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Master thesis

Building climate resilience as a tool to improve disaster risk management: the case of tropical cyclones Idai and Kenneth in Mozambique

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Abstract

Natural disasters have devastating effects on the communities where they impact, especially when it comes to developing countries since they have less capacity to cope with their consequences and, moreover, their economies usually rely on climate-sensitive sectors such as agriculture and fisheries. Taking as a case study two tropical cyclones that consecutively struck Mozambique in 2019, this thesis aims to answer the following research question: *How did the disaster risk management of the Government of Mozambique in the face of cyclones Idai and Kenneth contribute to exacerbating the pre-existing vulnerabilities of local communities and how was the aim to build climate resilience included along the preparedness and response process?* To answer this question, the paper examines the response measures taken by the Mozambican government following the cyclones. Concretely, five areas will be analyzed. The first one, which is considered to be part of the preparedness phase for a disaster, refers to the forecast of the cyclones and the dissemination of early warning systems. As regards the response phase, I will look at the capacity of critical infrastructure to resist climate shocks, followed by an analysis of the resettlement options offered to affected communities and the support given to people that stayed in their damaged homes. Later on, the paper will delve into the impact of the cyclones on people's livelihoods and will finish by exploring the provision of Water, Sanitation and Hygiene (WASH) services to the population. The methodology used by this thesis is based on policy analysis and Monitoring & Evaluation (M&E), not only looking at the response to the studied cyclones but also revising the legal framework concerning disaster management in Mozambique. Regarding the conceptual framework, I will draw on the idea of resilience and vulnerability to climate hazards. Therefore, this thesis will argue that resilience needs to be included along all the phases of the disaster management cycle: mitigation and preparedness measures need to build resilience among the population to increase their capacity to withstand the impacts of climate disasters and recover from them, but the actions taken during the response and recovery phases also have the opportunity to create resilience by 'building back better'. Moreover, I will consider the need to include climate adaptation measures within development plans, which is labeled as 'mainstreaming'.

The main findings of this research are the following. Firstly, during the last decades the Government of Mozambique has made relevant steps to move from a reactive disaster management to a proactive one but the pre-existing vulnerabilities of the country together with its limited capacity to respond make those efforts still insufficient. Secondly, in the wake of

cyclones Idai and Kenneth, some of the response measures were successful but many other deficiencies were identified. Thirdly, the proactive stance of the government is not accompanied by adequate measures that build resilience among the population by addressing their main vulnerabilities during the mitigation and preparedness phases.

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List of abbreviations

ASJ – Al-Sunna wa Jama'a (Islamist group in Cabo Delgado)

DNGRH – National Directorate of Water Resources Management

DRR – Disaster Risk Reduction

DRM – Disaster Risk Management

ENAMMC – National Strategy for Adaptation and Mitigation of Climate Change

FGC – Disaster Management Fund

IDP – Internally Displaced People

INAM – National Institute of Meteorology

INGC – National Institute for Disaster Management

INGD – National Institute for Disaster Risk Management and Reduction

IPCC – Intergovernmental Panel on Climate Change

M&E – Monitoring and Evaluation

MSF – Médecins Sans Frontières (Doctors Without Borders)

NGO – Non-governmental organization

PDNA – Post Disaster Needs Assessment

PNGA – National Environmental Management Plan

PPRR – Prevention, Preparedness, Response, Recovery

UNISDR – United Nations International Strategy for Disaster Reduction

UNOCHA – United Nations Office for the Coordination of Humanitarian Affairs

WASH – Water, sanitation and hygiene

WMO – World Meteorological Organization

Introduction

It is now an established fact that human-caused greenhouse gas emissions "have led to an increased frequency and/or intensity of some weather and climate extremes" since pre-industrial times (IPCC, 2021). In other words, according to the latest report of the Intergovernmental Panel on Climate Change (IPCC), human influence is attributed to the strengthening of several types of extreme weather events, including extreme precipitation, droughts, and tropical cyclones (ibid.). Consequently, people's exposure to such disasters will rise as well. After a disaster strikes, the affected communities are faced with circumstances – such as meeting survival needs and adapting to the loss of infrastructure – that are significantly different from any struggle they might experience in their daily life, a situation that usually lasts for prolonged periods of time (Paton & Buergelt, 2019).

This is especially relevant for developing countries, which are likely to be the most affected by climate hazards due to their geographical location but especially given their limited capacity to respond. In this sense, Mozambique is one of the countries most prone to weather-related disasters in the world, ranking fifth when looking at the period from 2000 to 2019 but reaching the first position when considering the year 2019 alone (Eckstein et al., 2021). That year, the country was hit by two category-4 tropical cyclones[1] just a month apart: cyclone Idai made landfall in mid-March while cyclone Kenneth did so six weeks after. Not only was it the first time that two strong cyclones struck the country in the same season but the former is also considered to be one of the most devastating tropical cyclones to ever hit the region. In fact, the frequency of tropical cyclones globally is expected to "decrease or remain unchanged" (IPCC, 2021). However, scientific projections suggest that if global warming continues, the intensity of these kinds of extreme events will increase – that is, higher wind speeds and rain rates –, thus raising the proportion of category 4 and 5 tropical cyclones (McSweeney, 2021; IPCC, 2021).

For this reason, and considering the capacity of weather-extreme events to wreak havoc on developing countries, it becomes necessary to anticipate and mitigate disaster risk to protect

[1] The classification of tropical cyclones is based on the maximum sustained wind speed and is divided into five categories. Category 4 refers to 'intense tropical cyclones', characterized by maximum sustained wind speeds ranging between 166 and 212 km/h (WMO, 2021).

the affected communities and their livelihoods and to give them tools to increase their capacity to face such an adverse situation. Indeed, the lack of preparedness exacerbates the losses produced by disasters and extends the recovery period, meaning that taking preparedness measures in the face of prospective hazards by making communities resilient may contribute to lessen its impacts and ease the post-disaster phase.

This paper will take cyclones Idai and Kenneth as a case study to look at the disaster risk management of the Government of Mozambique. During the last decades, the country has implemented an array of policies and frameworks for disaster risk reduction, aiming at moving from a reactive stance to a proactive one. When disasters strike they become an acid test to assess the actual capacity of the country to respond and whether the preparedness measures taken have been effective to build resilience among the population. As for Mozambique, the studied cyclones indicate that even though some improvements have been made in relation to previous disasters, there are still several challenges to be faced. In this sense, the Secretary-General of the World Meteorological Organization (WMO) Petteri Taalas stated that "the two cyclones are a wake-up call that Mozambique needs to build resilience" (WMO, 2019a), highlighting that despite the efforts made to date, there is still a long way off.

In this sense, drawing on the concept of resilience, this paper aims at analyzing the weaknesses of disaster risk management in Mozambique by answering the following research question:

How did the disaster risk management of the Government of Mozambique in the face of cyclones Idai and Kenneth contribute to exacerbating the pre-existing vulnerabilities of local communities and how was the aim to build climate resilience included along the preparedness and response process?

To support the findings, two sub-questions will be considered:

- Which pre-existing vulnerabilities characterized Mozambique prior to the impact of cyclones Idai and Kenneth and how did they contribute to aggravating the effects of such disasters?

- Which mechanisms exist in Mozambique to regulate disaster management and to which extent does the government include disaster adaptation within development plans?

For the research, two different bodies of literature will be used. On the one hand, the concepts of resilience and vulnerability are used as the umbrella to analyze how the already existing conditions in the country worsened the extent of the impacts of the cyclones as well as the response of the Government of Mozambique to both Idai and Kenneth. On the other hand, the paper considers the need to include climate change adaptation within development plans considering that they have an influence on each other: that is, disasters jeopardize human development at the same time that development projects can either exacerbate or reduce climate risks.

Even though the case study used for the research encompasses both cyclones Idai and Kenneth, the analysis will focus more on the former since it had more ravaging impacts and the amount of information available on it is considerably higher than on the latter. However, Kenneth is still included due to the already-mentioned particularity of being the second cyclone to hit the country in the same season, significantly influencing the response to Idai. Hence, even if the limited data available on cyclone Kenneth constrains the possibility of deeper assessing the response given to it, it is still interesting to analyze both cyclones as a whole.

In the next chapter, I will describe the Monitoring & Evaluation methodology used for the research. Following, I will delve more in-depth into the conceptual approaches outlined above. This will then lead to the analysis, which will start by presenting the case study as well as the legal and policy framework of Mozambique regarding disaster risk reduction. Later on, the response measures implemented in the face of the cyclones will be revised considering the areas most impacted – namely critical infrastructure, housing or livelihoods – and how the populations' needs arisen from the disaster were dealt with.

Methodological considerations

For the purpose of this thesis, I will employ a Monitoring and Evaluation (M&E) methodology based on qualitative indicators of climate change adaptation to answer the research question. The indicators will constitute the basis to carry out a policy analysis and assess the disaster risk management and climate resilience of the Mozambican government. The data is collected through desk research and consists of different sources of information which will be used with the aim of gathering a varied array of data to be analyzed. This includes reports from NGOs, government publications and documents, academic articles, policy papers, and online news media. This data, which is available online, is mainly centered around the case study that guides this research, which is the tropical cyclones Idai and Kenneth that hit Mozambique in 2019.

The challenges of monitoring and evaluating climate change adaptation

Before explaining the methodology chosen for this paper, a preliminary remark needs to be done. Evaluating climate change policies might present more challenges than doing so with other development measures. This is mainly due to two factors: the inherent uncertainty of climate change and its long-term nature (Fisher et al., 2015). Even though development interventions also face the uncertainty of the context – such as funding or political circumstances – and usually need to be implemented in the long-term, it is easier to define which is the desired outcome and what will be considered as a success. However, climate adaptation projects are subject to a double uncertainty because of the unpredictability of which variations will the climate experience, how rapidly they will take place, and whether the climate predictions are reliable or not, as well as what their consequences will be (Fisher et al., 2015; Bours et al. 2013).

Thus, assessment of policies aimed at building climate resilience needs to be done over a long time horizon but "there is no definite point at which evaluators can determine that a system or community has fully adapted while the climate is still changing" (Fisher et al., 2015), which implies that there might not be a final point where the issues being addressed are fully solved. Another challenge for evaluating the results of adaptation policies is the complexity of socio-economic systems, which makes it difficult to attribute results to specific interventions. The

existence of other development measures, for instance, may also help to increase resilience to the impacts of climate change (Olivier et al., 2013).

In this sense, the assessment of climate policies requires moving beyond the methods used for policy analysis in other fields and looking for those that take into consideration the mentioned challenges.

Steps to evaluate the selected case study and the use of indicators

This research will use a method based on the guidelines for Monitoring and Evaluation (M&E) of climate change adaptation of the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), which is a German agency that works in international development cooperation. The organization proposes five steps to monitoring the results of adaptation projects to climate change. Yet not all the steps will be followed in this paper because, as the authors of the guidelines note themselves, "it may be useful to skip a step or even to focus on a single step" depending on the policies and adaptation projects assessed (Spearman & McGray, 2011).

It has to be noted that the existing M&E frameworks for climate adaptation projects are designed to evaluate concrete interventions. However, the intention of this research is not to analyze a single policy or project but to look at the whole package of measures taken by the Mozambican government to face climate disasters and, in particular, the threat of cyclones Idai and Kenneth. In other words, the research does not aim at monitoring the effects driven by a particular measure but to have a general look at the effectiveness and appropriateness of both the already existing policies in the country before the cyclones took place regarding disaster preparedness and the measures taken specifically to respond to their impact. Therefore, and considering that there is no specific framework on how to assess disaster preparedness policies or disaster response measures, the guidelines designed for evaluating a disaster adaptation project will be adapted to the needs of this research.

To do so, two steps will be followed to move afterwards to a discussion. The first step is to describe the adaptation context. The objective is to explore the climate and non-climate factors that are both likely to aid or constrain the measures taken. In other words, by doing this initial description it is easier to better understand the factors that climate policies both are influenced

by and aim to influence (Spearman & McGray, 2011). The description of the context allows us to define who is exposed to what risks and which non-climate factors are driving vulnerability, for instance. Therefore, this information enables us to set a baseline for the subsequent analysis of the results (ibid.).

The second step is to define the indicators that will support the M&E. The fact that adaptation to climate change faces specific and diverse contexts entails that the measures taken are equally varied. The implemented policies are tailored to each particular context and address factors relevant to those circumstances (ibid.). Hence, there exist no universal indicators that can be used to measure the performance of climate adaptation policies – and, in consequence, there is no reference point for measuring results that allows us to compare how it has been done versus how it should have been done. Furthermore, "vulnerabilities and their causes also vary widely from one location to another, making it difficult to compare adaptation results and identify transferable recommendations" (Olivier et al., 2013). Therefore, qualitative indicators will be used in this paper, which will become a mere guideline for the analysis to be done and will be assessed according to what is observed that should have been conducted in a different manner.

More concretely, climate hazard indicators will be used, which "focus on a physical manifestation of climate change or a hazard that may put people or ecosystems at risk" as well as the severity and frequency of these phenomena (Spearman & McGray, 2011). These indicators are part of the adaptation actions dimension of a given project or set of policies, which encompasses the implementation of activities that address particular climate risks and vulnerabilities (ibid.). In the face of this lack of universal indicators, the ones used for this paper have been selected according to the main areas of intervention referred to by the sources of information used – that is, the operation updates released by different NGOs or the data published by the government or other researchers. The indicators are the following:

1) Early warning systems. Looking at how both cyclones were forecasted and how the warnings were disseminated to the communities.
2) Infrastructure. Describing the impacts of the cyclones on critical infrastructure and reflecting on its capacity to withstand climate shocks.

3) Shelter and resettlement. Explaining the resettlement options that the government of Mozambique offered to the people affected by Idai and Kenneth as well as the support given to families that stayed in their damaged homes and assessing its effectiveness.
4) Livelihoods and food security. Reflecting on the vulnerability of the livelihoods of the population of Mozambique and looking at how affected they were due to the cyclones.
and 5) Water, Sanitation and Hygiene (WASH) services. Observing the actions taken to ensure access to sufficient and safe WASH services for the communities impacted by the cyclones.

Furthermore, the role of international assistance will also be considered by including references to their support actions since the scale of both cyclones exceeded by far the national capacity to address their impacts alone.

Further methodological considerations

Some further methodological considerations need to be done. First, notwithstanding that during the paper it is emphasized the importance of taking a proactive approach to disaster management instead of a reactive one – that is, taking prevention and preparedness measures before a disaster strikes rather than focusing on the response and recovery phases –, the information about the actions taken in this sense can be hard to find while data on the measures taken after the cyclones is easily found. For this reason, this research uses the information on the actions taken following cyclones Idai and Kenneth to reflect on the actual level of preparedness and resilience of the communities to such events.

Second, even though the case study of this research encompasses both cyclones Idai and Kenneth, wider information is available on the former. For this reason, cyclone Idai will become the main object of study along the paper while cyclone Kenneth will remain secondary. However, the latter is still included in the research because of the singularity of the case study – being the first time that, one the one hand, two cyclones of such magnitude hit Mozambique in the same season and, on the other hand, that a cyclone strikes as far north in the country –, as will be explained later.

Regarding the constraints found during the research, it needs to be noted that the official language in Mozambique is Portuguese, a language I am not proficient in. Nevertheless, to a large extent I do have reading comprehension, which has allowed me to still use not only international sources of data but also local ones. The limitation refers to the fact that my lack of vocabulary in Portuguese has hindered the process of searching for these sources and thus some potential data for this research might have been unintentionally overlooked. Furthermore, the initial idea was to include interviews to experts – especially researchers and NGO workers in the area – or even to someone from the Mozambican National Institute of Disaster Management (INGC) to enrich the research and the analyzed data but the several petitions did not receive any answer, reason why the research is only based on online data.

Conceptual framework

In the following chapter, the conventional disaster management cycle will be explained to understand the process by which governments face disasters, both before and after they strike. This paper will consider it as a framework since it is the most established and commonly used – even by the Sendai Framework for Disaster Risk Reduction, which is an international agreement adopted by the UN Member States. However, as will be seen, there are some critiques to this model from authors that question whether it is outdated, which will be taken into consideration along the research to connect the framework with the idea of resilience. Later on, the notions of resilience and vulnerability will be explored. These concepts are particularly relevant considering that they are widely used not only by disaster researchers but also by governments in their discourses and even climate programs and policies. The last section of this chapter is about the inclusion of climate change adaptation in development discourses, which is increasingly necessary to guarantee that both fields make steps together rather than undermine each other's efforts.

The aim of this chapter is therefore to shed light on concepts that turn to be crucial in the area of disaster risk reduction (DRR) and which are closely intertwined, being sometimes difficult to separate one from the other. It is beyond the scope of this paper to quantitatively measure both the resilience and vulnerability created by the disaster management of the Mozambican government, so I will not explain the different proposals to do so. Instead, the idea of exploring both resilience and vulnerability is to look at how the Mozambican government incorporates them in their plans later in the analysis.

The disaster management cycle

The United Nations International Strategy for Disaster Reduction (UNISDR) points that disaster risk reduction "is aimed at preventing new and reducing existing disaster risk and managing residual risk, all of which contribute to strengthening resilience" (United Nations, 2016). To achieve this goal, disaster risk management applies policies and strategies that are usually guided by the most common framework used in literature: the disaster management cycle, which is composed of four different phases – namely prevention, preparedness, response,

and recovery – which is known as the PPRR framework (Sawalha, 2020; Arifah et al., 2019). Each of these stages include multiple procedures that at the same time vary depending on the organization or the governmental agency applying them, or even on the academic authors (Sawalha, 2020). It must be pointed out that the different stages might overlap so that it is difficult to determine when a phase finishes and the following one starts. For this reason, some of the measures taken along the disaster management cycle can be considered to be part of different stages at the same time – mainly in the prevention and preparedness ones. Furthermore, climate disasters take place in a continuum, meaning that a country might be hit by another calamity even before the recovery from the last one is over, thus overlapping the different phases of the cycle. This approach entails a shift from reactionary models of disaster management, where the focus was providing assistance to affected communities, towards a proactive model that anticipates the hazard aiming at minimizing the exposure to hazards and mitigating their impact (Raikes et al., 2019).

The first of the components of this approach to disaster management is prevention, also called mitigation or disaster risk reduction (DRR). Mitigation measures are taken before a prospective disaster occurs and seek to "either make a hazard less likely to occur or reduce the negative effects if it were to occur" (Coppola, 2015: 225). However, for many types of disasters – such as cyclones – it is not possible to reduce the probabilities that they manifest eventually. In these cases, the strategy is not to diminish the risk likelihood but the negative consequences of the hazard on people, infrastructure, the environment, and even on the economy (ibid.). For natural disasters, structural measures – those that involve engineered solutions that alter the physical environment – are more commonly used. In the concrete case of cyclones, some of the options that can contribute to reducing the impacts of the storm are the elevation of structures above storm surge levels as well as their strengthening against strong winds, or the construction of shelters for displaced people (Coppola, 2015: 226). However, there are also nonstructural measures – that is, those that do not imply the usage of engineered solutions – that can be effective to mitigate the impacts of a disaster. It is the case of early warning systems, community awareness and education programs, or the approval of regulations restricting activities in high-risk areas (ibid.).

According to Coppola (2015: 260), the implementation of mitigation measures faces several obstacles. Considering that mitigation projects can be highly expensive, the main challenge is their cost. It is thus important to educate the involved stakeholders about the expected outcomes of such measures when a disaster strikes so that they do not prioritize investing the necessary resources in other non-disaster programs. Indeed, the benefits of mitigation measures can outweigh the initial economic costs by reducing casualties but also property losses (ibid.). Another obstacle is low levels of political support. Political leaders may prefer launching projects that allow them gaining public support, such as some related to education or health services, rather than disaster mitigation programs (ibid.). If there is no imminent threat it can be considered that hazards might not take place in the end and therefore it might be felt as investing resources in an intangible project.

Mitigation measures are not enough to prevent a community from suffering the impacts of a hazard, so the phase of preparedness serves as a complement to them. This second phase of the disaster management cycle "minimizes hazards' adverse effects through effective precautionary measures that ensure a timely, appropriate, and efficient organization and delivery of response and relief action" (Coppola, 2015: 276). On the one hand, after identifying the hazard that might impact a country, the government needs to take preparedness measures such as planning which actions will be taken in the event of a disaster and which actors will be involved in the response, as well as developing technology and equipment to assist in the response to a disaster. On the other hand, citizens also need to be prepared for the disaster. This is achieved not only by raising their awareness about the risks of a hazard and how it affects them but also by giving them skills that reduce their vulnerability. It is thus important to teach citizens how to react to a hazard: how to recognize warnings but even empower them to provide first-aid to needed people around them (Coppola, 2015). Community preparedness can be done through different channels such as mass media, via the internet, in schools, or with advertisements in the streets, for instance. However, again it becomes necessary to take into consideration several obstacles so that the message reaches its target, namely the levels of illiteracy among the population, their access to technology and the media, or the challenges faced by people living in extreme poverty to take preparedness measures (ibid.).

Disasters strike around the world despite the previous efforts to mitigate risk and prepare for its consequences. Therefore, the response phase starts as soon as it is manifest that a hazard will hit the country imminently and it is extended until the emergency declared immediately after the event is over (Coppola, 2015: 322). This is the most complex of the phases since "it is conducted during periods of very high stress, in a highly time-constrained environment, and with limited information" (ibid.). Cyclones, unlike other hazards such as earthquakes, may be expected with some advance notice, which allows pre-disaster response measures. This is the case of warning and evacuation or even the positioning of supplies in the affected area so that they are available for the victims immediately after the hazard (ibid.). Once the disaster event begins and is recognized by response officials, actions aiming at saving lives are also set in motion. On the one hand, activities to react to the immediate needs are taken, such as search and rescue, first aid, or evacuation. On the other hand, response requires other measures including the resumption of critical infrastructure – electricity or transportation routes – as well as the provision of food and water and health assistance (ibid.). In this phase it is also necessary to establish coordination mechanisms so that all the stakeholders involved provide the most efficient response possible. International agencies usually participate in disaster management after the hazard has already struck, thus coming into play in the response stage (ibid.).

Despite efforts to mitigate disaster impacts, devastating effects are often unavoidable. After responding to the immediate needs arisen in the aftermath of the hazard, recovery actions are implemented seeking to "repair, reconstruct, or regain what has been lost as a result of a disaster and, ideally, reduce the risk of similar catastrophe in the future" (Coppola, 2015: 405). This process may last for months or even years depending on the magnitude of the catastrophe. Even though some recovery actions may be planned before a disaster occurs, the reality is that such planning usually begins when the hazard has already hit a country (ibid.).

Recovery is the phase of the disaster management cycle where more funds are invested and more actors get involved. Several components of a society may be damaged after a disaster and thus require being rehabilitated or rebuilt: the government, infrastructure, natural environment, housing, and livelihoods, among others. Despite the destruction caused by a disaster, the recovery period can be considered as an opportunity not only to increase community resilience to future hazards but also to carry out development improvements and build better

infrastructures and livelihoods, for instance (Coppola, 2015). Thus, the recovery phase is not only meant to return the society back to normal but to upgrade the previous existing conditions. However, the pressure exerted on disaster managers so that the pre-disaster conditions are restored as fast as possible – mainly by the community itself that urges to bring to an end to the inconveniences they suffer – turns to be an obstacle to make the most of this opportunity (ibid.).

The need to review the conventional disaster management cycle

Yet the evolving nature of modern disasters is becoming more complex since it is rooted in an increasing number of factors that interact with each other (Sawalha, 2020). This raises the need to reflect on whether the disaster management cycle remains effective enough or whether it should be brought up to date by combining it with other frameworks that complement it with contemporary management insights (ibid.). Even though it is out of the scope of this paper to discuss how the traditional disaster management cycle should be revised, some of the perspectives brought up by critical authors will be browsed so that they can be taken into account along the research.

The main criticism of the PPRR model refers to its linearity. Some authors (Kelly, 1999; Crondstedt, 2002) consider that the disaster management cycle sets up arbitrary and artificial barriers between the four phases, which in turn assume a sequential order that, in practice, is blurred. In this sense, Kelly (1999) acknowledges that dividing disasters into stages is only useful to simplify the non-linear nature of a disaster but emphasizes that it is the events stemmed from the calamity which need to be the focus of the disaster management efforts: "It does not matter what disaster stage you are in if you don't have a handle on what is happening".

O'Brien et al. (2010) argue that the current approaches of disaster management may be effective for routine hazards, that is, those from which it is possible to obtain previous information on the potential for danger. However, such approaches turn out to be ineffective in the case of future disasters that imply a great level of uncertainty. It is known that climate events will occur but the timing, location, and magnitude cannot be predicted with precision. In this sense, the authors criticize that the disaster management cycle puts equal emphasis on

the four different stages – even though in practice it is the response phase the one receiving more attention – whereas the focus should be put on the preparedness of communities instead (ibid.). For this reason, O'Brien et al. (2010) suggest that disaster management should evolve from an event focus to a resilience building focus to increase communities' coping capacity in the face of disruption and the need to adjust to new realities. Indeed, as will be further explained in the following section, resilience is a concept that has become predominant in the field of disaster risk management during the last decades.

Defining resilience in the context of climate hazards

Resilience is broadly defined as "the capacity to resist and recover from loss" (Zhou et al., 2010, Fekete et al., 2014). However, despite the fact that several authors have based their research on the idea of resilience, there is still no consensus on its definition. The authors emphasize different elements of the concept but in general they coincide on referring to the capacity of a community or system to cope with disturbances without collapsing and the ability to recover from such shock.

Resilience has been generally defined either as a desired outcome or as a process leading to a desired outcome (Manyena, 2006). Earlier authors tended to lean towards the former, thus emphasizing a reactive perspective, but recent definitions have been more process-oriented. In the outcome-oriented conceptualizations, disaster resilience is seen as the 'shock absorber' that moderates the outcome of a hazard so that the negative consequences are the least possible (ibid.). Even though this approach cannot be considered wrong, it is rather simplistic since resilience is not merely about resistance to change and conservation of existing structures but also about the opportunities that emerge from disturbances so that the system evolves (Folke, 2006). In this context, process-oriented approaches incorporate the idea of adaptation besides the buffer ability. Adaptive capacity entails the social learning by communities and governance institutions in the aftermath of a disaster (Cutter, 2016). When considering adaptation, resilience is seen both as a contextual and a personal construct since it depends, on the one hand, on the exposure of people to danger and, on the other hand, on their adaptive strategies (Manyena, 2006). This idea highlights a futuristic dimension of resilience: adaptation takes

place in the post-disaster phase as a strategy to mitigate future hazards (ibid.). Thus, the idea of adaptive capacity can be considered the umbrella concept containing resilience as an influencing factor (Klein et al., 2003).

Folke (2006) argues that in a resilient socio–ecological system, "disturbance has the potential to create opportunity for doing new things, for innovation and for development. In a vulnerable system even small disturbances may cause dramatic social consequences". For this reason, policies based on the resilience perspective do not aim at controlling change in systems assumed to be stable but at managing the capacity of the socio-ecological system to cope with and adapt to such change (ibid.).

Disaster resilience implies a deliberate process where the affected community takes actions to increase its capacity to face disturbances. Therefore, resilience is considered a quality to be acquired by taking steps such as recognizing the human role in disasters, having a disaster plan, and creating the conditions so that the plan can be implemented (Manyena, 2006). Furthermore, resilience demands ensuring equity and access to resources within the system – or community – so as to not privilege one group over another. For this reason, it is important to consider the question of resilience to what but also resilience for whom (Cutter, 2016).

Bahadur et al. (2013) compiles characteristics of the concept of resilience common in different academic papers, such as high diversity, effective governance and institutions, the ability to work with uncertainty and change, and community involvement and the inclusion of local knowledge, among others. The first of these characteristics, the one referring to high diversity, is especially interesting for this paper since, as will be explained in further detail, Mozambican citizens mainly work in agriculture and fisheries. According to Norris et al. (2008, as cited in Bahadur et al., 2013), "communities that are dependent on a narrow range of resources are less able to cope with change that involves the depletion of that resource". In the same way, Cutter et al. (2000) argue that a community based on a single sector such agriculture or fishing is less resilient than another whose economic base is diversified and will thus have a major stability of its livelihoods. Dependency on limited natural resources reduces the level of resilience of the community since an extreme event is more likely to affect the main source of livelihoods (ibid.). For Adger (2000), such dependence does not necessarily imply relying on a single crop or fish stock but on an integrated ecosystem: "resource dependency relates to communities and

individuals whose social order, livelihood and stability are a direct function of their resource production and localized economy". In this sense, the author points at income stability and social stability as two elements that reflect the consequences of stresses associated with resource dependency – the latter being manifest through indicators such as the impacts of population displacement (ibid.).

In order to build resilience to disasters it is also necessary to engage the local community, who should participate in assessing and addressing their own vulnerabilities to hazards (Norris et al., 2008, as cited in Bahadur et al., 2013). The individuals themselves will have to react to emergency situations if the response capacity of the government is overwhelmed in the face of a disaster. Thus, the idea of co-management stands up for decentralized structures and for shared rights and responsibility for resource management to achieve a higher degree of resilience (Bahadur et al., 2013). Indigenous knowledge and community-based monitoring fill in the gaps of global science and can contribute with valuable insights. However, in the context of climate change adaptation the limits of local knowledge need to be acknowledged and a combination of both arises as the most appropriate approach (ibid.).

A critique to the use of the concept of resilience is that it aims at returning to "normal" or, in other words, to the situation previous to the disaster. This idea involves returning to the conditions that led to the disaster in the first place, which in most cases include vulnerability, poverty, and poor development (Kelman et al., 2015). Therefore, resilience would not entail an improvement of the living conditions but recovering precarious circumstances that could trigger a new disaster. In other words, restoring the system as it was before the disaster may return it to a state where it is vulnerable to the impact of the same perturbation again (Bahadur et al., 2013). Thus, the idea of resilience should not intend to go "back to normal" but to progress and "bounce forward" (Kelman et al., 2015).

Cannon & Müller-Mahn (2010) consider dangerous the shift from the discourse of vulnerability to a greater emphasis on the concept of resilience. The authors are concerned that resilience thinking removes the inherently power-related connotation of vulnerability and, consequently, of the process of adaptation. In other words, they claim the need to acknowledge that disasters are socially constructed events (Cannon & Müller-Mahn, 2010). While the vulnerability approach claims for policies that reduce such condition of being at risk through interventions

in the economic and political allocation of resources, there are no equivalent measures for the resilience approach, which "depoliticizes the causal processes inherent in putting people at risk" (ibid.). Fekete et al. (2014) put it in other words by warning that a misuse of resilience may "justify a hidden transfer of responsibility from public authorities to citizens". Despite this, the authors urge to build resilience as a measure of disaster prevention – understood as fostering preparedness in case of an unexpected hazard – considering the increasing frequency of extreme events. Strengthening local capacities through the implementation of concrete plans is especially important in countries where public authorities are weak, not trustworthy, or have no resources for disaster risk management (Fekete et al., 2014).

The concept of vulnerability and its relation to resilience

The concept of vulnerability often appears related to resilience. Again, there exists a lack of consensus on its interpretation among researchers, which entails debates on whether both concepts are opposed or complementary or whether one is a factor of the other. According to Cutter (1996), differences on the meanings of vulnerability arise from two main approaches to the concept: research focuses either on the likelihood of exposure to a hazard or on the likelihood of suffering adverse consequences in the aftermath of the disturbance, or even a combination of the two.

Blaikie et al. (2004) define vulnerability as "the characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard". For the authors, the definition involves a combination of factors – such as class, gender or health status – that determine the degree to which someone's life and livelihoods are put at risk by an event, arguing that some groups are more prone to damage (Blaikie et al., 2004). Thus, vulnerable groups are those that find it hardest to reconstruct their livelihoods after a disaster, which in turn makes them more vulnerable to the impacts of subsequent hazards (ibid.). Following the distinction of Cutter (1996), this definition fits into the second approach to vulnerability, the one that focuses on coping responses to disasters.

While some definitions of vulnerability are simply framed as the residual consequences that remain after the process of adaptation has taken place, the above-mentioned perspective

considers it an overarching concept: vulnerability does not exist in isolation, only involving the exposure to some specific disturbance, but it also takes into consideration pre-existing constraints on the capacity to respond to such impact (Cutter, 1996). In this sense, the assessment of vulnerability needs to consider the complex range of historical, social, economic and institutional factors that enhance or limit the options for adaptation of a community, thus determining its level of vulnerability (Kelly & Adger, 2000; Blaikie et al., 2004; Cutter, 1996; Manyena, 2006). Thus, this causal perspective highlights the social construction of vulnerability (Cutter, 1996; Cannon & Müller-Mahn, 2010) and arises from social conditions that are usually not closely related to the natural disaster itself (Cutter, 1996).

At the same time, focusing only on the processes that make people vulnerable risks focusing on their weaknesses and reducing them to being passive or even victims. For this reason, more recent authors try to avoid this connotation by highlighting people's 'capacity' to protect themselves rather than just the 'vulnerability' that limits them (Blaikie et al., 2004). In other words, the processes that produce vulnerability are countered by people's capacity to resist and adapt to them either before a disaster or during its aftermath (ibid.).

Exposure to shocks can increase the vulnerability of a system but can also enhance resilience by providing experience to respond to future disturbances (Bahadur et al., 2013). Nevertheless, repeated exposure to stresses could exhaust resources within a system, thus increasing vulnerability and reducing resilience (ibid.).

The inclusion of climate change adaptation within development plans

Developing countries are likely to be the most affected by the effects of climate change for different reasons. Firstly, because they tend to be located geographically in areas that are more prone to climate hazards. Secondly, because they have limited capacity – human, institutional and financial – to respond to the consequences of such disturbances. And thirdly, because these countries usually rely on climate-sensitive sectors such as agriculture and fisheries (Mitchell & Tanner, 2006). Considering that poor countries are often objects of development plans, climate change adaptation should be integrated into such projects. Otherwise, climate change may hamper progress on poverty reduction. Sudden extreme events – as well as slow-onset

disasters and weather changes – impact on natural resources, thus threatening people's livelihoods and increasing food insecurity (ibid.). Poorer communities are already on the edge of their coping capacity, reason why effective risk reduction policies to both kinds of disasters are needed to avoid that their livelihoods are even more undermined (O'Brien et al., 2008). In fact, the adaptation efforts that people need to make to face increasing climate change impacts are not easily distinguishable from those made in response to other simultaneous pressures such as political instability or infectious diseases such as HIV/AIDS (ibid.).

In this sense, development projects should take into consideration how climate change can affect the efficiency of the resources invested and the achievement of objectives (Agrawala & Van Aalst, 2008). It is thus necessary to integrate policies and measures to address climate change into development plans instead of managing climate separately – a practice labeled with the concept of 'mainstreaming' – especially for those plans designed for the medium or long term since it is then when climate impacts will appear (Klein et al., 2007; Agrawala & Van Aalst, 2008). According to Klein et al. (2007), mainstreaming can bring two achievements. On the one hand, it can contribute to the climate proofing of existing projects, meaning that it can redress those projects whose effectiveness is threatened by climate change or those that contribute to the climate vulnerability of its recipients. On the other hand, mainstreaming can ensure that future projects are directed to achieve a successful adaptation to climate change, thus aiming at reducing the vulnerability of communities. The latter has implications for the design of development priorities and projects themselves (ibid.). However, mainstreaming may also turn counter-productive by creating conflicting goals, loss of political edge, and methodological problems resulting from an overloading of the discourse (Jerneck & Olsson, 2008).

A mainstreamed adaptation strategy should take a comprehensive approach that addresses the underlying factors of vulnerability to climate change, which are structural issues customary of low development, such as high dependence on natural resources or incapacity to meet basic needs (Klein et al., 2007). Thus, the level of vulnerability of a community depends not only on the magnitude of the climate event per se and its impacts but also on its adaptive capacity (ibid.). At the same time, the adaptive capacity of communities is often limited by a lack of resources, poor institutions and inadequate infrastructure, amongst other factors. Therefore,

vulnerability can be reduced not only through mitigation of greenhouse gas emissions and through policies to adapt to the impacts of climate change but also through development plans aimed at addressing such non-climate factors and improving the living conditions of those affected, which will enhance their adaptive capacity (ibid.). In this sense, adaptation to climate change appears to be 'indirect' as a by-product of other coping mechanisms that simultaneously increase resilience to climate hazards for poor people – an example would be diversified cropping strategies (O'Brien et al., 2008). However, indirect adaptation is not a specific response to the impacts of climate change because a community will prioritize meeting its basic needs before worrying about additional pressures induced by climatic hazards (ibid.).

One of the challenges to mainstreaming is that poverty reduction does not always equate to vulnerability reduction. Indeed, some projects aimed at combating poverty do in fact increase vulnerability. For instance, the construction of a new road may induce the settlement of new inhabitants in areas exposed to natural hazards (Klein et al., 2007). In such cases, adaptation would require the implementation of measures focused on specific threats to ensure that development activities are not detrimental to climate change. For this to be done, it is necessary to understand the complex societal processes that produce vulnerability and poverty (ibid.). Another aspect to be considered is whether current development activities may affect future options for adaptation to climate change – for instance, by building human settlements in areas that are likely to be exposed to climate hazards (Agrawala & Van Aalst, 2008).

The neo-liberal discourse considers economic growth as the best way to reduce poverty, thus suggesting that it would contribute to achieve the goal of development. However, economic growth is deemed responsible not only for increasing inequality but also for environmental damage (Cannon & Müller-Mahn, 2010). It is widely accepted that economic growth is a major source of global warming since it boosts the usage of fossil fuels. Even though not all extreme weather events can be attributed to global warming, climate-related hazards are becoming more frequent and intense. Consequently, it is counter to any process of adaptation to climate change (ibid.). In this sense, projects presented as development but actually based on economic growth may lift people out of poverty but will parallelly increase their exposure to hazards and consequently their vulnerability – in some cases they may even be pushed to degrade the

environment to survive (ibid.). Thus, this so-called 'development' could actually be considered responsible for the manufacturing of risks.

Governments should also provide climate protection to local communities. Newell (2004) suggests that policy integration is the greatest contribution governments can make to achieve this goal, therefore applying the concept of mainstreaming beyond development agencies. The idea is to view climate change not as an isolated problem that needs to be tackled exclusively through policies in areas directly related to it – such as environment or energy – but also in areas like transport or industry. In other words, climate change is considered a product of a series of policies. If such policies are not designed to ensure minimal impact on climate change, then they will counteract any step forward achieved by the environmental-friendly actions taken. This measure can contribute to avoiding the need for expensive mitigation and adaptation projects at a later stage at the same time that is one of the least economically costly solutions (ibid.). Unfortunately, on many occasions the same governments that express their commitments to fight climate change are the ones that keep supporting institutions and companies that generate high levels of greenhouse gas emissions.

Presentation of the case study

This chapter will present the case study on which this paper is based. It will start by outlining some characteristics about Mozambique that are considered relevant for this research to then continue by describing the events that took place in 2019 and their particularities.

Mozambique is one of the countries in the world most prone to weather-related disasters and the impacts of climate change, being regularly affected by droughts, floods and cyclones. These natural hazards have always impacted the country, but they are becoming increasingly frequent and intense due to climate change, thus posing serious constraints to national development (UNDP, 2021b). Indeed, Mozambique is considered to be the most affected country by climate change in 2019, followed by Zimbabwe and the Bahamas, according to the Global Climate Risk Index 2021 published by the non-governmental organization Germanwatch (Eckstein et al., 2021). In the Long-Term Climate Risk Index, which analyzes the most affected countries from 2000 to 2019 based on average values over such a period, Mozambique ranks fifth. The country entered the top 10 this year precisely as a consequence of the devastating cyclones that will be studied in this research (ibid.). While some countries appear in the top of the ranking due to extreme events on an ongoing basis, others – such as Mozambique – are included as a result of exceptional ravaging catastrophes. However, the intensity of such disasters indicates that it is a matter of time until the next exceptional catastrophe occurs (ibid.).

This paper will focus on cyclones Idai and Kenneth, two consecutive tropical cyclones that in 2019 left extensive destruction in their paths – which are the main reason why Mozambique leads Germanwatch's 2019 ranking. In fact, this is the first time in recorded history that two strong tropical cyclones have made landfall in Mozambique in the same season (UNOCHA, 2019). Idai is considered to be one of the most devastating tropical cyclones to ever strike the Southern Hemisphere, becoming the deadliest and costliest in the South-West Indian Ocean (UNOCHA, 2019; Eckstein et al., 2021). On the other hand, Kenneth is the first cyclone to hit the country as far north (ibid.). This reaffirms the fact that even though Mozambique has a long history dealing with natural disasters, their pattern is changing not only in regard to the degree of damage left in their wake and their periodicity but also concerning the areas affected.

A tropical cyclone is a circular storm originating over tropical oceans that brings violent winds, torrential rain, high waves and, in some cases, very destructive storm surges and flooding – like hurricanes and typhoons, but different terms are used according to the part of the world where it takes place (WMO, 2021). Cyclones are considered to be one of the most devastating natural disasters owing to their potential to cause significant impact on life and property, even in the formative stages of their development. The fact that they encompass different hazards that can individually produce negative impacts means that combined, these hazards interact with one another and increase the potential for damage (ibid.). The Southwestern Indian Ocean, where Mozambique is located, is one of the most tropical cyclone active areas in the world (Charrua et al., 2021). The cyclone season in Mozambique generally takes place from November to April and every year three to twelve cyclones form in the Mozambique Channel. Within the country, the Central region is the area most prone to climate hazards in general and cyclones in particular (ibid.). Furthermore, Mozambique is downstream of nine major river basins in Southern Africa, which makes the territory more vulnerable to floods but also to low water flows during droughts due to the use of water by upstream countries (WMO, 2019b).

Tropical cyclone Idai struck not only Mozambique but also Zimbabwe and Malawi, even though the former was the country where the storm hit hardest. On 14 March 2019, tropical Cyclone Idai made landfall in the port City of Beira, which is located in the Central region of Mozambique and is home to 500,000 people. It moved across the region hitting four Mozambican provinces – Sofala, Manica, Zambezia and Tete (as shown in Figure 1). Idai brought strong winds with top speeds of 195 kilometers per hour as well as heavy rain that exceeded 200 mm in 24 hours, causing rivers to overflow with flood waters rising above 10 meters. The cyclone also brought a large storm surge in the coastal cities of Sofala province, mainly in Beira (Trujillo, 2019). As a result, it is estimated that more than 1.5 million people living in the four provinces hit by the cyclone were affected, over 1,600 injured and more than 600 people died (ibid.) – other sources raise the number of people that required urgent humanitarian assistance after the cyclone to 1.85 million (UNOCHA, 2019). Furthermore, Idai damaged over 240,000 houses and displaced more than 140,000 people that fled from the impacts of the hazard.

Tropical Cyclone Kenneth made landfall six weeks later, on 25 April, in the northern provinces of Cabo Delgado and Nampula, flattening entire villages in its wake and killing at least 45 people (UNOCHA, 2019). Kenneth was the strongest cyclone ever recorded in the African country with wind speeds reaching 220 kilometers per hour and floods of 2.5 meters height (Eckstein et al., 2021). The storm caused the destruction of at least 2,500 homes and the loss of a high number of crops, fishing equipment and boats (Emerton et al., 2020). According to the Post Disaster Needs Assessment (PDNA) conducted after the cyclones, the total cost of recovery and reconstruction for both Idai and Kenneth is estimated at 3.2 billion US dollars. Cyclone Idai alone is considered to have caused over 1.4 billion USD in total damage – which refers to the impact on infrastructure and physical assets, being the transport and housing sectors the most affected – and 1.39 billion USD in total losses – which reflect the impact in the national economy, being the agriculture sector the one that suffered the most (Trujillo, 2019).

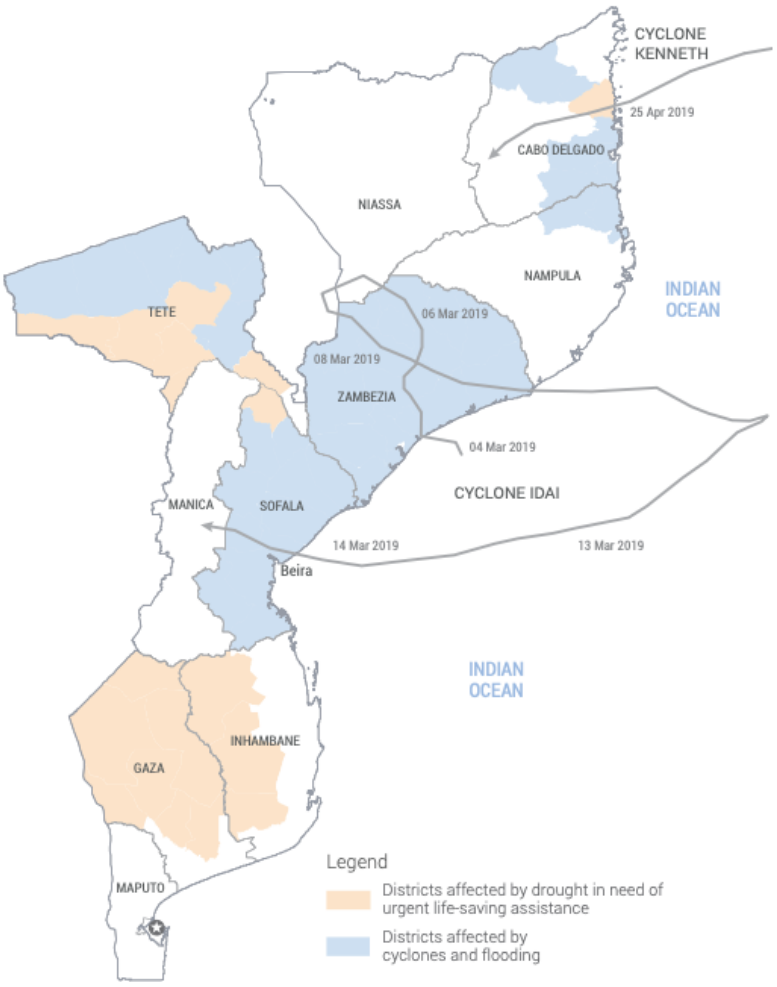

Figure 1 (taken from UNOCHA, 2019a)

Pre-existing vulnerabilities in Mozambique

In this chapter, the main pre-existing vulnerabilities in Mozambique will be outlined since they shape the main challenges that the government needs to deal with along the disaster management cycle. The sub-question that will guide the chapter is the following: *Which pre-existing vulnerabilities characterized Mozambique prior to the impact of cyclones Idai and Kenneth and how did they contribute to aggravating the effects of such disasters?* Indeed, before cyclones Idai and Kenneth struck the country, Mozambique was already facing several hurdles. It is not possible to analyze all the vulnerabilities of the country in this paper since it would be very complex and, as in every country, there are dozens of structural problems that need to be solved and cannot be done in the short term. However, the paper will highlight the most relevant for this research and for the case study in particular: in other words, it will outline the factors that exacerbate the impacts of the cyclones by increasing people's vulnerability to such events. This chapter will look over poverty in Mozambique, the large number of people living in informal settlements in high-risk areas, and armed conflict in Cabo Delgado. Even though the geographical location of the country, as explained in the previous section, constitutes a vulnerability in itself, it is a static characteristic that cannot be changed, as opposed to the ones presented below that could show signs of improvement in the long-term.

Poverty and food insecurity

Mozambique is one of the poorest countries in the world, with 46.1% of its more than 30 million inhabitants living below the poverty line. It is one of the countries with the lowest human development index, ranking 181 out of 189 countries (UNDP, 2021).

To better understand the current poverty situation in Mozambique, it needs to be taken into consideration that the country has a quite recent colonial past: it has been under Portuguese colonial rule since the 16th century and achieved its independence in 1975. Even though the Portuguese regime brought some industrial growth in the 1950s, at the time of independence Mozambique had an underdeveloped economy even by African standards (Brück, 2000). In 1977, a civil war broke out in the country, which resulted in a 15-year conflict that undermined even more the national economy. It was only after the end of the civil war in 1992 that

Mozambique began to experience some economic progress (Daniel, 2020). As Brück (2000) explains it, the war had the worst effects on the Mozambican economy:

> "Overall, war in Mozambique diminished the competitiveness of the economy [...]. These effects distinguish war from a natural disaster or even from the experience of decolonization, where the basic functions of the economy are not challenged as severely or systematically. The very nature of the war in Mozambique with its aim of political destabilization had the most profound effect on the economy."

Despite the reduction in poverty rates during the two decades following the end of the civil war, the population increased by more than 50% in the same period, meaning that in absolute terms the number of poor people in 2015 was nearly the same as in 1996 – that is, about 12 million inhabitants, which back then were almost 70% of the population (Daniel, 2020; UNDP, 2021b). In other words, the economic progress achieved in the country during those years – the national economy grew by an average of 7.9 percent annually in that period – "only translated into modest poverty reduction" (Baez & Olinto, 2016). Moreover, such economic growth "has not been equitable and has not necessarily translated into similar gains in living standards of the population": improvements in such standards have been heavily concentrated in urban areas and in the southern part of the country (UNDP, 2021b).

Since 2016, Mozambique has experienced a slowdown in economic growth and an increase in poverty rates, especially in rural areas. Some of the reasons for this reversal are spiraling debt, the impact of natural disasters – namely El Niño drought and cyclones Idai and Kenneth –, and the military attacks in the northern and central regions of the country (Daniel, 2020; UNDP, 2021b). Indeed, in 2019 the real GDP growth reached only 2.3%, compared to the 4.7% projected by the government at the beginning of the year. The main causes were losses in agricultural production, as well as disruption to transport, communications and services (UNDP, 2021b), derived from the factors just mentioned.

Furthermore, the vast majority of the population – more than 70% – works in agriculture and fisheries, two sectors highly vulnerable to climate variabilities and extreme weather events (Hellmuth et al., 2007). As stated previously, other climate-related events such as floods and droughts are frequent threats in Mozambique. Thus, this kind of climate disasters jeopardize people's livelihoods, which are usually lost either because the crops get damaged or due to

forced displacement, and increase food insecurity among the affected. Indeed, when Idai and Kenneth made landfall, the central and southern regions of the country were experiencing the effects of a severe drought as a consequence of scarce rains in early 2019 and the agricultural production was already expected to be low due to such conditions. A few months before the cyclones took place, between September and December 2018, 1.78 million people were severely food insecure in Mozambique (MOPHRH, 2019). The provinces most affected by cyclone Idai were precisely the ones that were already suffering the consequences of the drought, thus aggravating food insecurity in the country.

Poverty is therefore one of the main obstacles that the country faces and it is exacerbated among the affected populations after a natural disaster strikes. In this sense, as Baez & Olinto (2016) argue, "accelerating poverty reduction also requires protecting vulnerable populations from the effects of extreme weather". Furthermore, poor people are more vulnerable since they have less resources to respond to hazards, thus suffering more the impacts of such disasters.

Informal settlements in high-risk areas

Since the end of the war in 1992, Mozambique has experienced a rapid growth of population that has taken place together with little urban planning and limited public investment in infrastructure, which "has led to an uneven distribution of people and assets across the territory" (Matoso, 2015). During the last decades there has been a proliferation of informal human settlements that have expanded to low-lying areas with high flood risks. Thus, informality becomes one of the main factors that exacerbates vulnerability to climate disasters. As Holz (2018) explains it, "populations living in informal settlements not only have access to poor quality services and housing, they also have more difficulty being included in awareness programs". Considering that most houses in Mozambique have been built by their own residents, access to adequate housing is considered a significant challenge in the country (ibid.).

In Mozambique, 66% of the inhabitants live in rural areas, while in urban areas approximately 80% of the population live in informal settlements. Moreover, it is estimated that around 60% of Mozambicans live in areas at risk of natural disasters (UN-Habitat, 2017). In Maputo alone – which is the fourth city in the country most vulnerable to extreme climate events due to its

location near the coast – over 70% of the population live in informal settlements that, in most cases, have been built on flood-prone areas (UN-Habitat, 2017; Matoso, 2015). In addition to this, houses are built with materials that do not have adequate structural strength to withstand disasters (Holz, 2018). In other large municipalities, the so-called 'bairros informais' (informal neighborhoods, in Portuguese) constitute nearly 90% of the urban population (UN-Habitat, 2017). In most cases, the cost of moving away from these high-risk zones into less prone areas is above the economic capacity of the populations living there (Matoso, 2015), forcing them to stay even if they are aware of the risks that it entails.

The expansion of informal settlements is the result of both the lack of planned growth and the inability of the population to access land in the well-developed parts of the city. Thus, the inhabitants of these 'bairros' are impoverished migrants that settled in these cheaper areas at the cost of higher levels of exposure to climate impacts (Matoso, 2015). Adequate and resilient housing "must be a safe investment that will withstand recurring events that can affect its integrity" (Holz, 2018). The UN-Habitat highlights that despite the existence of risk reduction strategies on national plans, there are no specific resilient housing policies. However, awareness about this issue is increasing and some plans to build resilience against climate events are starting to emerge, such as the project 'Cities and Climate Change' (Cidades e Mudanças Climáticas, in Portuguese) funded by the World Bank (ibid.). In some cases, the government has also worked with communities living in high-risk areas to avoid the construction of new houses and to raise awareness about the necessity to consider moving somewhere safer. However, "these have been sporadic and localized interventions" (Matoso, 2015) that are insufficient.

Armed conflict in Cabo Delgado

In the northern province of Cabo Delgado, where cyclone Kenneth made landfall, there is an ongoing armed conflict since 2017. An Islamist armed group locally known by several names, including Al-Sunna wa Jama'a (ASJ) and Al-Shabab – which has no connection to the Somali jihadist group with the same name –, has since carried out several attacks, killed hundreds of people and left hundreds of thousands displaced. Even though ASJ has not made clear the goals of its insurgency, it has manifested a desire to establish rule by a hardline version of Islamic

law in the region (Gartenstein-Ross et al., 2021). The group is attempting to seize Cabo Delgado by undermining the Mozambican government's military and political authority and gaining local support. The poor socio-economic conditions of the area together with religious and ethnic tensions are also reportedly drivers of the violence: Cabo Delgado is one of the poorest regions in the country and also where the largest Muslim population is located – considering that Mozambique is a Christian-majority country (ibid.). The militants of the group are believed to be frustrated youth that have feelings of marginalization both due to socio-economic factors – they are usually unemployed and have low levels of education – and religious and ethnic tensions (France 24, June 2018; Gartenstein-Ross et al., 2021).

The first attack of ASJ took place in October 2017 in Mocímboa da Praia district, where three police stations were targeted. Thereafter, the assaults spread to other districts of Cabo Delgado (IISS, 2021; HRW, 2020). Even though most of its victims are civilians, government targets have increased as the group has improved its operational tactics and weaponry, even succeeding to exert control over some territories (Gartenstein-Ross et al., 2021). At the same time, the Mozambican military forces have proved incapable of countering the insurgency, "lacking both adequate resources and the capabilities to contain militant activity or protect civilians" (ibid.). Thus, the government of Mozambique has asked for international assistance, including military training. Since the events in 2017, it is calculated that ASJ has been responsible for more than 3,100 deaths and the displacement of more than 800,000 people (IISS, 2021).

Thus, cyclone Kenneth aggravated the already existing vulnerabilities of the populations affected by armed conflict in Cabo Delgado. Some people already displaced by the attacks in the region experienced secondary displacement due to the cyclone. At the same time, ASJ's insurgency negatively impacts climate vulnerability: "Conflicts (especially protracted conflicts) erode and challenge institution-building, and states', groups', and individuals' ability to handle, adapt to and plan for climate change" (Norwegian Red Cross, 2019).

Mozambican policy framework on disaster management

After having looked at the pre-existing vulnerabilities of Mozambique, it is now relevant to explore the policy framework on disaster management to understand the basis that shapes the measures taken by the government to deal with climate hazards and later assess the response to the concrete case of tropical cyclones Idai and Kenneth. To do so, in this section I will discuss the sub-question: *Which mechanisms exist in Mozambique to regulate disaster management and to which extent does the government include disaster adaptation within development plans?*

Over the past two decades, Mozambique has made relevant advances as regards disaster risk management by adopting several laws, policies and plans with the aim to face the challenges posed by climate hazards. The implementation of these frameworks has been a key point for the amelioration of both the preparedness and response to the climate events that occurred in the country in the last years, even though there is still room for improvement. In this chapter, there will be explained the main policies addressing DRM in the country as well as other development plans that appear to be relevant for the DRM framework of Mozambique. Before listing those policy instruments and the legislative framework, it will be outlined the evolution to a proactive disaster management approach in detriment to the reactive one that characterized the previous disaster management strategy of the country. The chapter will finish by highlighting the role of the annual Contingency Plan to predict probable disasters for the following season as well as to open the way for self-criticism.

The shift from a reactive to a proactive disaster management approach

The current Mozambique's disaster risk management strategy is led by the National Institute for Disaster Risk Management and Reduction – in Portuguese called *Instituto Nacional de Gestão e Redução do Risco de Desastres* (INGD) –, which is the result of an institutional transformation process that has taken place since the 1980s to the present. In that decade, the national government created a council to coordinate the different state bodies involved in combating natural disasters with the aim to provide a quick and efficient response to such hazards. A governmental disaster relief agency was also created as the executive body of such

council (INGD, 2020). In 1999, after the National Policy on Disaster Management was passed, both bodies were replaced by a new governmental agency for disaster management: the National Institute for Disaster Management (INGC, by its acronym in Portuguese), whose objective was "the direction and coordination of disaster management, namely, in prevention and relief actions for victims in risk areas or affected by disasters" (INGD, 2020; Koivisto & Nohrstedt, 2017). These reforms implied a shift of emphasis from disaster reaction to preparedness and risk reduction (Koivisto & Nohrstedt, 2017; Wiles et al., 2005).

One year later, cyclone Eline hit Mozambique causing one of the biggest floods recorded in the country's history. Its devastating effects highlighted the necessity of implementing a proactive strategy in the face of disasters. Aware of this, from the year 2000 the government of Mozambique has defined disaster risk reduction (DRR) as one of the national priorities and has adopted a proactive approach "aimed at reducing the vulnerability of local communities, the economy and infrastructure to extreme events caused by the cyclical occurrence of phenomena, both natural and those resulting from human action" (Conselho de Ministros, 2017). This approach considers DRR a cross-cutting issue in Mozambique and all ministries are supposed to integrate it in their planning (UNECA, 2015). In this sense, the government also started a process of integrating DRR activities into development plans – or, in other words, it initiated the practice of mainstreaming (Conselho de Ministros, 2017). This stance reaffirmed the government's intention of leaving behind the previous reactive approach based mainly on relief and recovery actions to start developing a culture of prevention and preparedness.

The INGC was replaced by the INGD after the recent approval of Law 10/2020 of 24 August. It is divided in different departments and divisions, each of them with specific functions. One of them is the Prevention and Mitigation Division, which is responsible for implementing disaster risk prevention and mitigation policies and strategies, ensuring humanitarian assistance and rapid recovery for disaster victims, or even working for the inclusion of materials on disaster risk management in the education system (INGD, 2020). Another division is the Post-Disaster Reconstruction Coordination one, which works to ensure resettlement and the restoration of basic social services and infrastructure in the aftermath of a disaster, plan land use in disaster high-risk zones, or promote the construction of infrastructure resistant to natural hazards (ibid.).

Policy instruments defining disaster management in Mozambique

Since the end of the civil war, the government of Mozambique has adopted several plans and strategies aimed at framing the DRR efforts of the country. It is remarkable that not only instruments that directly refer to disaster management have been developed but also national frameworks concerning other areas of action have included disaster risk considerations. In fact, Mozambique has set up as one of the few African countries that have recorded progress in mainstreaming DRR into national plans across sectors (UNECA, 2015). The following review of the main instruments that frame disaster risk management in Mozambique evidence such endeavor.

The National Environmental Management Plan (PNGA in Portuguese) became the first program designed to deal with the environmental problems of the country. It was established in 1994 with the objective of balancing development needs with environmental protection by "ensuring that economic development does not offend the sustainability of the natural resources and ensure that their exploitation is viable in the long term" (Comissão Nacional do Meio Ambiente, 1994). The PNGA already considered that the conditions of extreme poverty in which the majority of the Mozambican population live are a main factor in the environmental degradation of the country (Comissão Nacional do Meio Ambiente, 2010). In this sense, the report points at the need to overcome several limitations that contribute to exacerbate the environmental problems, such as poor institutional infrastructure related to environmental management, lack of legislation or regulatory instruments, lack of information about environmental issues, or poor promotion of community awareness and participation, among others (ibid.). In view of these challenges, the PNGA aims at establishing a national environmental policy, strengthening institutional capacity, and raising community awareness (ibid.), which did not become a reality until two decades after, as will be seen below.

In 2012, the government adopted the National Strategy for Adaptation and Mitigation of Climate Change (ENAMMC in Portuguese) for the period 2013-2025. The overall objective of the document is to establish action guidelines for building resilience to the impacts of climate change, including the reduction of climate risks and promoting the development of low carbon and green economy (Ministério da Terra e Ambiente, n.d.). The ENAMMC defines climate risk reduction and adaptation as a national priority, at the same time recognizing the importance

of reducing the impacts of climate change through actions of mitigation and low carbon development but "without prejudice to development actions" (Conselho de Ministros, 2012). In relation to this, the Strategy points at the fact that fighting poverty is the main development objective in Mozambique and that "opportunities for adaptation and climate risk reduction make an immediate link with this objective". The document highlights the need to integrate climate change into the development agenda of all socio-economic sectors (ibid.).

More recently, in 2017, the Government approved the Master Plan for Disaster Risk Reduction in Mozambique for a period of 13 years (2017-2030), which replaces the previous Master Plan for Prevention and Mitigation of Natural Disasters (2006-2016). The current Master Plan has been designed for a longer period to align it with the main international instruments that establish the guidelines for disaster risk reduction, namely the Sustainable Development Goals and the Sendai Framework for Disaster Risk Reduction. The document considers DRR as its main line of action to reduce vulnerability to extreme events in Mozambique and aims at incorporating DRR into all levels of governance in the country. To achieve this goal, the plan seeks to "understand and address the causes of risk and not just the impacts of disasters" (Conselho de Ministros, 2017), thus reaffirming the proactive approach adopted by the Mozambican government in the face of climate hazards. The plan highlights the strengthening of human and infrastructural resilience as one of its central priorities as a tool to prevent the emergence of new disaster risks (ibid.). Furthermore, the Master Plan 2017-2030 also acknowledges the relationship between disasters and human development, especially the fact that hazards hamper the development of the country. In this sense, the document states that the plan seeks "to contribute to the country's development process, through the substantial reduction of the risk of disasters, loss of human lives, livelihoods and health, as well as assets economic, physical, social, cultural and environmental aspects of people, companies and communities." (ibid.).

Another policy document that deserves to be considered when reviewing the DRM framework of Mozambique is the government's five-year program (2015-2019) – in Portuguese, *Programa Quinquenal do Governo* –, which explains the priorities of the country's development in the different areas of Government action. Even though it does not directly address disaster risk reduction and management, it does relate development and climate

change, therefore being a clear example of the efforts for mainstreaming. Indeed, one of the objectives included in the document is to "reduce the vulnerability of communities, the economy and infrastructure to climate risks and natural and anthropogenic disasters" (Conselho de Ministros, 2015). The program acknowledges that in order to achieve such an objective it is necessary to follow two strategies. First, the existing preparedness measures and the readiness of both institutions and communities have to be strengthened to guarantee their ability to respond effectively and in a timely manner to climate threats. Second, the prevention and mitigation measures aimed at reducing the degree of exposure of people and goods to climate risks also need to be reinforced (ibid.). Overall, the program advocates for the integration of DRM guidelines into development plans at all levels of governance (IFRC, 2021).

As it can be observed, the government of Mozambique has made major steps over the last years to establish frameworks for increasing disaster preparedness, building climate resilience and reducing the risks of natural hazards – in addition to the already-mentioned progress towards mainstreaming DRR. However, despite the adoption of these measures, "there is [still] room to strengthen implementation and monitoring" (Norton et al., 2020).

Mozambique's legislative framework on disaster management

The Law 10/2020, known as Disaster Risk Management and Reduction Law, is the current legal framework in Mozambique that establishes a legal regime to face the challenges posed by climate disasters and "the need to build resilience to extreme events" (Lei 10/2020). However, this law was not the one in force when Idai and Kenneth struck the country. The applicable law by the time of such cyclones was the Law No. 15/2014 of 20 June, emerging as the first legal framework for disaster management in Mozambique. Such law sought ensuring "not only a prompt and efficient response to cases of already consummated calamities, but also to prevent their occurrence or its effects in the future, through a proactive stance" (Lei 15/2014), thus stressing the need to take mitigation and preparedness measures to reduce the impact of forthcoming hazards in the Mozambican population. The prevention measures, according to this law, are based on the history of previous hazards that have hit the country, the analysis of their impacts, and on scientific studies on the predictions of future phenomena capable of causing disasters (ibid.). The adoption of this law meant the recognition of the

country, at its highest political level, of the importance of establishing legal principles and mechanisms to prevent and reduce the risk of disasters and their impacts on the economy and communities (Conselho de Ministros, 2017).

While the law in force by the moment when Idai and Kenneth hit the country does not explicitly refer to the concept of resilience at any point, the new law makes a strong emphasis on the idea of building resilience and even dedicates a section to such an objective. The Law 15/2014 only refers to vulnerability reduction and points at strategic readiness – defined as "the country's systematic state of preparedness to prevent potential effects of climate change" (Lei 15/2014) – to achieve so. Some of the measures encompassed in strategic readiness are the identification of potential climate variabilities, the approval of pertinent legislation, the education of communities, and planning and training actions (ibid.). Regarding the law currently in force, it puts together the prevention, mitigation, adaptation and resilience measures, which describes as "the set of actions that the Government must take to ensure that the country remains permanently prepared to face the occurrence of disasters through national and local policies and strategies" (Lei 10/2020). As a matter of fact, this definition reminds to the one used for the idea of 'strategic readiness' in the former law, but the new wording reflects the shift of discourse of the Mozambican government as regards to disaster management: it includes a concept that so far had not been widely used in other policy documents being aware that it is a central element in the current DRM approaches.

The predictions of the annual Contingency Plan for the 2019 season

The government of Mozambique prepares annually a Contingency Plan for the mitigation and management of disaster risk, in compliance with the provisions of Law 15/2014. This document "serves as the basis for the process of coordination, response and management of extreme events" (Conselho de Ministros, 2018) in the country. Such plans include an assessment of the previous rainy season, followed by a climate forecast of the following one. It also contains an analysis of calamity risks, even drawing some possible scenarios of climate disasters that might occur in the country. Lastly, the contingency plans define several actions to be taken in the preparedness, response and recovery phases, the existing coordination mechanisms, and the available resources – both financial and logistic – to face such threats. In other words, the aim

of these documents is to establish "intersectoral interventions for a rapid response and post-disaster resilient recovery" (ibid.).

For the 2019 season, when Idai and Kenneth struck Mozambique, the Contingency Plan's goal was to "reduce the loss of human life and destruction of vital infrastructure in Mozambique, as well as ensure rapid humanitarian assistance and the normalization of life for those affected by extreme events" (ibid.). The document already considered a possible scenario of risk that was the result of the combination of several climate threats: strong winds, floods, drought, and cyclones. It estimated that a total of 1,540,560 people could be at risk, of which 307,574 due to the cyclones (ibid.). The prediction pointed at the province of Nampula as the one with a larger number of population at risk since this phenomena occur more frequently in the region, also considering the higher exposure and vulnerability of the districts located along the coast. As it can be observed in Figure 1, in the end this province was not hit neither by cyclone Idai nor Kenneth. However, the Contingency Plan also considered the provinces of Inhambane, Sofala, Zambezia and Cabo Delgado as presenting a "medium to high risk of probability of occurrence of cyclones" (ibid.). The former was mainly affected by drought, but cyclone Idai did impact on Sofala and Zambezia while cyclone Kenneth hit Cabo Delgado. Indeed, of the three scenarios exposed, this one was concluded to be the most likely to take place. Hence, even if the document was drawn up five months before the first cyclone of the season struck the country, the forecast was quite accurate as far as possible. Moreover, the document warned about the necessity of being prepared to respond to probable situations of epidemics such as cholera and malaria – which, as will be explained later, did take place in the end – as well as to internally displaced people due to extreme climate events, including cyclones and floods (ibid.).

The document also points at the main causes of the country's vulnerability to natural hazards. It stands out its acknowledgment of the "weak institutional capacity for readiness, response and rapid post-emergency recover" (Conselho de Ministros, 2018) in the face of climate disasters, as well as the also weak institutional capacity to guarantee the application of policies concerning territorial ordering, resulting in the "massive occupation of risk zones without considering resilience and risk reduction measures" (ibid.). This refers to the expansion of informal settlements in high-risk areas, as has been explained in the previous chapter. The plan

also highlights the existence of non-resilient critical infrastructure in high disaster risk areas and its consequent exposure to such risks. As will be further explained in the following sections, the lack of infrastructure and buildings prepared to withstand and recover from the physical impacts of climate variabilities increases the exposure of communities to disasters as well as the material losses that result from such hazards. Lastly, the document outlines the weak systematic implementation of DRR measures as another factor that creates vulnerability in the country. Considering that the Contingency Plan is a document written by the Council of Ministers, which is the highest executive organ of the Mozambican government, it is remarkable that it includes a piece of self-criticism by listing the main weaknesses of the national disaster management. However, it does not include any measures to be taken to improve its performance or some desirable goals that are sought to be achieved in the defined period.

The sources of funding for responding to disasters in Mozambique

In 2017, the government of Mozambique created the Disaster Management Fund (FGC, by its acronym in Portuguese), which is managed by the INGD. The sources of this fund are, on the one hand, appropriation from the State Budget – of which the minimum annual contribution is 0.1% – and, on the other hand, donations from cooperation partners (Conselho de Ministros, 2018; Matera et al., 2018). The resources of the FGC are intended for response, recovery and reconstruction activities following the impact of a climate calamity (Conselho de Ministros, 2018).

The main sources of funding for disaster management in Mozambique are ex-post, meaning that they are established only after the disaster event occurs (Matera et al., 2018). As for the sources designated before the event, which are mainly found in the Annual Contingency Plans, they are limited and generally only cover the financial needs during the initial emergency phase (ibid.). Therefore, even though the creation of the FGC is a step forward, the financial capacity of the government still needs to be strengthened so that when a future disaster strikes the country it is able to mobilize the necessary resources to face its consequences, thus increasing what Matera et al. (2018) label as “financial resilience”.

The response of the Government of Mozambique to cyclones Idai and Kenneth: successes and limitations

The following chapter constitutes the core of this research since it will present the data regarding the selected case study that will allow to discuss the research question: *How did the disaster risk management of the Government of Mozambique in the face of cyclones Idai and Kenneth contribute to exacerbating the pre-existing vulnerabilities of local communities and how was the aim to build climate resilience included along the preparedness and response process?* In this sense, this chapter will look at the response of the government of Mozambique to the threat of both tropical cyclones Idai and Kenneth. It will be discussed that even though the implementation of the already-mentioned DRR frameworks may have played an important role in mitigating the adverse consequences of the storms, they proved to be insufficient to fulfill the needs of the affected communities. To do so, I will start by examining the dissemination of early warning systems, followed by the challenges derived from poor infrastructure and housing in the country. Later on, I will explain how the government chose resettlement as the preferred durable solution in the wake of the disaster but did not guarantee an adequate implementation, as well as the support given to families that stayed in their damaged homes. The last sections will observe the impacts of the cyclones on people's livelihoods and the consequences of loss of WASH services.

Before getting started with these sections, some preliminary considerations need to be done. Firstly, even if the institutional capacity of the government of Mozambique had been higher, the magnitude of both Idai and Kenneth was such that it would have still exceeded its ability to cope with their impacts on its own. In this sense, the country asked for international assistance to face the situation. The Law 10/2020 regulates international humanitarian assistance and establishes that the government is responsible for granting authorization for the entry of international aid personnel and relief goods for the affected populations, as well as for coordinating, directing and supervising such humanitarian assistance (Lei 10/2020). Furthermore, the creation of the INGC in 1999 has enabled a better collaboration between governmental bodies and humanitarian aid organizations by virtue of a "clear delineation and knowledge of roles and responsibilities" (Norton et al., 2020). Thus, the humanitarian response for both cyclones was coordinated and quick. A large number of organizations participated in the response efforts in different sectors – shelter, health, food insecurity or WASH, among others. Concretely, 231 organizations were working in the areas affected by Idai by June 2019, while 46 organizations were doing so in the areas impacted by Kenneth (HDX, 2019; OCHA

2019). The United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA) worked together with the INGD to set up an operational command center in Beira that instructed the emergency response efforts along the country (Yarnell & Cone, 2019). Moreover, as for Idai more than eleven countries sent military units to the city of Beira to conduct search and rescue operations and provide logistical support (ibid.). Humanitarian aid contributes to the emergency response to the disaster and mostly offers short-term relief but only stays for a limited period of time. For this reason, it is necessary to create the conditions so that the government is capable of autonomously meeting the affected populations' basic needs when humanitarian aid comes to an end (Andrade & Ndapassoa, 2020). In this sense, the following section will also provide some data to show that several challenges persist long after the catastrophe.

On 19 March 2019 the government declared a National State of Emergency. It then created the Cabinet for the Reconstruction of Post-Cyclone Idai on 11 April – that is, almost one month after Idai hit the country and two weeks before Kenneth. Indeed, on 22 May that same year, the Cabinet's mandate was expanded to the areas affected by the latter. The body has territorial scope and temporary nature "but enjoys the autonomy and powers of authority and technical decision necessary for the effective and efficient performance of its functions" (Trujillo, 2019). The main responsibilities of the Cabinet are designing a strategy for infrastructure reconstruction and recovery of the social and productive sectors, monitoring the progress and results achieved, evaluating the losses and damages, as well as mobilizing resources for the recovery of the country after the cyclones, among others (ibid.).

Lastly, during the months following the disaster, concerns were raised about insufficient funding. As has been explained in the previous section, Mozambique has made relevant steps during the last years towards implementing disaster risk reduction policies and plans and establishing government institutions mandated to strengthen the country's capacity to respond to climate hazards. Nevertheless, the institutional capacity of Mozambique is constrained by the limited resources of the government: indeed, the country is highly dependent on foreign assistance for funding. This reality, together with the above-mentioned fact that the magnitude of the cyclones was overwhelming per se, obliged the country to ask for international financial support. The PDNA estimated that the total cost of recovery and reconstruction for the provinces affected by both Idai and Kenneth was up to US$3.2 billion (Trujillo, 2019). Despite the fact that international donors pledged $1.2 billion in June 2019, as of early 2020 the

government was still pending to receive those funds, thus hindering the implementation of recovery measures (Norton et al., 2020). Even if humanitarian support filled part of that gap, this was not "occurring at the scale or time frame needed" (ibid.). Indeed, the Humanitarian Response Plan led by UNOCHA requested $414,4 million to support affected populations by cyclone Idai and an additional $113 million in response to cyclone Kenneth. By date – almost three years after the disaster –, the former appeal has been funded only by 38.6%, while the latter has received 21.5% of the requirements (UNOCHA's FTS Tracker, 2019). Alongside these funds, the World Bank committed $350 million to support Mozambique's recovery in two areas: immediate relief, funding measures such as re-establishing water supply or curbing the spread of diseases, as well as other long-term measures aimed at improving climate resilience, mainly rebuilding damaged infrastructure and crops (World Bank, 2019a; Norton et al., 2020). In short, the combination of the already limited financial capacity of Mozambique together with the magnitude of the cyclones and the fact that international funding support was delayed and insufficient has become a huge obstacle for the recovery process of the country.

The (in)efficiency of early warning systems during the cyclones

The use of forecasts to predict hazards enables taking early action to mitigate their impacts. As soon as it is detected that a climate risk is likely to take place, early warnings need to be disseminated among both decision-makers and communities. Early warnings become a key element of disaster risk reduction since they can avert casualties and reduce the economic and material impacts of climate hazards (WMO, 2018). According to the World Meteorological Organization (WMO), to be effective, early warning systems "need to actively involve the people and communities at risk from a range of hazards, facilitate public education and awareness of risks, disseminate messages and warnings efficiently, and ensure that there is a constant state of preparedness and that early action is enabled" (ibid.).

In Mozambique, the institutions mandated to release early warnings in case of climate threats are the National Institute of Meteorology (INAM) and the National Directorate of Water Resources Management (DNGRH), coordinated by the INGD. In the face of a disaster, warnings are issued to district governments and local authorities, which are responsible – in collaboration with NGOs in the area – for the dissemination of information among the communities as well as for their timely evacuation (Hellmuth et al., 2007). After the impacts caused by cyclone Eline in the year 2000, the early warning system in Mozambique was

improved considering the challenges faced during such events. It is particularly relevant the fact that, by then, the country's warning system only issued forecasts and alerts regarding floods. A few years later, a tropical cyclone warning system distinct from the flood one was created, which is responsible for informing communities of the probable arrival of a cyclone at least 48 hours in advance (ibid.).

A beforehand forecast of the trajectory and intensity of cyclones – as well as other climate hazards – would be a crucial factor so that communities in risk areas could be evacuated and precautionary measures could be taken. However, the tracks and strengths of tropical storms and cyclones are difficult to predict more than a few days ahead (Kolstad, 2020). Indeed, it is not usual to obtain accurate forecasts of the course of such hazards more than 10 days ahead. However, both probabilistic predictions based on seasonal timescales and the experience from previous disasters can be used to anticipate future events as well as to raise awareness about upcoming risks (ibid.).

Both cyclones Idai and Kenneth were forecasted with quite precision several days ahead of the storm as for the location of landfall, windspeeds, and rainfall (Norton et al., 2020; Zurich Flood Resilience Alliance, 2020). In the case of Idai, the forecasting system detected the probability of the development of a tropical cyclone in the Mozambique Channel already on the 26th February – which is more than two weeks before it made landfall in the city of Beira. More precise predictions about the characteristics of the cyclone were accessible from five days ahead of the disaster (Emerton et al., 2020). It has to be noted that track forecasts point at the predicted location of the center of the cyclone, but the winds and rain originated from such can extend for hundreds of kilometers around it. For Idai, this consideration was made after it made landfall: the initial predictions indicated that the storm would move further west before dissipating but the cyclone remained over central Mozambique instead (ibid.). Consequently, the sustained periods of heavy rainfall stemming from the cyclone hit the same region rather than spreading over the country. Track forecasts did not perceive this pattern until the 16th March, which is two days after Idai made landfall in the port of Beira, and “this resulted in uncertainty in the flood forecasts” (ibid.). Thus, warnings about potential flooding were issued too late for communities to react. Indeed, forecasts of cyclone-related flooding continue to be a challenge in Mozambique (Zurich Flood Resilience Alliance, 2020).

In the case of cyclone Kenneth, the first signs of a possible tropical cyclone that could develop in Tanzania or northern Mozambique were detected on the 18th April – that is, one week before

it made landfall. Forecast uncertainty decreased as the date approached and the landfall location became much more accurate from three days prior to the cyclone's arrival (Emerton et al., 2020). Unlike Idai, Kenneth's track was way more predictable. This is explained because the former, as shown in Figure 1, meandered across different regions, while the latter remained in the area of Cabo Delgado. In this case, flooding forecasts indicating the characteristics of such hazard and determining which communities were most at risk were released:

> "[...] international humanitarian organizations noted that this was the first time that flood risk information had been provided in real-time to them, and that the type of information was perceived as extremely valuable, innovative and promising for future interventions, particularly due to the move from weather forecasts to more impact-based forecasts" (ibid.).

The bulletins allowed decision-makers to understand the flood risk: an early response took place in the areas that were likely to be at higher risk, which may have become cut off during the peak of the flooding thus impeding the arrival of humanitarian aid until the water levels had abated – which is what actually happened with cyclone Idai due to the delayed flood bulletins (ibid.).

Despite the lack of timely flooding predictions for Idai, the fact that both cyclones were forecasted quite in advance enabled to alert the actors involved in the preparedness and response of the cyclones – namely, governmental authorities and humanitarian organizations – as well as to disseminate warnings to the communities. However, accurate forecasting alone is not sufficient: "warnings are only useful if people can interpret and act on them" (Zurich Flood Resilience Alliance, 2020). Most affected people admitted not knowing how to react to those warnings and which actions to take to protect themselves and their properties, especially considering that they had not experienced such strong winds before (Norton et al., 2020). Indeed, the low frequency nature of tropical cyclones in the country becomes a major factor that influences risk perception (WMO, 2019b). In the case of cyclone Idai, when people received the alerts they understood that a cyclone was approaching but did not react because they underestimated its magnitude and believed that it would be similar to the cyclones that had previously experienced:

> "Official warnings such as 'stay safe, go to your house, close windows and doors, make sure you stay inside', though clear and accurate, failed to communicate the qualitative difference between winds of 60km/h such as had been experienced in previous cyclones and Idai's 180 km/h winds" (Zurich Flood Resilience Alliance, 2020).

To avoid this to happen again, it is necessary to improve warning communications: considering that people do not understand the terminology used in the alerts – for instance, 50 mm of rain or wind speeds of 150 km/h –, messages should be user-oriented and be accompanied by information about both the potential impacts of the upcoming disaster and specific actions that people should take to protect themselves (WMO, 2019b; Zurich Flood Resilience Alliance, 2020). Moreover, the INGD should promote education and raise public awareness regarding climate hazards, their associated risks, and how to face them in the most resilient way possible. In fact, a survey conducted by Chapungu (2020) shows that most responders admitted lacking knowledge about climate change, even ignoring its link with extreme weather events: "Some attributed the cyclone to spiritual forces that were punishing their communities for social ills and various other transgressions" (ibid.), which made them being passive about possible climate hazards.

Yet these awareness activities should be carried out as an ongoing basis "but not initiated during emergencies" (WMO, 2019b) since they take time and, besides, vulnerable communities should be involved in the preparedness process. What happened during cyclone Idai highlights the still existing flaws in disaster risk reduction in the country despite the efforts of the government to shift the previous reactive disaster risk management to a proactive strategy. The existing community awareness programs prove to be insufficient, either because they do not reach the whole population or because they are not efficient enough. In any case, the fact that communities exposed to the disaster ignored how to translate early warnings into actions to reduce or even avoid the risk imply that the government's objective to build resilience among the population is still far from being reached.

Besides increasing the knowledge of the communities about climate risks, the government also faces another challenge: the dissemination of inaccurate information in previous occasions has created mistrust on the reliability of the issued warnings. For instance, one season farmers were warned about upcoming droughts and they invested in products according to those forecasts, but in the end there was abundant rainfall (Chapungu, 2020). Due to some wrong meteorological warnings, communities started ignoring them, which turns out to be dangerous because that makes them more vulnerable. This makes it imperative for INAM and DNGRH to disseminate the most precise warnings possible so that people's trust can be regained.

Furthermore, a fact-finding mission sent to Mozambique by WMO after cyclone Idai – whose visit coincided with cyclone Kenneth – reported that some confusions took place when the

warnings were issued due to the similarity of the coding systems used by INAM and INGD. The former has a coded warning system that consists of three different colors that indicate the hours left before a tropical cyclone makes landfall. During Idai, the alerts issued by INAM were confused with the system used by INGD, which also uses colors to establish the required readiness levels for institutions involved in disaster risk management (WMO, 2019b). Similarly, DNGRH also employs a color coding system that refers to the level of flooding risk. In light of this situation, the WMO urges to harmonize the color coding systems used by INAM and DNGRH to release warnings, as well as to differentiate it from the coding system used by INGD: "failure to do so results in confusion of decision makers and the public during emergencies" (ibid.), which can lead to an inefficient response to the disaster.

Lastly, during Idai in Beira city the wind cut off the communication and power lines, thus affecting the communication channels – that is, phone lines, radio, and television – and consequently interrupting the diffusion of warnings. This resulted in serious impacts to communities and people were forced to find ways to escape floodwaters (Norton et al., 2020; Zurich Flood Resilience Alliance, 2020). Indeed, the WMO's report points at the absence of an alternative communication system that can be used to disseminate warnings in the case of failure of normal communication means as one of the weaknesses identified in emergency preparedness and response to the cyclones. In this sense, it argues that the communication of weather forecasts should not be limited to the different conventional media channels but should be complemented with community-based social structures, such as community leaders (WMO, 2019b). Nevertheless, the mass media still play an important role and need to be involved in weather forecasting and the dissemination of alerts. Radio becomes the most important media due to its capacity to spread warnings as soon as they are issued by the authorities, but especially because Radio Mozambique broadcasts in local languages (Hellmuth et al., 2007), thus contributing to the awareness of disaster risks by the different communities and consequently increasing their resilience to hazards.

In short, Mozambique has demonstrated having the capacity to obtain accurate forecasts regarding climate disasters. In fact, not only the country predicted both cyclones a few days prior to their landfall but it already considered the scenario of being hit by a tropical cyclone in the annual contingency plan published in October. However, the challenges arose at the moment of disseminating the corresponding early warnings. Putting aside the failure to anticipate flooding caused by cyclone Idai, the dissemination of alerts was not efficient enough. One the one hand, warning messages turned out to be confusing but, above all, people at risk

had not been taught to understand them. On the other hand, the only use of traditional communication channels left some communities isolated after the cyclone cut off power lines. Altogether, even if early warnings were broadcasted, they could not be fully efficient due to the lack of complementary actions that the government should have taken during the disaster preparedness phase: that is, educating the population about the risks of climate hazards, providing tools so that they know how to react in those situations and, ultimately, engaging communities in the design and dissemination of warning messages. Guaranteeing that people at risk can make the most out of early warnings is directly translated into an increase of their resilience to hazards due to their ability of making knowledge-based decisions that reduce their exposure to the upcoming disaster.

The lack of climate proof infrastructure and housing in Mozambique

Communities are not the only ones that need to be resilient in the face of disasters. Even in the case that early warnings are properly understood and affected people take the right measures, the damage to infrastructure and properties is likely to be severe if they are not prepared for such circumstances. In this sense, a few days after cyclone Idai hit Mozambique, the United Nations Special Representative for Disaster Risk Reduction, Mami Mizutori, stated the following:

> "Cyclone Idai underlines that no matter how effective early warnings are, there is still a huge demand for greater investment in resilient infrastructure in many parts of the world if we are to break the cycle of disaster-response-recovery" (United Nations, 2019).

Indeed, the passage of cyclones Idai and Kenneth through Mozambique resulted in massive infrastructure damage and loss. The assessment reports published after the cyclones estimate that such destruction was up to $796 million, with transport and energy infrastructure being the sectors hardest hit (Macamo, 2021). Furthermore, the cyclones also caused serious damage to housing. It is estimated that 240,000 houses were partially or completely destroyed by cyclone Idai, of which 60% were located within informal settlements in urban areas "with high levels of environmental, social and economic vulnerability" (Trujillo, 2019). An additional 50,000 houses were damaged or destroyed by cyclone Kenneth (World Bank, 2019b).

Both cyclones and subsequent flooding ravaged a large proportion of the core infrastructure of the impacted provinces, including roads, bridges, hospitals, schools, communications, and

electricity and water supplies. In particular, it is estimated that Idai damaged up to 29 percent of the national road network, which is mainly due to poor construction standards (ibid.). In the immediate term, this situation hindered evacuation, search and rescue, and emergency response in the affected areas for at least 4 or 5 days after Idai struck (Trujillo, 2019). In Cabo Delgado, the destruction of main roads and bridges caused by Kenneth limited the capacity of humanitarian aid to access critically impacted areas. Moreover, damages to hospitals also complicated the ability to provide care to the victims and contain the spread of diseases as a result of floods (Norton et al., 2020). However, UN's Special Representative Mami Mizutori also highlighted that the destruction of key infrastructure has consequences "not just for the emergency response phase but for the long-term efforts of these countries to eradicate poverty and hunger" (United Nations, 2019). In the case of the city of Beira, only 30 percent of the city had been reconstructed by June 2021, mainly due to the high dependence on donor support – which is facing considerable delays. Furthermore, the COVID-19 pandemic has also negatively impacted post-cyclone reconstruction and other climate resilience plans along the country (Macamo, 2021).

Cyclones Idai and Kenneth also had adverse impacts on local businesses: "In addition to the direct costs associated with damages to facilities and equipment, local enterprises suffered from the indirect effects of infrastructure disruptions, as well as demand and supply shocks" (World Bank, 2019b). Thus, the recovery of the private sector after the cyclones was key to recover the previous levels of employment and, in this way, ensure the restoration of livelihoods and slow down the increase in poverty levels.

There were also cases where infrastructure proved to be prepared for climate shocks. The most relevant example is the drainage system in the city of Beira, which is particularly vulnerable to flooding due to its low-lying location. The system was built in the 1960s and had been rehabilitated along the decade prior to the cyclones under different funded projects (Trujillo, 2019). The benefits of such investments became manifest after Beira suffered from rainfall-induced flooding in January 2019 and again after Idai made landfall. The drainage system responded efficiently by facilitating a rapid water disposal, with only temporary flooding in some neighborhoods. The exception was for some areas where the drainage network had not been rehabilitated, thus not being able to handle the high levels of rain (ibid.). The fact that the system successfully drained rainwater to the sea prevented prolonged flooding and larger material losses. Indeed, "years of investment in urban drainage systems in Beira reduced the flood impact in comparison with areas outside the drainage network" (Norton et al., 2020). A

report of the World Bank agrees on the fact that the areas that had benefited from rehabilitation projects "suffered little to no flood damage" compared to areas excluded from such investments (World Bank, 2019b). However, it also highlights the need for further strengthening the resilience of coastal protection and drainage networks to future shocks:

> "The city has a vulnerable coastal protection system due to lack of maintenance and insufficient investment, as well as an inadequate drainage system, which is poorly maintained and in urgent need of expansion due to rapid urbanization" (ibid.).

As for housing, it becomes one of the most affected sectors in the wake of the cyclones. In fact, the cyclone Idai PDNA points at the Housing and Human Settlement sector as "the most expensive and complex of the entire Post-Idai Reconstruction Plan" (Trujillo, 2019). This is because Mozambique faces a lack of adequate housing at the national level, which has become a structural problem as a result of several factors. On the one hand, most of the areas affected by the cyclones have low elevation and are close to river basins, which makes them highly vulnerable to subsequent flooding. Furthermore, disasters hit in an already weak urban environment where houses are built with low-quality materials and techniques that are not prepared to resist climate shocks (Trujillo, 2019; Nkhonjera & Mathibela, 2019). Indeed, data shows that in 2017 more than 64 percent of the inhabitants in Mozambique lived in houses with adobe, wooden sticks and bamboo as predominant materials (World Bank, 2019b). On the other hand, the high rates of urban population growth registered in the country push people to settle in high-risk areas, especially due to a lack of land use planning (Trujillo, 2019). The loss of housing – which usually comes together with the simultaneous loss of all the household goods – exacerbates poverty due to the difficulties to recover from it:

> "For families that have lost everything at once, finding the necessary financial and material resources to simultaneously rebuild housing, replace domestic items, and rebuild livelihoods, will be extremely challenging and will take time" (ibid.).

To avoid the repetition of these impacts when forthcoming disasters strike the country, the reconstruction of damaged infrastructure and housing needs to strengthen its resilience to climate hazards. In other words, it is fundamental that the rebuilding process is based on the idea of "building back better", that is, using the restoration of infrastructure as an opportunity to improve its characteristics and make it climate proof. Hence, the construction strategy needs to include resistant materials, as well as to take some measures such as reinforcing walls and anchoring roofs so that they can withstand strong winds and harvest rainwater. The challenge

"lies not only in constructing new resilient affordable housing, but also retrofitting existing housing structures" (Nkhonjera & Mathibela, 2019). This also applies to public infrastructure such as hospitals or police stations, which need to be either designed to resist climate shocks or located in safe areas to ensure provision of basic services during emergencies (WMO, 2018). Moreover, Mozambique needs to build multi-purpose resilient infrastructure such as schools or stadiums that can be used as shelters in the event of tropical cyclones or floods (ibid.), even though it needs to be noted that some public buildings were already used for that purpose in the wake of both Idai and Kenneth (World Bank, 2019b). Lastly, reinforcing building regulations as well as having an adequate land use planning based on a risk assessment is essential to ensure that new houses are erected in safe locations (Trujillo, 2019) and to avoid the expansion of informal settlements.

Hence, the inclusion of climate adaptation into development plans is in itself a tool to build resilience in the country. Making communities resilient is of little use if it is not accompanied by other actions that create resilience in the country as a whole. The fact that people react efficiently to a disaster will enable them to reduce the impacts suffered in the short-term, for instance by evacuating to a safe area and thus avoiding being seriously injured. However, such resilience both in the previous moments to the impact and in the immediate aftermath fades if the devastation left by the cyclone impedes them from resuming their lives.

The provision of shelter and resettlement: a lost opportunity to build resilience

As has been explained in the previous section, the quality of housing in Mozambique was highly poor even before the cyclones, especially due to the lack of financial capacity to buy quality materials and the lack of knowledge of safe construction techniques – or, otherwise, the use of traditional building methods that do not integrate climate proofing (UNOCHA, 2019b). This pre-existing vulnerability exacerbated the devastation caused by Idai and Kenneth. During the cyclones, houses were mostly damaged due to unabated intense winds, but some of them also suffered from subsequent flooding as a consequence of being located in low-lying areas. In light of that situation, some people stayed in their homes despite the fact that they were damaged and the risk that remaining in the impacted area entailed. In some cases, the government and humanitarian organizations provided these people with materials so that they could rebuild their houses, mainly wooden poles and bamboo (IOM, 2019). Some others even

used recovered material from the debris for restoring their roofs (IDMC & IOM DTM, 2019; Norton et al., 2020). This means that the aid that communities received to reconstruct their homes did not take the opportunity to "build back better" since the toolkits distributed were compounded by the same fragile materials that composed the buildings already before the cyclones. Hence, the use of low-quality materials together with the fact that knowledge on building techniques was not provided either put these people back again to the position of vulnerability that made them lose their houses in the first place.

The main obstacle found by cyclone-affected communities to rebuild more resistant houses is access to and affordability of higher-quality materials:

> "For Mozambique's most vulnerable [populations], the materials they would need to build a cyclone-resistant house could cost the equivalent of 3 years of savings. This is a financial barrier that is impossible for most to overcome." (Norton et al., 2020)

This is added to the hurry to set up their homes with the available means to have a place to resume their lives as soon as possible. Furthermore, the pre-existing high poverty rates led some vulnerable families to sell the shelter materials provided by humanitarian aid to buy food (IOM, 2019). As a result, most of the reconstructed housing after the cyclones did not reach the minimum levels of resilience desired. Indeed, three months after the cyclones struck more than half a million people were still living in destroyed or structurally damaged houses, which were "unsafe, inadequately prepared, and lacking access to fundamental basic goods and services" (UNOCHA, 2019b). Considering that the following rainy season was approaching, the lack of resilient housing created a vicious circle by which people were increasing their exposure to climate hazards.

But not everyone had the chance to stay in their homes: thousands of people were forced to flee seeking refuge in safer places either because their houses were completely destroyed or because the ongoing impacts of the cyclones made it still dangerous to stay in the area. Concretely, 230,000 people were displaced after Idai and 24,000 other people following Kenneth (World Bank, 2019b). Initially, these people were either hosted by relatives and friends or in temporary accommodation centers such as schools and other public buildings. By the end of March, the peak of IDPs after Idai was recorded: 161 accommodation centers had

opened, hosting a total of 140,784 people (IDMC & IOM DTM, 2019). The following weeks, this number started decreasing as people returned to their communities to rebuild their houses. However, the accommodation centers were hosting many other people that could not move back to their homes since they were considered to be located in high-risk zones which were no longer appropriate for living. It soon became clear that the remaining provisional shelters needed to be replaced by durable solutions (Jacobs & Almeida, 2020) and the government of Mozambique opted for the resettlement of such people. Concretely, 60 resettlement 'neighborhoods' (known as *barrios*, in Portuguese) were established across the provinces impacted by Idai, hosting 12,800 households – that is, 58,233 individuals – as of July 2019 (UNOCHA, 2019b). As for Kenneth, two accommodation centers were initially set up in Cabo Delgado, which were later replaced by one resettlement site where 4,750 individuals affected by flooding were relocated (ibid.).

Even though the concept of resettlement can have different meanings depending on the discipline where they are used, in the case of cyclones Idai and Kenneth both the government and aid organizations refer to resettlement as the process of permanently relocating people to a new location to protect them from the impacts of climate change and provide them with the conditions for restarting their lives (Yarnell & Cone, 2019; Ferris & Weerasinghe, 2020). Hence, the main difference between resettlement and evacuation is that the former is intended to be permanent.

Yet the way in which the government of Mozambique carried out the resettlement process has been criticized by several NGOs – namely Oxfam, Save the Children, Care, and Plan International (Mutsaka et al., 2019; Cowan & Infante, 2019; Yarnell & Cone, 2019). The main reason is that the process was considered to be premature and rushed. The Mozambican government was anxious to reopen schools for classes and also to use them for the elections that were to be held a few months after, in October 2019. For this reason, in early April – that is, only three weeks after Idai made landfall – people that had sheltered in these buildings started to be relocated to other places: they were first moved into temporary transit sites and then to permanent resettlement areas (Yarnell & Cone, 2019). Within two months, the government resettled around 88,000 people and by mid-June all accommodation centers had closed (Jacobs & Almeida, 2020; IDMC & IOM DTM, 2019). Even though it was indeed

essential to move people away from such zones as well as to return public buildings to their usual activities, “the speed at which the IDPs were relocated and the process by which they were moved jeopardize the sustainability of the resettlement and the safety of at-risk populations” (Yarnell & Cone, 2019).

Resettlement requires time so that a proper planification can be performed. Before moving communities to a new location, the INGD must previously conduct an assessment of risks to make sure that the area is not prone to climate hazards and ensure the sustainability of the process. In this case, some of the potential sites to relocate affected people had been identified even before the cyclones struck since the disaster risk reduction strategy of Mozambique considers resettlement as a climate adaptation measure and it has already been carried out in the wake of previous disasters (Jacobs & Almeida, 2020). This prior evaluation, however, did not take place for all the resettlement sites chosen (Chapungu, 2020), which increases the vulnerability of relocated people since they are offered to restart their lives in an area that may be at risk of experiencing a new climate hazard in the future, pushing them to be displaced once again. A humanitarian official interviewed by Yarnell & Cone (2019) also suspected that resettlement sites were not being selected following a risk assessment: “I have no idea how the government chooses resettlement sites. It seems as though it is just based on what land is available”. In this sense, Jacobs & Almeida (2020) agree on the fact that as for cyclone Idai, “resettlement has mainly been an emergency measure in the aftermath of a disaster, and less part of a planned prevention strategy”.

Another principle that needs to be applied in order to guarantee that resettlement is carried out in an appropriate manner is ensuring effective communication and facilitating the participation not only of the relocated populations but also of other affected groups such as host communities. However, people displaced by cyclones Idai and Kenneth reproached not having received enough information about the process. Resettlement often occurred with almost no prior communication and displaced people were usually not aware about the options they had or how far they were being moved (Chapungu, 2020; Yarnell & Cone, 2019). The abruptness of the process together with the lack of information about the destinations “meant that people had no time to prepare, train or gather resources to migrate safely” (Chapungu, 2020), thus impeding that they could properly plan their migratory journey. In addition, providing

information about the process to the cyclone-affected communities is imperative to encourage them to relocate. Otherwise, uncertainty and concerns about their future in a new location together with lack of awareness about the risks of staying in a high-risk area can lead "to what may be regarded as 'illogical' choices" (UNHCR, 2014), that is, refusing to be resettled.

Resettled communities were offered small parcels of land where to move permanently. But even several months after settling in those lands, most of them were still living in tents (Yarnell & Cone, 2019), which is equally unsafe. Moreover, the government must guarantee that resettled people will be able to restart their lives in the new area. Resettlement does not only consist in removing people from high-risk areas to safer ones but it is a long-term process. Considering its disruptive nature, the government has to provide all the necessary means so that relocated communities can adapt to the new environment and protect them against the inherent impoverishment of resettlement (Mathur, 2015). Thus, the physical relocation has to be complemented with policies that aim at restoring the previous standards of living of the resettled population and, ideally, even enhance them (UNHCR, 2014).

To do so, the government has to implement measures that can serve as pull factors and make the relocation site more attractive than the high-risk area where cyclone-affected communities used to live (Jacobs & Almeida, 2020). On the one hand, it has to ensure that displaced populations can rebuild lost livelihoods due to resettlement, thereby avoiding that they see themselves obliged to start their lives from scratch. This entails providing them with land and facilitating access to job opportunities. Otherwise, by not helping people to find new livelihoods, they become dependent on the aid provided by the government and humanitarian organizations (Jacobs & Almeida, 2020), which is, in turn, temporary. On the other hand, the provision of basic services such as schooling and health care, and even psychological support, must also be ensured. Moreover, for resettlement to be sustainable, adequate compensation mechanisms need to be established to prevent targeted communities from fearing that moving will be detrimental. This can be done through different ways such as offering cash, land, materials, or even professional training (ibid.).

The extent to which resettled populations were provided support and had access to basic services "varied drastically" across provinces, according to a report published by Yarnell &

Cone (2019) based on field visits to different resettlement sites a few months after they were set up:

> "In some areas, each displaced family had a tent, was distributed food every two weeks, and said it felt relatively secure. In other sites, IDPs were dropped in areas that they were not familiar with, where they did not feel safe, and where they received limited food and materials for shelter." (Yarnell & Cone, 2019)

However, concerns about access to education, hospitals, and job opportunities were identified in almost all resettlement sites (ibid.). Indeed, a year after Idai, most of the resettlement sites were still being developed and several basic humanitarian needs were lacking: the restoration of livelihoods continued to be insufficient, some pupils in higher primary or secondary levels could not go to school because corresponding levels of education were not offered in their camps, and access to essential health care remained limited, among other shortcomings (Norton et al., 2020; UNOCHA, 2019b). Ultimately, if people feel that the new site does not offer enough income-earning opportunities, they will decide to move elsewhere – or even go back home – in search of better conditions (Mathur, 2015), even if that entails moving to an area prone to climate hazards. Thus, the discouraging conditions existing in the camps drove some people to move back to their previous homes.

As a final remark, disaster risk management in general and resettlement planning in particular also need to integrate a gender perspective. Indeed, women were one of the most vulnerable groups to the consequences of the cyclones, together with children, disabled people, and the elderly. The overcrowded conditions in relocation sites, together with other conditions such as scant lightning, entailed an increase of gender-based violence cases across resettlement neighborhoods (UNOCHA, 2019a).

To sum up, by using inadequate materials and techniques to reconstruct the buildings instead of taking such damage as an opportunity to retrofit them and increase their climate resilience, these people were pushed to rebuild vulnerable houses – and so to increase their own vulnerability. Furthermore, the fact that some families sold the materials they were provided with to get some money for food reflects the relationship between development and climate change, as well as the structural problems that Mozambique needs to address besides DRR:

communities not only face the effects of climate hazards but also several other challenges at the same time that contribute to increasing their vulnerability. That is, people are affected by other issues rather than climate change that might appear to be a priority for them due to their immediacy – such as food insecurity or access to health – unlike future climate disasters that might be underestimated owing to the uncertainty of whether and when they will occur again. As a result, the few resources that families have are first invested in their basic needs, in this case relegating the use of adequate materials to rebuild their houses.

As for resettlement, the government of Mozambique needs to guarantee the efficiency and sustainability of the process. Hence, it has to ensure, on the one hand, that the relocation sites are not located in disaster-prone areas to prevent resettled populations from multiple displacements. On the other hand, it has to make the process more transparent by informing affected people about the available options and future prospects so that they can make informed decisions taking into consideration their long-term goals and aspirations. Lastly, livelihoods and basic services have to be provided to relocated communities considering that most of them have to restart their lives from scratch far from home. If the process is not implemented in a proper way and the restoration of previous standards of living is not offered, resettlement risks driving people to a worse situation than they were before. As a last resort, people can even decide to move back to their homes if they feel that it offers better opportunities even if they are located in high-risk areas. In other words, the government needs to ensure that the process of resettlement does not exacerbate the already existing poverty levels and vulnerabilities of relocated people but that it allows them to adapt and build climate resilience.

The loss of livelihoods and the aggravated food insecurity

While those who were displaced were forced to find new livelihoods, the ones that could stay in their homes also saw their sources of food and income affected since a huge proportion of productive farmland was destroyed by the cyclones: Idai ruined more than 715,000 hectares of crops and Kenneth did the same with nearly 55,500 hectares, also wrecking fishing boats and facilities (UNOCHA, 2019a). It is estimated that the former alone caused agricultural losses

valued at a minimum of $141 million. The crops more affected included products such as maize, beans and rice (Save the Children, 2020).

Mozambique has one main harvest season per year, which usually begins in March or April and accounts for 80 to 90 percent of annual production: “For households dependent on agriculture, stocks from that harvest typically carry families through until the following year” (Yarnell & Cone, 2019). Cyclone Idai made landfall right before the beginning of the harvest season that year and Kenneth did so in the midst of it, thus prolonging what was an already difficult season. Indeed, even before both cyclones struck Mozambique, the country was facing high levels of food insecurity due to an ongoing drought in many central and southern provinces – which are precisely the areas most impacted by Idai (MOPHRH, 2019). The agricultural production was already expected to be low due to such conditions so, considering that over 80 percent of the Mozambican population relies on agriculture as a primary source of income, the devastating effects of the cyclones worsened food insecurity (ibid.). In fact, the impacts of climate hazards are not limited to the destruction of crops but the lack of flood-resistant storages for seeds and harvested food also increases the exposure of farmers at risks: “Their core assets are their homes, the food and seed they contain, and their arable land, all of which are climate vulnerable.” (Norton et al., 2020).

In the response phase of the disaster, international humanitarian organizations provided affected people with food rations. With the aim of recovering lost livelihoods, the government of Mozambique, together with some NGOs, also distributed seeds and agricultural tools for the following planting season. Those efforts proved to be insufficient since only a fifth of the households impacted by Idai – out of half a million farming families – had received such support as of August 2019 (Yarnell & Cone, 2019). Hence, the loss of crops forced communities to depend on food assistance “to survive a lean season that started earlier and lasted longer than normal” (ibid.). In fact, the actual consequences of the cyclones on people’s livelihoods were not felt until some months after the disaster. According to Oxfam International (2019), the number of people in need of food aid rose by 25% between April and September that year: up from 1.6 million to 2 million people, which represents 10 percent of Mozambique’s population. In other words, six months after the disaster the existing food insecurity crisis was still overwhelming humanitarian aid since the demand exceeded by far the available supplies (ibid.). The explanation for this is that the distribution of food rations was a short-term solution while the provision of support for planting new crops, which could have helped families at least in the medium-term, had to face different obstacles. The problem was

that not only farming families lost their crops containing food for that same season but extensive flooding damaged the productive soil by covering it with mud and sand, thus impeding the preparation of the land for the following season (Yarnell & Cone, 2019) regardless of the seeds and tools available. Furthermore, even if some crops were successfully replanted with the support of aid organizations, they were later damaged due to heavy rain and its subsequent flooding in December that same year (Save the Children, 2020). Thus, the challenging conditions to recover the previous livelihoods and the lack of alternative ones kept exacerbating people's vulnerability and their struggle to survive.

The fact that communities affected by the cyclones were suffering from food shortages pushed them to use any options they found to eat. Some farmers planted tomatoes since it is one of the few fast-growing crops they could cultivate. But other people opted for more dangerous strategies, as warned the Oxfam Country Director in Mozambique, Rotafina Donco:

> "Women are skipping meals so that the little food there is can be given to children. Families are foraging for wild plants as there's not enough or very little to eat. Hunger risks becoming the silent killer of those who survived Idai." (Oxfam International, 2019)

In fact, prior to Idai and Kenneth, impoverished families resorted to negative coping strategies such as selling productive assets and removing children from school to work to cover basic needs (IFRC, 2020). Considering that most households were already struggling to subsist on the few resources they had, the loss of such livelihoods due to the impact of the cyclones further forced them to increasingly make desperate decisions in an attempt to survive, including early marriages, child labor, child trafficking or survival sex (IFRC, 2020; Plan International, 2020), mostly affecting girls.

Indeed, as has been previously noted, women are particularly vulnerable in the wake of climate disasters. In Mozambique, women play an important role in agricultural production. Even though men still control most rural land plots, women have to some extent decision-making power about how to manage such crops and what to plant, at the same time that they provide labor to the production of food (Gustafson, 2014; UNOCHA, 2019a). In the aftermath of the cyclones, their caregiving burden increased as a result of illnesses and injuries, thus reducing the time invested in agricultural production and increasing their food insecurity (UNOCHA, 2019a).

Furthermore, the communities affected by cyclone Kenneth had to face an additional obstacle to recover their livelihoods. As has been previously explained, the province of Cabo Delgado suffers from the attacks of armed groups. In this sense, some people were not only displaced due to the impacts of the cyclone but also fled violence, thus moving away from their livelihoods and farming lands. The fact that these people "feared going to the fields" in case of possible assaults (ibid.) implied aggravating even more the vulnerabilities created by the cyclone alone. In other words, such communities were affected by overlapping risks, namely climate disasters and violence. But as long as they avoided returning to their lands, their exposure to food insecurity was also prolonged.

In short, the fact that the Mozambican population relies on climate sensitive sectors not only as a source of income but especially of food is in itself an obstacle for creating resilience when it comes to livelihoods. In fact, farmer families mostly cultivate their land as a way of subsistence, thus growing food for their own consumption and having scant surplus for sale. In this sense, the government should aim at providing durable solutions besides the provision of seeds and agricultural tools. For instance, it would be desirable to increase farming productivity as well as to facilitate access to markets so that people could make some profit out of their harvests, which would contribute to decreasing poverty levels. Moreover, the construction of safe storage warehouses is essential to protect farmers' harvests (Norton et al., 2020). Lastly, the diversification of livelihoods beyond agriculture into activities that do not directly rely on natural resources could also be considered as an option to reduce the vulnerability of communities since it would diminish their exposure to climate hazards and would prevent them from highly depending on humanitarian assistance even long after the impact of a disaster. The implementation of these recommendations, which go beyond climate adaptation and could also be included in development policies, would enhance the resilience of households by diminishing the loss of livelihoods and therefore their impoverishment.

The provision of Water, Sanitation and Hygiene (WASH) services

The last area of response that will be analyzed is the one referring to Water, Sanitation and Hygiene (WASH) services. The impact of cyclones Idai and Kenneth had serious consequences on people's access to health: at least 94 health centers were damaged, added to the numerous equipment, medical supplies and medicines that were destroyed, as well as the fact that staff

working in the health sector were themselves affected by the cyclones (UNOCHA, 2019b). In any climate disaster, this may result in the collapse of the healthcare system, also entailing the interruption of treatments for people suffering from illnesses prior to the cyclones and health programs such as immunization (Kouadio et al., 2012). In order to alleviate the consequences of this foreseeable situation and paying attention to Idai forecasts, some humanitarian organizations such as the Red Cross took early action by distributing water and sanitation supplies to some vulnerable communities before the cyclones struck to accelerate the handing out of relief supplies after the disaster (Norton et al., 2020). After their landfall, NGOs rapidly distributed thousands of dignity and sanitation kits, and built latrines and sanitation facilities (ibid.).

In addition to the impacts on health facilities and personnel, the prolonged effects of natural disasters bring about increases in infectious disease transmission. In the event of flooding – which followed both Idai and Kenneth –, the massive displacement of people into unplanned and overcrowded resettlement camps as well as contamination of water sources are some of the factors that may lead to disease outbreaks (Kouadio et al., 2012). Indeed, these two circumstances together with the fact that cholera is endemic to Mozambique, which usually experiences outbreaks of this disease towards the end of the rainy season, were the basis for a new cholera outbreak following cyclone Idai that was officially declared on 27 March 2019 (MSF, 2019). As for cyclone Kenneth, the outbreak was confirmed one month later, on 1st May (WHO, 2019). Aware of this risk, the Ministry of Health established a surveillance system to ensure early detection of any outbreak of infectious diseases in the most affected districts by cyclone Idai (Lequechane et al., 2020). The collected data allowed rapid implementation of measures to prevent cholera from further spreading and to treat already existing cases. To achieve so, WASH activities included provision of clean and safe water, as well as distribution of essential commodities to health centers – namely cholera kits or rehydratation solutions – and hygiene promotion activities (ibid.). Regarding the latter, the international NGO Doctors Without Borders (MSF) worked to explain the risk of disease outbreaks to communities by going door-to-door to inform people about how to protect themselves against cholera and how to access medical care if needed but it also put on street theater groups to further disseminate the information (MSF, 2019).

The Ministry of Health also set up different cholera treatment centers, which were established not only to cure existing cases but also to face a possible exponential increase in the number of cases of such disease (MSF, 2019; Lequechane et al., 2020). Moreover, a massive oral cholera vaccination campaign was conducted. In Sofala province, the one most affected by cyclone Idai, the campaign was directed to more than 800,000 individuals. In only a few weeks, it reached 98.6% of the targeted population, leading to a reduction of the reported cholera cases (Lequechane et al., 2020). In the beginning of May, a total of 6,733 people were reported infected, including 8 deaths (WHO, 2019). Another vaccination campaign was run in mid-May in the provinces affected by cyclone Kenneth, where the number of cholera cases was significantly lower: 225 cases and no deaths were reported in Cabo Delgado province (ibid.).

Communicable diseases do not break out in the immediate phase following the disaster but may occur several days, weeks or even months after it strikes (Kouadio et al., 2012). In this sense, while the spread of cholera was being contained, the proliferation of mosquitoes due to stagnant waters as a consequence of the cyclones resulted in a concerning number of reported malaria cases. As a response, thousands of mosquito nets were distributed and an indoor spraying campaign was carried out – an intervention that consists of covering with insecticide the internal walls and ceilings of a house so that malaria vectors die when they come in contact with it (WHO, 2019). The risk of the mentioned diseases together with others such as bloody diarrhea or acute malnutrition remained a humanitarian concern during several months (ibid.).

WASH is considered to be "the strongest of all the response sectors" (Norton et al., 2020) due to both the anticipatory measures taken and the rapid response after the cyclones. The efficiency of such efforts was partly thanks to large-scale WASH programs that were already in place to face previous needs as well as the existence of several organizations in the region specializing in WASH, which contributed to the emergency with skilled staff and equipment (ibid.). However, the disaster management concerning WASH was still improvable when it comes to taking mitigation measures prior to the cyclones to avoid the loss of infrastructure:

> "WASH efforts were more focused on quickly containing the consequences of loss of critical WASH infrastructure, rather than on reducing the risk of loss of the infrastructure itself" (Norton et al., 2020).

This is where the concept of resilience appears again. The aim of the government should be – as noted in the previous section referring to critical infrastructure – to invest in building health facilities that are better prepared to withstand the impacts of climate hazards so that they remain operational after extreme events and the disruption of the health system is less severe. During the reconstruction phase after Idai and Kenneth, some humanitarian organizations already worked to rebuild sanitation facilities in a way that made them resistant to future floods, which implies a will "to learn from past events and to adapt construction approaches" (ibid.).

Moreover, WASH services can also play an important role when building climate resilience, for instance by enabling access to water at times of scarcity or, as has been explained, by reducing the risk of communicable disease outbreaks following natural disasters (UNICEF & GWP, 2017). By ensuring that affected communities by a calamity will have access to clean water and health services or that the conditions that contribute to the spread of infectious diseases will be addressed, people are relieved of worrying about avoidable health issues and are able to focus on other challenges stemmed from the disaster, such as the loss of livelihoods or the need of shelter. In other words, the access to adequate WASH services enables to create resilience by lessening the burden that impacted populations have to deal with after a disaster and thus helping them to be in healthy conditions that will allow them to better cope with the situation.

Lastly, and taking into consideration the gender perspective again, it needs to be highlighted that the cyclones also aggravated the vulnerability of women and girls due to an increased risk of being victims of gender-based violence. Their exposure to such risk stemmed, on the one hand, from the fact that the contamination of water sources forced them to walk longer distances to access clean water and, on the other hand, from having to use crowded latrines in communal spaces (UNOCHA, 2019a). In this sense, the Mozambican government needs to consider the additional vulnerabilities faced by some population groups in order to implement specific measures to protect them, for instance by establishing safe spaces for women and girls (ibid.). At the same time, the mere fact of enhancing the measures intended at providing WASH services for the overall affected population also contributes to further protecting women and girls, for instance by providing them with closer sources of clean water or building gender segregated latrines.

Conclusion

This research started by posing the following question: *How did the disaster risk management of the Government of Mozambique in the face of cyclones Idai and Kenneth contribute to exacerbating the pre-existing vulnerabilities of local communities and how was the aim to build climate resilience included along the preparedness and response process?* To answer this question, I first looked at the main vulnerabilities existing in the country and I followed by revising the Mozambican legal framework regarding disaster risk management. After getting a better picture of the conditions in which cyclones Idai and Kenneth struck, it becomes easier to understand the challenges that the Government of Mozambique had to face to respond to the disaster and the shortcomings that characterized such response. In fact, the paper has argued that developing countries are harder impacted by extreme weather events, therefore being relevant to take into consideration the factors that explain this reality. Even though the mitigation and preparedness measures taken in the country prior to the cyclones have not been revised, the hurdles arisen during the response and recovery phases evince the effectiveness and flaws of such previous measures. In this sense, this thesis has analyzed five areas concerning disaster management in the face of tropical cyclones Idai and Kenneth in Mozambique. Drawing on the concept of climate resilience, the paper has analyzed the dissemination of early warning systems, the capacity of critical infrastructure to withstand climate hazards, the housing support and resettlement options offered to affected communities, and finally the impact of the cyclones on people's livelihoods and the provision of WASH services. Bearing in mind that the magnitude of the catastrophe would most likely have exceeded the coping capacity of any country, some of the weaknesses detected during the response would have still appeared in the event of a less devastating disaster due to the still existing need to take measures towards a truly proactive DRM strategy and to build resilience among the population.

The main findings resulting from the analysis are the following. Firstly, since the end of the civil war and learning from past events such as cyclone Eline in the year 2000, Mozambique has made relevant progress to move towards a proactive disaster risk management by implementing several DRR policies and plans. The government has also become aware of the need of mainstreaming climate adaptation into development plans, thus acknowledging its

cross-cutting nature. Indeed, development policies can directly contribute to climate adaptation. However, the country also faces several development challenges such as poverty or lack of adequate housing that in turn become vulnerabilities in the face of weather hazards. Therefore, the efforts made by the government of Mozambique have so far proved to be insufficient since it also needs to address several structural problems. In other words, the pre-existing vulnerabilities highlighted by this research – acknowledging that there are many others – have set up the basis for what have been the main weak points of the disaster management in the wake of cyclones Idai and Kenneth. This means that such vulnerabilities were further exacerbated after the events due to both the limited institutional capacity to respond and the lack of resilience among the population.

Yet the strengths of the government's disaster management should not be undervalued: accurate and timely forecasts of the cyclones were issued, and WASH measures were quite effective – mainly the early distribution of supplies and the containment actions of communicable disease outbreaks. This reflects that the lessons learned from previous events have been useful to improve some aspects of the disaster response. Nonetheless, the research has exposed that in general all the areas of response to the cyclones presented numerous flaws. Despite the adequate forecasts, the dissemination of early warnings turned out to be ineffective, and the poor infrastructure of health facilities rendered them non-operational after the disaster. The other areas presented even more room for improvement. Poor construction standards of critical infrastructure and housing resulted in massive destruction that to some extent could have been avoided by retrofitting those buildings during the mitigation phase to make them climate proof. The resettlement options offered by the government did not follow most of the basic principles to guarantee the effectiveness and sustainability of the process, which risked driving people to an even more vulnerable situation than they were prior to the disaster. Lastly, the fact that most of the population depends on climate-sensitive sectors and that previous measures had not been taken to protect their livelihoods triggered a worsening of the already existing food insecurity situation. Overall, the identified shortcomings in the response and recovery phases demonstrate that, even if the government stands for a proactive disaster risk management, in practice there are still a lot of measures that need to be taken in the mitigation and preparedness phases to reduce the consequences of disasters on people's lives.

Moreover, both the government and the humanitarian organizations present in the country are aware of the need of building resilience among the population. The response and recovery phases of cyclones Idai and Kenneth were an opportunity to 'build back better' and thus enhance the climate resilience in the country and, indeed, some steps were taken towards such a goal. Nevertheless, these efforts somehow remained halfway through due to the lack of complementary measures. For instance, it is of little use providing families with materials to rebuild their damaged houses if they are not taught construction techniques that integrate climate proofing. Or offering parcels in resettlement sites if the restoration of previous standards of living is not ensured. Therefore, it looks like there exists an intention of creating resilience, but the measures taken are incomplete. Such measures need to be included along all the phases of the disaster management cycle, especially prior to the events: mitigation and preparedness actions will further enable to increase people's capacity to withstand the impacts of climate disasters and recover from them. Even if the government of Mozambique has implemented some measures in these previous phases, many others are needed to address the multiple vulnerabilities that the population face. The more vulnerabilities people have to overcome, the less resilient they are against climate disasters. And during the response and recovery phases of cyclones Idai and Kenneth they had to deal with multiple overlapping vulnerabilities – especially in the provinces affected by the latter, which had to face the additional vulnerabilities created by armed conflict in the region.

Ultimately, this paper has shown the ongoing needs regarding livelihoods, shelter, and WASH services of impacted communities by Idai and Kenneth that persisted even a year after the disaster. This is the result of several factors, namely the ravaging nature of the events, the weak institutional capacity of the country to respond together with the insufficient foreign funding received, and the acute vulnerabilities that affected the Mozambican population even before the catastrophe. But there is another factor that further contributes to hindering the recovery of the communities: the occurrence of subsequent disasters. Even though I have not delved into the climate hazards that have hit the country after the cyclones comprising the case study, it needs to be noted that other extreme events have impacted the country once again, which opens the way for deepening the research started by this paper. The major example is the case of tropical cyclone Eloise, which made landfall in January 2021 and caused severe flooding in the

central provinces of Mozambique, which were still recovering from cyclone Idai. Despite the efforts made to build resilience among the communities after the events in 2019, thousands of people remained in need by then and therefore were still vulnerable and not ready to face a new disaster. This situation also shows how the different phases of the disaster management cycle can overlap. The areas affected by cyclone Eloise were in the recovery phase of Idai, which included the implementation of mitigation measures such as building more resistant buildings, and before such phase was over, they found themselves in a response phase again. In short, countries prone to climate disasters are constantly immersed in the PPRR cycle and need to strengthen their resilience as a way to alleviate the process. In the same way that cyclone Eline became a turning point for the disaster management of Mozambique, the challenges arisen in the wake of Idai and Kenneth can also teach some lessons to further enhance the coping capacity of the country.

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