ongoing issue even if current drainage plans are implemented, with projections of more intense rainfall over the 21st century, pointing to the need for more holistic and long-term solutions" (Jack, 2022, para 7). Climate change projections of course bear a degree of uncertainty, and all in all, there is still a high level of uncertainty about what future levels of risk can be anticipated in Lusaka, and what levels of risk communities need to become resilient to (Jack et al., 2016; Muñoz-Erickson et al., 2021; Vincent & Conway, 2021). However, pluvial flooding is already a risk at present. Therefore, even though the magnitude of action that needs to be undertaken is still unclear, the precautionary principle makes a strong case for enhancing the flood resilience of communities in the unplanned settlements up from the current level.

Lusaka is Zambia's largest city and continues to grow rapidly (Lusaka City Council, 2022; Pilli-Sihvola & Väätäinen-Chimpuku, 2016). Of Lusaka's 2.5 million inhabitants, 70% live in unplanned peri-urban settlements, or so-called 'compounds' (Grönwall et al., 2010; Lupale & Hampwaye, 2019; Nchito, 2007; Nchito et al., 2018; Taylor et al., 2021b). Some of the compounds, such as Kanyama and George, are particularly flood-prone due to their low-lying locations near or within flood risk areas such as floodplains and wetlands (Grönwall et al., 2010; Nchito et al., 2018; Phiri, 2014). In the compounds, people's vulnerability to the flood events is elevated by poor water,

[1] Some modeling was recently done by the FRACTAL+ project, which is introduced in Section 1.4. Unfortunately, these models are not available yet as they have yet to be published.

sanitation, and hygiene (WASH) conditions; poverty; inadequate housing quality; a lack of stormwater drainage systems; and insufficient waste management (Nchito et al., 2018; Siachoono, 2013; Taylor et al., 2021b). Therefore, the flooding events disproportionately affect their livelihoods, causing water-borne disease outbreaks such as typhoid fever and cholera epidemics; morbidity and mortality; displacement; economic and social livelihood disruption; and damage to homes and infrastructure (Dodman et al., 2022; FCFA, 2016; Grönwall et al., 2010; Mashi et al., 2020; Taylor et al., 2021b). Thus, there exists a strong and urgent case for building the flood resilience, reducing the vulnerability, and increasing the adaptive capacity of the communities who live in Lusaka's flood-prone compounds.

1.1 Problem definition

Considering the urgent need to increase community flood resilience (CFR) in the unplanned settlements, Lusaka City Council (LCC) has made the building of flood resilience a policy priority in Lusaka (Nchito et al., 2018; FCFA, 2016; Jack, 2022). This priority has been carved out during previous work under the 'Future Resilience for African Cities and Lands' (FRACTAL) project (FRACTAL, 2017; Jack, 2022; Nchito et al., 2018). In earlier FRACTAL engagements, community representatives and other stakeholders working in and on governance, flooding, water, sustainable development, urban planning, and health in Lusaka came together. They decided that in the light of future climate change predictions and current socioeconomic development challenges, the building of flood resilience should receive more attention (FCFA, 2016; FRACTAL, 2017; Jack, 2022; Jones, 2018; Nchito et al., 2018; Mwalukanga & Daka, 2017).

However, now that the agenda has been set, there remains ambiguity and a research gap around 1) what stakeholders understand under 'flood resilience' and 2) how they think flood resilience in the unplanned settlements can be enhanced in the future. In relation to these questions, three gaps have been identified in the literature which this thesis addresses:

1. First, there is a need to understand perceptions of flood resilience in the Lusaka context, because only a context-specific definition can lead to context-specific solutions (Rawlins & Kalaba, 2020).
2. Second, based on a context-specific understanding of flood resilience, there is a need to start planning for the implementation of the concept by identifying measures that could potentially be implemented to enhance flood resilience (Bouwer et al., 2021; Djalante et al., 2011).
3. Third, multiple stakeholder views on these two issues need to be captured because realising flood resilience is a multi-stakeholder endeavour. Any individual, group, organisation, or institution who has interests in influencing decisions related to CFR, or who is affected by them can be considered a stakeholder (Cornell, 2006; Golder & Gawler, 2005). It is also important that the voices of affected community members from Kanyama and George are also included (Taeby & Zhang, 2018).

In practical terms, filling these knowledge gaps could help Lusaka City Council, which is responsible for the formulation of Lusaka's new integrated development plan, to understand what 'flood resilience' means to different stakeholders (Jack, 2022; Yiwo et al., 2022). Beyond having the potential to inform policy planning, the research can also provide the stakeholders with an understanding of each other's perceptions of flood resilience. The discussion on flood resilience and climate change adaptation in the city is still in its early stages (Taylor et al., 2021a).

Being a wicked problem that stretches across the science-policy-society interface[2], the flooding issue can only be tackled through multi-stakeholder collaboration (Liberatore, 2001; Sarkki et al., 2020; Taeby & Zhang, 2019). In Lusaka, it has already been established that working towards increased flood resilience should be a multi-stakeholder endeavour, characterised by collaboration among actors who will need to work across institutional silos as well as collaboration with the communities (FCFA, 2016; Fekete et al., 2020; FRACTAL, 2017; Mwalukanga et al., 2017; Ndebele-Murisa et al., 2020). While previous research has highlighted which actors in Lusaka are important (FRACTAL, 2017; Ndebele-Murisa, 2020; Mwalukanga et al., 2017), it remains unknown how these different actors understand flood resilience. As "achieving resilience depends on what we mean by it", this thesis sets out to understand how relevant stakeholders define flood resilience (Fisher, 2015, p.35). This can also "increase understanding between actors" about their mutual definitions of flood resilience, which could be helpful when working towards the common goal of enhancing CFR in the unplanned settlements (Taylor *et al.,* 2021a, p.79; Yiwo et al., 2022). Part of the rationale is also that how a problem is defined will inform what kind of solutions are proposed (Archibald, 2020). While the existing literature recommends a few measures that could be implemented to increase resilience to flooding in Lusaka's unplanned settlements, this list could be enhanced further and enriched by finding out who is in favour of which solutions (Nchito et al., 2018). By including community views on this matter, one can also research whether the solutions that the community would like to see align with those that decision-makers are proposing to implement (van Aalst et al., 2008).

Previous research shows that communities who are empowered to participate in decision-making processes are more likely to feel ownership over measures that are implemented (van Aalst et al., 2008; Yiwo et al., 2022). However, existing literature on resilience building processes highlights that genuine involvement of communities in participatory decision-making processes is still often lacking (Rodina, 2019; van Aalst et al., 2008; Yiwo et al., 2022; Ziervogel et al., 2016a). Hence, it is crucial to research and communicate the views of communities on the matters that affect them most (Rodina, 2019; van Aalst et al., 2008; Yiwo et al., 2022; Ziervogel et al., 2016a).

From an academic perspective, addressing the outlined research gap is critical because for the concept of flood resilience to be applied, it first needs to be defined (Fekete et al., 2020; Hartmann & Jüpner, 2020). While the discussion on the concept of resilience has been flourishing for many years since its first introduction by Holling in 1973, the discussion on resilience to the specific hazard of flooding is relatively recent (Disse et al., 2020; Holling, 1973; Walker et al., 2004). There is an ongoing debate in the literature about what it means for a system to be resilient to flooding (Disse et al., 2020; Hartmann & Jüpner, 2020, p.1). Many different definitions of resilience exist, both inside and outside of the flood risk management (FRM) and flood risk governance (FRG) context (Hartmann & Jüpner, 2020; Holling, 1973; Rodina, 2019). This abundance of definitions can cause confusion when it comes to implementation (Hartmann & Jüpner, 2020).

A definition of flood resilience for Lusaka would need to be context-specific, because "context appropriate adaptation interventions and strategies that respond directly to localised climate change stressors, hazards, and vulnerabilities are critical for the sustainable development of countries like Zambia" (Rawlins & Kalaba, 2020, p.2026). To date, African countries receive much less research funding and as a result also less 'academic attention' than high-income countries in the 'Global North'[3] (Matczak & Hegger, 2021). The following statistics illustrate this well: even though Africa is home to 16.4% of the world's population, the continent only receives 0.8% of annual research and development funding (Hendrix, 2017). This funding discrepancy is reflected

[2] Where society and social, scientific and governance process meet and intersect (Sarkki *et al.,* 2020).
[3] The 'Global North' includes but is not limited to North America, Australia, Europe, Singapore, New Zealand, and other countries.

in the lack of coverage that many African countries receive as compared to the 'Global North' when it comes to climate change adaptation research, and more specifically flood resilience and flood risk governance research (Matczak & Hegger, 2021). This is paradoxical, given the expected disproportionate impacts of flood risk and climate change impacts in many African countries (Matczak & Hegger, 2021). Lastly, because "much of the resilience agenda has been shaped by policies and discourses from the Global North, its applicability for cities of the Global South, particularly African cities, has not been sufficiently addressed" (Ziervogel et al., 2017, p.1). Working on context-specific definitions for Lusaka makes a small start on filling the gaps outlined above.

1.2 Aim and research questions

This research aims to generate context-specific knowledge on how community flood resilience in Lusaka's unplanned settlements is perceived and could be enhanced, by capturing multi-stakeholder perspectives on the matter. Understanding how stakeholders define flood resilience[4] is deemed important because it is expected to inform the types of measures that they propose to build CFR in the future. Simultaneously, the measures that they propose could be considered in future decision-making processes around CFR in Lusaka.

The overarching research question that the thesis aims to answer is: ***How do different stakeholders define flood resilience, and how do they think community flood resilience could be enhanced in Kanyama and George?*** To answer the overarching research question, two research questions have been formulated:

1. How do different stakeholders in Lusaka define flood resilience, in terms of a desirable state to be achieved?
2. How could community flood resilience in Kanyama and George be enhanced according to stakeholders?
    a. How could resilience to flood events in Kanyama and George in Lusaka be enhanced in the view of community members?
    b. What governance and other measures could enhance community flood resilience in Lusaka according to other stakeholders?

In addition, a specific objective of the research is to capture some of the complexities and structural inequalities that heighten the community's vulnerability to flooding events, as understanding these is a crucial step towards enhancing CFR. Chapter 2 addresses this objective. While stakeholders in Lusaka are aware of the context, the knowledge is expected to be useful for those who may be less familiar with the context, such as international development agencies working in Lusaka and external academics working on CFR in other settings.

1.3 Scope and delimitation

The research focuses on the unplanned settlements in Lusaka, as this is where the urgency to strengthen the flood resilience of the resident communities is the highest (Nchito et al., 2007). Two flood-prone unplanned settlements are studied in detail, which are called Kanyama and George (Phiri, 2014). This choice has been made because these two research sites were accessible, and because studying two settlements provides a more nuanced picture than just studying one. A case study design was chosen to accommodate an in-depth description of the case study its context

[4] The rationale behind asking stakeholders to define 'flood resilience' and not specifically 'community flood resilience' is that the former definition is more general. It can therefore be applied to other scales than just the community scale in the future depending on the stakeholders' needs, such as the city scale.

(Yin, 2014). This is crucial, because the resilience and vulnerability of a system cannot be studied without considering its context (Salami et al., 2017; Turner et al., 2003).

The theoretical approach that the thesis takes is rooted in social-ecological systems (SES) theory, which was pioneered by Berkes and Folke (1998). This choice was made because the "relatively recent conceptualisation of flood resilience was inspired in large part by social-ecological systems literature" (Matzcak & Hegger, 2021, p.2). While many different definitions of social-ecological systems have been provided, an SES can be understood as an interlinked and interdependent system in which both societal (humans) and ecological (biophysical) subsystems interact (Colding & Barthel, 2019; Holling, 1973; Walker et al., 2004). This definition is based on the idea "that the delineation between social and ecological systems is artificial and arbitrary" (Folke et al., 2005, p.443). The choice to take a social-ecological approach was made because it lends itself well for studying cities and the urban sustainability challenges that they face, given that people and nature are intricately interlinked and interacting in cities (Colding & Barthel, 2019; Du Plessis, 2008).

The delimitations of the study will be explained by means of five question that are important to answer when studying the resilience of SES (Dewulf et al., 2019; Grasham et al., 2021; Rodina, 2019):

1. **Resilience to what?**
   Given that LCC made flood resilience a priority, this research focuses explicitly on the single hazard of pluvial flooding. In reality Lusaka of course faces multiple hazards and compounding risks, which will likely worsen as climate change intensifies (Dewulf et al., 2019; Dodman et al., 2022; Keating et al., 2017). However, it is expected that some of the measures that this research will identify could also help to build resilience to other hazards.

2. **Resilience of what and of whom?**
   Resilience can be conceptualised at different levels of organisation, from individual, to household, to community resilience, and beyond (Dewulf et al., 2019; Rodina, 2019). This thesis focuses on communities because "the community level is where flood impacts are felt most viscerally, where much action on flood resilience needs to be taken and [which is] the focus of many flood and development activities" (Keating et al., 2017, p.80). Besides being a convenient and popular choice for unit of analysis in the social-ecological systems literature, the community level was also chosen because "there is acceptance that development and disaster preparedness interventions must operate at the level of the relatively small entities that are commonly called 'communities'" (Rodina, 2019; Van Aalst et al., 2008, p.168). The community unit is used while acknowledging that in real life, it is not possible to separate a community from those individuals who constitute it and the broader (city, country, global) context that it is situated in (Dewulf et al., 2019; Keating et al., 2017). It is also acknowledged that communities are no homogeneous group of people, but rather consist of different individuals who might have different lived realities of flooding and differentiated vulnerability levels depending on their gender, education, health, and social capital (Dodman et al., 2022; Taeby & Zhang, 2019). Moreover, Dewulf et al. (2019) raise that after the boundaries of a system have been defined, it needs to be decided what, within that system, must become more resilient or what must be supported to remain resilient. This can be a very political choice, because the (financial) capacity to make every component of a system resilient is often lacking (Dewulf et al., 2019). To address this point, the thesis provides an overview of possible resilience-enhancing measures that actors propose but does not prescribe what specific measures should be implemented.

3. Resilience at what spatial scale?

In urban research, a community can be defined by its administrative boundaries (Keating et al., 2017). This thesis focuses on community resilience within the administrative boundaries of Kanyama and George, and therefore adopts the definition that a community is "a population of a flooded neighbourhood with [a] common geographic boundary" (Bulti et al., 2019, p.4). Therefore, when this thesis hereinafter refers to CFR, it refers to resilience within the communities of Kanyama and George, as defined by their administrative boundaries. The map in Figure 2-1 (Chapter 2) shows the location of the two compounds.

4. Resilience at what temporal scale?

The case study is cross-sectional in design and investigates flood resilience in the future, at no specific time scale. The research was designed around the assumption that any increase in resilience will be helpful as compared to current levels. This choice was made because 1) the city of Lusaka is not yet planning for different specific timescales 2) there is a tension between focusing on the short-term resilience of a system vs. long-term resilience (Dewulf et al., 2019). Short-term resilience is criticized for neglecting 'long-term sustainability', which can cause short-term 'resilience-traps' or resource lock-ins (Dewulf et al., 2019). Long-term resilience is criticised for neglecting daily struggles, and it is difficult to plan for the very long term (30+ years) amidst high uncertainty around the climate scenarios that we need to expect (Dewulf et al., 2019; Trisos et al., 2022). At a later stage, when doing adaptation planning, decision-makers could use the findings as input and match them to timescales which they deem suitable. Lastly, van Aalst et al. (2008) argue that there is value in complementing the use of global climate models with studies of current vulnerability to risks, as planning for future scenarios, no matter at what temporal scale, will always need to be informed by a community's current state of knowledge and experience (van Aalst et al., 2008).

5. Resilience for what purpose?

Dewulf et al. stress that "caution is needed when applying resilience to situations characterised by marginalisation, poverty, and precarity" (2019, p.8). They namely warn that "the risk here is that a focus on increasing the resilience of vulnerable social groups normalises their structural marginalisation and puts the burden of dealing with that situation on the very same vulnerable groups" (Dewulf et al., 2019, p.8). The thesis acknowledges this point and tries to address it within its scope, in three steps. First, by shedding light on the contextual structural inequalities and other root causes that elevate the community's vulnerability (Chapter 2 and 3), the presentation of which is supported by the use of a flood vulnerability framework specific to African cities (Salami et al., 2017). Second, by emphasising that the communities have agency and focusing explicitly on their views in question 2a. Third, by expressing full support for the argument that 'humanitarian resilience' to disasters such as flooding cannot be achieved "in the absence of development resilience" (Dewulf et al., 2019, p.8). Development resilience refers to the ability of an individual or household to avoid poverty even when exposed to different shocks (Dewulf et al., 2019). Efforts to build flood resilience thus cannot succeed on their own. They need to be accompanied by wider resilience-building and sustainable development efforts, which Zambia is expected to pursue as the country aims to become "a prosperous and climate resilient economy by 2030" (Dewulf et al., 2019; Ministry of National Development Planning & Ministry of Lands, Natural Resources and Environmental Protection, 2016, p.9).

Last, it must be emphasised that the thesis aims to capture different stakeholder perspectives. The thesis captured the views of the communities in Kanyama and George; of the local government; of national ministerial departments; of an NGO; a civil society organisation; an international development organisation; academia; and of a water utility. This selection covers the different

categories of stakeholders whose involvement in multi-stakeholder adaptation processes and flood resilience is deemed important (Conde et al., 2005; Edelenbos et al., 2016; FCFA, 2016). Considering the time constrictions and the focus on adding onto existing research, the thesis does, however, not conduct a full stakeholder analysis. Previous research has already identified which stakeholders are important, and what their mandate is, as explained in Chapter 5.1 (FCFA, 2016). The emphasis is on capturing different perspectives, the importance of which has been outlined in Section 1.1. The stakeholders who were interviewed and included in data collection efforts have been selected based on previous work by Stockholm Environment Institute (SEI) and other research institutions in Zambia.

1.4 Cooperation with Stockholm Environment Institute

This research was conducted in collaboration with the SEI Oxford Office on a project called FRACTAL-PLUS (FRACTAL+)[5]. From 2015 to 2021, a project called '**F**uture **R**esilience for **A**frican **C**ities and **L**ands' (FRACTAL) took place. FRACTAL+ was an extension of this project (2021-2022) and focused on '**P**articipatory Climate Information Distillation for Urban Flood Resilience in **Lus**aka'. In a nutshell, the project produced hydro-climate data for Lusaka[6], and brought together different stakeholders to interrogate this data and decide what it means for future adaptation in the city (Jack, 2022). This was done at transdisciplinary and participatory multi-stakeholder workshops called 'Learning Labs' in Lusaka, where different stakeholders worked together in interactive and creative ways to co-create and exchange knowledge (Jack, 2022). A core aim of the FRACTAL+ project was to inform future work and support policy planning for flood resilience in Lusaka.

My research builds on the work done by the FRACTAL+ project. There was no conflict of interest, as I researched my own topic related to the wider project theme. It is thanks to the FRACTAL+ project that I was able to visit Kanyama and George, and that I was able to attend a multi-day Learning Lab in Lusaka. At the Learning Lab, I had the opportunity to interact with stakeholders and to host a short workshop session to collect data[7]. As explained in Chapter 4, the FRACTAL+ project also provided me with secondary data from a community survey, which I analysed.

1.5 Ethical considerations

As clarified in Section 1.4, there were no conflicts of interest at play, and I undertook my own independent research related to the FRACTAL+ project. No one was in the position to influence my analysis and conclusions other than my supervisor. Contributions towards field work costs were received from Central European University (Vienna, Austria) and from the FRACTAL+ project consortium. Besides that, the research was not funded by an external organisation. Throughout the thesis, the ownership of ideas, text and images has been clearly attributed. In line with the IIIEE's copyright policy, written permission to include Figure 2-1 was obtained from the first author of the paper in which the figure was published.

All information of the interviewees and any other persons whose inputs were processed by means of the other data collection methods has been anonymised. During the stay in Lusaka, all people that I spoke with were official 'Learning Lab' participants who all signed informed consent forms before attending. No names were disclosed in the reporting of any results or at any other point of the research. For the key informant interviews that were conducted, participants all received a

[5] FRACTAL-PLUS website: https://www.fractal.org.za/2022/04/29/fractal-plus/

[6] The models could not be included in the thesis as they have not yet officially been published by the UK Meteorological office.

[7] Explained in further detail in Chapter 4 (Research design and methodology)

'consent form and participant information sheet' (see Appendix A) to sign. On this form, they could indicate whether they consented to being identified by the name of their organisation (eight out of nine interviewees consented to this). As all results were anonymised, participants are not expected to suffer any disadvantage or damage from their participation in the study or any harm to their reputation, dignity, or privacy (Creswell & Creswell, 2018). In the consent form and participant information sheet (Appendix A), interviewees were made aware that their participation was voluntary and that they could withdraw from the research until a given time (05.05.2022) without facing any consequences (Creswell & Creswell, 2018). On the form, interviewees could also indicate their preference to receive a copy of the research upon its completion. The consent form also clearly outlined the aims of the thesis project to prevent the unintended raising of expectations of research subjects.

As indicated on the participant consent form, the collected data will be safely stored in a password-protected folder on my iCloud drive for a duration of five years. All names have been removed from the materials in the folder and have been replaced with identification numbers that are stored in a separate password-protected folder, therefore personal identification should not be possible. Since the video recordings from the interviews were destroyed after the written transcripts were created, there is no photo material on the drive that could lead to visual identification.

Reflexivity was important throughout the entire duration of the research process, especially because the topic bridged both sustainability and development research (Kherfi, 2018; Knaggård, 2018). Practicing reflexivity includes reflecting on how one's own background, culture, biases, and experiences may shape one's work as a researcher, including one's interpretation of collected data and the meaning one ascribes to it (Creswell & Creswell, 2018). Empathy was also important throughout the research, especially when listening to stakeholders sharing their perspectives and experiences. During the fieldwork in Lusaka, ethical considerations were also at play. Permission was obtained to take photos in Kanyama and George, and where people are visible in photos, their faces have been blurred to prevent identification.

The research design has been reviewed against the criteria for research requiring an ethics board review at Lund University and has been found not to require a statement from the ethics committee. Nonetheless, ethics approval was obtained for this project outside of Lund University. As detailed in Chapter 4, data for this thesis research was collected through key informant interviews, a stakeholder workshop, and field observations. An ethics application was made to SEI for the key informant interviews, which was approved. The stakeholder workshop was conducted at the two-day FRACTAL+ Learning Lab. All activities at the Learning Lab, including my stakeholder discussion session and the taking of field observations, were covered by the FRACTAL+ ethics proposal, which was approved by the University of Bristol in the UK. Additionally, written permission was granted to analyse secondary data from a community flood experience survey that was conducted by the FRACTAL+ project.

1.6 Audience

Considering the context-specific nature of the case study, the societal actors to whom this thesis is expected to be useful to are stakeholders in Lusaka who are working on flood resilience, climate change adaptation and development. These include Lusaka City Council, international development agencies (such as GIZ), ministerial departments (such as the Disaster Management and Mitigation Unit (DMMU), and the Zambia Meteorological Department (ZMD)), academia (such as the University of Zambia), NGOs, and civil society organisations. There is an expected overlap between the stakeholders who were interviewed and the stakeholders to whom the thesis could be useful.

As Ndebele-Murisa et al. (2020) emphasise, the findings from this thesis could be valuable to other cities in Southern Africa that face comparable contexts and challenges of pluvial flood risk in unplanned settlements. The thesis may also be interesting for academic researchers who are interested in the topic of community flood resilience.

1.7 Outline

Chapter 1 (Introduction) introduces the research topic, the research problem, the research aims and the research questions. In addition, this chapter explains the scope of the research, discusses ethical considerations, and identifies the intended audience.

Chapter 2 (Case study) introduces the case study sites of Kanyama and George compounds, which are embedded in the Lusaka context and the wider Zambian context.

Chapter 3 (Literature review) presents an in-depth literature study and highlights existing gaps in the research field. The conceptual framework is also introduced.

Chapter 4 (Research design and methodology) presents the research design and the methodology that was used for data collection. A brief reflection on reliability and validity is also provided.

Chapter 5 (Results and analysis) provides an intertwined description of the findings and their analysis.

Chapter 6 (Discussion and recommendations for future research) provides an in-depth discussion of the findings, their significance, and their implications. Recommendations for future research are made, and the limitations of the methodological choices are also reflected upon.

Chapter 7 (Conclusions and recommendations) presents the final conclusions and a final summary of the work. Building on these conclusions, several recommendations are made.

Chapter 8 (Summary of the recommendations) provides a concrete overview of the recommendations explained in Chapter 7.

2 Introducing the case study site and country context

As is characteristic for case studies, this chapter provides a 'thick description' of the case study sites Kanyama and George, as well as the Lusaka and Zambia contexts that they are embedded in (Creswell & Creswell, 2018; Geertz, 1973; Schoch, 2020). The chapter provides an understanding of the (contextual) factors that elevate the community's vulnerability and exposure to floods.

2.1 Country context

Zambia is located in Southern Africa (Pilli-Sihvola & Väätäinen-Chimpuku, 2016). The country is landlocked between eight neighbouring countries and has a population of 19.5 million (African Development Bank, 2016; United Nations Population Fund, 2022). Zambia was formerly a British Colony, and English is still the country's main official language even though independence was gained in 1964 (Marten and Kula, 2008). Besides English, the multilingual nation has recognised seven other official national languages (Marten & Kula, 2008).

As outlined in Zambia's official 'Vision 2030' document, the country aspires to develop into "a prosperous middle-income nation by 2030" (Republic of Zambia, 2006, p.6). The World Bank classifies Zambia as a 'lower middle-income country' (Pilli-Sihvola & Väätäinen-Chimpuku, 2016; Sopitshi & van Niekerk, 2015). Contrastingly, the United Nations (UN) classifies Zambia as a 'Least Developed Country' (Pilli-Sihvola & Väätäinen-Chimpuku, 2016). This is because Zambia faces high levels of poverty and income inequality[8], among other sustainable development challenges (Pilli-Sihvola & Väätäinen-Chimpuku, 2016; Sachs et al., 2019; World Bank, 2022b). More than 54% of the population still lives below the poverty line of $1.90 per day (African Development Bank, 2016; Castañeda et al., 2016; Kapenda, 2016).

Zambia's V2030 and 8NDP demonstrate that achieving socio-economic development is high on the political agenda (Republic of Zambia, 2006). However, besides development, another urgent challenge that demands attention in Zambia is climate change (Ministry of National Development Planning & Ministry of Lands, Natural Resources and Environmental Protection, 2016). Table 2-1 provides an overview of Zambia's development and climate change plans and policies. Both the NPCC and the 8NDP stress that climate change is already interacting with- and exacerbating existing development challenges (Rawlins and Kalaba, 2020; Ministry of Finance and National Planning, 2022; Ministry of National Development Planning & Ministry of Lands, Natural Resources and Environmental Protection, 2016). Both the NPCC and the 8NDP also specifically link to flooding, stressing that flooding events have increased in the past and harm livelihoods and the economy. All three documents reflect that thought has been given to the question of how to pursue sustainable development under climate change, and part of the answer is by building resilience. All three documents, the V2030, 8NDP and NPCC, state that they strive to achieve resilience in one way or the other – not directly in relation to flooding but in terms of achieving resilience to external shocks (V2030), making the economy climate-resilient (NPCC) and pursuing CRD pathways (8NDP).

Between 1960-2003, the mean annual temperature in Zambia has already risen by 1.3 °C, twice as much as average global temperatures have risen in the same timeframe (Ministry of National Development Planning & Ministry of Lands, Natural Resources and Environmental Protection, 2016)..In addition, over the past 40 years, an increase in droughts and floods has been observed in Zambia, which have negatively affected livelihoods (Kabechani et al., 2016; Rawlins and Kalaba, 2020). In 2006-2007 for example, extreme floods affected 1.5 million people across the country (FCFA, 2016). The floods occur in the rainy season, which lasts from November to April (Pilli-

[8] Zambia has a Gini coefficient of 0.57 (data from 2015), which is quite high given that a Gini coefficient of 0 means perfect income equality and a Gini coefficient of 1 means total income inequality (World Bank, 2022a).

Sihvola & Väätäinen-Chimpuku, 2016). The rainy season has also become "shorter and more intense" (Kabechani et al., 2016, p.10). All these effects are expected to intensify in the future, with climate change bringing rising temperatures, more frequent and longer droughts, and intensifying precipitation and heavy rainfall events during the rainy season (Kabechani et al., 2016; Ministry of Finance and National Development, 2022; Pilli-Sihvola & Väätäinen-Chimpuku, 2016).

Table 2-1 Zambia's national-level development and climate change policies

Document title	Description and link to resilience	Mentions of flooding
The National Long-Term Vision 2030- 'Vision 2030' (2006-2030)	Zambia strives to become a prosperous middle-income nation by 2030, with "an economy which is competitive, self-sustaining, dynamic and **resilient to any external shocks**" […] and is free from donor dependence" (Republic of Zambia, 2006, p.8).	-
National Policy on Climate Change (>2016)	Zambia wants to become "a prosperous and **climate-resilient** economy by 2030", and resilience building is seen "as an integral part of the development process" (Ministry of National Development Planning & Ministry of Lands, Natural Resources and Environmental Protection, 2016, p.9). To decrease the vulnerability of communities to climate change, adaptation and disaster risk reduction measures should be undertaken to build their climate resilience (Ministry of National Development Planning & Ministry of Lands, Natural Resources and Environmental Protection, 2016, p.13).	**Floods** are already problematic at present, affecting the agricultural sector, worsening access to clean water, disrupting mining activities and causing water-borne disease outbreaks. They are predicted to increase in frequency and intensity in the future (Ministry of National Development Planning & Ministry of Lands, Natural Resources and Environmental Protection, 2016).
Eighth National Development Plan (2022-2026)	The theme of the plan is "socioeconomic transformation for improved livelihoods". Climate **resilience** is integrated throughout the plan, and its importance for socioeconomic development is emphasised (Ministry of Finance and National Planning, 2022, p.29).	Climate variability and climate change are causing **floods** (Ministry of Finance and National Planning, 2022). To increase community resilience, climate-resilient infrastructure should be developed, and disaster risk reduction improved (Ministry of Finance and National Planning, 2022).

Various initiatives and indexes exist that rank countries according to their vulnerability to climate change and their potential to adapt. The Notre Dame Global Adaptation Initiative has ranked Zambia as the 41st most vulnerable country in the world to the impacts of climate change and as the 53rd least-ready country to tackle climate change (Notre Dame Global Adaptation Initiative, 2022; Pilli-Sihvola & Väätäinen-Chimpuku, 2016). Simultaneously, the Global Climate Risk Index, which evaluates the vulnerability and exposure of countries to extreme weather events, has placed Zambia in a lower-risk category relative to other countries (Pilli-Sihvola and Väätäinen-Chimpuku, 2016). These rankings tell a two-fold story. First, "Zambia provides an example of a context where the climate risk is mainly dictated by the societal vulnerability, and not the natural hazard, per se" (Pilli-Sihvola and Väätäinen-Chimpuku, 2016, p.463). Second, "unless prominent vulnerabilities in Zambia are effectively addressed, the country is likely to experience an increasing risk of natural hazards due to its high level of vulnerability and low level of preparedness" (Pilli-Sihvola and Väätäinen-Chimpuku, 2016, p.463). The SES perspective can provide a more detailed picture of societal vulnerability and how resilience-enhancing measures can try to decrease vulnerability. As the social vulnerability is to a large degree influenced by the characteristics and locations of the

unplanned settlements, a more detailed image of the flooding situation within Kanyama and George will now be sketched.

2.2 Introducing Lusaka and Kanyama and George compounds

Figure 2-1 shows a map of Lusaka. Lusaka is Zambia's largest city and one of the fastest growing cities in Southern Africa (Lusaka City Council, 2022; Pilli-Sihvola & Väätäinen-Chimpuku, 2016). As Lupale and Hampwaye summarise, Lusaka "is experiencing many problems relating to urban sprawl, rapid land conversion, unregulated developments and high levels of urban poverty" (2019, p.57). The city's population has rapidly increased in the past years, and the current population of 2.5 million people is expected to almost double by 2035 (Taylor et al., 2021b). This rapid population growth is driven by two factors: 1) a high annual population growth rate of 4.9%, and 2) increasing rural to urban migration that is spurred on by the search for better livelihoods, especially now that climate change and variability are already contributing to poorer agricultural productivity in Zambia's rural areas (Grönwall et al., 2010; Mwalukanga & Daka, 2017; Taylor et al., 2021b).

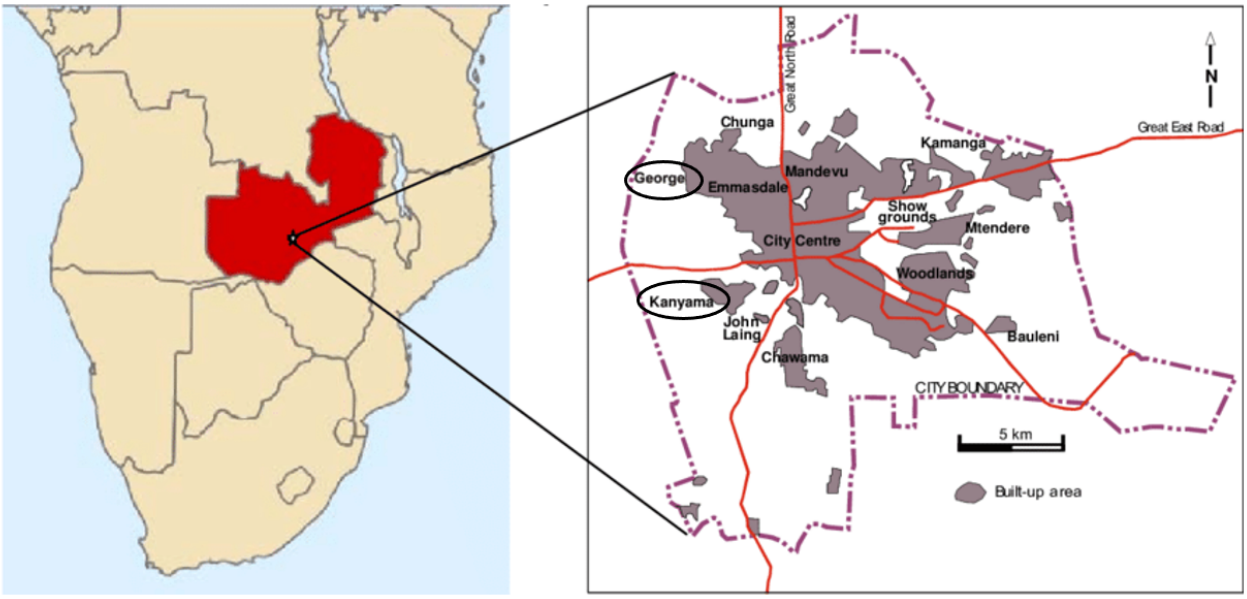


Figure 2-1 Map of Zambia indicating the location of Lusaka (left), and a city map of Lusaka showing the locations of Kanyama and George compounds (right)

Source: Grönwall et al. (2010, p.48). Written permission to use the figure was obtained from the lead author of the article[9], in compliance with IIIEE copyright rules.

In the past, urban planning has not been able to keep up with the rapid population growth, which has led to the 'mushrooming' or proliferation of densely populated informal settlements or 'compounds' around the city (Chitonge & Mfune, 2015; Ndebele-Murisa et al., 2020). According to the UN, informal settlements are characterised by three criteria. First, housing is often non-compliant with building and safety regulations and is constructed in unsafe, "geographically and environmentally hazardous" areas that are unfit for habitation (UN Habitat, 2021, p.6). Second, the settlements lack infrastructure and the provision of basic services such as clean drinking water and waste management because they are not formally recognised by the city (UN Habitat, 2021).

[9] On 29.04.2022, in written form via email correspondence with J. Grönwall

Third, tenants often don't have official tenure security or land ownership rights to the land that they inhabit (Chisola, 2012; UN Habitat, 2021).

Of Lusaka's inhabitants, 70% live in such 'compounds' or 'unplanned settlements' (Nchito et al., 2018; Wragg & Lim, 2015; Taylor et al., 2021b). Lusaka has around 43 compounds, most of which are located in 'peri-urban areas' at the city's geographical periphery (Grönwall et al., 2010; Siachoono, 2013; Wragg & Lim, 2015). Peri-urban areas exist in the transition space between urban and rural areas, often at the edges of cities (European Commission, 2022). This thesis focuses on Kanayama and George compounds as they have both experienced pluvial flooding events in the past and are likely to experience more of it in the future (Jack et al., 2020). As Figure 2-1 shows, Kanyama and George are both located in Lusaka's western peri-urban areas (Wragg & Lim, 2015). They are both for the most part unplanned, high-density settlements. An estimated 170,000 people live in Kanyama (Brinkhoff, 2010), and 70,000 people in George (Urban Poor Fund International, 2013).

Many of the compounds started as informal settlements, including Kanyama and George (Lungu, 2018; Phiri, 2014). Quite a few of the compounds have been legalised and received formal status to pave the way for the provision of services such as waste management and water supply, including Kanyama and George (Lungu, 2018; Phiri, 2014). While the local government, NGOs, and international development agencies such as Care International have undertaken a lot of efforts to improve basic service provision, Kanyama and George still struggle with many of the same issues that they had before they received a formal status. To date, sewerage systems, running water and clean drinking water are lacking, making for an unsafe WASH situation (FCFA, 2016). Residents often build their own sanitation facilities, which are shared by many people (Grönwall et al., 2010). These facilities include hand-dug pit latrines (Grönwall et al., 2010). Floodwater often interacts with human waste from the pit latrines, contaminating groundwater and surface water (Dodman et al., 2022). The large scale, direct exposure of the vulnerable population to contaminated water can cause waterborne disease outbreaks such as cholera (FCFA, 2016; Mwamba et al., 2018; Nyanga et al., 2018). There is a lack of solid waste management, and adequate stormwater drainage system infrastructure is lacking (Dodman et al., 2022; FCFA, 2016; Taylor et al., 2021b).

One factor that majorly increases the exposure of Kanyama and George compounds to flooding events is their location. Lusaka was founded on marshland, and while most of the city receives heavy rain during the rainy season, not all areas flood (Nchito et al., 2018). This is because some areas have been upgraded with stormwater drainage systems. Furthermore, the geological rock profile differs across the city with some neighbourhoods being located on a sloping part of the low-lying Lusaka plateau from which water drains away towards the peri-urban residential areas (Phiri, 2014). A key reason why Kanyama and George are particularly vulnerable to pluvial flooding events is because they are built in unsafe locations that were not meant to become inhabited (FCFA, 2016). Kanyama and George are located on a mix of wetland and marshland areas, parts of which were initially supposed to become farmland (Nchito et al., 2018). The two settlements are located on the flat part of the low-lying plateau (Nchito et al., 2018). Here, the geological profile consists of a layer of highly permeable limestone, which sits on top of a thick layer of impermeable dolomite bedrock (Nchito et al., 2018; Phiri, 2014). Heavy rainfall quickly causes flooding because the permeable upper limestone layer quickly gets saturated, but the impermeability of the bottom rock layer prevents water from being taken up and causes the already-high groundwater table to rise quickly when it rains (Grönwall et al., 2010; Nchito et al., 2018; Phiri, 2014). The groundwater table is quite shallow at 0.5-30m under the surface (Grönwall et al., 2010). The construction of roads and houses in the settlements has hardened the ground surface, making the ground

impermeable, and trapping water in stagnant pools (Phiri, 2014). Moreover, some of the buildings in the settlements are positioned so that they block natural drainage pathways (Phiri, 2014).

Wragg and Lim write that "the city's struggle to provide infrastructure and housing to the majority of its inhabitants is variously blamed on a lack of political will, a badly resourced city council and a centralized planning process but is also rooted in structural inequalities established during the colonial era" (2015, p.262). The last point deserves further elaboration. It is important to stress that the problematic locations and lack of service provision in the compounds are remnants of colonial spatial planning practices which reinforced racial and class segregation (Wragg & Lim, 2015; Myers, 2003). In short, 'high-quality' land on the sloping plateau in the city centre was distributed to British settlers, while locals who were mainly employed as domestic workers, mine workers, and agricultural workers, were pushed to settle on 'poorer quality' land at the outskirts of the rapidly growing city (Wragg & Lim, 2015; Myers, 2003).

In Lusaka, there is a need for localised climate information to improve science-based decision-making in the face of climate change (Daniels et al., 2020). The ZMD faces some limitations in capacity and is therefore being supported by the UK Meteorological Office (Met Office) in providing climate information (Jones, 2018). The Met Office has been providing climate modelling support under the FRACTAL+ project (Jones, 2018). Jack et al. (2020, as cited in Taylor et al., 2021b, p.118) explain that these models predict that "Lusaka will continue to experience wet rainfall seasons with the associated risk of large-scale flooding. Some projections suggest that localised heavy rainfall events might become more frequent and intense". Considering these predictions, flooding has been named a 'burning issue' in Lusaka (Jack et al., 2021). As a result, the conscious choice has been made to focus this research on the single hazard of pluvial flood risk. While watershed considerations within and around Lusaka are not included in the scope of this research, it must be stressed that Lusaka is hydrologically speaking closely interlinked with the surrounding region (Grönwall et al., 2010). The city for example heavily depends on the Kafue River, which is 65km away, for almost half of its industrial and domestic water supply, as well as for a large part of its electricity (FCFA, 2016; Grönwall et al., 2010; WWF Zambia, 2016). Some runoff from Lusaka also drains into streams that enter the Kafue River (Grönwall et al., 2010).

3 Literature review and conceptual framework

This chapter presents the literature review, which is followed by the conceptual frameworks and theories that the research is based on.

3.1 Literature review

The literature review presents the state-of-the-art knowledge about CFR that is of relevance to the research questions. First, CFR is situated in the context of flood risk management. Then, community flood resilience is introduced, and key concepts from the SES literature are explained. Measures for increasing CFR, as well as governance aspects related to CFR are discussed. Lastly, the multistakeholder dimension of CFR is contextualised.

As explained in Chapter 1, Kanyama and George are located at the peri-urban edge of Lusaka. The body of literature on flooding in unplanned settlements has increased in recent years, but still heavily relies on literature dealing with the urban rather than the peri-urban setting (Winter & Karvonen, 2022). It is debatable how applicable resilience literature from the urban setting is to the peri-urban settlement (Winter & Karvonen, 2022). This thesis, therefore, enriches the existing literature by examining peri-urban settlements.

3.1.1 A paradigm shift towards more resilience in dealing with floods

Flood risk management includes "activities of organisation, planning and application that [address] measures for preparing, responding to, and recovering from" floods (Etinay et al., 2018, p.577). Traditionally, FRM focused on managing flood impacts by protecting people from the water, primarily through engineering measures such as dikes, flood walls and drainages, and through reactive measures such as relief programmes (Etinay et al., 2018; Heintz et al., 2012; Karrasch et al., 2021; McClymont et al., 2019; Mulwanda et al., 1993). However, a paradigm shift took place towards a more risk-based approach to flood management that focuses on minimising the negative consequences of flooding on humans and the environment (Heintz et al., 2012; Karrasch et al., 2021; Kuhlicke et al., 2020; McClymont et al., 2019). This paradigm shift happened in part because the strict focus on technical solutions primarily managed the physical components of the system, disregarding the social component of the social-ecological system (McClymont et al., 2019). The paradigm shift towards more reflexive and proactive FRM called for the kind of holistic solutions to manage risk that resilience thinking can help to provide, by not only making changes to the physical but also to the social environment (Karrasch et al., 2021; McClymont et al., 2019). Such measures include active stakeholder participation in FRM and activities that raise people's awareness of how to respond to a flooding event (Karrasch et al., 2021). Conceptualising flooding "as an opportunity for resilience rather than a disaster" paves the way for finding ways to live with the water instead of fighting it, which is useful when preparing for a future characterized by high uncertainty (McClymont et al., 2019, p.1166).

This paradigm shift in FRM was spurred on by a wider paradigm shift that saw disaster risk management (DRM) (which focuses on disaster relief and response) being complemented with disaster risk reduction (DRR), which was articulated in the Sendai Framework for Disaster Risk Reduction to which Zambia is a signatory (Adekola et al., 2020; Azad et al., 2019; Etinay et al., 2018; United Nations, 2015). The Sendai Framework calls upon governments to make the resilience of communities to disaster risk a priority, especially in rapidly urbanising cities such as Lusaka (Dodman et al., 2022, p.17; United Nations, 2015). Researchers can play a role in contributing to this goal by addressing "the need for improved understanding of disaster risk in all its dimensions of exposure, vulnerability and hazard characteristics", and how disaster risk governance for specific hazards like flooding can be strengthened (United Nations, 2015, p.5).

This thesis contributes to these objectives for the case of Lusaka, in particular by using the conceptual framework presented in Chapter 3.2.2.

3.1.2 Introducing and defining community flood resilience

The concept of resilience was pioneered by Holling (1973) in the discipline of ecology but has spread to many other disciplines including FRM (McClymont et al., 2019; Walker et al., 2004). As Fekete et al. illustrate, "resilience is [both] a term and a concept: broad, contested and yet mushrooming" (2020, p.2). There is no single definition of resilience, with more than 70 different definitions existing in the scientific literature (Fisher, 2015; Liao, 2012; McClymont et al., 2019). A concise definition of resilience is "the capacity of a SES to continually change and adapt" (Folke et al., 2010, p.1). In Zambia's NPCC, resilience is defined as "the ability of a system and its component parts to anticipate, absorb, accommodate or recover from the events of the hazardous event in a timely and efficient manner" (Ministry of National Development Planning & Ministry of Lands, Natural Resources and Environmental Protection, 2016, p.vii). This definition contrasts with the IPCC definition of resilience provided on page one, because it does not explicitly refer to the ability of a system to adapt and transform[10]. The CFR definition that this thesis works with has been chosen because it does include these ideas of adaptation and transformation, which feature heavily in recent thinking on flood resilience (Bulti et al., 2019). Community flood resilience (CFR) can be defined as "the ability of a community - and all of its socio-ecological and socio-technical networks across temporal and spatial scales - to maintain or rapidly return to desired functions in the face of flood events, to adapt to change, and to transform systems that affect the current and future adaptive capacity" (Bulti et al., 2019, p.4). A socio-technical network refers to the interaction between human systems and technological systems, for example like early warning systems that transmit flood information to people via mobile phones (Amir, 2018).

Resilience can be understood as a tripartite concept because the SES literature speaks of three capacities that make a system, such as a community, resilient (Alexander et al., 2016; Matczak & Hegger, 2021; McClymont et al., 2019; Walker et al., 2004). The first capacity is the '*capacity to resist*', which refers to the capacity of a system to withstand a flooding event and maintain functionality (Hegger et al., 2016). This capacity originates from the 'engineering' approach to resilience, in which (mostly) engineered solutions help a system to maintain stability amidst a disturbance and be impacted as minimally as possible (Hegger et al., 2016; Matczak & Hegger, 2021). As such, a system is considered resilient when it can 'bounce back' to its original state after a flooding event (McClymont et al., 2019; Meerow & Stults, 2016; Hegger et al., 2016; Rodina, 2019). The second capacity is the *'capacity to absorb and recover',* which is embodied in the resilience definition that is provided in Zambia's NPCC (Hegger et al., 2016; Matczak & Hegger, 2021). This capacity indicates that in the longer term, a system can absorb shocks from flooding events and undergo changes to better cope with them, for example through social learning (Hegger et al., 2016). When a system has the capacity to absorb and recover, it can respond to the flooding event (for example through timely early warning systems) and is able to recover from its impacts (McClymont et al., 2019; Hegger et al., 2016; Matczak & Hegger, 2021). The third capacity is the '*capacity to adapt and transform*', which is reflected in the IPCC definition of resilience. This capacity indicates that a system can 'bounce forward' to transform into a completely new state, in which it is better able to cope with the impacts of flooding events (Hegger et al., 2016; Matczak & Hegger, 2021; McClymont et al., 2019; Meerow & Stults, 2016). The notion of adaptation and transformation embodies the idea that a system can adjust by undertaking deliberate changes and can even learn how to harness opportunities that arise from a flood event (Folke et al., 2010; Hegger et al., 2016).

[10] The IPCC defines resilience as "the capacity of social, economic, and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganising in ways that maintain their essential function, identity and structure while also maintaining the capacity for adaptation, learning and transformation" (Ara Begum et al., 2022, p.19).

A system can be considered resilient if it possesses one or more of the three capacities. However, in recent years, there has been a strong focus on strengthening the capacity of systems such as communities and cities to adapt and transform, given the urgent need to find innovative ways to adapt to climate change and respond to changing risks (Matczak & Hegger, 2021; Rodina, 2019).

To date, "the academic debate on resilience [in flood risk management] is only in its infancy", which also explains why flood resilience in Lusaka has not previously been discussed in the literature (Hartmann & Jüpner, 2020, p.1). The debate is complicated by the many different definitions of resilience that exist – the example definitions from the NPCC and the IPCC demonstrate this. The multitude of resilience definitions can be considered both a virtue and a problem (McClymont et al., 2019). While they provide flexibility, they also cause ambiguity, leading to confusion when different stakeholders are working towards the common goal of enhancing resilience but have different definitions (Hartmann & Jüpner, 2020; Taeby & Zhang, 2019). Indeed, "resilience means different things across scales, sectors and society", which is why "it can only be meaningful from a contextual perspective" (Grasham et al., 2021, p.3). The need for context-specific resilience research and resilience definitions is a point that many authors agree upon, which is why the case study focuses only on Lusaka, and specifically on Kanyama and George (Djalante et al., 2011; Grasham et al., 2021; McClymont et al., 2019; Rawlins & Kalaba, 2020; Yiwo et al., 2022). Furthermore, defining flood resilience is also considered a pre-condition for "successfully implementing it in flood risk management" (Hartmann & Jüpner, 2020, p.2). No research has defined flood resilience in Lusaka to date, and this thesis responds to this gap in research question 1, which collects and analyses flood resilience definitions from multiple stakeholders in Lusaka.

3.1.3 Key concepts for understanding community flood resilience

Several other concepts in the CFR literature are important when it comes to the aim of enhancing resilience (Turner et al., 2003). The first term is 'vulnerability', which refers to the degree to which a community experiences harm when exposed to a flood (Turner et al., 2003). While floods cannot be stopped from happening, "it takes vulnerability for a [flood] to become a disaster" (Island Press & The Kresge Foundation, 2015, p.15). Chapter 2 demonstrated that vulnerability in Kanayama and George is high and has both a biophysical and social dimension (Island Press & The Kresge Foundation, 2015). Often, the phrases of 'increasing resilience' and 'decreasing vulnerability' are used interchangeably, because there is an inverse relationship between the two concepts (Shah et al., 2018). When a community's level of resilience increases, the degree of damage and disturbance that it will suffer from a flood is thought to decrease (Shah et al., 2018). This thesis works with the assumption that reducing the vulnerability of communities is a key aspect of building their resilience.

However, a community's vulnerability to a flood is not merely determined by its level of resilience but also by its level of exposure to flooding, its susceptibility (or 'sensitivity') to flooding, and its coping capacity to deal with flooding (Turner et al., 2003). To fully understand how a community's resilience can be increased, it is also crucial to understand the social and environmental conditions that shape vulnerability by influencing the levels of exposure and susceptibility. Lastly, the concept of 'risk' needs to be discussed. Risk is "the probability and magnitude of consequences after a hazard" (Turner et al., 2003, p.1). As the equations in Figure 3-1 show (Hammer et al., 2019; Turner et al., 2003), risk is a function of exposure and susceptibility to the flood hazard.

1) Flood **risk** = flood **hazard** x **vulnerability** to flooding
2) **Vulnerability** to flooding = **exposure** to flooding x **susceptibility** to flooding
Therefore, 3) Flood **risk** = flood **hazard** x **exposure** to flooding x **susceptibility** to flooding

Figure 3-1 Explaining flood risk in Lusaka as a product of exposure and susceptibility to flooding

Source: Author's own based on Turner et al. (2013) and Hammer et al. (2019)

To build resilience in Kanyama and George, flood risk needs to be reduced so that the communities suffer lower consequences and impacts when flooding events happen (Vincent & Colenbrander, 2018). As explained, a key strategy to reduce flood risk is to reduce vulnerability (Vincent & Colenbrander, 2018). While it is not possible to stop the flooding events from happening, it is possible to help communities to better 'live with the water' (Batica & Gourbesville, 2016; Liao, 2012). Living with the water is easier when a high level of resilience and a low level of vulnerability are achieved, compared to the current situation of high vulnerability and low resilience (Hammer et al., 2019; Turner et al., 2003). Vulnerability can be decreased by increasing the coping and adaptive capacities of the community (Vincent & Colenbrander, 2018). Coping capacity is the ability of a community to withstand floods, and a key assumption of coping capacity is that it increases over time as people are exposed to the same hazard and learn to develop ways to deal with it (Bouwer et al., 2021; Jabeen et al., 2010). Adaptive capacity is the ability of a community to actively undertake adjustments that reduce their vulnerability to flooding events, such as flood-proofing homes (Amoako, 2018; Bouwer et al., 2021; Jabeen et al., 2010). Transformative capacity, on the other hand, is the ability of a community "to recreate the system as a whole" (Bouwer et al., 2021, p.3).

While communities rely on help from other stakeholders to become more resilient, they are often already resourceful on their own in terms of devising diverse strategies to cope with- and adapt to the flood impacts (Turner et al., 2003). Indeed, communities can be described as possessing some level of built-in-resilience consisting of "preventative, impact minimising and economic strategies, asset accumulations, and development of social support networks" that can be deployed to deal with a flood (Heath et al., 2010, p.14; Jabeen et al., 2010). Previous research demonstrated that in peri-urban areas where policy enforcement and regulation by the government is low, as is the case in Lusaka's compounds, residents often pursue their 'own' adaptation options to cope with flooding (Winter & Karvonen, 2022). These can also be described as 'spontaneous' or 'autonomous' adaptation actions, such as the digging of handmade drainages (Winter & Karvonen, 2022). That would be an example of a modification to the physical environment to make sure that rainwater can flow away instead of causing flooding (Jabeen et al., 2010). Physical improvements can also be made to individual houses (Jabeen et al., 2010). Social networks have been shown to be particularly important support networks in unplanned settlements, both in- and outside of times of disaster (Amoako, 2018; Jabeen et al., 2010).

In sum, thinking in terms of vulnerability, hazard, risk, exposure, susceptibility, coping and adaptive capacity can help to identify different ways in which resilience can be enhanced. As will be explained in Chapter 3.2.1, this thesis uses a visual flood vulnerability framework to depict what has just been discussed and apply it to the case of Lusaka.

3.1.4 Flood resilience-enhancing measures

One of the most critical questions related to building CFR in Kanyama and George is of course how resilience can be increased. One strategy is by implementing measures that increase resilience,

for example by reducing vulnerability or strengthening adaptive capacity (Vincent & Colenbrander, 2018). However, there is no straightforward answer as to what measures can help build CFR. It has also been established that measures need to be context specific (Grasham et al., 2021; McClymont et al., 2019; Rawlins & Kalaba, 2020). Since no-one knows the local context better than the communities and other stakeholders in Lusaka, specific ideas for how CFR can be enhanced in Lusaka should be generated based on their perspectives (Djalante et al., 2011; Grasham et al., 2021). Research question 2 has therefore been dedicated to exploring their suggestions how CFR could be enhanced.

While research on CFR has been increasing, "the existing knowledge on [CFR] is highly fragmented" to date (Keating et al., 2014, p.1). In many cities, like Lusaka for example, CFR is still in the 'definition stage', which is the first stage that must be completed before the concept can be operationalised (Balsells et al., 2015; Bulti et al., 2019; Hartmann & Jüpner, 2020). However, existing research has demonstrated that a key assumption when it comes to measures that can strengthen CFR is that a diversified mix of strategies would be most appropriate (Hegger et al., 2016; Huang & Fan, 2020). Such a mix of strategies should contain various measures that are both structural (engineering focused) and non-structural (such as early warning systems) (Meyer et al., 2012; Salami et al., 2017). The diverse measures should address different components of resilience, including social, environmental, institutional, economic, and attitudinal factors (Bulti et al., 2019; Salami et al., 2017). Hegger et al. (2016) argue that measures should address different FRM aspects, such as flood risk prevention (to reduce the community's exposure to flooding, for example through urban planning); structural measures for flood defence (to keep the water away); flood risk mitigation (such as floodproofing homes); flood preparation (early warning systems, evacuation); and flood recovery (flood insurance and home reconstruction).

It must also be mentioned that measures that could increase CRF are often not flood-hazard specific and could therefore help to strengthen resilience to other hazards and sustainable development efforts more broadly (Salami et al., 2017). This becomes particularly clear when looking at different dimensions which are used in flood resilience assessment frameworks (Bulti et al., 2019). One well-known framework that has been developed is the Zurich Alliance Community Flood Resilience Measurement Framework (Campbell et al., 2019; Keating et al., 2017; Zhong et al., 2020). The Zurich framework evaluates sources of resilience according to the categories of 1) human capital (such as knowledge on how to deal with flooding events), 2) social capital (such as social networks), 3) natural capital (such as access to water), 4) physical capital, and 5) financial capital (such as savings) (Keating et al., 2017). Others categorise similar sources of resilience according to slightly different dimensions, such as physical or environmental (such as quality housing), economic (such as financial capacity), social (access to sanitation and health services), attitudinal (access to a social networks) and institutional (early warning systems are in place) (Bulti et al., 2019). Early warning systems can for example be used to warn people about other natural disasters than just floods, and the presence of quality housing, basic levels of sanitation and effective institutional structures are all important for achieving sustainable development. A short note on resilience assessment tools is also in order. Most of these tools are made for and in wealthy nations like the US and Australia, therefore their applicability to other parts of the world, including African cities, remains limited (Bulti et al., 2019). Existing flood resilience frameworks are also critiqued for their failure to capture many of the complexities associated with resilience, which is also one key reason why this study does not focus on measuring flood resilience but rather on understanding it from a qualitative perspective (Bulti et al., 2019).

CFR has become a politicised topic, and therefore, any choice of measures that will be implemented is likely to be political too (Grasham et al., 2021; Hartmann & Jüpner, 2020; Hegger et al., 2016). It is also false to assume that the implementation of resilience-enhancing measures

will (directly) lead to an increase in flood resilience (Hegger et al., 2016). The temporal and spatial scale of measures should also be carefully considered (Turner et al., 2003). Especially the scale at which resilience-enhancing measures are applied must be given due consideration to prevent maladaptation (Grasham et al., 2021). The IPCC defines maladaptation as "actions that lead to increased vulnerability or risk to climate impacts or diminish welfare" (Dodman et al., 2022, p.41). In practice, maladaptation can mean that measures which are implemented in one community cause flooding to increase elsewhere, like when drainage systems are built that are disconnected and lead floodwater to another area (Dodman et al., 2022; Rodina, 2019). The risk of maladaptation can be reduced by including local priorities in the design of solutions (Grasham et al., 2021). The temporal scale is also important for thinking about timelines and preventing the lock-in of unfavourable solutions and resources that might hinder a transformation at a later point (Dornelles et al., 2020).

Previous research has proposed various structural and non-structural measures that could support flood-preparedness in Lusaka (Nchito et al., 2018). These measures address inadequacies in the drainage network, suggest solid waste management improvements, recommend stricter urban planning enforcement, and suggest that stakeholder engagement be strengthened (Nchito et al., 2018). Measures focusing on social processes around resilience that have been put forth in other contexts include the provision of trainings and flood-related education, measures that increase public awareness, the forecasting of flood events, and a well-planned emergency response (Gourbesville, 2012).

3.1.5 Enhancing community flood resilience is a multistakeholder-endeavour

A global shift towards more democratic governance has led to increased attention for the engagement of different stakeholders in decision-making processes (Edelenbos et al., 2016; Rodina, 2019). Indeed, the literature on CFR is unanimous that stakeholder engagement is very important for building CFR, and that bottom-up processes are more conducive to building CFR than top-down processes (Aldunce et al., 2016; Rodina, 2019). There is consensus that building CFR "is a shared responsibility among all stakeholders", that can only be achieved if multiple stakeholders work together (Taeby & Zhang, 2019, p.1). Stakeholder engagement can build legitimacy and increase the quality of decisions, and a key assumption is that a diverse range of actors will be able to tackle problems more effectively (Edelenbos et al., 2016). Power and responsibility should ideally be shared between the national and local government, communities, NGOs, civil society organisations, development agencies, and public and private actors working in the water sector (Amoako, 2018; Conde et al., 2005; Grasham et al., 2021; Rodina, 2019; Seeliger & Turok, 2013). This, however, is easier said than done because stakeholders are unique and might make different decisions based on their perspectives and priorities (Taeby & Zhang, 2019). Multistakeholder participation, in which the 'multi' stands for a diverse range of involved stakeholders, has also been critiqued for its complex, expensive, and resource-consuming nature (Djalante et al., 2011; Djalante, 2012; Edelenbos et al., 2016; Taeby & Zhang, 2019). Other barriers to multistakeholder participation include a lack of institutional support and capacity to undertake stakeholder engagement (Edelenbos et al., 2016).

Community involvement in multi-stakeholder processes is deemed important when it comes to enhancing CFR and adapting to climate change (Conde et al., 2005; Few et al., 2007; Yiwo et al., 2022; Taeby & Zhang, 2019). This is because the community is most impacted by the decisions that are made, and because including the community in decision-making processes can increase ownership over solutions that are implemented, which can increase their success in the long run (Adekola et al., 2020; Taeby & Zhang, 2019; van Aalst et al., 2008). However, it seems that community involvement is not always meaningful, and is sometimes considered as a method to

"get buy-in or social acceptance […] only in later stages of resilience-building, not necessarily in the planning and strategic decision-making ones" (Djalante et al., 2011; Rodina, 2019, p.10). Many 'levels' of community involvement are possible: involvement can range from merely being informed of decisions, to being consulted on paper, to being involved in transdisciplinary knowledge co-exploration and co-production processes (Cornwall, 2008; Daniels et al., 2020; Pretty, 1995). Ambiguity exists around different terms that are being used in relation to stakeholder involvement, which include for example 'collaborative processes' and 'stakeholder 'engagement', which are less passive than stakeholder 'participation' (Edelenbos et al., 2016; Rodina, 2019). While community participation is no silver bullet for increasing CFR, there is consensus that involving communities in the planning and implementation of measures that affect them can help to enhance their CFR (Few et al., 2007; Rodina, 2019). As such, decision-making processes should become more transparent, inclusive, people-centred, collaborative, and flexible (Rodina, 2019; Taeby & Zhang, 2019).

Taeby & Zhang (2019) argue that the first step towards more collaborative decision-making processes is a better understanding of the perceptions that different stakeholders have about CFR. They stress that there is an urgent need for studies that investigate different stakeholder views on CFR, in particular the views of the community (Taeby & Zhang, 2019). This thesis has answered to this call. Furthermore, research on how flood victims in unplanned settlements in African cities think about flood responses remains limited to date (Amoako, 2018). There is also the problem that "existing literature perceives residents in flood-prone informal settlements as politically voiceless, lacking the full knowledge of the dynamics of their vulnerability" (Amoako, 2018, p.950). This thesis aims to challenge this view by including the perspectives of community members in research question 2a.

Moreover, McClymont et al. stress the need for studies that take a bottom-up approach "by focusing on individual perspectives of resilience by those who have experienced flooding" (2019, p.1167). This thesis adopts such a bottom-up approach by investigating local definitions of flood resilience, which allows for proposed CFR-enhancing measures to be studied based on a local understanding of what flood resilience should achieve, rather than from the author's own pre-conceived meaning of what CFR should be (McClymont et al., 2019).

3.1.6 Adaptive governance for enhanced resilience

The word 'governance' refers to "structures and processes by which people in societies make decisions and share power" (Folke et al., 2005, p.444; Torres-Lima et al., 2019). As Bouwer et al. explain, "building resilience at the local government level will require governance which is able to respond to the growing threats of climate-related risks, while transforming the vulnerabilities of the most marginal populations" (2021, p.1). If CFR is to be enhanced in Kanyama and George, it is thus crucial that governance processes are conducive to this cause (Hegger et al. 2016). Governance processes are namely important for how measures are selected, designed, planned, implemented, evaluated, and for deciding who is involved in the processes. Previous research has championed adaptive governance (AG) as an approach that can enhance the resilience of a system to different natural hazards, including flooding (Djalante et al., 2011; Djalante, 2012; Holling, 1978; Sendzimir et al., 2018). The AG framework proposes that enhancing resilience requires, among other factors, inclusive decision-making processes, multistakeholder collaboration, and the distribution of power down to local governance bodies (Djalante et al., 2011). Research on flood risk governance strategies for enhancing resilience argues the same (Driessen et al., 2018; Matzcak & Hegger, 2021). Both adaptive governance and FRG are further explained in Chapter 3.2.3, as they form a crucial part of the conceptual framework.

3.1.7 Introduction to the governance system in Lusaka

The governance system in Lusaka will now be introduced. Zambia has decentralised its governance system based on the idea that local decision-makers are best informed about the problems in their local area, and in the best position to tackle them (Resnick et al., 2019). Lusaka City Council is the local government and chief administrative body for the capital and bears responsibility for infrastructure and service provision in the unplanned settlements (FCFA, 2016; Grönwall et al., 2010; Resnick et al., 2019). Decision-making power has also been distributed down to the settlement level, to units called 'Ward Development Committees' (WDCs) (FCFA, 2016). Each settlement contains one or more 'wards', which are neighbourhoods delineated by size. The WDCs receive funds to involve their communities in the planning and implementation of infrastructure and service provision projects (FCFA, 2016). Besides the LCC and the WDCs, there are many other stakeholders who need to be involved in resilience building and climate change adaptation efforts (FCFA, 2016). Previous research has identified which stakeholders are important when it comes to improving issues that lie at the nexus of water, sustainable development, and climate change, and what their mandate is (FCFA, 2016). A list of these stakeholders is included in Chapter 5.1.

The case study description demonstrated that the flooding problem in Lusaka's peri-urban settlements of Kanyama and George is complex. The flooding problem is more than just an environmental problem – it has strong social, economic, and political dimensions, is rooted in structural inequalities, and interacts with urgent development challenges (Nchito et al., 2018). The limited number of papers and policy briefs that do cover the flooding problem in Lusaka demonstrate that more action is needed to reduce the vulnerability of communities to flooding events, as previous efforts have been unsuccessful in doing so (Nchito, 2007; Nchito et al., 2018; Mulwanda, 1993). In the media, inaction is blamed on poor governance (Lusaka Times, 2010a) and the poor enforcement of (urban planning) laws (IRIN news, 2008). Others argue that solving the problem is the community's responsibility, faulting them for having settled in flood-prone areas (Nchito, 2007). According to Siachoono (2013), the government has demonstrated the political will to act on the flooding problem.

Table 2-1 demonstrated that Zambia has set up a policy framework for climate change adaptation and resilience-building activities at the national level, that consists of the NPCC, the 8NDP and the V2030 (Rawlins & Kalaba, 2020; Romdhani et al., 2018). The government has also adopted an Integrated Planning Approach to coordinate spatial and development planning activities, which reflects the search for holistic solutions (Banda et al., 2022; Taylor et al., 2021b). However, policy barriers to implementation exist in Zambia, especially in the form of capacity constraints, which are exacerbated by meagre public budgets (Rawlins & Kalaba, 2020; Taylor et al., 2021a). These capacity constraints limit the institutional capacity to implement existing plans (Rawlins & Kalaba, 2020; Romdhani et al., 2018).

3.2 Conceptual framework(s) and theories of relevance to the research

This sub-chapter explains the conceptual frameworks and existing research that inform the theoretical basis of this research. In line with the case study design, these frameworks have been chosen to be as relevant to the Lusaka context as possible. Using these frameworks also helps to build on the existing research base for community flood resilience in sub-Saharan Africa.

3.2.1 The TANDEM Framework for co-designing climate services

During the project preceding FRACTAL+, a multi-step framework called 'Tandem' was developed (Daniels et al., 2019, 2020). The Tandem framework lays out a holistic process for decision-makers and users of climate services to work together in decision-making processes (Daniels et al., 2019,

2020). Climate services are climate data or information that aids individuals and organisations in decision-making processes for resilient city planning, development planning, and adaptation planning (Daniels et al., 2019). The climate projections that FRACTAL+ created for Lusaka and discussed with stakeholders are one example of such a climate service, and they found that the pluvial flooding will likely worsen in the future (Jack et al., 2020). The framework encompasses several steps that need to be covered to successfully co-design future decisions with multiple stakeholders. One important step of the framework, and a next logical step in Lusaka, is to "identify solutions, recommendations and ways forward" (Daniels et al., 2020, p.8; Stockholm Environment Institute, 2022). The step in the framework also requests that possible solutions should indicate which actors could deliver them and at what temporal and spatial scale such solutions would need to happen (Daniels et al., 2020). Since this thesis builds on the work done in Lusaka, this step of the framework has informed research questions 2a and 2b, which focus on identifying future solutions. The reporting of the solutions in Chapter 5.2 indicates which actors could be responsible for implementing which measures; and Chapter 6 includes a reflection on the temporal and spatial scale of the proposed solutions.

3.2.2 Flood vulnerability framework for African cities

In Lusaka, complex interactions between structural inequalities, development challenges and environmental factors form a complicated picture of social vulnerability to flooding events. Existing models of flood vulnerability have primarily been developed in and for developed countries such as the US (Bulti et al., 2019), and hence fail to capture this complexity that is at play in Lusaka. Salami et al. (2017) addressed this gap by creating a context-specific flood vulnerability framework for African cities facing flood risks. Figure 3-2 shows a reconstruction of the framework. This research utilises the framework in three ways. First, the framework helps to visually guide members of the audience who are not familiar with SES theory around vulnerability and resilience. Second, the framework informed the formulation of research question 2. Third, the original framework by Salami et al.[11] was slightly modified to reflect Turner's notion of spatial scales and their importance when thinking about resilience (as discussed later in this sub-chapter). Lastly, an updated version of the framework will be presented in Chapter 6 (Discussion) to reflect some key findings of this research.

[11] The original framework was not included here because the first author of the paper did not respond to the request for permission to do so, which would have been required in line with the IIIEE's copyright policy.

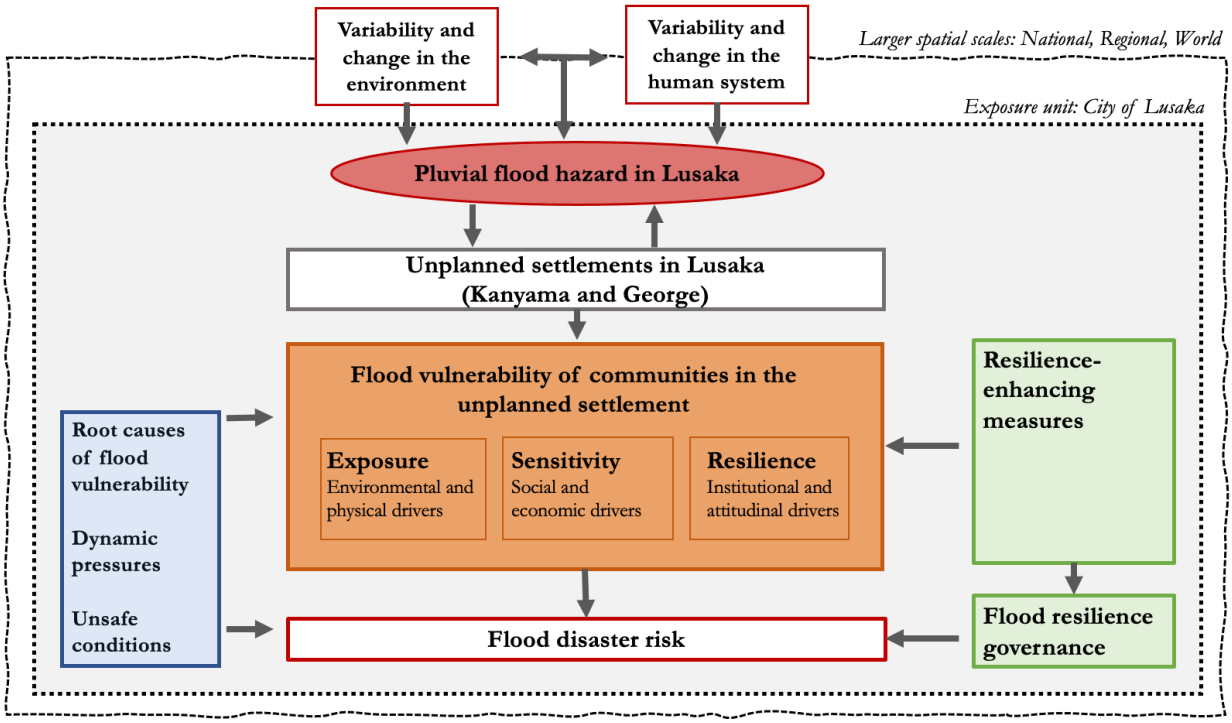


Figure 3-2 The conceptual flood vulnerability framework for African cities by Salami et al. (2017), with changes

Source: Recreated from Salami et al. (2017, p.5)

Figure 3-2 summarises several components discussed in the literature review. It shows that vulnerability to flooding is determined by the degree of exposure to the flooding hazard, the sensitivity (or 'susceptibility') of the community to the flooding hazard, and the community's resilience to the flooding hazard (Salami et al., 2017). Exposure is primarily determined by environmental drivers such as the frequency and duration of a flood (Salami et al., 2017; Turner et al., 2003). Susceptibility is mostly a product of social conditions (such as access to insurance or drainage systems in the area) and economic conditions (such as access to economic capital to flood-proof one's home) (Salami et al., 2003; Turner et al., 2003). Lastly, resilience is a product of coping capacity, and it is impacted by attitudinal drivers such as previous experiences with flooding and the ability to pursue adaptation mechanisms (Salami et al., 2017). It is assumed that resilience in the communities can be strengthened with institutional support, such as early warning systems that warn inhabitants so that they can prepare for a flood (Salami et al., 2017; Turner et al., 2003).

Vulnerability to flooding in the unplanned settlements has root causes such as high poverty levels, high inequalities, and insufficient government capacity to address these problems (Salami et al., 2017; Turner et al., 2003). Dynamic pressures such as rapid urbanisation and unsafe conditions caused by the settlements' location in flood-prone peri-urban areas further influence vulnerability to flood risk (Salami et al., 2017; Siachoono, 2013). It is assumed that to achieve lower vulnerability, resilience needs to increase, and susceptibility and exposure should decrease. While the framework is already quite comprehensive, one missing component in the original diagram by Salami et al. (2017) is the 'exposure unit', as described by Turner et al. (2003). The unplanned settlements in Lusaka are, of course, not an isolated unit, but a unit that is exposed to environmental influences from the wider city of Lusaka, the region, and the world, such as climate change, for example (Turner et al., 2003). Human conditions such as a rapidly growing population are also spurred on by regional changes where climate change is causing agricultural problems, and more people move to Lusaka in search of livelihoods (Turner et al., 2003). In essence, the 'system' of the unplanned

settlements is exposed to changes at other spatial and temporal scales, which interact with the hazard of flood risk and increase vulnerability (Turner et al., 2003). Figure 3-2 shows the updated diagram, which includes this notion of the 'exposure unit'.

Figure 3-2 also depicts (in green boxes) the assumption that a mix of different resilience-enhancing measures can strengthen resilience and decrease vulnerability to flooding events, and that such measures need to be accompanied by actions at the governance level (Hegger et al., 2016; Salami et al., 2017). This thesis research explores such flood vulnerability reduction measures, both in terms of governance and non-governance measures further (RQ2a and 2b).

3.2.3 (Adaptive) governance strategies for improving flood resilience

As introduced in Chapter 3.1.6, the adaptive governance approach, which was pioneered by Holling (1978) in his work on the adaptive management of SES, could help to enhance resilience in Lusaka's unplanned settlements (Djalante et al., 2011; Djalante, 2012; Folke et al., 2005; Seeliger and Turok, 2013; Sendzimir et al., 2018).

Djalante et al. (2011) have identified four different characteristics of an AG approach that can increase a system's resilience to natural hazards, including flooding, which will now be discussed. These include 1) polycentric and multi-layered institutions, 2) participation and collaboration, 3) self-organisation and networks, and 4) learning and innovation (Djalante et al., 2011, p.1). AG processes require active interaction between governing bodies and institutions at different levels (eg. local and national), especially in decentralised governance systems where power has been passed down to different actors (Folke et al., 2005). Second, participation and collaboration among these different actors are deemed important (Djalante et al., 2011; Folke et al., 2005). Having structures in place for participation and collaboration can help to ensure the longevity of these processes (Torres-Lima et al., 2019). However, there are often tensions between balancing effectiveness and opening participatory processes to many different stakeholders (Folke et al., 2005). Next, social networks amongst different actors are needed to foster collaboration (Djalante et al., 2011; Folke et al., 2005). If communities want to self-mobilize, they need capacities to form networks amongst themselves (Folke et al., 2005). Collaboration also stimulates social learning and innovation, which are important for a system to adapt to disturbances in creative ways (Djalante et al., 2011; Folke et al., 2005; Torres-Lima et al., 2019). It is important to note that a governance approach can still qualify as an AG approach even if not all four characteristics are present (Folke et al., 2005). The analysis of the key informant interviews will be structured according to the characteristics of AG outlined here.

The question of how governance systems can better respond to the need to build resilience to natural hazards has also been studied from a FRG perspective. Driessen et al. (2018) and Matczak and Hegger (2021) have proposed a list of six governance strategies that can improve flood resilience, which overlap slightly with the four characteristics of AG. The six strategies include 1) diversified and 2) aligned FRM strategies, 3) stakeholder involvement, including of citizens, 4) the presence of rules and regulations, 5) the availability of financial and non-financial resources, and 6) a public societal debate on FRG (Driessen et al., 2018; Matczak & Hegger, 2021). It is critical to mention that these six strategies were distilled from studies in European countries, which could limit the generalisability of these findings to the Lusaka context (Matzcak and Hegger, 2021).

3.2.4 The City Resilience Action Planning Tool

Lastly, to present the findings for research question 2, a framework has been adapted from the 'City Resilience Action Planning Tool' (City RAP). This tool was developed to help local governments in sub-Saharan Africa strengthen resilience in their cities and within specific neighbourhoods. The tool can be used to identify actions that could be undertaken and

mainstreamed into "existing and future policies, plans, budgets, institutional set-ups and actions" (UN Habitat & DiMSUR, 2020, p.6). While not designed for flood resilience specifically, the tool will be applied to the specific flooding hazard. The tool is explicitly designed to be used in bottom-up planning processes with the community and other stakeholder involvement (UN Habitat & DiMSUR, 2020), therefore, it was deemed fit-for-use in this research[12].

The tool theorises that urban resilience has five pillars, which are explained in Table 3-1 (UN Habitat & DiMSUR, 2020). The findings of this thesis will be organised according to these five pillars. Pillar 1) was officially called 'urban economy and society', but it has been renamed to 'urban communities and economy' to better reflect the focus that this research places on the communities. When flood resilience planning is undertaken in Lusaka, and/or if a flood resilience assessment is conducted in the future, the solutions formulated based on multi-stakeholder input and organised according to these five pillars can be used to check that key priorities are being addressed.

Table 3-1 The five pillars of flood resilience, based on the CityRAP tool

#	Flood resilience pillar	Description of what the pillar incorporates
1	**Community**	Aspects related to the community's capacity to prepare for, deal with, and recover from flooding events; and build flood resilience in the long-term. These aspects include but are not limited to competences, social capital, and relationships with other stakeholders (Bulti et al., 2019; UN Habitat & DiMSUR, 2020).
2	**Urban governance and economy**	Processes and structures that allow for multi-stakeholder participation in decision-making processes; and policies, plans and frameworks that are in place and relevant for achieving flood resilience (UN Habitat & DiMSUR, 2020). Includes, for example, processes for collaboration and participation. Also includes what can be done at the governance level to increase community capacity. The dimension also includes economic aspects, such as financial capacities of institutions and organisations (UN Habitat & DiMSUR, 2020).
3	**Urban planning, housing, and environment**	Different aspects related to urban planning, the design of buildings, the environment, and climate change (UN Habitat & DiMSUR, 2020).
4	**Resilient infrastructure and basic service provision**	Aspects related to the availability of resilient urban infrastructure and access to basic services (such as water and sanitation facilities) (UN Habitat & DiMSUR, 2020).
5	**Urban disaster risk management**	Aspects related to "the ability of local government and communities in terms of capacity, knowledge, processes, and systems in place, to prevent, anticipate, respond to and recover rapidly from" flooding events (UN Habitat & DiMSUR, 2020, p.9). This includes early warning systems, for example.

Source: Created by author, based on UN Habitat & DiMSUR (2020)

[12] The tool has been developed by UN Habitat and the African 'Technical Centre for Disaster Risk Management, Sustainability and Urban Resilience' (DiMSUR).

3.2.5 Ladder of stakeholder participation

The importance of stakeholder involvement in CFR processes has previously been explained. Pretty (1995) introduced a 'ladder of participation' that presents a typology for different degrees of community involvement in decision-making processes (Conde et al., 2005). As visualised in Figure 3-3, the bottom rung of the ladder depicts passive involvement of communities in decision-making processes, while the top rung depicts high community influence in decision-making processes and little reliance on other stakeholders (Conde et al., 2005; Cornwall, 2008).

Figure 3-3 The ladder of community participation in decision-making processes

Source: Recreated by author, based on Conde et al (2005), Cornwall (2008), and Pretty (1995)

3.3 Literature review conclusion

In conclusion, the literature review has demonstrated the need for CFR resilience research that captures the perspectives of the local communities and other stakeholders. Defining flood resilience in the local context is an important pre-requisite for thinking about flood-resilience enhancing measures that can be implemented. Such measures can be organised according to different dimensions like the 'five pillars of flood resilience' (Chapter 3.2.4) or the different capacities of resilience for example different aspects of FRM. To successfully brainstorm, plan, design, implement and evaluate CFR-enhancing measures, appropriate governance processes need to be in place. The adaptive governance approach and perspectives from FRG (Chapter 3.2.3) outline how governance processes could optimally support the building of CFR and ensure a certain level of community participation (Chapter 3.2.5) in the entire process. An understanding of key concepts related to resilience can help to ensure that measures address different aspects of vulnerability, such as exposure and susceptibility. The flood vulnerability framework (in Chapter 3.2.2) can aid this understanding. Furthermore, it is critical that these governance processes ensure the genuine involvement of community members in participatory and transdisciplinary multi-stakeholder decision-making processes to make sure that CFR measures that are implemented are context-specific and that the local communities have ownership over them. Involving a diverse

number of stakeholders at the local and regional scale will increase the chance of measures being appropriate across temporal and spatial scales, preventing maladaptation and resource lock-ins while paving the way for transformative adaptation to climate change.

4 Research design and methodology

In this chapter, the research design and methodology are presented.

4.1 Research design

The research design takes the shape of a qualitative, descriptive, single case study (Yin, 2014). These different components will now be explained, and their choices justified.

This thesis pursues a qualitative methods approach thanks to its suitability for gaining a deep and holistic understanding of the "the meaning individuals or groups ascribe to a social or human problem" (Creswell & Creswell, 2018, p.41), which aligns with the research aim.

A case study design was chosen because case studies are well-suited for understanding a complex social phenomenon in-depth (Yin, 2014). Additionally, case studies are appropriate when the boundary between the phenomenon and its context is not clear cut (Yin, 2009). The three most-common case study designs that exist are descriptive, explanatory, and exploratory case studies (Yin, 2014). However, the boundaries between them are often blurred, with some aspects overlapping (Yin, 2014). This thesis takes a descriptive case study approach. Yin, a leading author on case study research, defines a descriptive case study as one "whose purpose is to describe a phenomenon (the "case") in its real-world context" (Yin, 2014, p.238).

A descriptive case study approach was chosen for four reasons. First, it was deemed the most suitable for understanding the complex phenomenon of urban flood resilience in Lusaka, especially from a SES perspective that strongly emphasises context; and for understanding the perspectives of the multiple stakeholders who are operating in that context (Yin, 2014). Second, the descriptive approach is most appropriate for achieving the research aim of generating context-specific knowledge as compared to an explanatory or exploratory design (Yin, 2014). An explanatory case study namely focuses more on eliciting causal relationships, and an exploratory approach predominantly focuses on the formulation of further research questions (Yin, 2014). The descriptive approach also suits the research questions that set out to understand stakeholders' perceptions of flood resilience and how it can be enhanced. Descriptive case studies are appropriate for addressing how and what questions in line with the research questions (Yin, 2014). Lastly, descriptive case studies can also be used to develop theory further, which this thesis does by applying the flood vulnerability framework for African cities by Salami et al. (2017) and making some adjustments to it (Baškarada, 2013).

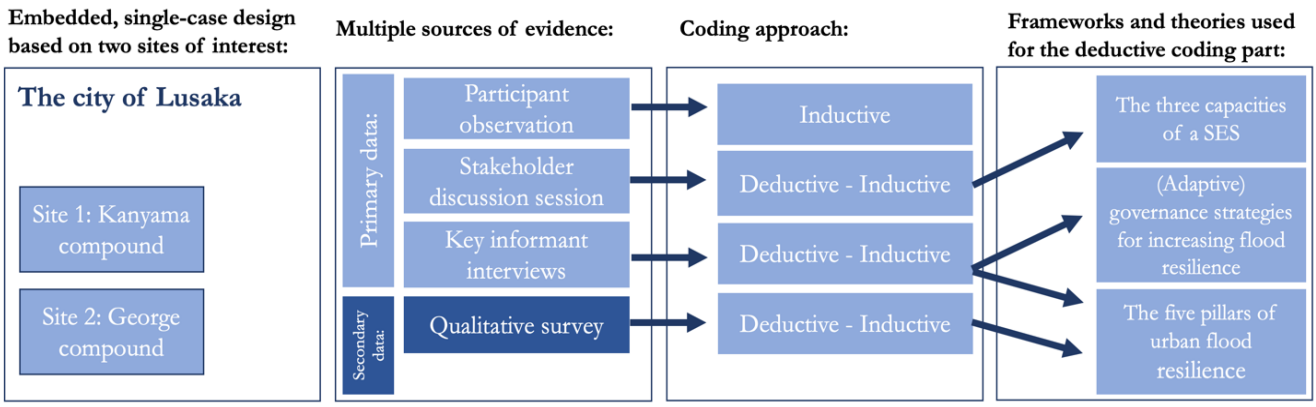


Figure 4-1 Visualization of the research design, the analytical process, and how it links to the conceptual framework

As visualized in Figure 4-1, the case study has an embedded single case design. The single case that this study addresses is that of the unplanned settlements of the city of Lusaka, and it is based on two (embedded) sites of interest: Kanyama and George (Mulwanda, 1993; Phiri, 2014; Yin, 2014). It is acknowledged that these findings cannot necessarily be generalised to the entirety of Lusaka, however, by studying two informal settlements, the case study provides a more nuanced picture of the situation than it would have if only one unplanned settlement had been studied. The case study is informed by multiple sources of evidence, namely interviews, participant observation, a stakeholder discussion (all primary data), as well as secondary survey data.

4.2 Data collection methods and materials collected

The four methods which were used to collect data will now be explained in greater detail, one by one. Primary data was collected through key informant interviews, a stakeholder discussion session, and participatory observation in Lusaka (Yin, 2014). Secondary data from a survey was obtained and analysed. Table 4-1 shows which data collection method was used to answer which research question.

Table 4-1 Overview of the four different data collection methods that were used

Data collection method	Conducted when	Primary research questions that data collected helps to answer
Secondary survey results	February 2022	RQ2a
Participant observation	End of March 2022	All
Stakeholder discussion group	End of March 2022	RQ1
Key informant interviews	End of April 2022	RQ2b

4.2.1 Secondary data from a community flood experience survey

Table 4-2 Information about the community flood experience survey method

Data collection method	Design	Type of data	Sample size	Primary or secondary data	Ethics	Supplementary materials	In-text citation for data collected with this method
Analysis of secondary data from a community flood experience survey	Open-ended text questions	Textual data	N=20, 10 respondents from Kanyama and 10 respondents from George	Secondary (from the FRACTAL+ project)	Written permission to use the data was obtained	The survey questions of which data was used are attached in Appendix B	(Community survey, 2022)

Table 4-2 provides information about the secondary data that was analysed from the community flood experience survey which was conducted by the FRACTAL+ project in February 2022. The survey was conducted by researchers from the University of Zambia Department of Geography and Environmental Studies in collaboration with ward councillors from the compounds (see Table 5-1 for more information on the ward development committees and ward councillors). The survey results were received in an anonymised format, the only known information about the respondents was that they are all inhabitants of either Kanyama or George compound. The choice was made

to analyse the survey data because this was the only way to capture the community's views, as they were not accessible for interviews.

4.2.2 Participatory observation in Lusaka

Table 4-3 Information about the participatory observation method

Data collection method	Type of data	Sample size	Primary or secondary data	Ethics	In-text citation for data collected with this method
Participatory observation	Visual (photographs) and textual data	NA	Primary	Covered by the FRACTAL+ project ethics approval	(Personal observation, 2022)

Participatory observation or 'participant observation' is "the process of learning through exposure to or involvement in the day-to-day routine activities of participants", in the research setting (Schensul et al., 1999, as cited by Kawulich, 2005, p. 2). Travel to Lusaka was undertaken and, here, I was directly exposed to the research setting and the community members and other stakeholders operating within it. Visual and textual accounts were collected through incidental encounters. Participant observation in an 'observer as participant' constellation (where it was known to other participants that I joined as a researcher) took place in the context of a multi-day 'Learning Lab' by the FRACTAL+ project, as explained in Chapter 1.4 (Creswell & Creswell, 2018; Yin, 2014). This included visits to Kanyama and George compounds in the company of Ward councillors who know the community members well. Here, a walk around was organised, and some photographs were taken on a smartphone (once permission was granted) to add richness to the study (Kawulich, 2005). Some pictures have been included in Chapter 5 (Findings and Analysis). Some engagements at the community centres were attended, where careful listening and casual conversations took place. Besides the site visits, the author engaged in the FRACTAL+ project's interactive 'Learning Lab' activities together with 25 stakeholders from the communities and different organisations. Here, I was carefully listening and observing, and sometimes engaging in natural conversations (Kawulich, 2005). Throughout the time in Lusaka, fieldnotes were taken in a journal and later transcribed to a digital format. For the duration of the participatory observation process, a conscious effort was made to be open, non-judgemental, respectful, reflective of the impressions and to blend in (Kawulich, 2005).

4.2.3 Stakeholder discussion session

Table 4-4 Information about the stakeholder discussion session method

Data collection method	Design	Type of data	Sample size	Primary or secondary data	Ethics	Relevant materials	In-text citation for data collected with this method
Stakeholder discussion session	20-minute interactive stakeholder discussion	Textual data	In total 24 definitions of flood resilience were collected from 24 participants	Primary	The workshop was covered by the ethics of the FRACTAL+ project.	The full list of definitions is listed in Appendix C.	(Stakeholder workshop, 2022)

At the FRACTAL+ Learning Lab, a 20-minute long[13] interactive discussion was organised. In the discussion session, participants were randomly mixed and seated at round tables with four tables of 5 five people and one table of four people. They were first asked to write down their individual definitions of community flood resilience on a sticky note and to paste this onto a large piece of paper in the middle of the table. Then, participants were asked to share and discuss their individual definitions with the others at the table.

4.2.4 Key informant interviews

Table 4-5 Information about the key informant interviews that were conducted

Data collection method	Design	Type of data	Sample size	Primary or secondary data	Ethics	Relevant materials	In-text citation for data collected with this method
Key informant interviews	Semi-structured interviews, duration between 22-90 minutes	Textual data	9 interviews were conducted with 9 different stakeholders	Primary	Ethics approval was obtained from Stockholm Environment Institute	Example of interview protocol in Appendix D	(_stakeholder code_ interview, 2022)

Semi-structured key informant interviews were conducted to answer research question 2b. Interview participants were recruited during the Learning Lab in Lusaka and via the FRACTAL+ network, and one participant was recruited through the author's personal network. Initially eleven people were invited to participate in the interviews, and nine people responded positively; with whom interviews were conducted in the end. The interviews were conducted online via Zoom and Microsoft Teams depending on the interviewee's preference and lasted between 22 and 90 minutes, subject to the interviewee's availability. All interviewees signed participant informed consent forms (Appendix A) and consented to the interviews being recorded.

Table 4-6 shows that each of the nine interviewees represented a different organisation or institution. The interviewees represented all six different categories of stakeholders whose involvement in multi-stakeholder adaptation processes and flood resilience building efforts are deemed essential (Conde et al., 2005). The specific names of the organisations and institutions are listed in Table 4-6, whereas only one participant did not consent to the disclosure of the name of their organisation. More specific information about interviewees' roles within the organisations was not disclosed to guarantee their anonymity.

Table 4-6 Overview of the stakeholders who were interviewed

Stakeholder category, informed by Conde et al. (2005)	Name of organisation or institution and abbreviation
Local government	Lusaka City Council (LCC) - Department of City Planning

[13] A longer duration was not possible due to the programme schedule.

Stakeholder category, informed by Conde et al. (2005)	**Name of organisation or institution and abbreviation**
National government, ministries, and ministerial departments	Disaster Management and Mitigation Unit (DMMU), government department under the Office of the Vice President
	Zambia Meteorological Department (ZMD), government agency under the Ministry of Green Economy and the Environment
Civil society organisation	People's Process on Housing and Poverty in Zambia (PPHPZ)
Non-governmental organisation	Lusaka Water Security Initiative (LuWSI)
International development organisation	German Development Agency (GIZ)
Utilities and service providers	National Water Supply and Sanitation Council (NWASCO)
	Lusaka Water Supply and Sanitation Company (LWSC)
Other	Health professional (organisation non-disclosable)

Source: Created by the author, based on stakeholder groups identified by Conde et al. (2005).

4.3 Data analysis

All primary data that was collected was prepared for analysis. The handwritten notes from the participatory observation and the findings from the group discussion were digitised. The recordings from the key informant interviews were transcribed using the platform 'Trint'[14], because the author was already familiar with it. Then, all the materials (including the secondary interview data) were uploaded into the software programme NVivo (Version 1.6), which is a qualitative analysis software. The data was triangulated, as is typical for a case study research design that uses multiple sources of evidence (Yin, 2014).

Next, a thematic content analysis (TCA) was performed in NVivo. A TCA can provide a detailed description of qualitative data in terms of its thematic content (Anderson, 2014; Braun & Clarke, 2006). It is suitable for answering research questions aimed at understanding people's perceptions of a given topic or phenomenon (Braun & Clarke, 2006; Brulé, 2020). Therefore, it is well-suited to the descriptive case study approach. However, it should also be mentioned that TCA can be influenced by the researcher, since they determine the conceptual framework according to which the analysis is conducted. As is typically the case in TCA, a semantic approach was pursued where themes are based on what is explicitly said in the interviews, rather than implicit meanings of the data (Braun & Clarke, 2006). Both deductive and inductive coding approaches can be used in a TCA (Braun & Clarke, 2006). As indicated in Figure 4-1, a deductive-inductive coding approach was used for all data except for the data collected through participant observation. For the deductive-inductive approach, data was coded in two rounds. In the first round, deductive coding was done where data was organised according to a semi pre-determined coding structure based on the conceptual frameworks outlined in Chapter 3.2. Figure 4-1 depicts which frameworks and theories were used on what data. In the second round an inductive content analysis was conducted where new codes were added as new themes emerged from the data, and the coding structure was adjusted accordingly (Braun & Clarke, 2006; Chandra & Shang, 2019; Creswell & Creswell, 2018).

[14] Trint.com

4.4 Reliability and validity

Two concepts that can be used to evaluate the quality of research are validity and reliability (Creswell & Creswell, 2018; Yin, 2014). In qualitative research, validity can be ensured by taking steps to guarantee that findings are accurate (Creswell & Creswell, 2018). Two types of validity are relevant to single-case descriptive case study research (Yin, 2014). The first type is construct validity, which is "the accuracy with which a case study's measures reflect the concepts being studied" (Yin, 2014, p.238). The second type is external validity, which is "the extent to which the findings from a case study can be analytically generalised to other situations" (Yin, 2014, p.238). Internal validity is not relevant for descriptive case studies (Baškarada, 2013; Yin, 2014). The construct validity of the findings was strengthened through data triangulation, which entailed collecting data using four different research techniques and subsequently identifying themes from this data in NVivo (Creswell & Creswell, 2018; Yin, 2014). Triangulation strengthens the research because the more information is collected from different sources, the more comprehensive and detailed the insights and the easier to spot inconsistencies (Mishra & Rasundram, 2017). External validity was enhanced by using theory (Chapter 3.2), which can help to generalise some of the findings (Yin, 2014). Additionally, time was spent in the field and a thick description was used to describe the case study site (Chapter 2) and convey the results (Chapter 5), which Creswell & Creswell (2018) argue adds validity by providing a rich and realistic account. Qualitative reliability, on the other hand, refers to consistency in the research approach (Creswell & Creswell, 2018). Using protocols can strengthen reliability as it allows other researchers to repeat the research if they want to (Yin, 2014). An interview protocol has therefore been attached in Appendix D. Additionally, transcripts were manually checked and corrected after the auto-transcription to ensure that there were no mistakes (Creswell & Creswell, 2018).

5 Findings and analysis

This chapter presents the findings and analysis of the research in an integrated manner. The findings are reported in the chronological order of the research questions.

5.1 Stakeholder definitions of flood resilience in Lusaka

Research question 1 asked 'How do different stakeholders in Lusaka define flood resilience, in terms of a desirable state to be achieved?' A key assumption was that flood resilience in Lusaka is a desirable state that has yet to be achieved (Bulti et al., 2019). The question was answered with the definitions collected during the interactive group discussion. The definitions of two stakeholders who were absent from the group discussion were collected during the interviews.

5.1.1 Overview of relevant stakeholders

An overview of the stakeholders who participated in the research, and an explanation how their mandates link to enhancing CFR in Lusaka, is provided in Table 5-1.

Table 5-1 Overview of flood risk stakeholders in Lusaka and definitions, in alphabetical order

Stakeholder name	Abbre-viation	Stakeholder category	Mandate or purpose	How mandate links to enhancing CFR
Disaster Management and Mitigation Unit	DMMU	Government department	Primary body responsible for DRM and DRR (FCFA, 2016).	In charge of disaster risk response and disaster risk mitigation, responsibilities include early warning systems and relocations (DMMU interview, 2022; FCFA, 2016).
Ward Development Committee councillors (for both George and Kanyama)	George WDC, Kanyama WDC	Civil society representation	The WDC in George is a "mechanism for community participation in planning and development" (FCFA, 2016, p.23). The elected ward officials are called councillors (Republic of Zambia, 2019).	Ward councillors are in close contact with their community. They provide a community-level support structure and can play an important role in disseminating information and involving community members (FCFA, 2016).
German Development Agency	GIZ	International development agency	Providing financial and capacity support for development and climate change-related projects (FCFA, 2016).	Provision of capacity building and financing to pursue different projects related to resilience, particularly in the water and sanitation sector (GIZ interview, 2022).
Lusaka City Council	LCC	Local government authority	LCC is the local government authority and is responsible for local governance matters, development, city planning, and service delivery (water, sanitation and drainage included) (FCFA, 2016; GIZ interview, 2022).	Important actor on the CFR dimensions related urban planning, development planning, and service delivery (LCC interview, 2022; FCFA, 2016).
Lusaka Water Supply and Sanitation Company	LWSC	Water sector	Commercial utility under ownership of LCC that controls the city's water	Provision of clean water and sanitation services, including during flooding

Stakeholder name	Abbre-viation	Stakeholder category	Mandate or purpose	How mandate links to enhancing CFR
			supply network (FCFA, 2016; Grönwall *et al.,* 2010).	events (LWSC interview, 2022).
Lusaka Water Security Initiative	LuWSI	NGO	LuWSI is a multistakeholder platform that has partnered with 33 other organisations and institutions in Lusaka to improve water security (LuWSI interview, 2022).	LuWSI works on water risks, including flooding, by facilitating stakeholder collaboration, building the capacities of different stakeholders, undertaking advocacy, and implementing projects (LuWSI, 2022).
People's Process on Housing and Poverty in Zambia and Zambia Homeless and Poor People's Federation	PPHPZ, ZHPPF	Civil society organisations	PPHPZ (national level organisation under Slum Dwellers International) and ZHPPF (grassroots organisation under PPHPZ) work with communities in the compounds to improve their livelihoods by addressing issues of climate change, water, sanitation, urban planning, and governance (PPHPZ interview, 2022).	Activities are directly (slum greening to increase urban green infrastructure and reduce surface run-off) and indirectly (working on sustainable livelihoods in the unplanned settlements) related to building CFR (PPHPZ interview, 2022).
University of Cape Town	UCT	Academia	Research, capacity building and facilitation of transdisciplinary multistakeholder processes under FRACTAL+.	Researching flood resilience and facilitating transdisciplinary multistakeholder workshops on resilience (Personal observation, 2022).
UK Foreign Commonwealth Development Office	UK FCDO	Government	Provides funding to tackle challenges such as climate change and development in Zambia.	Provides funding for projects of relevance to enhancing CFR (Personal observation, 2022).
University of Zambia	UNZA	Academia	Research, capacity building and facilitation of transdisciplinary multistakeholder processes under FRACTAL+.	Researching flood resilience and facilitating transdisciplinary multistakeholder workshops on resilience (Personal observation, 2022).
Zambia Meteorological Office	ZMD	Government agency	Responsible for weather forecasting.	Forecasting rainfall events that might cause pluvial flooding (ZMD interview, 2022).
Zambia National Water and Sanitation Council	NWASCO	Water sector	National regulatory authority for water supply and sanitation services (Grönwall *et al.,* 2010).	The provision of clean drinking water and sanitation services during floods (Grönwall *et al.,* 2010; NWASCO interview, 2022).

5.1.2 Definitions of flood resilience

In total, 24 definitions of flood resilience were collected, which are listed in Appendix B. From some organisations, multiple representatives were present at the stakeholder workshop, which explains why more than one definition is listed for some stakeholders.

While there is overlap between some definitions, they span a rather broad spectrum. No single stakeholder gave the exact same definition, and even within organisations, people gave quite different definitions. Figure 5-1 visualises the stakeholders' varying definitions of flood resilience. Most of them defined flood resilience as an ability *of* the community. This included the ability to adapt to, plan for, and anticipate floods before they happen; the ability to cope with, respond to and withstand the impacts of floods while they happen; and to quickly recover from floods after they have happened (Batica & Gourbesville, 2016). In the long run, some would consider a resilient community one that has learned to live with floods (such as LCC), in line with the paradigm shift towards resilience in FRM which was discussed in the literature review (Karrasch et al., 2021; McClymont et al., 2019). Others consider a community be resilient if it can thrive despite floods happening, and if it can reduce the impacts of flooding.

The blue circle shows that another stakeholder (NWASCO) indicated that the water system needs to become more resilient, for the community depending on that water system to become resilient. The green circles show that other stakeholders understand flood resilience to be attained if certain processes are possible, such as the ability of stakeholders to shift resources and effectively communicate with each other. Here it was noteworthy that the definitions provided by the LuWSI representative and the Kanyama WDC councillor both emphasise the need for stakeholder collaboration, demonstrating a clear link between their definition and mandate.

Figure 5-1 Mind map of different meanings of flood resilience as provided by stakeholders in Lusaka

Source: Author's own, created in NVivo

5.1.3 Linking the definitions to the three capacities of a resilient system

More than half of the definitions were explicitly related to the three capacities of a resilient system which were discussed in the literature review (Hegger et al., 2016; Matczak & Hegger, 2021). Therefore, the definitions have been organised according to the three capacities in Figure 5-2.

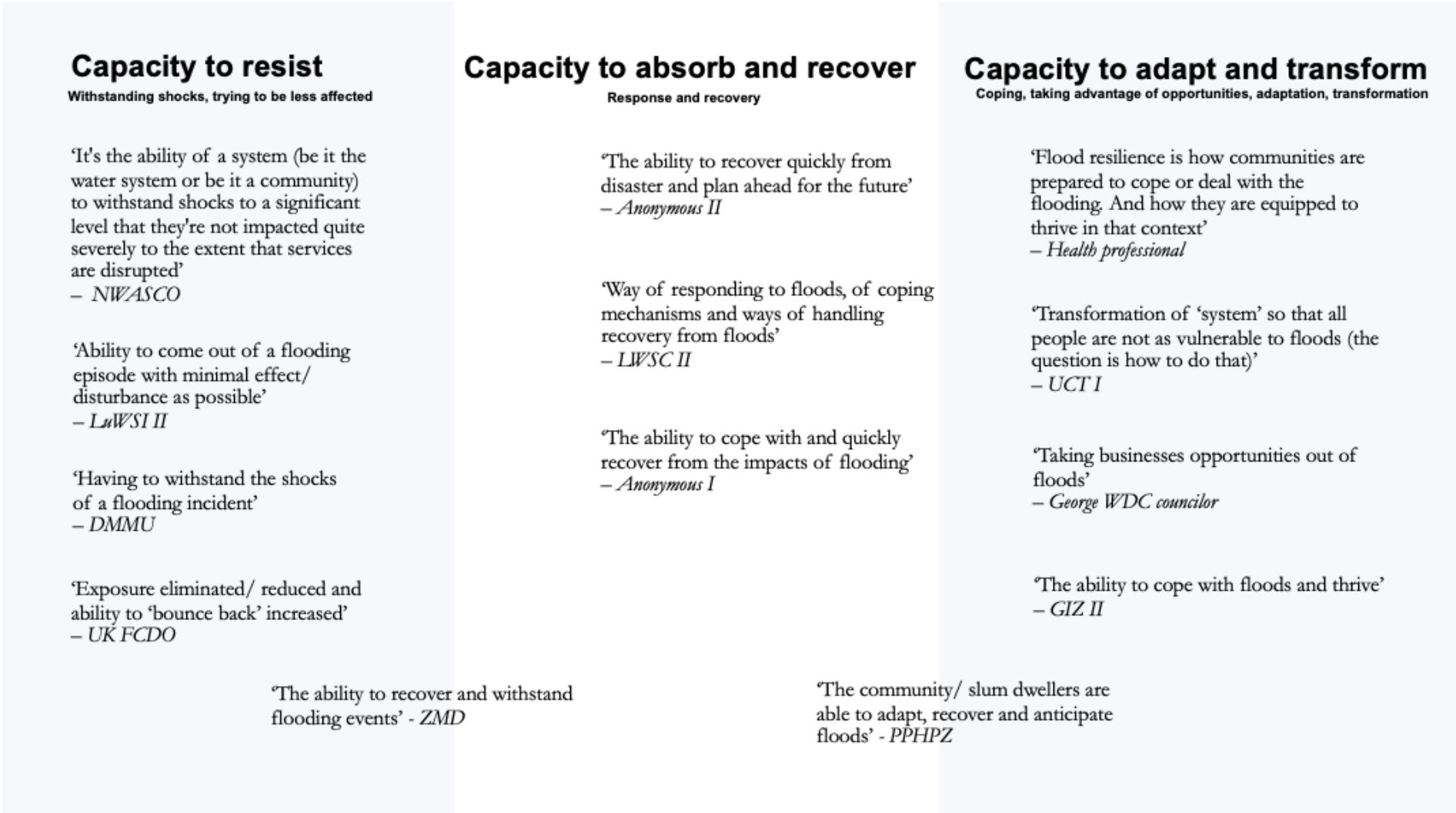
Several definitions reflected the 'capacity to resist', which implies that the community or system can withstand disturbances from flooding events, is not too severely affected and is capable of 'bouncing back' to its pre-disturbance state after the event (Hegger et al., 2016; Matczak & Hegger, 2021). The UK FCDO representative's definition, for example, mentioned the theoretical term of 'bouncing back'. One of the LuWSI representatives described a system to be flood-resilient when it has the "ability to come out of a flooding episode with minimal effect/disturbance as possible". The DMMU representative definition flood resilience as "the ability of a system […] to withstand shocks to a significant level that they're not impacted quite severely to the extent that services are disrupted". Several stakeholders thus view resilience in terms of the capacity to resist (Hegger et al., 2016; Meerow & Stults, 2016).

A definition that included aspects of both the 'capacity to resist' and the 'capacity to absorb and recover' was that by the ZMD representative, who defined flood resilience as "the ability to recover and withstand flooding events". Based on this definition, one could argue that ZMD would likely consider a flood resilient system to have both capacities. Hegger et al. (2016) reflect that this is a common debate and that it is possible for a system to display the presence of two or even all three capacities depending on which FRM strategies they put into place. Here, a 'capacity to resist' could likely be achieved by increasing the means of flood risk prevention and improving drainage systems (Hegger et al., 2016). However, there are also trade-offs because to absorb and recover, flood risk mitigation and flood recovery strategies would arguably need to be strong (Hegger et al., 2016). There could be trade-offs where "a high capacity to resist may limit the capacity to absorb and recover" (Hegger et al., 2016, p.5).

The 'capacity to absorb and recover' indicates that a system can respond to a flood and recover from it, because measures that enable a timely response (such as early warning systems) and recovery (such as a disaster management plan, which DMMU is responsible for) are in force (Hegger et al., 2016; McClymont et al., 2019). This capacity was also reflected in several definitions. One LWSC representative emphasised that the "way of responding to floods" is essential. Two representatives, who chose to remain anonymous, stressed the importance of a quick recovery. In the literature, the temporal dimension of recovery is described as key feature of CFR, with a speedy recovery being desirable (Liao, 2012; McClymont et al., 2019). However, the two anonymous definitions also included a notion of coping and planning ahead, which can be considered characteristic of the 'capacity to transform and adapt'. Therefore, the definitions were placed to the right side of the 'capacity to absorb and recover' column in Figure 5-2.

The 'capacity to adapt and transform' was also frequently mentioned (Hegger et al., 2016). One GIZ representative and the health professional both emphasised the community's ability to cope. The definition by the George WDC councillor suggested that business opportunities could be derived from the floods, in line with Ahmed (2014). Such business opportunities could for example include the upcycling of waste into sellable products (Personal observation, 2022). In a discourse analysis of Zambia's NPCC and other policy documents, Romdhani et al. (2016) observed that "climate change is framed as a threat to development and to a lesser extent as an opportunity to access more funding" (p.3). Based on the findings, it can be argued that studying floods and other climate change hazards from a resilience perspective, particularly from a 'capacity to adapt and transform' perspective, could open the door for further consideration of opportunities that might arise, and how the communities can use these opportunities to their benefit.

Figure 5-2 Overview of 13 flood resilience definitions, grouped according to the three capacities



One representative from UCT mentioned that flood resilience requires the "transformation of [the] 'system' so that all people are not as vulnerable to the floods" (Stakeholder workshop, 2022). This definition reflects a preference for "more flexible and adaptive forms of resilience" (Meerow & Stults, 2016, p.9), which have been gaining attention in the literature for their ability to make SESs more resilient amidst rising climate uncertainty. The UCT definition also includes that "the question is how to [achieve] that [transformation]", which many researchers ask themselves (Folke et al., 2010; Walker et al. 2004; Ziervogel *et al.,* 2016b). Unlike for the other capacities, Hegger et al. (2016) state that it is more difficult to tie concrete measures from flood risk management to the capacity to adapt and transform. Rather, the presence of institutions and related actors who rethink their interactions, pursue new approaches and create platforms to learn are among the list of attributes that have been deemed important to build capacity to transform (Folke et al., 2010; Hegger et al., 2016; Walker et al. 2004).

5.1.4 Interim summary

In sum, stakeholders in Lusaka have diverse definitions of flood resilience (Meerow & Stults, 2016), as expected. However, there are also quite some overlaps between the definitions, which underlines the importance that stakeholders exchange on this topic as suggested by Taylor et al. (2021). When contrasting the stakeholders' definitions with the textbook IPCC definition of resilience (Ara Begum et al., 2022) and the community flood resilience definition by Bulti et al. (2019) which were introduced in the literature review, it becomes clear that there is only a little bit of overlap. This highlights the need for a Lusaka-specific definition of community flood resilience. Stakeholders should get together to discuss which aspects of their definitions they would like to achieve as they work to increase CFR in Kanyama and George. One of the key findings is that the stakeholders' definitions span a spectrum of all three capacities of resilience (Hegger *et al.,* 2016), implicating that the choice of measures that are chosen to enhance CFR should help to achieve all three capacities. However, if stakeholders decide that there is a strong push towards achieving adaptive and transformative action, as conveyed by the IPCC definition of resilience (Ara Begum et al., 2022), the CFR by Bulti et al. (2019) recent research from other African cities such as Durban (Ndebele-Murisa et al., 2020), then the chosen measures should be tailored to build adaptive and transformative capacity. Now, measures that the different stakeholders think could increase CFR will be discussed.

5.2 Community members' views on how CFR could be enhanced

Question 2a asked 'how could resilience to flood events in Kanyama and George in Lusaka be enhanced in the view of community members?' This question was answered using the secondary survey data. The survey was conducted among ten community members from Kanyama (who have lived there for 22 years on average) and ten from George (who have lived there for 15 years on average (Survey results, 2022). The main reasons that the respondents cited for having moved to the respective compounds were cheap(er) housing, proximity to their businesses or workplaces, and the presence of social networks consisting of friends and family (Survey results, 2022). Social networks, "play a significant role in disaster resilience" because they provide a support structure (Amir, 2018, p.8). In the survey, the respondents suggested a detailed range of structural and non-structural measures that could 1) help them to better cope with flooding events and 2) reduce the impact of flooding on their lives. The respondents had clear ideas of who should be responsible, or who they should be working together with for achieving the proposed measures. The findings have been organised in Table 5-2, according to the 'five pillars of community flood resilience'.

Table 5-2 Measures that could increase community flood resilience as proposed by 20 community members, organised according to the 'five pillars of community flood resilience'

#	Flood resilience pillar	Measures proposed by the community to improve their flood resilience	Who the community deems responsible
1	**Community**	**Trainings** for community members on how to deal with floods	DMMU
		Education for community members on how to maintain and clean the environment	WDCs, councillors, government
		Sensitisation of community members about drainage management (there should be no throwing garbage in the drainages, no building in the drainages, no vandalisation of drainages)	WDCs, councillors, LCC
		Financial help and more equal **sharing of resources**	Well-wishers, LCC, government
2	**Governance and economy**	More **help** from the government	Government
		More **leadership**	
		Empowerment of community members needs to be supported	All
3	**Urban planning, housing, and environment**	**Development control**	LCC
		Relocation to other areas	
		Planning interventions	
		Help with **flood-proofing** of houses	
4	**Resilient infrastructure and basic service provision**	**Drainage construction and management**	Local authority and government
		Improved **solid waste management** (waste collection, establishment of dumpsites, provision of bins)	
		Malaria spray programs	
		Prevention of **water contamination** during flood events	
5	**Disaster risk management**	**Trainings about** disaster preparedness (how to prepare for a flood) and emergency response (how to cope and respond during a flood)	DMMU
		Information dispersed to communities should be timely, distributed via mobile phones and contain information on how much rain is expected	ZMD and DMMU
		Opportunity to learn more about weather and flood forecasts by means such as a community weather station, a radio station reporting on weather forecasts, a flood officer in the community	ZMD and others

5.2.1 Community

Starting with pillar 1, most respondents indicated that training and community sensitization could increase the community's capacity to deal with floods. Trainings would help community members "to be well informed citizens" and should equip the community with general knowledge about floods and how to deal with them (Community Survey, 2022). Such trainings should be organised by DMMU. Community members called for sensitisation programmes to bring about a "mentality change so people don't throw garbage in the drainages" or build in them (Community Survey, 2022). Increased financial help and "equality in sharing resources" would also help the community to deal with flooding, as this could increase the financial ability to pursue adaptation, coping and/or recovery options (Bulti et al., 2019; Community Survey, 2022).

5.2.2 Governance and economy

While the term 'governance' was not explicitly mentioned in the survey results, community members touched on themes related to governance. These themes included empowerment (one respondent expressed the "need to be empowered") and community organisation (community members should "help each other") (Community Survey, 2022). These answers indicate that community members could benefit from the strengthening of processes and structures around community empowerment and community organisation. Community organisation is covered by the 'self-organisation and networks' dimension of the adaptive governance framework and has been recognised to contribute to enhanced resilience (Djalante et al., 2011; Folke et al., 2005; Tyler & Moench, 2012). Achieving (more) community empowerment would require progress on the AG dimension of 'participation and collaboration', and a shift up the ladder of stakeholder participation (Conde et al., 2005; Cornwall, 2008; Pretty, 1995). Pursuing bottom-up decision-making processes and creating structures for proactive community participation in both the formulation and implementation of policies, plans and measures can empower the community (Lee, 2017). Moreover, respondents called for "better and committed leaders" at the community level and a call for "help from the government" (Community Survey, 2022).

5.2.3 Urban planning, housing, and environment

Respondents mentioned several ways in which their resilience to flooding events could be strengthened at the urban planning level. Being well aware that Kanyama and George are located in flood-prone areas, some respondents indicated the need for the stronger enforcement of development control in the future, to "constantly remind [people] to build in [the] right places" (Community Survey, 2022). Siachoono (2013) explains that while LCC has the mandate to govern land, the enforcement is low, and structures often get built on land that has been reserved for other purposes such as drainage systems or green space. Community members would also like to see planning interventions and better housing planning and would welcome help to "improve the houses to become flood resistant houses" (Community Survey, 2022). Home modification to reduce the impacts of flooding is a commonly cited adaptation measure in the CFR literature (Jabeen et al., 2010). People often undertake such improvements on their own if they can finance them, which can be considered a coping strategy (Jabeen et al., 2010). Flood-proofing homes and market stalls can, for example, be achieved by raising the structures (Jabeen et al., 2010). Such adaptation was observed in Kanyama, where a market stall had been raised on rocks to keep wooden legs dry from the flood water (Figure 5-3) (Personal observation, 2022). However, more complex modifications such as the raising of a residential house can be expensive, and therefore the residents could use financial help to flood-proof their houses (Community Survey, 2022).

Figure 5-3 A market stall structure in Kanyama has been elevated above the water level with rocks.

Source: Author's own, photographed in March 2022

Lastly, four out of the 20 respondents proposed that the best way to increase their resilience would be to reduce their exposure to flooding through relocation "to a better area" (Community Survey, 2022). It was not clear whether the respondents meant temporary or permanent relocation. Sometimes governments temporarily relocate residents to safer areas during prolonged heavy flooding (Jabeen et al., 2010). This happened in Lusaka during the 2010 floods when 430 people from Kanyama and other people were relocated to a different area in the city (Lusaka Times, 2010b). Sometimes, permanent relocation is the only option when governments have made the difficult choice to demolish buildings to make space for drainage systems or other infrastructure (Personal observation, 2022). However, whether short or long-term, relocation is a debated topic as it can mean "losing the option to return later to assets and social and livelihood networks" (Jabeen et al., 2010, p.425). Relocation is further discussed in chapter 5.3.3.

5.2.4 Resilient infrastructure and basic service provision

Regarding resilient infrastructure and basic services, community members emphasised the need for more drainage systems to be constructed. Drainage systems should ideally be deep and covered (Community survey, 2022). To date, drainage is lacking on most streets in Kanyama and George. Drainage systems are mostly limited to the few main roads running through the compounds (Figure 5-4A). Some smaller drainages have been hand-dug in side streets by community members (Figure 5-4B). Community members describe most drainage systems as being in a poor state and being too shallow (Community Survey, 2022). Solid waste management should also be improved because waste is currently not being collected in most areas within Kanyama and George (Community Survey, 2022). As a result, people dispose of solid waste in existing drainages (Figure

5-4C), which get congested. Drainages were also observed to be congested with silt and rocks (Personal observation, 2022; Siachoono, 2013).

A. Drainage on a main road in George

B. Litter in the drainage on a main road in George

C. Litter in the drainage off a bigger road in George

Figure 5-4 Drainage systems in Kanyama and George compounds

Source: Author's own, photographed in March 2022

Flooding creates stagnant pools of water which are a favourable breeding habitat for malaria-transmitting *Anopheles* spp. mosquitoes (Elsanousi et al., 2018). Anti-malarial residual insecticide spraying programmes could therefore increase CFR by decreasing the negative health side-effects that are often caused by flooding (Community Survey, 2022). Respondents also called for interventions to prevent water contamination during flooding (Community Survey, 2022). Drinking water often gets contaminated when it floods, causing waterborne disease outbreaks such as of cholera or dysentery (Community Survey, 2022; Nyanga et al., 2018). This contamination is complex to solve as it is caused by the lack of a sewer network, sanitation infrastructure, and piped water in the compounds (Nyanga et al., 2018; Mwamba et al., 2018). People use pit latrines and retrieve water from hand-dug wells (Nyanga et al., 2018). The latrines and water wells are often too close to each other, less than the recommended distance of 30 metres apart (Nyanga et al., 2018; Mwamba et al., 2018). When it floods the latrines to overflow, leading to the mixing of human waste with flood and groundwater, which causes diseases to spread quickly (Grönwall et al., 2010; Nyanga et al., 2018; Siachoono, 2013). Linking back to the flood vulnerability framework presented in Figure 3-2, it becomes clear that the measures of drainage building, solid waste management, increased levels of sanitation and malaria spray programmes would reduce the population's susceptibility.

5.2.5 Disaster risk management

Community members from Kanyama and George also indicated that their resilience to flooding events could be enhanced through improved DRM. These measures would include trainings and community sensitization about how to react during a flood emergency (Community Survey, 2022).

The community members also indicated that they would benefit from improved information dispersal and early warning systems (Community Survey, 2022). Receiving timely information (such as flood warnings and weather forecasts) can help community members improve their disaster preparedness and react quickly. Respondents would ideally like to receive such information on their mobile phones (Community Survey, 2022). Lastly, respondents think that having different channels to access information about flooding and forecasts, which ZMD generates, would help them to be better informed and hence improve their resilience. Ideas included having a community weather station, a flood officer in the community, and more information about flooding being provided on the radio (Community Survey, 2022).

5.2.6 Responsibilities and interim conclusion

When asked who should oversee the implementation of CFR enhancing measures, respondents placed significant responsibility on both the local authority (LCC) and the community alike. It is namely "government responsibility to take care of [the community]" and to "provide a safe environment to the community" (Community Survey, 2022). The community, on the other hand, also needs "to be in the forefront" because they "are the ones affected" (Community Survey, 2022). Other help should be provided by the WDCs, councillors, and the national government. When asked what they needed to better cope with the flooding event, two respondents also mentioned "help from well-wishers" (Community Survey, 2022).

In sum, the respondents presented more than 18 different measures and action points that could be taken across the five different pillars of flood resilience. The respondents have a clear picture of who could help them with what and stress that the community should (be able to) take on a more active role in improving their flood resilience.

5.3 Other stakeholders' views on how CFR could be enhanced

Research question 2b asked 'What governance and other measures could enhance community flood resilience in Lusaka according to other stakeholders?' The answers have been organised according to the 'five pillars of flood resilience' and are depicted in Table 5-3.

5.3.1 Community

Before discussing the actions that the stakeholders proposed, it must be acknowledged that the community members already display a certain level of adaptive capacity (Bouwer et al., 2021; DMMU interview, 2022). This was observed during my visit to Lusaka. Community members have found ways to adapt to the flooding without external help, for example by raising their market stalls (Figure 5-3), wearing rainboots to keep dry feet (Figure 5-5A) or creating elevated pathways through the flood waters using bricks (Figure 5-5B) (DMMU interview, 2022). The DMMU interviewee also stressed that "within themselves, some [people] are really good in terms of working together as a community". The findings therefore build upon the recognition that the community is already taking action where they can, but that support from stakeholders is required to help the community to become more resilient.

A. An elevated brick path through standing water in Kanyama

B. A lady wears rainboots in Kanyama

Figure 5-5 Coping mechanisms to deal with flooding in Kanyama

Source: Author's own, photographed in March 2022

First, DMMU suggested that community members should receive trainings about how to prepare for the approaching rainy season, when the flooding usually happens. The community survey showed that such trainings are desired at the community level.

Next, the core action that stakeholders identified as necessary to enhance CFR is the empowerment of the communities to participate more meaningfully in decision-making and policy planning processes. In the survey, only one community member had explicitly stated the "need [for the community] to be empowered" (Community survey, 2022). Contrastingly, almost all the interviewees identified that there is further room for improvement when it comes to the type and extent of involvement of community members in decision-making processes. This is the case for higher-up processes at the LCC level where decisions are made around essential plans and programmes related to the future development of the compounds, such as the 'Local Area Plans' and the 'Slum Upgrading Programme' (Table 5-4). The stakeholders' call that community involvement in decision-making processes should be further increased is echoed by the literature (Adekola et al., 2020; Aldunce et al., 2016; Djalante et al., 2011; Edelenbos et al., 2016; Rodina, 2019; Taeby & Zhang, 2019). Aldunce et al. stress "that there is a need for increasing community participation" (2016, p.59). The question is how to achieve that. The results indicate that action should be taken mostly at the governance level (as discussed in the following sub-section), for example by developing processes and structures that support genuine community involvement. At the same time, the community needs to have the skills and information to participate in processes and structures that are put into place at the governance level.

The literature review discussed that different terms such as engagement, participation and empowerment are used to describe varying degrees of community participation (Edelenbos et al., 2016; Rodina, 2019). The GIZ interviewee indicated that to them, empowerment means building

Table 5-3 Measures that could increase community flood resilience as proposed by 9 different stakeholders, organised according to the 'five pillars of community flood resilience'

#	Flood resilience pillar	Proposed measures	Proposed by
1	**Community**	Further strengthen the community's capacity for self-organisation and collective thinking and inform community members when opportunities arise to participate in decision-making processes	GIZ
		Further strengthen the relationships of the community (and existing community organisations) with other stakeholders	GIZ, LuWSI
		Organise trainings, for example at the community centres, to sensitize the community on how they can prepare for the approaching rainy season	DMMU
2	**Governance and economy**	Pursue a **mix of structural and non-structural measures** and place **more emphasis on governance processes**	GIZ and others
		Allocate resources for long-term planning and project evaluation cycles for results accountability (also for donor-funded projects)	GIZ
		Capacity-building to ensure that institutions have the skills and knowledge to fulfil their mandates and work on enhancing CFR	LuWSI, LWSC, NWASCO, PPHPZ
		Mobilize financial resources to cover the economic costs of pursuing CFR, and tie policies to specific financing mechanisms	GIZ, LuWSI, PPHPZ
	Participation and collaboration	Increase efforts to ensure more **community participation** in decision-making processes: - Create a mandate that makes community involvement in decision-making processes mandatory for all institutions - Allocate budget specifically to improve community participation so that financial constraints are not a barrier to participation	GIZ, LuWSI, LWSC
		Increase the participation of other stakeholders (such as civil society and the water sector) in decision-making processes	GIZ, LuWSI, LWSC
		Create a structure to foster stronger **partnerships, long-term collaboration, and collaborative planning** on CFR; and **improve coordination among stakeholders by** defining roles and responsibilities for more accountability.	GIZ, LuWSI, LWSC, NWASCO, PPHPZ
		Improve **knowledge sharing** and **information exchange** between stakeholders	DMMU, LWSC, PPHPZ
		Build more **trust** among all stakeholders involved in CFR	LuWSI
	Polycentric and multi-	Improve governance at the local level by distributing financial resources to the WDCs so that they have the finances to plan at the lower level and include the communities in the planning	GIZ, NWASCO, PPHPZ

#	Flood resilience pillar	Proposed measures	Proposed by
	layered institutions	Strengthen the internal collaboration and communication among different government departments	LuWSI
	Learning and innovation	Continue existing knowledge co-production and exchange processes in transdisciplinary, multistakeholder settings to encourage learning and innovation (such as FRACTAL+ workshops). These workshops also provide a setting for considering the temporal and spatial scale of CFR enhancing solutions.	GIZ, HP
	Self-organisation and networks	Invest in the community's ability to self-organise	GIZ
3	**Urban planning, housing, and environment**	Relocate (some) people to a less flood-prone area	DMMU, NWASCO
		Make housing more flood-resilient (improve or raise existing structures and design new houses appropriately) and ensure that housing is safe (by enforcing building codes)	DMMU, LWSC
		Pursue ecosystem-based adaptation measures to mitigate the flooding	DMMU, PPHPZ
4	**Resilient infrastructure and basic service provision**	**Increase basic service provision**, especially for WASH, and make existing and future sanitation facilities climate resilient (for example by raising them) to protect water sources and safeguard health	HP, LWSC, PPHPZ
		Drainage system construction and maintenance	DMMU
5	**Disaster risk management**	**Improve weather forecasting:** - Provide more nuanced information on the amount of expected rain (in mm) and devise a 'flooding threshold' that warns people how many mm of rain in what time has the risk of causing flooding. Create a flood warning level scale. - Increase the reach of the weather forecasts by diversifying and expanding the channels that are used from Facebook and WhatsApp to national news broadcast and radio for more reach - Improve accuracy of forecasts by building a weather station in Kanyama	PPHPZ, ZMD
		Improve the early warning system and emergency response communication: - Provide people with tips on how they should prepare for- and behave during a flood instead of just issuing a warning - Translate the content into the 7 national languages, and into local dialogues where capacity allows - Make information easy to understand	DMMU, PPHPZ
		Capacity building for climate science: - Build capacity at the local level, with help from long-term collaborations with external climate scientists - Promote education programme for meteorology	NWASCO, ZMD

"power at the local level" (GIZ interview, 2022). The question is, "can the community develop their own independent agenda and advocate for that agenda?" (GIZ interview, 2022). According to most interviewees, currently not yet. Therefore, the community's capacity for collective thinking and the capacity to self-organise should be strengthened (Djalante et al., 2011; GIZ interview, 2022). It is namely through collective thinking that "communities articulate their need at a particular time" (GIZ interview, 2022). Skills trainings could be provided to help build such capacities, for example in the form of workshops (GIZ interview, 2022).

At the same time, the interviewees indicated that the community's relationship with other stakeholders should be strengthened, especially with LCC. One interviewee stated that one reason why "the community's views are not heard [is] because the authorities that you have or the technical people that you have, feel that these people (the community) do not have the know-how and can provide the right information" (Interview[15], 2022). This is problematic because the "communities, even uneducated communities, really have the ability to really think critically about their own circumstances and find solutions" (GIZ interview, 2022). However, they need to be equipped with the skills and the platforms to express their voice (LuWSI, LWSC, GIZ interviews, 2022). Building stronger linkages between the community and other stakeholders could help to resolve some of the misconceptions that might stand in the way of more genuine community involvement (Djalante et al., 2011). Closer linkages between the community and other stakeholders could also ensure that community members are informed about opportunities to participate in decision-making processes when they do arise. To date, it is often difficult to find out about opportunities to participate (Personal observation, 2022). It can also be expensive for community members to participate because they need to take time off work to participate (Personal observation, 2022). Vice versa, high financial costs are also a key barrier to community engagement for the government (Djalante et al., 2011). The PPHPZ interviewee stated that they "heard [the government] openly saying that community engagements are expensive for them. It requires a lot of resources to do".

5.3.2 Governance and economy

Financial constraints were found to be the most critical barrier to enhancing CFR in Lusaka (GIZ, LWSC, LuWSI, PPHPZ interviews, 2022). The problem is that "as much as we speak about flood resilience, without a proper financing mechanism, it won't be able to take off" (PPHPZ interview, 2022). The GIZ interviewee stressed that policies and plans are there (see Table 5-4), but implementation is the problem. LCC is currently working on implementing a 'Slum Upgrading Programme' and 'Local Area Plans' (Table 5-4) (LCC interview, 2022). LCC also has "a strategic plan where climate resilience and mitigation and adaptation is prioritised", but this plan could unfortunately not be seen (LCC interview, 2022). However, currently, LCC can only implement about 60-65% of their plans, because they lack capacity for the remaining 35-40% (Field observation, 2022). The ability to mobilise funding for the existing plans and for resilience-enhancing projects will be critical to overcome the financial barriers. A National Climate Change Fund is expected in Zambia in the future, perhaps extra financing could be mobilised from here (Mulenga, 2022).

Donor funding is one option for financing resilience-building and climate change adaptation measures, but this is a limited financial source that also comes with its own problems. As such, project priorities are highly dependent on donor agendas: "if the funder is not interested it, then it won't be funded" (PPHPZ interview, 2022). Donor funding is also less ideal because Zambia aims to be "free from donor dependence" by 2030 (Republic of Zambia, 2006, p.8). Donor

[15] No name is disclosed here to guarantee anonymity.

projects are also often short-lived in their timeline, lacking continuity after donors have left the country and stopped providing funding (Grasham et al., 2021; GIZ interview, 2022). More consistent project evaluations should thus take place to ensure that donors take accountability for the results that their projects aim to achieve, and to ensure more long-term progress towards CFR and other related projects (GIZ interview, 2022). Moreover, in terms of non-financial resource constraints, capacity building of different institutional stakeholders was deemed important, for example in terms of having more technical engineers at the LCC (LuWSI, LWSC, NWASCO & PPHPZ interviews, 2022). Financial and non-financial resource constraints have also been identified as barriers to achieving flood resilience in the existing literature (Driessen et al., 2018; Matczak & Hegger, 2021).

In Lusaka, the approach to dealing with floods is still very technically oriented, with drainages being the favoured solution to tackle flooding (GIZ interview, 2022; McClymont et al., 2019). However, the GIZ interviewee and others indicated that to enhance CFR, there ought to be more emphasis on non-structural as well as governance measures (GIZ interview, 2022). The interviewees identified three key governance measures that could enhance CFR. These include 1) more genuine community involvement in decision-making (as already touched upon in 5.3.1), 2) improved collaboration among the stakeholders working on CFR in Lusaka, and 3) the financial empowerment of the WDCs (GIZ, LuWSI, LWSC, NWASCO & PPHPZ interviews, 2022). These three points all fall under the "key characteristics of AG that help build resilience to natural hazards", and they will now be further discussed (Djalante et al., 2011, p.3). Based on these findings, it can be argued that that pursuing an adaptive governance approach in Lusaka could likely help to enhance CFR (Djalante et al., 2011; Folke et al., 2005).

The capacity of the community to self-organise was also identified to be important for enhancing CFR, and it falls under the AG framework's category of 'self-organisation and networks' (Djalante et al., 2011; GIZ interview, 2022). However, because the self-organisation of the community was already discussed in Chapter 5.3.1, it won't be repeated.

5.3.2.1 Participation and collaboration

One characteristic of AG is 'participation and collaboration', both of which "favourably influence the capacity to manage resilience" (Djalante et al., 2011, p.5). Several interviewees suggested that increasing community participation in decision-making processes, especially at the planning stage and at the LCC level, would be critical for enhancing CFR in Kanyama and George (GIZ, LuWSI, LWSC & PPHPZ interviews, 2022). Based on the accounts of the interviewees, looking at the ladder of community participation (Figure 3-3), when community participation does take place, it mostly spans the spectrum between 'passive participation' and 'functional participation' (Conde et al., 2005; Cornwall, 2008; Pretty, 1995). Often "meetings are held and very rarely you find community members", or information is being 'extracted' from the community, especially by consultants from abroad (LuWSI interview, 2022; GIZ interview, 2022). To reach a level of 'interactive participation' on the ladder, communities should be able to "develop their own independent agenda and [to] advocate for that agenda" (GIZ interview, 2022).

Lusaka City Council already emphasises community engagement in their plans and uses a human rights-based approach to participation (LCC interview, 2022; United Nations, 2022). One interviewee suggested that participation could be mandated for all government and donor projects happening in the compounds (LuWSI interview, 2022). As such, every institution would "need to involve the community, have their views heard, make sure [they] have a platform for them to be heard and even for that information to be utilised" (LuWSI interview, 2022). As

financial constraints are the most significant barrier to more community participation (Djalante et al., 2011), LCC is recommended to allocated budget to strengthen these processes further (LuWSI, LWSC, and GIZ interviews, 2022). Communities also need to be informed about meetings taking place. It was also shared that other stakeholders, such as NGOs, GIZ and NWASCO would like to participate in more meetings by LCC. At these meetings, important decisions are made about plans such as the ones listed in Table 5-4, which have important implications for what kind of upgrading developments are planned in which compounds (NWASCO interview, 2022).

The GIZ interviewee stressed that increased collaboration among stakeholders could lead to more systematic solutions for enhancing CFR: "when people cooperate, they are more likely to address these systems and solutions that cut across. They are more likely to apply their ideas to solutions that are more integrated". While the LuWSI platform already does considerable work in bringing together stakeholders working on water issues in Lusaka, work on CFR could benefit from even higher levels of collaboration. The NWASCO interviewee suggested that this collaboration should extend beyond flood risk stakeholders, including also urban planners (NWASCO interview, 2022). Djalante et al. stress "that collaboration not only requires bringing actors together, but also maintaining participatory and collaborative responses over the longer term" (2011, p.6). A stakeholder focus group could be established that meets regularly, to bring actors together and create more long-lasting change. As Aldunce et al. (2016) illustrate, "promoting collaborative structures is a significant source for building resilience because it gives opportunities for the integration of multiple levels of governance; it opens up channels for the flow and sharing of resources and knowledge; and it facilitates learning, innovation, changing actions and adaptation" (p.60). In the interviews, a lack of trust was identified as a key barrier to collaboration (Bouwer et al., 2021; Djalante et al., 2011; López-Marrero & Tschakert, 2011). In Lusaka "trust is something that really needs to be built. We need to make sure that we not only build trust within the organisations, but among the organisations and the community" (LuWSI interview, 2022). Increasing knowledge sharing and information exchange between stakeholders could help to foster more trust and collaboration (Bouwer et al., 2021; DMMU interview, 2022).

Table 5-4 The city-level plans and programmes that were mentioned during the interviews

Plan name	Details
Local Area Plans (LAPs)	LCC creates LAPs for the individual compounds, by means of an integrated planning approach that considers the social, economic, political, and environmental dimensions of the issues that need to be tackled. In Kanyama, the last LAP was centered around water security and sanitation, and community members were involved in deciding which issues to prioritize. One priority that was identified was the need for drainage systems (LCC interview, 2022).
Disaster Risk Reduction Strategy for Lusaka	Created by LCC in collaboration with the UN Development Programme (UNDP), as a result drainage systems were created on Kanyama's main roads (LCC interview, 2022).
Slum upgrading programme	Strategy to upgrade the informal settlements (LuWSI interview, 2022; Swedish International Centre for Local Democracy, 2017).

5.3.2.2 Polycentric organisation

Zambia has a decentralised governance system (FCFA, 2016). The country "has a well-defined devolution process" (GIZ interview, 2022) that has distributed responsibilities down to the Ward Development Committee level, "which is the lowest governance level in the country"

(PPHPZ interview, 2022).). WDCs are, however, not yet able to fully exercise these responsibilities because development and urban planning policies end at the district level and have not yet been extended to the WDC level (PPHPZ interview, 2022). The WDCs also lack financial resources (GIZ interview, 2022). As CFR needs to be increased at the community level, more power and funds should be devolved down to the WDC level so that the WDCs can design and implement local area plans and other measures, and develop them with community input (GIZ, NWASCO & PPHPZ interviews, 2022). The GIZ interviewee further specified that it is the organisational development of the WDCs that should be invested in, to ensure that they have what they need to be effective. This includes organisational abilities, an office, financial management system skills, processes, and people (GIZ interview, 2022). These findings align with the literature: "polycentric and multi-layered institutions have a very high potential to influence the capacity to manage resilience" (Djalante et al., 2011, p.4). They namely "allow for opportunities for local institutions which can better match the social-ecological contexts and dynamics", but such arrangements can be "ineffective if lower government levels do not have power and resources" (Djalante et al., 2011, p.4).

5.3.2.3 Learning and innovation

Learning and innovation play an essential role in resilience-building and climate change adaptation processes (Djalante et al., 2011; Folke et al., 2005). The LCC, GIZ and LWSC interviewees all stressed that more learning exchanges could help to enhance CFR, especially the types of interactive and transdisciplinary knowledge co-production and exchange processes that the FRACTAL+ project previously organised (Arrighi et al., 2016; GIZ interview, 2022; Taylor et al., 2021a). Such learning exchanges could continue to focus on climate forecasting and climate modelling (LWSC interview, 2022). Knowledge co-production refers to processes that produce knowledge "with rather than for society" and symbolises a shift from top-down knowledge creation processes to processes that appreciate inputs from non-academic actors including practitioners and citizens (Arrighi et al., 2016, p.10; Taylor et al., 2021a). Co-production processes also provide a space for the input of local knowledge, which the IPCC has deemed very important in urban decision-making processes around climate change adaptation and resilience (Dodman et al., 2022). Transdisciplinary knowledge co-production processes also help build resilience because they embody the values of flexibility, reflexivity, inclusion, and collaboration (Arrighi et al., 2016; Taylor et al., 2021a). Reflecting on a changing context and changing priorities will be important in Lusaka as climate change intensifies. The health professional stressed that learning needs to consider the changing context: "the future is driven by context. How is the context changing? And what do people need?" (HP Interview, 2022). In sum, the continuation of transdisciplinary knowledge co-production processes could help to build CFR because they provide a valuable platform for bringing together the different stakeholders, overcoming institutional silo thinking, and planning together (Arrighi et al., 2016; Bouwer et al., 2021; GIZ interview, 2022).

5.3.3 Urban planning, housing, and environment

The interviewees identified several measures related to urban planning, housing and environment which could enhance CFR in Lusaka were they to be implemented. These can be split up into three categories: 1) Relocating people to other places in the city, 2) improving the state of housing, and 3) improving the natural environment.

The NWASCO interviewee stressed that relocation, or resettlement, is a highly political issue, which has also been highlighted by Jabeen et al. (2010). Relocation has complex social dimensions, because people are often deeply embedded in and dependent on their social and

environmental networks (Mwamba & Peng, 2020; Sim et al., 2019). These networks "form part of their coping strategies" and they strengthen over time, which makes them particularly important for people like the survey respondents who have lived in Kanyama and George for more than 15 or 22 years (Mwamba & Peng, 2020; Sim et al., 2019, p.12). At the same time, relocation can be a long-term option for decreasing residents' exposure to flooding by moving them out of Kanyama or George and to a different location (DMMU interview, 2022; Salami et al., 2017). For those who would like to relocate, having the option to do so could be a long-term solution towards becoming flood resilient. However, this depends on whether they get moved to an area that is less flood-prone and offers the same or better livelihood options (NWASCO interview, 2022). It is also not possible to relocate the entire community. Sometimes, a few people need to be relocated "to create space for roads [and] for drainages", as some compounds are being upgraded according to the slum upgrading strategy (Table 5-4) (NWASCO interview, 2022). However, this is also difficult as people ask for very high compensations when they are forcibly relocated, which is expensive for the government (NWASCO interview, 2022).

The second measure that interviewees identified for enhancing CFR is the flood-proofing of homes so that people's exposure to flooding is reduced. The LWSC interviewee proposed that this could be done by ensuring that houses are built according to a minimum standard of safety, which could be stipulated in a building code. "The responsibility would lie both in the community members [as] the dwellers of the peri-urban areas, and enforcement by the local authority of building codes, so that we have a minimum standard we allow. Even though it's cheap, it should be safe" (LWSC interview, 2022). The other option is that people "raise their houses and also raise up the roof", which community members are already doing by themselves (DMMU interview, 2022). This reflects their coping capacity (DMMU interview, 2022; Jabeen et al., 2010). Other stakeholders could provide support, such as Standard Bank, which has been piloting a green and resilient housing project called 'buy-a-brick campaign' together with PPHPZ (PPHPZ, 2022; PPHPZ interview, 2022). The houses are raised because they are "specifically meant to overcome floods" (PPHPZ interview, 2022). As Lusaka's population is predicted to grow, it is important that the city "plan[s] better in the future" so that new settlements are not built "in low-lying areas, in marshland and in flood retention zones" like Kanyama and George (NWASCO interview, 2022).

There has been a strong focus on grey infrastructure (built structures such as drainages) in previous interventions in the settlements, and very little focus on 'green infrastructure' (planned natural areas such as green spaces) (Mulligan et al., 2020; PPHPZ interview, 2022). The PPHPZ interviewee advocated for more nature-based solutions (NBS) in the form of tree planting to alleviate the impacts of pluvial flooding and thereby increase CFR (Dodman et al., 2022). NBS have also been advocated by Dodman et al. (2022) in the WGII 6AR chapter on cities, settlements, and infrastructure, for trees can alleviate the impact of floods by reducing surface water run-off (European Commission, 2013; PPHPZ interview, 2022). Trees can also help break the wind associated with heavy rainfall events, which can blow roofs off houses. The presence of trees and other green spaces can also produce 'cascading co-benefits' for the community, such as recreational value and improved air quality (Dodman et al., 2022; PPHPZ interview, 2022). This call by PPHPZ for more green infrastructure is consistent with the increasing recognition that NBS can help to build climate resilience in the peri-urban areas of African cities (Dodman et al., 2022; Thorn et al., 2021). Financial barriers are the most common barrier to the implementation of NBS in sub-Saharan Africa (Thorn et al., 2021).

5.3.4 Resilient infrastructure and basic service provision

Stakeholders identified several actions related to resilient infrastructure and basic services that could improve CFR in Kanyama and George. The community respondents had strongly stressed that the presence of drainage systems would increase their resilience to flooding events. The need to build more drainages was mirrored by several stakeholders including DMMU and LCC. The GIZ interviewee emphasised that technical solutions like drainage systems need to be part of the solution but cannot be the only solution. The argument was presented that the "huge amounts of money invested" into drainage in the past did not lead to any considerable improvements in the flooding situation (GIZ interview, 2022). "If you take the amount that has been invested in their floods, they shouldn't have floods at all" (GIZ interview, 2022). Therefore, "if we are going to invest in drainage, then we must clearly say how we are investing in the processes that are […] more likely to result in the sustainability of the drainage. Like that people have the ability to renew the drainage […] or clean drainages or […] have the organisational capacity to control and govern themselves well" (GIZ interview, 2022). Technical solutions that are implemented to improve CFR should thus be accompanied by carefully designed processes. The survey respondents had identified improved solid waste management as an urgent issue, also in relation to drainage maintenance. Through the interviews it became clear that solid waste collection has been outsourced from LCC to contractors, but that a key issue is that "sometimes people are not paying" for the waste to be collected (LCC interview).

Related to the call for more drainage to be constructed, the DMMU interviewee expressed the need for "dams which will be useful for water storage". When new drainage systems are constructed, it needs to be considered where the drainages will lead the water to, as to avoid maladaptation that shifts the flooding problem to surrounding compounds (Rodina, 2019). While considerations about watershed dynamics at the Lusaka level fell outside of the scope of this research, they will be important to consider when planning drainage systems at the city level, along with wider urban water infrastructure considerations (Rodina, 2019).

There was also strong agreement among stakeholders that increasing basic service provision and making public sanitary facilities more climate resilient is crucial for enhancing CFR (HP, LWSC & PPHPZ interviews. This can be done by "raising the sanitation facilities" to make "them impenetrable [and] to lessen the interaction with groundwater" (LWSC interview, 2022). This can reduce the likelihood of groundwater contamination and subsequent waterborne disease outbreaks during flood events, reducing the community's susceptibility (Grönwall et al., 2010; LWSC interview, 2022). LWSC considers the raising of structures an "immediate solution" that can be implemented in the short run. New structures, such as sanitation blocks, should directly be designed to be elevated (LWSC interview, 2022).

5.3.5 Disaster risk management

The interviewees suggested several improvements that could be made with regards to early warning systems and disaster response, primarily by ZMD (responsible for weather forecasts) and DMMU (responsible for issuing disaster risk warnings if the need to do so becomes evident in the weather forecast). The weather data generated by ZMD is valuable, but it could be packaged and distributed more effectively to support communities in planning and better preparing for flooding events (ZMD interview, 2022). More nuanced information on the amount of expected rain (in mm) could be provided, and a compound-specific threshold could be calculated that answers to the question "how many millimetres of rain do we need to have a flood?" (PPHPZ interview, 2022). A 'flood danger' scale could be created, indicating the level of risk that a certain rainfall event might cause flooding in the communities in question (PPHPZ

interview, 2022). The PPHPZ interviewee presented this idea as follows: "We are expecting 50 millimetres of rainfall, but already at 40 or 20 in Kanyama it will be flooding. So maybe in terms of the danger, Kanyama is at level 1 [of the flood danger scale]". Moreover, the content of messages sent with the early warning system can be further improved by presenting it in a "simple and local language that people understand" (DMMU interview, 2022). It is crucial that information is translated into Zambia's seven national languages to reach a broader audience (Marten & Kula, 2008). Lastly, the information that is sent should provide people with recommendations on how they can prepare for and behave during a flood, instead of issuing a warning without further instructions as is currently done (PPHPZ interview, 2022).

The ZMD interviewee explained that ZMD has limited financial and human capacity and expanding this capacity would also allow for people to work on the ideas outlined above. Two strategies that were identified to increase capacity were that 1) external scientists could help to build local capacity in Lusaka, as done under the FRACTAL+ project, and 2) the government should "advertise the [meteorological education] programme better" (ZMD interview, 2022).

Weather forecasting for Kanyama and George is done using satellite data and a weather station at Lusaka City Airport, which is located at the other end of the city (ZMD interview, 2022). The ZMD interviewee explained that if "we could have a weather station in Kanyama, we would be able to make more specific measurements for Kanyama [and] we would be able to predict better" (ZMD interview, 2022). In case the financial resources to build a weather station in Kanyama would become available in the future, it would be helpful for more accurately predicting heavy rainfall events that can lead to pluvial flooding, allowing the community to have a longer preparation time before a flood occurs (ZMD interview, 2022). However, this might require populated land to be cleared as "stations need to be in unobstructed areas, where there are no houses and trees" (ZMD interview, 2022). Weather forecasts are communicated online and via social media (Facebook and WhatsApp), but if 'airtime' could be purchased to broadcast the forecasts on the national news and radio, the chances that the weather forecasts reach the communities would increase (ZMD interview, 2022). ZMD also mentioned that "people have always doubted science because the predictions are never 100% accurate" (ZMD interview, 2022). An explanation on the weather forecast that some uncertainty always accompanies could perhaps take away some of this doubt. Training some community members to understand the forecasts, who can then explain them to others, would also be a way to spread awareness about weather forecasts (ZMD interviewee, 2022).

5.4 Interim conclusion and link to the three capacities

Two research questions were answered in this thesis. The first research question asked how different stakeholders in Lusaka define flood resilience. It was demonstrated that definitions span a spectrum of three 'capacities for resilience' (Hegger et al., 2016), namely the capacities to resist, to absorb and recover, and to transform and adapt (Hegger et al., 2016). The implications for implementation are that stakeholders also indicated a broad range of possible measures that could be undertaken to enhance CFR, which were the focus of research question 2. The answers to research question 2 showed that all in all, there is quite a lot of overlap between the actions that communities think could enhance their CFR and those that the other stakeholders think could enhance the CFR. However, there are also some nuances that the community members reported, for example, in the types of trainings they would like to receive and modifications to the early warning systems that they would like to see.

The actions that were proposed can be divided into the five pillars of flood resilience (UN Habitat & DiMSUR, 2020). The structural measures that were identified to increase CFR

included the flood-proofing of homes and the construction of more drainage systems and flood resilient sanitary infrastructure. Non-structural measures such as improvements in early-warning systems and flood risk communication could also support CFR enhancement. Most importantly, consistent with the literature on the topic, it was found that appropriate governance processes need to be in place to support the implementation of such measures and to ensure that they meet the community's needs. The four principles of adaptive governance (Djalante et al., 2011; Folke et al., 2005) provide a helpful framework for categorising the top governance priorities that the stakeholders identified for enhancing CFR. Improving community involvement in decision-making processes, and improving stakeholder collaboration, will be the most important. Financial constraints were found to be the primary limiting factor for all stakeholders in Lusaka.

The GIZ interviewee stated that "we cannot make a claim for resilience if we are unprepared to transform". The findings demonstrate that the community members and all other stakeholders in Lusaka are prepared to undertake changes to enhance CFR. An important question that needs to be answered in the future, is into which direction stakeholders would like to transform. The three capacities can guide the stakeholders on how they would like to transform the SESs of Kanyama and George in the future. The findings indicate that there is strong support for moving towards transforming them into systems which have both the 'capacity to absorb and recover' and the 'capacity to transform and adapt' (Hegger et al., 2016).

6 Discussion and recommendations for future research

By capturing multistakeholder perspectives, this study contributed unique knowledge about how community flood resilience in Lusaka's unplanned settlements is perceived and could be enhanced. The findings from the two research questions contribute to both science and practice and will now be discussed in two sections. Flowing directly from the discussion are recommendations for future research. Lastly, the strengths and limitations of the methodology are discussed, and the overall conceptual approach is reflected upon.

6.1 Discussion and recommendations for future research related to RQ1: different definitions of flood resilience

The current level of community flood resilience in the unplanned settlements of Kanyama and George is low. To investigate what a more flood resilient community could look like, research question 1 asked 'How do different stakeholders in Lusaka define flood resilience, in terms of a desirable state to be achieved?'

6.1.1 Differing definitions and understanding of flood resilience

Consistent with existing literature, the analysis of the stakeholders' 24 different definitions revealed that resilience remains a vague concept that is understood in a myriad of ways even when applied to the specific hazard of flooding (Fekete et al., 2020; Liao, 2012; McClymont et al., 2019). This can be a virtue because a wide range of definitions of flood resilience provides flexibility and creativity in the range of actions that can be proposed to enhance CFR (Hegger et al., 2016). As reflected in the multitude of measures that were proposed in Table 5-2 and 5-3. At the same time, inconsistency of definitions can be limiting in that there is no common understanding of when a community could be considered resilient, generating ambiguity about what actions should be prioritised to enhance it (Borie et al., 2019). The findings also demonstrated that stakeholders have different ideas of what should become resilient to flooding, and how. The majority said it is the community that needs to become resilient. One stakeholder indicated that it should be the water system that needs to be made resilient, as a precondition for the community itself depending on that water system to become resilient to flooding. Others conceptualised resilience to result from the presence of processes such as effective communication and collaboration among stakeholders, rather than a system attribute achieved. This implies that future work on (flood) resilience in Lusaka should clearly specify the questions of resilience 1) of what, 2) to what, 3) for whom, as well as 4) at what temporal and spatial scale(s), 5) and for what purpose (Dewulf et al., 2019).

6.1.2 Thinking in terms of capacities for flood resilience

The definitions alluded to the need for a resilient community to possess 1) the capacity to resist, 2) the capacity to absorb and recover, and 3) the capacity to adapt and transform in the face of flooding events (Alexander et al., 2016; Bulti et al., 2019; Hegger et al., 2016; Walker et al., 2004). These three capacities continue to be discussed in the SES literature, and there is disagreement whether a resilient system should possess all three of those capacities, or a combination of two, or perhaps just one such capacity (Alexander et al., 2016; Hegger et al., 2016; Keck & Sakdapolrak, 2013). There is also discussion whether a strong focus on the capacity to resist, for example, by exclusively focusing on technical solutions like drainage systems, can hinder system transformation (Hegger et al., 2016; Liao, 2012). This research does not answer these questions, but it makes an academic contribution by indicating that thinking in terms of the theoretical capacities of resilience could guide decision-making about what kind of community flood resilience stakeholders want to work towards, and through which measures. If the stakeholders

in Lusaka would like to emphasise system transformation to build CFR, which is advisable as Hegger et al. (2016) deem the capacity to adapt and transform a "precondition of resilient systems" (p.4), then it is advisable to prioritise measures that are in line with this approach (Folke et al., 2010). These could include strengthening the communities' coping capacity, supporting adaptation efforts, helping communities harness opportunities such as water harvesting and strengthening adaptive governance to improve stakeholder collaboration and embrace learning and innovation (Alexander et al., 2016; Folke et al., 2010; Hegger et al., 2016). Whether pursuing these measures will enhance the flood resilience of a community is, of course, a different question that depends on many other factors such as what other risks they get exposed to under a changing climate. However, existing research in Europe indicates that specific strategies have the potential to strengthen the presence of one or more of the three capacities (Alexander et al., 2016; Hegger et al., 2016).

6.1.3 Towards a shared definition of community flood resilience in Lusaka

The practical contribution that the definitions found under research question 1 make are 1) that they demonstrate that together, stakeholders envision the presence of different capacities, which opens the door for implementing a wide range of measures, and 2) that stakeholders could use the definitions as a starting point to work towards a shared vision of what CFR in Lusaka could look like. During their research on multi-stakeholder perceptions on flood management in Ghana, Yiwo et al. (2022) found that flood perceptions depend on the profile of stakeholders. The same holds true for flood resilience definitions: they vary by stakeholder. Stakeholders in Lusaka could come together to work towards a shared definition for the CFR that they would like to build in the unplanned settlement. While it might be challenging to settle on one definition, it might be possible to reach consensus on different dimensions that a definition should contain and to decide on the capacity or capacities that they envision a flood resilient community or city to possess. If this is not done, there is a risk that stakeholders who push the flood resilience project the strongest in the future might align actions with their own definition of CFR. Other definitions might be disregarded, which can close the door for some of the capacities depending on the definition.

All in all, research question 1 can be considered legitimate. While 24 different definitions of flood resilience were evaluated, the question can arguably only be considered fully answered once definitions from the communities in Kanyama and George have also been collected and analysed. The community views were brought in via the survey, which did not ask for a definition of flood resilience. Further research is also needed on how to operationalise these multiple definitions. In resilience research in general, there remains a significant research gap on how to move from conceptualisation to operationalisation (Balsells et al., 2015; Bulti et al., 2019; Caldarice et al., 2019; Rodina et al., 2019). This research has arguably moved the context-specific discussion on Lusaka a little bit closer to operationalisation from conceptualisation.

6.2 Discussion and recommendations for future research related to RQ2: the proposed CFR-enhancing measures

Research question 2 asked "how could community flood resilience in Kanyama and George be enhanced according to stakeholders?" This question was answered in two sections, the first capturing community views by answering the sub-question "how could resilience to flood events in Kanyama and George in Lusaka be enhanced in the view of community members?" The second sub-question captured the views of all other stakeholders and asked, "what governance and other measures could enhance community flood resilience in Lusaka according to other stakeholders?"

The findings revealed that both community members and other stakeholders have many concrete suggestions on how CFR in Kanyama and George could be enhanced. These suggested measures were categorised according to the five pillars of flood resilience adapted from UN Habitat and DiMSUR (2020). The pillars are 1) community, 2) governance and economy, 3) urban planning, housing, and environment, 4) resilient infrastructure and basic service provision, and 5) disaster risk management. By organising them according to these pillars, they become more actionable because they break down the complex problem into distinct thematic areas. Table 5-3 shows which stakeholders proposed what, so that stakeholders who proposed similar measures can identify each other, seek out collaboration, and take advantage of synergies between their work. By presenting community members' own views separately from the views of other stakeholders, the chances that the priorities and capacities of each type of stakeholder can be taken into account increase. These include, for example, LCC, GIZ and LWSC. Civil society organisations such as PPHPZ and ZHPPF can also use the findings to advocate for measures that are better aligned with the community's needs. It is important to stress that of course, it is not a given that CFR would be enhanced even if the measures were to be implemented in real life (Keating et al., 2017). This depends on other factors and can be exacerbated as other climate risks amplify and negatively affected the vulnerability of communities (Dodman et al., 2022). Furthermore, climate risks can and do evolve over time, and therefore the response measures and their effectiveness need to be regularly monitored, re-evaluated, and adjusted based on what is learnt (Dodman et al., 2022; Singh et al., 2021; Roberts, 2010). Such monitoring requires political will and institutional capacity (Roberts, 2010; Shakya et al., 2018).

6.2.1 Towards operationalising the proposed measures

The proposed measures could make a practical contribution to CFR in Kanyama and George because they can be used as a departure point for future work. Of course, the list of proposed measures is by no means ready to use. First, the list would need to be further enhanced with contributions from a broader range of stakeholders. This is necessary because many of the measures cannot be successfully implemented by one actor and would need the collaboration of others. ZMD and DMMU for example need to work very closely together when it comes to early warning systems. Flood insurance, for example, was not identified as a resilience-enhancing measure even though Almoradie et al. (2020) and Surminski and Oramas-Dorta (2014) deem it important in the African context. Broadening the interviewee base to include the Ministry of Finance or Standard Bank might have changed this. Next, the measures would need to undergo a rigorous feasibility assessment, and a few measures would need to be selected, for example by means of multicriteria analysis or integrated assessment, as further explained in Chapter 6.2.4 (Dixit & McGray, 2013). Such a selection would also be necessary because, as the interviews highlighted, financial constraints for implementation remain limited in Lusaka. As not all measures can be implemented, pathways and synergies would need to be identified with other development objectives and other policies of LCC and the national government (Schipper et al., 2022).

6.2.2 Towards adaptive governance and building transformative capacity

Perhaps the most important finding was that community members and other stakeholders believe that a shift towards more adaptive governance could increase community flood resilience (Djalante, 2011; Folke et al., 2005). In particular, stakeholders stressed that increased participation and collaboration would be crucial to increase community empowerment and increase the chances that community voices are heard, their needs are met, their adaptive capacity is strengthened, and their vulnerability to flooding is reduced (Djalante et al., 2011). This was also emphasized by other authors, arguing that "adaptive and inclusive urban risk

governance will be essential" in reducing the vulnerability of those living in flood-prone, densely populated settlements (Bouwer et al., 2021, p.9). Stakeholders also foresaw essential roles for the other three characteristics of AG in enhancing CFR (Djalante et al., 2011). In line with the idea of 'polycentric and multi-layered institutions', WDCs should be strengthened financially (Djalante et al., 2011). Learning and innovation efforts should be increased, and the communities' ability to self-organise, and form networks should be strengthened (Djalante et al., 2011). In essence, stakeholders thus see a transition towards more adaptive governance as critical for enhancing CFR. This finding is in line with research by Seeliger and Turok (2013), who suggest "adaptive governance as a framework for building resilience through strengthening local capabilities" (p.184) based on their research in South African informal urban settlements.

One fundamental question that arises is how a shift towards more adaptive governance could be brought about in Lusaka, starting with how community participation in decision-making processes, especially at the LCC level, could be increased. At the same time, it must be remembered that community participation is not a magic bullet (Few et al., 2007; Taeby & Zhang, 2019). While it is important, it cannot make adaptive governance happen on its own. Looking back to research question 2, it could have been interesting to focus more explicitly on pathways towards adaptive governance in Lusaka, however, this was not done initially as no information on the community or other stakeholders' interest in adaptive governance was accessible for this research. Beyond researching participation and collaboration, such AG research could also address the three other characteristics of AG (Djalante et al., 2011). For the aspect of 'polycentric and multi-layered institutions', one could focus on the WDCs (Djalante et al., 2011). The interviews highlighted that the WDC's seem to be a key player in enhancing CFR as they are the closest governance structure to the community, but at the moment, they do not have the political or financial means to fully exercise their mandate. For the aspect of self-organisation, future research could investigate how we can "organise communities so that they play a major role in driving the reduction of [the] vulnerabilities [that they face]", as Dobson suggests (2017, p.79). This research focused predominantly on stakeholders and organisations who operate in the 'formal' sphere, for reasons of access to people and information. However, "cities of Africa are […] shaped by informality", and so are the unplanned settlements (Kareem et al., 2020, p.4; Taylor & Peter, 2014). Future research along the axis of community organisation could investigate what solutions for enhancing resilience are already emerging autonomously within communities, how they contribute to adaptive capacity, and how they could perhaps be scaled up (Kareem et al., 2020).

Moreover, it would be interesting to further explore how transformative capacity, which some definitions from research question 1 called for, could be built. As Bouwer et al. argue, citing Moore et al. (2014), "transformative capacities are particularly important in the context of informal settlements, as transformation is key to alleviating cycles of poverty which […] exacerbate vulnerabilities" (2021, p.3). Such an investigation could build on previous work on transformative adaptation in South African cities by Taylor et al. (2019), Ziervogel (2019), and Ziervogel et al. (2016c). The research could be structured around the 'framework for analysing transformation in SES' as proposed by Moore et al. (2014).

6.2.4 Interdependencies between resilience and development

A key objective was to capture the complexities and structural inequalities that heighten the community's vulnerability to flooding events. The discussion of the structural inequalities showed that flood resilience and development are closely connected. There is no clear distinction as in unplanned settlements they are intricately intertwined (Schipper & Pelling, 2006; Sim et al., 2019). Many of the measures that stakeholders identified, such as improving access

to basic sanitation services and making community involvement in decision-making processes more genuine, are not exclusively 'CFR-enhancing' measures. Rather, they are measures that could indirectly improve CFR and social resilience by directly improving socioeconomic development conditions (Kareem et al., 2020). Therefore, a key conclusion is that resilience-building efforts in Lusaka's compounds need to go hand in hand with ongoing efforts to achieve sustainable development. In Lusaka, these efforts take the shape of working towards Zambia's Vision 2030 and 8NDP, policies that strive to reduce the percentage of people living below the poverty line and to increase access to safe drinking water and sanitation facilities (Ministry of Finance and National Planning, 2022; Republic of Zambia, 2006). Similar conclusions have been made by other researchers focused on the links between climate change adaptation, resilience, disaster risk management and sustainable development, such as Schipper and Pelling (2006) and Few et al. (2006).

Earlier research indicates that flood resilience and development efforts in Lusaka could both benefit from a stronger resilience narrative in the upcoming city-level integrated development plan (Few et al., 2006; Schipper & Pelling, 2006; Vincent & Colenbrander, 2018). The findings indicate that at the city level, further integration between climate change adaptation and development efforts could help to channel limited funds to increase the standard of living in the compounds while consciously working to reduce vulnerabilities and build resilience to already present and future climate hazards. This would align Zambia with the United Nations Development Programme's advice to developing countries to "treat climate change as a development issue, and systematically address it in their development strategies and policies in order to promote low carbon development, resource use efficiency and resilience building" (Dia, 2019, para. 8). Besides helping to achieve climate-resilient development, the streamlining of development and climate change efforts can also help to reduce the risk of development projects undermining resilience (Bunce et al., 2010). Future research could develop a framework to assess whether proposed adaptation or development options align with achieving disaster risk reduction, sustainable development, and social vulnerability reduction targets. Such a framework could use multicriteria analysis or integrated assessment to identify adaptation options instead of simple impact assessments that would limit the focus on narrowly defined development outcomes (Dixit & McGray, 2013). The framework should also account for future climate risk and use a Robust Decision-Making approach that is helpful for making decisions under high uncertainty (Vincent & Conway, 2021). Such an approach acknowledges that resilience building measures will have to work in a range of potential, yet uncertain, futures (Vincent & Conway, 2021).

6.2.5 Donor relationships and financing

The findings also showed that some stakeholders consider a rethinking of traditional donor relationships important, as these relationships sometimes foster dependencies and reinforce donor agendas rather than empowering local stakeholders to shape the design of development and projects. Moving forward, improving the genuine participation of target audiences in donor priority setting would therefore be important. To date, "all major disaster and climate change adaptation policies, plans and programmes initiated by the Zambian government have been funded and technically supported by multilateral or bilateral donors" (Funder & Mweemba, 2019, p.132). As Zambia moves towards its goal to become free from donor dependence by 2030 (Republic of Zambia, 2006), further research is urgently needed on how financing can be mobilised for measures that enhance CFR. This is especially critical because financial constraints emerged as the key barrier for the community, LCC, and other stakeholders to undertake CFR-enhancing measures. This finding is in line with previous research in Lusaka (FCFA, 2016) and elsewhere (Shackleton et al., 2015), which has identified financial barriers to climate change

adaptation and resilience-building efforts. In the literature, financial constraints are also frequently cited as an inhibitor for increased community involvement in decision-making processes (Djalante et al., 2011). On paper, the United Nations Framework Convention for Climate Change (UNFCCC) and the OECD Development Assistance Committee (DAC) have stressed the need to rethink climate finance for managing climate risk in the context of development cooperation (OECD, 2016, 2017; UNFCCC, 2020). In practice, however, significant barriers to mobilising finance remain. Therefore, future research should investigate how key barriers to funding (flood) resilience measures could be overcome in the Lusaka context.

To conclude, the findings under the second research question confirmed that communities and other stakeholders believe that CFR in unplanned settlements of African cities could be enhanced. The methodology involved a bottom-up engagement that gave community members and other stakeholders an opportunity to voice their perceptions (Salami et al., 2017). A contribution has also been made to overcoming siloed approaches (Bouwer et al. 2021; Fekete et al., 2020; McGill, 2020), which is crucial when dealing with the highly interdisciplinary, multi-scale and multi-institutional topic of flood resilience. Literature dealing with disaster risk management, (water) governance, international development, climate science, sustainability science, urban planning, African studies, health, social-ecological systems theory, resilience thinking, and climate change adaptation was consulted.

6.3 Possible revisions to the conceptual framework

The flood vulnerability framework by Salami et al. (2017) was used in this research, to counter the prevailing trend that "cities of the south are explored through and explained by urban theory from the north, which is not always appropriate or relevant" (Sim et al., 2019, p.11). The framework was updated based on the findings. In the initial diagram (Figure 3-2), resilience-enhancing measures and flood resilience governance were separated into two boxes. However, because the results indicate that the implementation of measures (structural and non-structural) needs to go hand in hand with changes in governance processes, ideally towards more adaptive governance, the diagram was updated to reflect this (Figure 6-1). Measures and governance were moved from separate boxes into a single box because they cannot function in isolation if CFR is to be enhanced in Kanyama and George. To illustrate, planning interventions (flood resilience pillar: urban planning, housing, and environment) or infrastructure interventions (flood resilience pillar: resilient infrastructure and basic service provision) will only be successful in the long run if they are designed through a participatory process that involves community members.

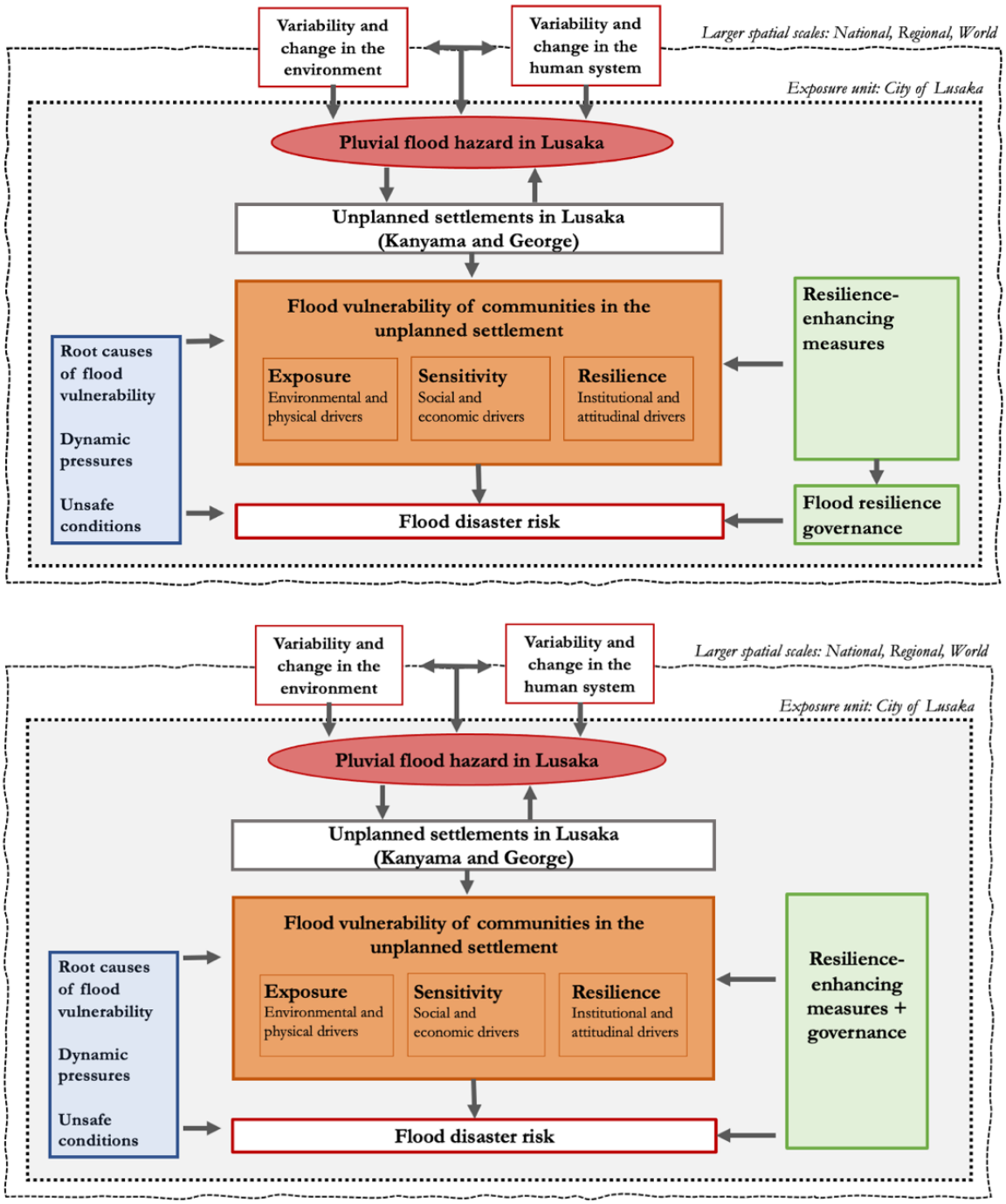


Figure 6-1 Revised conceptual flood vulnerability framework for African cities (bottom), with the original version for comparison (top)

Source: Recreated by author from Salami et al. (2017, p.5)

6.4 Reflection on the methodological choices

As expected, methodological choices affected the results. The case study design provided space for an in-depth description of the context and the structural inequalities that heighten the community's vulnerability (as was stipulated in the aim). Simultaneously, the single-case case study design limits the generalisability of the results. In future studies, generalisability of results to the wider city of Lusaka and beyond could be increased by studying more than two

compounds. Whereas community perceptions in Kanyama and George were found to be very similar, possibly because of the small survey sample size of n=10 community members from each compound, more diversity in perceptions on the enhancement of CFR likely exists across Lusaka's 43 compounds (Grönwall et al., 2010). Case studies can also be used for knowledge sharing and cross-city learning on resilience (Ndebele-Murisa et al., 2020). Cities in sub-Saharan Africa with decentralised governance systems that also face high flood risk in rapidly growing, unplanned settlements such as Durban (South Africa), Maputo (Mozambique), and Dakar (Senegal), may find the different CFR-enhancing actions that were identified under research question 2 useful (Butterfield et al., 2017; Ndebele-Murisa et al., 2020; Wachira, 2022).

The spatial scale of the analysis was the community level, not forgetting, however, the fact that the community level intersects with the individual, household, and city level (Norris et al., 2008; Zevenbergen et al., 2008). As Keating et al. (2017) mention, the concept of community remains elusive. The views of individual community members living in George and Kanyama were brought in via the secondary survey data because interviewing community members was not possible. This had implications: because information about the respondents' profile was limited, it remains unknown how representative the sample was of the wider community, for example in terms of gender, age, socioeconomic status, and the quality of their housing which might affect their lived experiences and perspectives on CFR (Dodman et al., 2022; Taeby & Zhang, 2019). Collecting data from a larger number of community members with more information on individual respondents' profiles could have resulted in different findings and more nuanced analysis of results by type of respondent (Creswell & Creswell, 2018). While 24 different definitions of flood resilience were collected, none were directly from community members but rather from civil society representatives from PPHPZ, ZHPPF, and WDC councillors. It is unclear to what extent these represent their personal and organisational views or those of the community. Future research could thus benefit from an explicit focus on how community members define resilience (Taeby & Zhang, 2019).

Temporal scales require attention when planning to implement flood resilience measures (Chelleri et al., 2015). Research questions 2a and 2b did not prescribe a temporal scale for the measures that the stakeholders should propose. This limits the direct applicability of the findings in planning processes by LCC. However, it was also consciously done because it remains unclear what levels of flood risk communities will need to become resilient to in the next five to thirty years. For the formulation of resilience plans, it will be crucial to understand future climate risk better so that it can be addressed (Vincent & Conway, 2021). It is also important that resilience plans remain flexible to avoid the lock-in of unsustainable short-term solutions that might hinder transformative adaptation in the longer-term (Cañizares et al., 2021; Chelleri et al., 2015). Documents for resilience planning at city and national level have yet to be developed, and it will make more sense to match timescales once plans are in place. Last, such plans should also take into consideration the implementation timeline and lifespan of adaptation measures, including how long it takes to build infrastructure and how long it might last (City of Chula Vista, 2011).

Choices of methodology and conceptual framework affected the results in a few other ways. For reasons of scope the choice was made not to conduct a stakeholder analysis, but doing so could have cast light on the political dimension of the flooding issue and the power dynamics that are at play in decision-making processes (Golder & Gawler, 2005; Taylor & Peter, 2014). Future research could investigate the politics around community participation in decision-making processes for urban planning and climate change adaptation, for example by researching how the political leverage of communities in these processes can be increased (Taylor & Peter, 2014). This relates closely to how the self-organisation of the community could be increased

(Djalante et al., 2011). The analysis revealed that one critical dimension of adaptive governance, namely participation and collaboration, were considered particularly important by the interviewees (Djalante et al., 2011). A more explicit rather than implicit focus on adaptive governance in the interviews may have yielded more detailed findings on how to move towards more AG and more participatory governance processes in Lusaka, that better respond to the needs of the communities in the unplanned settlements (Bunce et al., 2010).

The researchers' own bias and interests also affected the results because a transformative worldview led to the use of different frameworks and theories, which initially did not include adaptive governance (Creswell & Creswell, 2018). The 'five pillars of urban flood resilience' were a core component of the research (DiMSUR & UN Habitat, 2020). The five pillars provided a typology against which results were deductively coded in the first round of the deductive-inductive coding that was conducted as part of the thematic content analysis. Had another typology been used to thematically organise the results, for example, the typology of different community flood resilience dimensions by Bulti et al. (2019), the conclusions might have been presented differently. Last, the conceptual flood vulnerability framework and the five pillars could have been linked even more closely. The five pillars were agglomerated as one component of the framework (the green box 'resilience-enhancing measures + governance' in Figure 6-1). However, the five different pillars could have individually been integrated in the diagram. The pillar of 'urban planning, housing, and environment' could for example have been linked closely to the 'exposure' box in Figure 6-1, indicating that improvements in housing quality and urban planning could reduce the exposure of community members to flooding events (Salami et al., 2017).

7 Conclusions and recommendations

This chapter presents the conclusions and the recommendations in an integrated way because the recommendations flow directly from the conclusions. A concrete overview of the recommendations can be found in Chapter 8. Academics and researchers are invited to consult the recommendations for future research in Chapter 6.

Pluvial floods are common and cannot be prevented from happening in Lusaka, and their intensity, frequency, and variability are expected to increase as climate change worsens. However, the negative social and economic impacts of these floods can be mitigated by enhancing community flood resilience in the unplanned settlements, which are the worst affected. At the time of this research, Lusaka City Council had made flood resilience a policy priority. As flood resilience cuts across many different stakeholder mandates, it was a given that that building community flood resilience in the unplanned settlements would need to be a multi-stakeholder endeavour. This research was conducted to address two ambiguities standing in the way of more concerted action for increased CFR in Lusaka. The first ambiguity related to *what* different stakeholders in Lusaka understand under 'flood resilience' was necessary to address because defining flood resilience is a pre-condition for "successfully implementing it in flood risk management" (Hartmann & Jüpner, 2020, p.2). The second ambiguity related to *how* different stakeholders, especially the affected communities, thought that flood resilience in the unplanned settlements could be enhanced in the future. The research questions addressed these two gaps and were answered through nine key informant interviews, participatory observation in Lusaka, a stakeholder discussion session, and a community flood experience survey.

Stakeholders in Lusaka all had varying definitions of flood resilience, of which some deviated more from the 'textbook' IPCC definition of resilience than others (Ara Begum et al., 2022). Many definitions focus on the ability of communities to deal with flooding, for example by preparing before a flood event, coping during, and/or recovering after a flood event. Many definitions also stress the presence of one or more 'capacities of a resilient system', including the capacity to resist, absorb and recover, and to transform and adapt (Hegger et al., 2016). These definitions open the door to many different strategies to enhance CFR, which could, for example, decrease vulnerability by increasing the population's adaptive capacity or decreasing their exposure to floods. To harmonize future actions for enhancing CFR and to ensure that stakeholders are working towards a common goal, **it is recommended that all stakeholders in Lusaka who are working on or have an interest in CFR, including community members from Kanyama and George, come together to work towards one or more shared definition(s) of community flood resilience.** This will help coordinate future actions, decide which capacity or capacities to work towards, and prioritise what strategies should be pursued. A suitable arena of interaction to do this in could be future Learning Labs similar to the ones hosted by the FRACTAL and FRACTAL+ projects.

Community members and the other stakeholders proposed many context-specific actions that could be pursued to enhance CFR, among which there is significant overlap. These actions can be categorised according to the five pillars of urban flood resilience: 1) community, 2) governance and economy, 3) urban planning, housing, and environment, 4) resilient infrastructure and basic service provision, and 5) disaster risk management. Enhancing CFR will require a holistic approach that addresses all five pillars; therefore, **it is recommended that the measures listed in Table 5-2 and 5-3 are considered in future decision-making processes on CFR.** The other recommendations primarily address the attainment of the community and governance pillars as they received the most attention by research participants.

To strengthen the community pillar, **it is recommended that positions for a team of flood resilience officers are established in each community.** They would not be associated with the WDC and therefore not tied to political election cycles. Instead, they could be associated with PPHPZ and ZHPPF for access to an office, resources, and community networks. These flood resilience officers could be trained as technical officers and become the liaison persons for all things CFR related in the compounds. They could, for example, receive training from DMMU and ZMD so that they can answer questions of fellow community members about weather forecasts and how to prepare for floods. Their tasks could include capacity building, the coordination of activities such as trainings and sensitisation workshops on flooding. The flood resilience officers could collaborate closely with DMMU, LCC and the WDCs.

The governance pillar will need to receive particular attention from stakeholders, as a lot of potential for change was identified here. Stakeholders showed a high level of enthusiasm for working towards more adaptive governance in Lusaka (Djalante et al., 2011). Therefore, **it is recommended that a structure is created that fosters stronger partnership, long-term collaboration, and participatory and adaptive planning on CFR at the Lusaka city level.** This could, for example, be a 'CFR focus group' under the auspices of LuWSI and funded by LCC that meets regularly once every few weeks. It is crucial that alongside LCC, community members and other stakeholders can participate. The structure could also be under the auspices and covered by the National Climate Change and Development Council once it is created (Ministry of Tourism, Environment and Natural Resources, 2010).

To enhance community resilience in the long run, Lusaka City Council **is recommended to further increase community participation in the planning and implementation of policies and action plans** (Yiwo *et al.,* 2022). LCC is encouraged to **continue efforts to integrate climate change issues in upcoming local development plans,** as this will "establish a foundation on which to build resilience" (Bouwer et al., 2021, p.2). Furthermore**, it is recommended that a monitoring, evaluation, and learning scheme is set up to track whether adaptation and other measures are meeting the goals that have been set** (Smith et al., 2019). **LCC is also recommended to continue efforts to mobilize funds for the WDCs** as they are the governance structure with the closest proximity to the community level. Lastly, to improve the sharing and exchange of knowledge and information, it is **recommended that a WhatsApp group is set up for stakeholders in Lusaka working on CFR (including WDC councillors and flood resilience officers). If time and budget allow, a 'flood resilience in Lusaka' website could be set up to facilitate the sharing of policy briefs and research materials generated through engagements like FRACTAL+.**

As Djalante et al. (2011) write, "building the resilience of communities and societies to natural hazards and climate change impacts is not just an outcome, but a (long and challenging) process" (p.11). In Lusaka, enhancing CFR is a complex challenge given the high social vulnerability that prevails in the settlements and the structural inequalities (such as the location in flood-prone areas and lack of drainage systems), which exacerbate exposure to floods. However, many efforts have already been made to improve the situation by the different stakeholders working on governance, urban planning, disaster risk management, meteorology, water and sanitation, health, and development. Future efforts to enhance CFR should build on these existing efforts, be context-specific, take a systematic approach, and first and foremost empower the communities to take action how they see fit. This thesis has offered both an academic and a practical contribution that will hopefully bring researchers, practitioners, and the communities in Lusaka's unplanned settlements one step closer to a more flood-resilient future.

8 Summary of the recommendations

This section provides a concrete summary of the recommendations explained in Chapter 7.

At the community level:

1. It is recommended that a team of flood resilience officers is established in Kanyama, George and other flood-prone compounds.

For all stakeholders:

2. Stakeholders in Lusaka who are working to enhance flood resilience in the unplanned settlements are encouraged to come together (with community members) to work on a shared definition of flood resilience.
3. It is recommended that the measures listed in Table 5-2 and 5-3 are considered in future decision-making processes on CFR.
4. It is recommended that a WhatsApp group is set up for stakeholders in Lusaka working on CFR (including WDC councillors and flood resilience officers). If time and budget allow, a 'flood resilience in Lusaka' website could also be set up to facilitate the sharing of policy briefs and research materials generated through engagements like FRACTAL+.

For Lusaka City Council in collaboration with other stakeholders:

5. It is recommended that a structure is created that fosters stronger partnership, long-term collaboration, and participatory planning on community flood resilience at the Lusaka city level.
6. It is recommended that community participation in the planning and implementation of different policies and plans is further increased**.**
7. It is recommended that a monitoring, evaluation, and learning scheme is set up to track whether adaptation and other measures are meeting the goals that have been set.

For Lusaka City Council:

8. Lusaka City Council is encouraged to continue efforts to integrate climate change issues in upcoming local development plans.
9. Lusaka City Council is recommended to continue efforts to mobilise funds for the WDCs, as they are the governance structure closest to the community level.

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Appendices

- **Appendix A** includes the participant consent form and information sheet that all interviewees signed.
- **Appendix B** shows the survey questions that were used to answer research question 2a.
- **Appendix C** shows the full list of definitions of 24 flood resilience that were collected from stakeholders.
- **Appendix D** shows an example of the interview protocol that was used in the key informant interviews.

Appendix A: Participant consent form and information sheet

Name: Lena Grobusch
Date: 11th of April 2022
Contact details: Email address: l.grobusch@gmail.com and phone number: +31611809453
Institution: International Institute for Industrial Environmental Economics, Lund University, Sweden
Project title: Master thesis dissertation research about the building of urban flood resilience in Kanyama and George informal settlements, Lusaka, Zambia.

Consent form and participant information sheet – online interview

This form aims to familiarize you with the Master thesis research project that I am conducting interviews for. It aims to ensure that you are provided the necessary information about the research project and gives you the opportunity to confirm that you are willing to voluntarily participate in the research.

Participant information

About the research project

I am currently conducting my Master thesis research at Lund University, Sweden, which counts towards the fulfilment of the Erasmus Mundus Joint Master's Degree in Environmental Sciences, Policy, and Management at the Department of Environmental Sciences and Policy, Central European University in Vienna, Austria. I am conducting this research together with Stockholm Environment Institute as an external partner. The research builds on the 'FRACTAL-PLUS' project 'Participatory climate information distillation for urban flood resilience', in which you have recently participated.

The topic that I am researching is resilience to urban flooding events in the informal settlements of Kanyama and George in Lusaka, Zambia. The aim of the thesis research is two-fold. Firstly, the research aims to conceptualize what flood resilience means to different stakeholders at the local level. Secondly, the research aims to investigate solutions and recommendations for ways to advance flood resilience at the policy and governance levels. I am striving to capture the perspectives of different stakeholders on this topic. As an important stakeholder, I would like to interview you online to capture your perspective on these matters.

What is involved?

You are being invited to take part in the interview to provide your perspectives on urban flood resilience in Lusaka. The interview is expected to take maximum 30 minutes. The interview would take place over Zoom or Microsoft Teams according to your preference.

What will happen to my data?

At the start of the interview, you will be asked whether you consent to the interview being recorded. The video recording would only be used for the transcription of the interview and would then be deleted. The interview transcript would then be used to analyze the findings. The written information gathered from the interview transcript will be anonymized. This means that it will be given an identification number and any personal information that could be traced back to your identity will be removed. The identification number will be kept in a separate, password protected file that only I, as the lead researcher of the study will be able to access. Therefore, it will not be possible to identify you by anyone else other than myself by name from the documentation in this thesis project. However, the opportunity exists to be identified by the organization that you are affiliated with and/ or by your position in the organization that you are affiliated with. You are

free to withdraw from the research by the 5th of May 2022 without giving a reason. If you notify me (using the contact details provided) that you would like to withdraw, the recording and your data will be deleted from the study and will not be used.

The data collected during the interview will be used in my Master thesis. Upon completion, I aim to publish the findings, including the results from the interviews, in an academic journal, with co-authors from the Stockholm Environment Institute. The interview transcript will be safely stored in a password-protected folder on my iCloud drive for 5 years, for future reference.

By taking part, you are agreeing that you have read and understood this information and the information that follows below. Please ensure that you have read and understood this information before continuing. **Please complete the consent form below to confirm that you give consent to participate and to the subsequent use of the interview results as outlined above.** You may ask me questions at the time of the interview or afterwards, using the contact details provided.

Contact details

For any questions about the research and any enquiries that may arise, please contact:

Lena Carlotta Grobusch
MSc Candidate in Environmental Sciences, Policy, and Management
International Institute for Industrial Environmental Economics, Lund University, Sweden
Email: *l.grobusch@gmail.com*
Phone: *+31611809453*

Informed consent form

Please complete the table below to confirm that you are willing to participate in this research, by checking the boxes that apply to you and by placing your signature underneath the table:

		Yes	No
1.	I confirm that I have **read** the 'participant information' section of this document.		
2.	I have been **familiarised** with the thesis project, and had the opportunity to **consider the information, ask questions** and have had any **questions answered satisfactorily.**		
3.	I understand that my **participation in the interview process is voluntary** and that **I am free to withdraw by the 30th of April 2022** without giving a reason. If you notify me (at the contact details provided) that you would like to withdraw, the recording and your data will be deleted from the study and will not be used.		
4.	I understand that **I am not required to answer all the questions** that I am asked during the interview.		
5.	I give my consent that **the online interview can be recorded.**		
6.	I give my consent that **the written transcript of the recording of the online interview can be safely stored for future reference.**		
7.	I give my consent that the **content of the online interview can be transcribed, analysed, and published** in the form of the Master thesis project and in a research output in the form of a journal article.		
8.	I give my **consent to be identified by the organization that I am affiliated with.**		

9.	I give my **consent to be identified by my position in the organization that I am affiliated with.**		

Please, sign below to confirm your consent:

Name of Participant:

Date:

Signature:

If you would like to receive an online copy of the thesis project once it is published on the Lund University Library website, please write your email here to be contacted:

Email: _____

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Appendix B: Survey questions

Number	Survey questions to which the answers were analysed
1.	Where do you live? [George/Kanyama]
2.	How long have you lived in your community (number of years)? [Open text answer]
3.	Why did you move here? [Open text answer]
4.	What do you need to become better informed about how to react to flooding when it happens, and by whom? [Open text answer]
5.	What do you need to better cope/deal with the flooding event? [Open text answer]
6.	What do you think should change to reduce the impact of flooding on you and/or your household members' lives? [Open text answer]
7.	Who do you think should be in charge of these changes? Please give reasons, if possible. [Open text answer]

Appendix C: Full list of definitions that were collected from stakeholders

#	Stakeholder	Definition of flood resilience
1	**Anonymous I**	The ability to cope with and quickly recover from the impacts of flooding.
2	**Anonymous II**	The ability to recover quickly from disaster and plan ahead for the future.
3	**DMMU**	Having to withstand the shocks of a flooding incident.
4	**George WDC councillor**	Taking business opportunities out of floods.
5	**GIZ I**	Flood resilience means limited or less inconvenience that does not result in loss of lives, property of livelihood.
6	**GIZ II**	The ability to cope with floods and thrive.
7	**Health professional**	Flooding is a shock, that would disrupt the livelihood or economic activity. So, flood resilience is how communities are prepared to cope or deal with the flooding. And how they are equipped to thrive in that context.
8	**Kanyama WDC councillor**	Being well informed about the flood and working together with the government and the community.
9	**LCC**	Learn to live with the flood.
10	**LuWSI I**	Having different stakeholders coming together to effectively tackle the problem of flooding ensuring there is effective communication, funding, and project implementation.
11	**LuWSI II**	Ability to come out of a flooding episode with minimal effect/ disturbance as possible.
12	**LWSC I**	Being able to supply clean and safe drinking water even during flood events.
13	**LWSC II**	System/way of preparing for floods, way of responding to floods, of coping mechanisms and ways of handling recovery from floods.
14	**NWASCO**	It's the ability of a system (be it the water system or be it a community) to withstand shocks to a significant level that they're not impacted quite severely to the extent that services are disrupted.
15	**PPHPZ**	The community/slum dwellers are able to adapt, recover and anticipate floods.

#	Stakeholder	Definition of flood resilience
16	**UCT I**	Transformation of the "system" so that all people are not as vulnerable to floods (the question is how to do that).
17	**UCT II**	The ability to pursue options to avoid impacts that undermine well-being and future prospects.
18	**UK FCDO**	Exposure reduced/ eliminated and ability to 'bounce back' increased.
19	**UNZA I**	Capacity to reduce the severe impacts of flooding.
20	**UNZA II**	Being prepared ready to respond or cope with floods.
21	**UNZA III**	Flood resilience means being able to do my routine programmes regardless of flood occurrence.
22	**ZHPPF I**	Coping and adapting to the situation.
23	**ZHPPF II**	To be able to move resources for flood emergencies.
24	**ZMD**	The ability to recover and withstand flooding events.

Appendix D: Interview protocol

Note to readers: The interview protocol was formulated to be short and concise, considering that the stakeholders who were interviewed all have very busy schedules. In addition, the interview protocols were customised to the work of the specific stakeholder being interviewed. This customisation was based on the questions outlined in this interview protocol. Seeing as the interviews were semi-structured, additional questions were formulated and asked during the interview depending on what was being said.

Interview protocol - April 2022

Research question to be addressed: What governance and other measures could enhance community flood resilience in Lusaka?

Introduction

- Thank you again for taking the time to do the interview.
- Provide a brief explanation of who I am and that I am conducting the research for my master's thesis, as explained in the consent form.
- I would kindly like to ask if you are fine with me recording the video. As outlined in the participant consent form, the recording will be deleted after it has been transcribed.

Introductory questions

- *[Institution]* Please name the institution that you are working for
- *[Mandate]* Could you briefly describe what your institution's mandate is? What kind of activities / projects do you undertake to fulfil this mandate? What are you currently working on?
- *[Mandate's link to flood resilience]* And how is this mandate related to building flood resilience in Lusaka's unplanned settlements?
- *[Mandate]* What is your institution already doing related to flood resilience?
- *[CFR]* Based on your work, how would you define community flood resilience and how do you think it could be enhanced?

Solutions (more general questions)

Find out: What solutions and recommendations do stakeholders identify that could increase community resilience to urban flooding events in Kanyama and George?

- [*Solutions]* What kind of actions do you think could increase community resilience to urban flooding events in Kanyama and George?
- *[Solutions]* What solutions should be prioritized? What would be the top three actions that you would try to implement to build flood resilience?
- *[Solutions]* What kind of changes would be needed to achieve …?
- [*Resource availability]* What kind of resource challenges do you face in the current implementation of such/ related measures, if any? How could (financial, non-financial) capacity be increased?

- [*Responsibility]* Which structures or actors are needed to deliver or to support the delivery of such solutions? Who should be in charge of the implementation (of specific measures)?

Governance focus (more focused on the governance aspect)
Find out: What kind of changes should happen at the governance level to implement such solutions and recommendations? If governance has not already been mentioned under solutions.

- *[Governance]* What kind of changes do you think should happen at the governance level to increase community flood resilience?
- [*Community involvement]* To what extent is the community involved in decision-making processes around flood resilience? What is the current level of community participation, do you think it could be further increased, and if so, how?
- [*Stakeholder collaboration]* What is the current state of stakeholder collaboration, do you think it could be further increased, and if so, how?
- [*Coordinated action]* What kind of actions could be undertaken to foster more integrated and coordinated action between the different flood risk stakeholders?
- [*Working in silo's]* How could siloes be overcome to improve collaboration for CFR?
- *[Other concepts related to AG to ask about if they arise]*
    - Trust between different stakeholders
    - Institutions and decentralization
    - Policies – what policies are in place that help to address CFR, are they coherent?

Closing

- Thank you very much for taking the time for the interview. If you have indicated so on the consent form, I will send you a copy of the research once it has been finalized.
- If you mentioned any documents in our conversation, it would be very helpful if you could share them with me. Thank you!