

Document of
The World Bank

Mozambique Disaster Risk Management and Resilience Program

Technical Assessment Report

February 20, 2019

Acronyms and Abbreviations

ARC	African Risk Capacity
AT	Administrative Tribunal (<i>Tribunal Administrativo</i>)
BCR	Benefit Cost Ratio
CENOE	National Center for Emergency Operations (<i>Centro Nacional Operativo de Emergência</i>)
CLGRC	Local Disaster Risk Management Committee (<i>Cômité Local de Gestão do Risco das Calamidades</i>)
COE	Center for Emergency Operation (<i>Centro Operativo de Emergência</i>)
CNE	National Emergency Council (<i>Conselho Nacional de Emergência</i>)
CTGC	Technical Council for Disaster Management (<i>Conselho Técnico de Gestão de Calamidades</i>)
DFID	United Kingdom Department for International Development
DLI	Disbursement-linked Indicators
DMF	Disaster Management Fund (<i>Fundo de Gestão de Calamidades</i>)
DNASS	National Directorate for Water Supply and Sanitation (<i>Direcção Nacional de Abastecimento de Água e Saneamento</i>)
DNGRH	National Directorate for Water Resources Management (<i>Direcção Nacional de Gestão de Recursos Hídricos</i>)
DRM	Disaster Risk Management
ERR	Economic Rate of Return
ERRP	Bank-financed Emergency Resilient Recovery Project
e-SISTAFE	Electronic State Financial Administration System (<i>Sistema de Administração Financeira do Estado</i>)
EWS	Early Warning System
FASE	Common Fund for Education Support
GDP	Gross Domestic Product
GFDRR	Global Facility for Disaster Reduction and Recovery
GIZ	German Agency for International Cooperation (<i>Deutsche Gesellschaft für Internationale Zusammenarbeit</i>)
GoM	Government of Mozambique
GRIFF	Global Risk Financing Facility
INAM	National Institute for Meteorology (<i>Instituto Nacional de Meteorologia</i>)

INGC	National Disaster Management Institut (<i>Instituto Nacional de Gestão de Calamidades</i>)
IPF	Investment Project Financing
MEF	Ministry of Economy and Finance (<i>Ministério da Economia e Finanças</i>)
MINEDH	Ministry for Education and Human Development (<i>Ministério de Educação e Desenvolvimento Humano</i>)
NDRFS	National Disaster Risk Finance Strategy
NGOs	non-governmental organizations
NPV	Net Present Value
PAP	Program Action Plan
PDO	Program Development Objective(s)
PDRRD	National Disaster Risk Reduction Master Plan 2017-2030 (<i>Plano Director para a Redução do Risco de Desastres 2017-2030</i>)
PDPMCN	Master Plan for Prevention and Mitigation of Natural Disasters (<i>Plano Director para Prevenção e Mitigação das Calamidades Naturais</i>)
PES	Economic and Social Plan (<i>Plano Económico e Social</i>)
PforR	Program for Results
PMS	Program Management Secretariat
POM	Program Operations Manual
PQG	Government's Five-Year Program (<i>Programa Quinquenal do Governo</i>)
PSC	Program Steering Committee
TA	Technical Assistance
TAP	Technical Assistance Program
UCEE	Unit for School Construction and Equipment (<i>Unidade de Construções e Equipamentos Escolares</i>)
UGEA	Executive Procurement Management Unit (<i>Unidade de Gestão Executiva de Aquisição</i>)
UNAPROC	National Civil Protection Unit/Agency (<i>Unidade Nacional de Protecção Civil</i>)

Table of Contents

A. Introduction	6
B. Program Description.....	6
C. Program Strategic Relevance and Technical Soundness	13
Strategic Relevance.....	13
Technical Soundness.....	21
Program Institutional Arrangements.....	23
D. Program Expenditure Framework (description and assessment)	26
E. Program Results Framework and M&E (including DLIs)	32
F. Program Economic Evaluation.....	39
G. Technical Risk Rating and Mitigation Measures	42
H. Inputs into the Program Action Plan	44
I. Inputs to the Program Implementation Support Plan	47
Annex 1: Economic Analysis.....	50

List of Figures

Figure 1: Distribution of Local Disaster Risk Management Committees by Province, 2017

Figura 1: Estrutura Orgânica do Instituto Nacional de Gestão de Calamidades (INGC)

Figure 3: Government program and PforR Program

Figure 4: Occurrence of Disasters and Affected People in Mozambique, 1956-2016

Figure 5: Damages (in Millions of Current US\$) Caused by Disasters in Mozambique (1984-2014)

Figure 6: Institutional Arrangements

List of Tables

Table 1: Government program and PforR Program supported by World Bank

Table 2: Evolution of Poverty Rates and their Relation to Disasters

Table 3: Overall Program Expenditure (in Million Meticaïs) 2019-2023

Table 4: Total Program Expenditure (in USD Million) 2019-2023

Table 5: Budget Execution (in USD and %) by MINEDH and INGC (2015-2017)

Table 6: Program Financing 2019-2024 (US\$ million)

Table 7: Program's Results Chain

Table 8: Summary Table of Estimated Cost-benefit Analysis Result

Table 9: Summary of Benefit Cost Ratio (BCR) Values in Disaster Risk Financing and Reduction Projects

Table 10: Technical Input into Program Action Plan

Table 11: Main Focus of Implementation Support

A. Introduction

This Technical Assessment (TA) has been carried out as part of the preparation phase of the Program-for-Results (PforR). The purpose of the TA is to evaluate, with the Government of Mozambique's (GoM) support, the adequacy of Program arrangements and the performance in four areas: strategic relevance and technical soundness, expenditure framework, results framework and monitoring and evaluation capacity, and economic justification.

Working closely with the GoM, the TA has identified a number of weaknesses and possible improvements which have been formulated into specific proposed recommendations and actions to be taken by the GoM with support of the World Bank. This TA also identifies relevant key risks to the achievement of the Program's objectives and associated mitigation measures.

B. Program Description

B.1 Government program

The National Disaster Risk Reduction Master Plan 2017-2030 (*Plano Director para a Redução do Risco de Desastres 2017-2030* - PDRRD, or the "program") is the overarching programmatic framework for Disaster Risk Management (DRM) in Mozambique, within which the proposed Program is situated. The PDRRD is the second Master Plan to operationalize the DRM policy framework and was adopted in October 2017. It sets forth an ambitious and comprehensive DRM program for 2017-2030 to promote Mozambique's resilient development through disaster prevention, preparedness, response, and recovery. It also recognizes the need to mainstream disaster and climate resilience in public investments, territorial planning, and public financial management, while building capacity at all levels.

The program aims to reduce disaster risk, the loss of human lives, impact on livelihoods and critical infrastructures, as well as avoid the emergence of new disaster risks by increasing the resilience of people and infrastructure to climate and other natural and man-made hazards. To this end, the PDRRD defines five strategic objectives with corresponding results and actions (as shown in figure 3), which are aligned with the priorities of the Sendai Framework for Disaster Risk Reduction 2015-2030.

1) Strategic Objective One: Improving the understanding of disaster risk at all levels

Recognizing that appropriate knowledge and understanding of disaster risk constitutes the basis for defining adequate DRM measures, the first strategic objective of the Government of Mozambique's (GoM) program is to improve the understanding of disaster risk in all its dimensions, including hazard characteristics, exposure of people and assets, vulnerability, and capacity. The following key results were defined in this regard: (i) a comprehensive education strategy on disaster risk reduction implemented; (ii) a strategy for public communication and awareness raising of disaster risk reduction measures implemented; (iii) research and information management improved; (iv) a program of innovation and use of information technologies implemented; and (v) a DRM training program for trainers and leaders developed. Over the past years, the GoM has made some notable progress to improve the understanding of disaster risk.

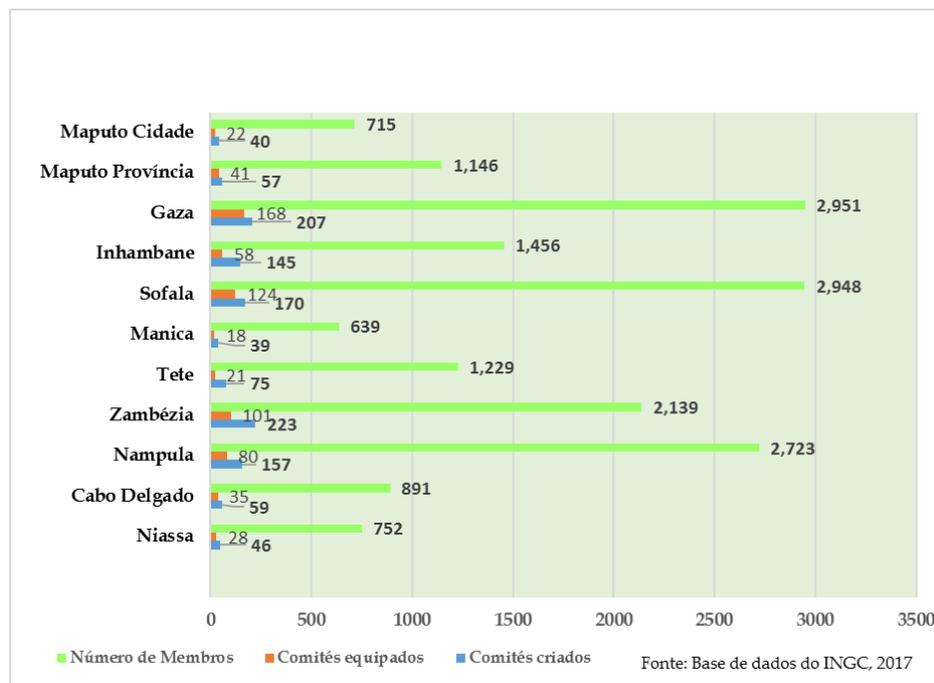
With support from the World Bank, the GoM acquired and processed high-resolution spatial and topographic data (through LiDAR¹ survey) for two of the country's most critical river basins (Limpopo and Zambezi). The GoM is currently working on integrating this data into hydrological and hydraulic models to improve flood risk maps. The GoM also obtained new hazard and exposure maps for all major perils at the national level, as well as nation-wide exposure data for school infrastructure, which were prepared with support from the Global Facility for Disaster Reduction and Recovery (GFDRR). However, a lot of disaster related data remains spread across various institutions and several databases, consequently planning and development decisions are frequently not guided by risk assessments. As a first step to address this challenge, in partnership with the World Bank and GFDRR, National Institute for Disaster Management (INGC) has revived the Mozambican GeoNode -a web catalog that allows users to share, access, and visualize geospatial data- and complemented it with GeoSAFE -a web-based application for hazard impact scenario analysis, visualization, and contingency planning.

2) Strategic Objective Two: Strengthening governance and public and private participation in disaster risk reduction

The program's second strategic area aims to strengthen DRM governance and enhance public and private participation in all aspects of DRM, particularly disaster risk reduction. It emphasizes the need for a clear vision, concrete plans, clear definition of roles and responsibilities, strong intra and intersectoral coordination, and encompassing stakeholder participation as the basis for effective and efficient DRM. To this end, the results for this strategic objective are as follows: (i) the regulatory system for disaster risk reduction is harmonized; (ii) responsibilities for disaster risk reduction are decentralized to local and communal level; (iii) disaster risk reduction is systematically included in sectoral and territorial planning; (iv) operational and organizational structure for disaster risk reduction is adjusted; and (v) participation of civil society, private sector, and volunteers in disaster risk reduction is strengthened. In response to the limited capacity of local communities to respond to the catastrophic floods of 2000, the GoM has also started the creation and training of Local Disaster Risk Management Committees (*Cômités Locais de Gestão do Risco das Calamidades* - CLGRCs) in highly risk-prone districts in some of the country's main river basins (Búzi, Zambezi, Limpopo). CLGRCs were instrumental in ensuring early evacuation of people at risk during the 2007 and 2008 floods in the Zambezi river basin, contributing to the prevention of loss of human lives. The creation, revitalization, equipment, and training of CLGRCs has become a priority for strengthening local capacity for disaster risk management. In 2017, there were 1,218 Committees, with a total of 14,255 members throughout the country, of which 698 Committees are equipped (see graphic 4). Ensuring the sustainable functioning of existing Committees and establishing Committees in all high-risk communities is one of the key challenges for the country to strengthen local capacity for emergency preparedness and response through the adequate use of early warning information.

¹ Light Detection and Ranging (LiDAR) surveys are conducted to create Digital Elevation Models (DEM), which are critical inputs into the development of flood management plans, for example.

Figure 1: Distribution of Local Disaster Risk Management Committees by Province, 2017



3) Strategic Objective Three: Mainstreaming DRM in public investment and territorial planning, and consolidating financial protection against disaster

The program’s third strategic area aims to enhance the role of public and private investments in disaster risk reduction through structural and non-structural measures. The following results are envisioned: (i) mechanisms and investments for the protection of infrastructures developed; (ii) program for risk-informed territorial planning and urban risk reduction implemented; (iii) financial protection strategy against disasters established; and (iv) program for the prevention and enhancement of arid and semi-arid zones implemented.

The GoM took an important step towards improving financial protection against disasters with the legal creation of the Disaster Management Fund (*Fundo de Gestão de Calamidades*, DMF) in October 2017 (Decree No. 53/2017 of October 18, 2017) and is working towards its operationalization before April 2019. The DMF is a dedicated account managed by INGC that is expected to receive annual budget allocations which is equivalent to at least 0.1% of the State budget (minimum annual allocation of about US\$4.5-5 million) to increase the availability and predictability of resources for emergency response and recovery and, in the future, possibly reconstruction activities. Disaster risk reduction activities will remain included in sectoral budgets. With technical support from the Bank, the GoM has elaborated the regulations to operationalize the DMF, which are expected to be adopted by April 2019. The DMF has been designed in such a way that it can purchase sovereign risk transfer instruments, which could eventually provide an important backstop to the fund in the event of a large disaster. In this regard, the GoM has been in dialogue with the African Risk Capacity (ARC) since 2014 around potential drought and/or cyclone insurance. This dialogue is still ongoing, and the WB will provide TA to the GoM complementing the PforR which will help the GoM assess the alignment of ARC’s sovereign

insurance solutions with their financial protection priorities, as well as other potential risk transfer options. The TA will analyze the suitability of multiple sovereign risk transfer instruments to meet the GoM's policy objectives in a cost-effective manner, recognizing the constraints and limitations of such instruments, such as basis risk.^{2 3}

The GoM has also made some progress towards mainstreaming DRM into investments and territorial planning, including the approval of a decree requiring that new public buildings comply with resilient design standards and environmental requirements, preparing methodological guidelines for the elaboration of urban planning instruments that require the consideration of disaster risk, and adopting a methodology to mainstream DRM in district planning processes. Despite the progress in improving construction standards for key public infrastructure, actions to reduce existing risks (through, for example, the retrofitting of public infrastructure) and future risks (through the systematic inclusion of resilient standards in the planning and construction of public infrastructure) are still limited. The education sector is among the most advanced sectors with regards to mainstreaming risk reduction in infrastructure provision. The Ministry of Education and Human Development (MINEDH) adopted an improved construction code in 2014 that incorporates resilient construction against cyclones and earthquakes. Since then, it has started to implement it for the construction of new school buildings financed by the Common Fund for Education Support (*Fundo Comum de Apoio à Educação* – FASE). FASE does, however, not include any funding for the rehabilitation or retrofitting of existing school buildings and class rooms that are vulnerable to hazards. With support from the World Bank under the Emergency Resilient Recovery Program (ERRP) and technical assistance (TA) from UN-Habitat, the MINEDH has therefore started testing new approaches to retrofit and repair existing school buildings/classrooms that are vulnerable to cyclones and strong winds in the provinces of Zambezia, Nampula, and Niassa.

4) Strategic Objective Four: Strengthening capacity for disaster preparedness, response, and rapid recovery⁴

The program's fourth strategic area guides action to improve systems and procedures for disaster preparedness (including forecast, early warning, drought mitigation), building capacity for rapid response and recovery at all levels, and promoting disaster response, recovery, and reconstruction approaches that empower women and are inclusive of people with disabilities. In this regard, the expected results are: (i) the mechanisms for disaster preparedness and response are consolidated; (ii) early warning system for various hazards are established and consolidated; (iii) post-disaster resilient recovery and reconstruction strategy established; and (iv) the process of planning food and nutritional security is consolidated. Over the last two decades, the GoM has made considerable progress towards strengthening national capacity for emergency preparedness and response. The

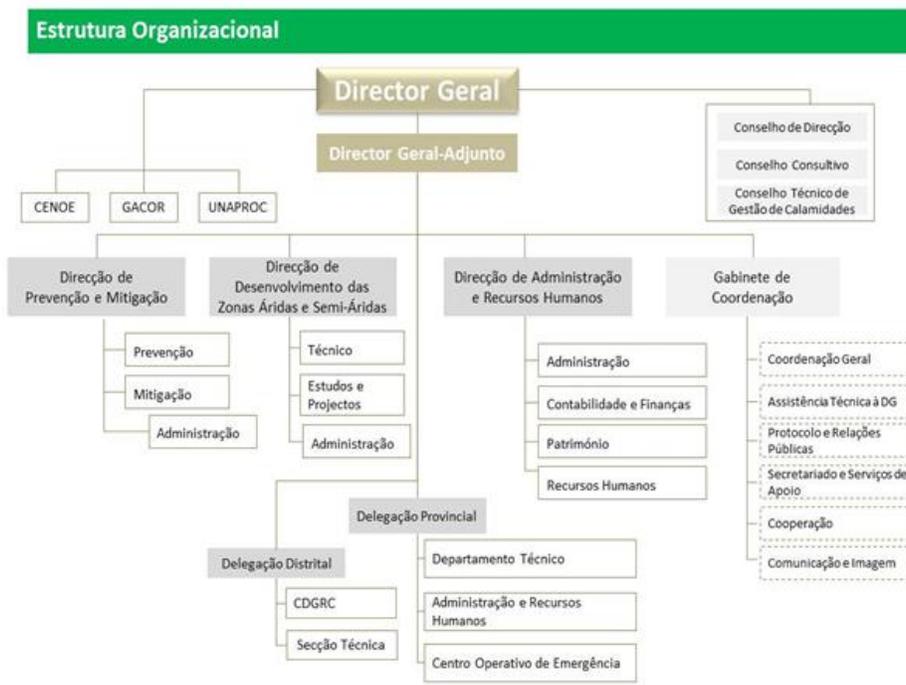
² Basis risk refers to the risk – with parametric insurance – that a parameter or a loss model do not capture an actual loss. If the exceedance of a given parameter or of a modelled loss are chosen as the trigger for a payout, the failure of such a parameter/loss model to capture actual losses can result in situations where a country experiences significant loss but receives no / low payout. This risk is inherent in insurance with parameter/index/model-based triggers. However, through rigorous review and testing of such risk transfer products this risk can be managed and understood.

³ The GoM's efforts to operationalize the DMF and to put in place sovereign risk transfer solutions build on the findings and recommendations of a diagnostic on *Financial Protection against Disasters in Mozambique* which GoM undertook with World Bank technical assistance.

⁴ The program supports mainly early recovery activities related to humanitarian assistance, such as the provision of agricultural seeds.

structure of INGC has evolved over time and, in 2007 (through Decree No. 52/2007 of November 27, 2007), was complemented with operational entities: the National Emergency Operations Center (CENOE), a multi-sectoral coordination structure for emergency response with Operational Emergency Centers (COEs) at regional, provincial, and district levels, and the National Civil Protection Unit (*Unidade Nacional de Protecção Civil – UNAPROC*), the operational branch responsible for search and rescue of disaster victims. Recognizing the role of communities as often the first responders to disaster events, the establishment of a network of DRM committees at local level (*Comitês Locais de Gestão do Risco de Calamidades – CLGRC*), composed of volunteers, has been fundamental to empower community members in the face of disasters. More recently, INGC has integrated the Post-Disaster Reconstruction Support Office (GACOR) into its structure (see figure 2 for INGC’s current structure). Under the leadership/coordination of the Technical Council for Disaster Management led by INGC (*Conselho Técnico de Gestão de Calamidades – CTGC*), the GoM has prepared its first annual contingency plan in 1999. It has been preparing and assessing them systematically since 2007.

Figure 2: Estrutura Orgânica do INGC



5) Strategic Objective Five: Building partnerships and international cooperation

Finally, the government’s program recognizes the importance of South-South and North-South cooperation to support disaster risk reduction efforts by allowing to mobilize and harness the potential of countries and supporting the strengthening of national capacities for DRM. In this sense, it aims to reinforce the cooperation within the Southern African Development Community (SADC), the African Union (AU), and with multilateral institutions, such as the World Bank.

B.2 PforR Program

The PforR Program (the “Program”) is anchored to the Government’s broader DRM program as set forth in the PDRRD. It will support a subset of results identified in the government program, which have been agreed with the GoM considering key challenges they want to address during the initial years of their DRM program and building on previous engagement of the World Bank in DRM in Mozambique. The PforR Program (total financing of US\$89 million, of which US\$83 million IDA and US\$6 million from the Global Risk Financing Facility - GRiF) will be complemented by a small Investment Project Financing (IPF) component (total financing of US\$7 million IDA) focusing on technical assistance and capacity building needed to achieve the desired outcomes.

Program Development Objective and Key Results

The Program Development Objective (PDO) is to strengthen the Government of Mozambique’s program to finance and prepare for disaster response and to increase the climate resilience of vulnerable education infrastructure in risk-prone areas.

Program Scope

In terms of duration, the Program will be implemented over a period of five years from April 2019 to April 2024 and, as such, support the second implementation phase of the PDRRD that will culminate in an intermediate program evaluation in 2024.

In terms of activities, the Program will support a set of activities that will contribute to the achievement of five results specified under strategic objectives (SO) two, three, and four of the government program. These results have been prioritized for the PforR Program based on the Government’s request for specific support, considering readiness for implementation, building on previous WB support in DRM, and complementing other ongoing and planned WB-support projects. The activities and results to be supported by the Program are structured into three results areas:

- **Results Area One: Improving financial protection against disasters.** The following activities will be supported:
 - Operationalization and recurrent capitalization of the Disaster Management Fund (DMF) that the Government legally established in July 2017; and
 - Developing the capacity of GoM to place sovereign catastrophe insurance coverage for cyclones and/or drought with capital or insurance markets.
- **Results Area Two: Strengthening Capacity for Disaster Preparedness and Response.** The following activities will be supported:
 - Strengthening and consolidation of early warning for cyclone and/or river flooding, by supporting the institutional coordination and centralized data system, and improving the communication and dissemination of warning information. These activities will focus on three Provinces, namely Gaza and

Zambezia (regions prone to floods), and Inhambane and Zambezia (regions prone to cyclones).

- Strengthening the system of local DRM Committees in vulnerable communities, by training and equipping existing Committees and establishing new ones.
- **Results Area Three: Building Climate Resilience in Vulnerable Education Infrastructure.** The education sector was chosen as a priority sector to mainstream new approaches for retrofitting and repairing public infrastructure, building on first pilot interventions supported under the Bank-financed Emergency Resilient Recovery Project (ERRP). The following activities will be supported:
 - Development of a risk-based strategic plan for school retrofit on a national level
 - Retrofitting and repairing vulnerable schools/class rooms in areas exposed to cyclone winds.

Under Results Area Three, activities will cover cyclone and windstorm areas, particularly in the seven coastal Provinces, namely Gaza, Maputo, Inhambane, Sofala, Zambezia, Nampula, and Cabo Delgado.

Figure 3 and table 1 below illustrate the relationship between the Government program and the PforR Program.

Figure 3: Government program and PforR Program (circles with dotted lines)

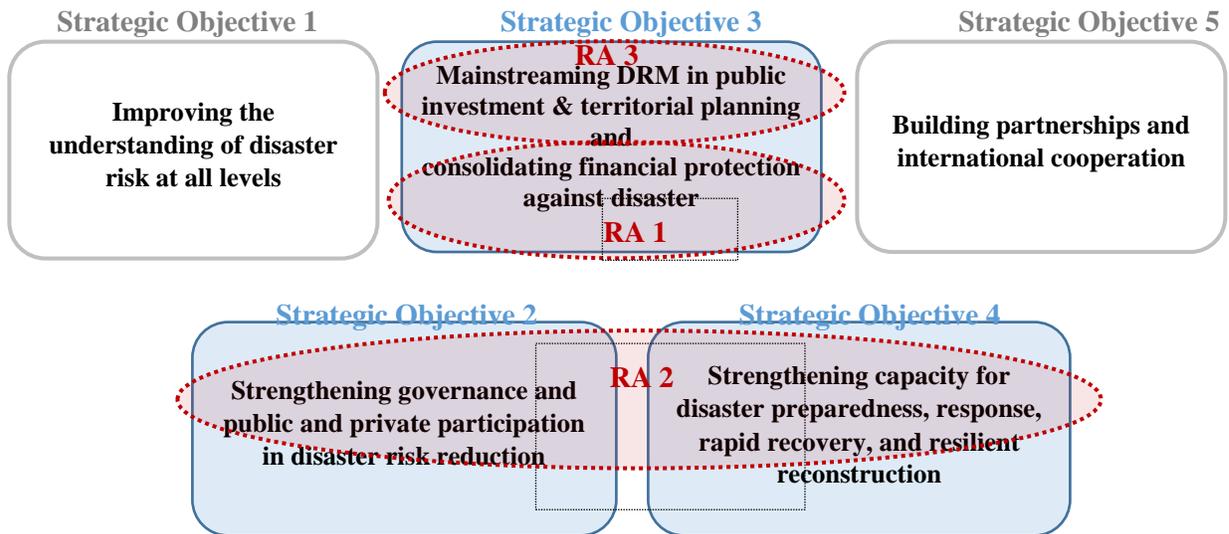


Table 1: Government program and PforR Program supported by World Bank

	Government program	PforR Program (WB-supported portion of Government program)
Results	<p>financial protection strategy against disaster established (result iii under SO3)</p> <p>responsibilities for disaster risk reduction decentralized to local and communal level (result ii under SO2)</p> <p>mechanisms for disaster preparedness and response consolidated (result i under SO4)</p> <p>early warning system for various hazards established and consolidated (result ii under SO4)</p> <p>mechanisms and investments for the protection of infrastructures developed (result i under SO3)</p>	<p>financial protection against disasters improved (RA1)</p> <p>capacity for disaster preparedness and response strengthened (RA2)</p> <p>climate resilience of vulnerable education infrastructure in risk-prone areas increased (RA3)</p>
Geographic scope	Whole country	<p>For RA1: whole country</p> <p>For RA2: Local DRM committees in high risk areas across the country; flood and cyclone early warning system covering risk-prone communities in the Gaza, Inhambane, and Zambezia provinces</p> <p>For RA3: Cyclone and windstorm prone areas</p>
Implementation period	2017 – 2030	2019 – 2024
Cost	US\$1.5 billion (estimated cost)	US\$132.27 million

Exclusions. The Program would exclude any reconstruction investments after a disaster event and those that do not meet World Bank policies for eligibility of PforR financing. Specifically, the Program will not finance permanent preventive resettlement activities that INGC may be carrying out outside of the Program (with funds that are not channeled through the DMF). Neither will the Program finance the procurement of works, goods, and services under high-value contracts above the Operations Procurement Review committee thresholds.

C. Program Strategic Relevance and Technical Soundness

Strategic Relevance

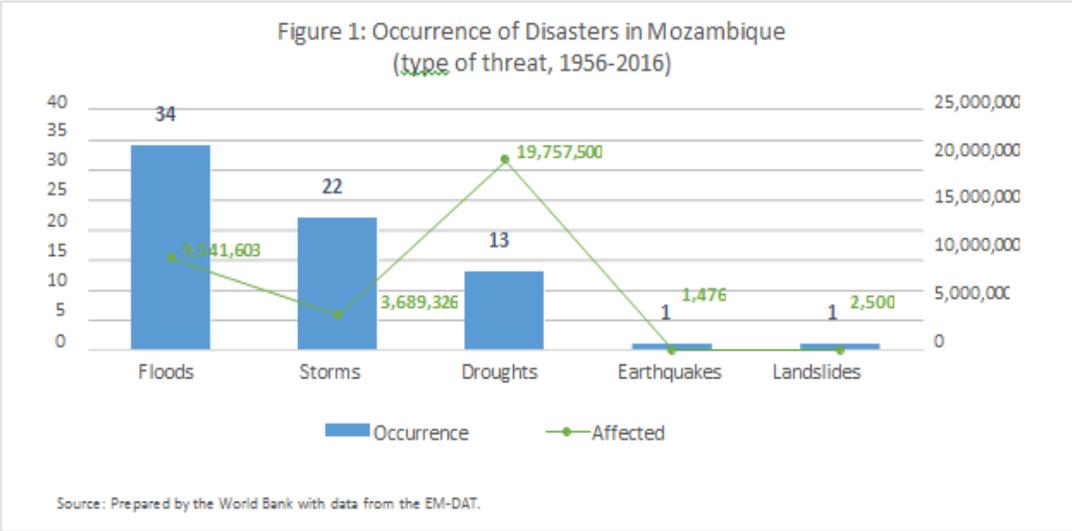
High exposure and vulnerability to climate and disaster risks

Mozambique is highly-exposed and vulnerable to natural hazards and climate variability. Over half of its population is vulnerable to climate-related shocks. The country’s coastline, home to over 60 percent of its population, borders one of the most active basins of tropical cyclones, the

Southwest Indian Ocean. In fact, regionally and globally, Mozambique is among the countries with the highest exposure to climate change and disaster risk. Among African countries exposed to risks from multiple weather-related hazards, such as flooding, epidemics, cyclones and drought, Mozambique ranks third (IFRC 2014). Other regional and global weather-related risk indexes portray a similar picture.

Droughts, tropical cyclones, and flooding are the most frequent shocks, but the country also faces seismic risk. Long and severe droughts constitute a recurring threat. They are experienced in 7 out of 10 years in the Southern regions, and in 4 out of 10 years in the Central regions (GFDRR, 2012). Lower-intensity droughts occur more frequently. Mozambique is also hit by one tropical storm or cyclone and by three or four additional tropical disturbances each year, on average (UN-Habitat, 2015). Five tropical cyclones (of category 1 to 4) making landfall between 2000 and 2008 have produced devastating effects in the country. Floods generally occur every two or three years, mostly during the rainy season and along the nine major international river systems that cross Mozambique or across the low-lying, densely populated coastal areas (GFDRR, 2012). Frequent floods tend to result from the high winds and heavy rains associated with cyclones, but also from a combination of excess rainfall, upstream discharges from major river basins, and poor drainage infrastructure. The frequency and intensity of climate-related shocks in Mozambique have intensified over the past four decades and it is projected that climate change will further increase these trends, both in terms of frequency and severity. The negative impact of these events is exacerbated by high levels of poverty and the Government’s limited fiscal space to respond effectively to these shocks.

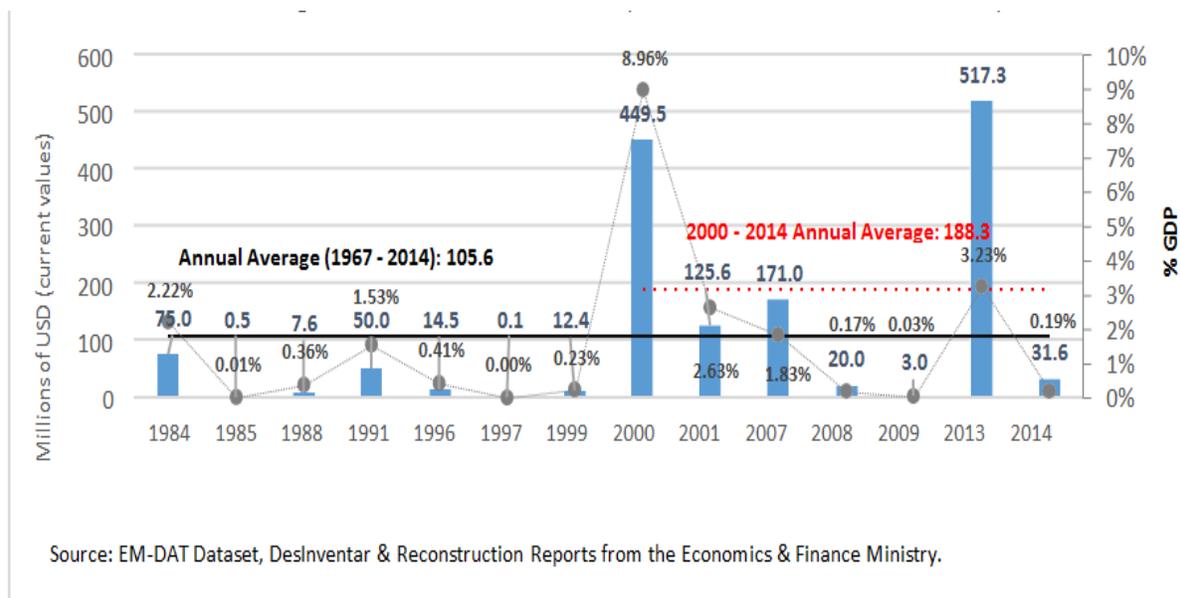
Figure 4: Occurrence of Disasters and Affected People in Mozambique, 1956-2016



Disasters have a significant impact on economic and social development

Most sectors of the Mozambican economy have suffered significantly from impacts of weather-related shocks, with sizable repercussions for the country’s budget. Assets worth approximately 37 percent of Gross Domestic Product (GDP) are exposed to two or more natural hazards, which translates into 1.1 percent annual average loss in GDP. The costs of the 2000 floods were estimated at almost US\$450 million (at current values) or nearly 9% of GDP. In 2013, floods in the Limpopo river basin caused total damages exceeding US\$517 million (at current values), equivalent to over 3% of GDP. It is estimated that annual economic losses between 1967 and 2014, a period marked by severe and prolonged droughts and devastating floods, averaged US\$105.6 million but grew to US\$188.3 million between 2000 and 2014 (see figure 5).

Figure 5: Damages (in Millions of Current US\$) Caused by Disasters in Mozambique (1984-2014)



The costs of weather-related disasters and potential losses are particularly high for the agricultural sector and are likely to increase due to climate change. This is driven by the country’s heavy reliance on this sector for providing livelihoods to the vast majority of its population. Almost the entire production (97 percent) comes from rain-fed agriculture, which is particularly vulnerable to extreme weather events. A 2009 estimate of drought and flood costs places average annual losses of maize and sorghum at 9 percent and 7 percent of each crop, respectively. Further losses of around 20 percent of crops are also estimated to occur once every ten years (GFDRR, 2012). Overall, drought causes an estimated loss of US\$20 million per year. Floods can also have devastating effects on agricultural production. For example, in 2000, cyclone Eline, which brought record-high levels of rainfall and subsequent flooding, resulted essentially in the standstill of agricultural activity and imposed an estimated cost equal to 20 percent of GDP (GFDRR, 2012 – Mozambique: Disaster Risk Financing and Insurance Country Note). Climate change is expected to exacerbate the impacts of shocks moving forward.

Climate shocks also have a significant negative impact on other sectors and provision of services that are key for human capital development in Mozambique. The high concentration of population and economic activities in coastal areas predisposes the country to large losses in case of extreme weather events. Floods and cyclones pose a particular threat to the safety of buildings and physical infrastructure. In the transport sector, over 3,000 kilometers of road are prone to flooding⁴. River floods and storm surge together cause an estimated US\$22 million damage to these roads per year. In the health sector, annual damage to healthcare facilities are estimated at US \$2.5 million. The effects of disasters on welfare are highest in rural areas and are higher for the poorest quintiles than the richest ones. These events also negatively affect human capital accumulation, as children in affected areas are less likely to attend school and are in some cases more likely to get sick. An analysis of the 2007 floods showed a reduction in primary school attendance of 20% after the event, with likely negative long-term effects on human capital³.

The education sector is among those most exposed to and affected by disasters. Nearly 5,000 classrooms are at risk of being affected by at least one natural hazard per year. Each year, over 550 classrooms are damaged or destroyed by disasters, affecting over 50,000 pupils and resulting in an economic price tag of over US\$2 million. Every year, there is a 1% probability that river flooding alone causes US\$21 million damages and affects 190,000 pupils. Cyclone winds affect the most number of pupils each year and cause significant economic damage to roofs and structures. Damaging earthquakes are much less frequent but can have a significant impact. On average, earthquakes are estimated to affect only 9 classrooms per year, whereas the 1/100 earthquake could affect 135 classrooms and 18,000 pupils. In 2015 alone, floods in the country's northern and central regions damaged or destroyed 2,363 classrooms. And, in 2017, cyclone Dineo destroyed 2,222 classrooms in the province of Inhambane, affecting 166,650 students and 5,000 teachers.

The impact of disasters also threatens poverty reduction and shared prosperity

The robust economic growth that Mozambique enjoyed over the past two decades has only translated into modest poverty reduction and inequalities are growing. According to the latest official figures, poverty has fallen from 54.1 percent in 2002 to 46.1 percent in 2014. International comparison data (using the US\$1.9/day 2011 Purchasing Power Parity poverty line) show a similar trend for Mozambique with poverty falling from 79.3 percent to 62.9 percent over the same period. However, with these figures, Mozambique still ranks among the countries with the highest levels of poverty. Mozambique's poor performance in translating mean per capita consumption growth into poverty reduction can largely be attributed to increased inequality. The Gini index fell from 0.54 in 1996 to 0.47 in 2002, then slid to 0.46 in 2008, and finally rose back to 0.54 in 2014. The recent economic downturn may also have had a negative effect on poverty reduction. Whilst inflationary pressures have subsided, relative food price levels are high and household consumption remains strained.

Poverty levels in the provinces most affected by disasters have declined more slowly or even increased. The provinces cyclically affected by disasters tend to show higher levels of poverty compared to the least affected provinces. Poverty levels in the provinces of Nampula, Zambezia, Manica, Sofala, and Gaza, that were afflicted by severe floods of the Zambezi valley in 2000 and

2008 displacing over 163,000 and 103,000 people respectively, actually worsened between 2003-2008. In Gaza province, the increase in poverty may also be associated with the 2005 and 2008 droughts, which caused significant losses of agricultural and livestock production. Poverty levels also increased in the provinces of Niassa, Cabo Delgado, and Nampula between 2009-2015, which suffered from increased isolation due to the destruction of roads and bridges by intense rains, severe floods, and strong winds in 2015, which left the entire northern region isolated from the rest of the country for about 30 days. Provinces such as Gaza and Zambezia, which were also affected by floods during this period, had the lowest levels of poverty reduction compared to other neighboring provinces not affected by disasters (see Table 2).

Table 2: Evolution of Poverty Rates and their Relation to Disasters

Província	Evolução da pobreza				Taxas de redução da pobreza			
	1997	2003	2009	2015	1997-2003	2003-2009	2009-2015	1997-2015
Nacional	69.7	52.8	51.7	46.1	-16.9	-1.1	-5.6	-23.6
Niassa	71.9	48.3	33	60.6	-23.6	-15.3	27.6	-11.3
Cabo Delgado	59.1	60.3	39	44.8	1.2	-21.3	5.8	-14.3
Nampula	69.4	49.1	51.4	57.1	-20.3	2.3	5.7	-12.3
Zambézia	67.6	49.7	67.2	56.5	-17.9	17.5	-10.7	-11.1
Tete	81.9	60.5	41	31.8	-21.4	-19.5	-9.2	-50.1
Manica	62.4	44.7	52.8	41	-17.7	8.1	-11.8	-21.4
Sofala	87.8	41.3	54.4	44.26	-46.5	13.1	-10.14	-43.54
Inhambane	83	78.1	54.6	48.6	-4.9	-23.5	-6	-34.4
Gaza	64.8	55.4	61	51.2	-9.4	5.6	-9.8	-13.6
Maputo Provincia	65.6	59	55.9	18.8	-6.6	-3.1	-37.1	-46.8
Maputo Cidade	47.1	42.9	29.9	11.6	-4.2	-13	-18.3	-35.5

Source: Adapted from MEF, 2016; WB, 2015, 2016 e 2017; INGC, 2006-2017 (several reports).

Provinces affected by:

- Floods, droughts, and cyclones
- Floods and droughts
- Floods and cyclones
- Cyclones
- Droughts
- Floods

There is a growing evidence base which demonstrates that disasters are a driver of inequality and poverty which disproportionately affect the poor, who have a limited capacity to cope with shocks. Recent poverty analysis conducted in Mozambique shows that household consumption is very responsive to disasters. Experiencing a cyclone, flood or drought can lead to a drop of up to 25-30% in per capita food consumption. Affected households also cut back on expenditures on basic non-food items. These negative effects on consumption resulted in a poverty increase of 12 and 17.5 percentage points in two of the three events analyzed (Baez et al., 2018).

Individuals affected by floods early in life also tend to have weaker labor market and consumption outcomes in adulthood, raising their vulnerability to poverty. On average, affected individuals exhibit a participation rate that is six percent lower compared to unaffected individuals. Similarly, floods are associated with lower expenditure levels per capita – approximately 14 percent less – and higher likelihood of households to be poor – nearly 18 percent more. This evidence suggests that effects of weather shocks that occurred decades ago show strong persistence over time and are still felt by affected individuals and their families to this day (Baez, WB, 2016). Reducing the impact of natural hazards is therefore of central importance for achieving poverty goals in Mozambique. The significant economic disruptions and large welfare losses caused by disasters emphasize the need to improve disaster risk management and increase resilience to natural hazards.

Mozambique faces significant funding gaps for disaster response, leading to reliance on international emergency aid

Mozambique currently lacks a strategic and comprehensive approach to financing disaster preparedness, response, recovery, and reconstruction, which results in significant funding gaps. Until recently, a budget allocation for the Annual Contingency Plan was the only ex-ante financial instrument for disaster preparedness, response and early recovery. The funds allocated to the Annual Contingency Plan have routinely been insufficient to cope with disaster events. At most, they allowed the GoM to undertake emergency response activities after small-to-medium sized events. In addition, the amount allocated to the Annual Contingency Plan was not predictable. To finance emergency response to larger events as well as post-disaster recovery and reconstruction, the GoM has been relying on ad-hoc budget reallocations - disrupting the implementation of regular government programs - and on donations or loans from the donor community. The latter are usually slow to materialize and insufficient to cover recovery needs. The need to mobilize resources after events results in inefficient response operations and prolonged and uncertain recovery and reconstruction processes, exacerbating the negative economic and social impacts of disasters. To mitigate these problems, the GoM has resolved to follow a more strategic approach to financing disaster response, starting with the establishment of the DMF, followed by sovereign risk transfer.

In addition to the GoM's limited ex-ante resources to respond to disasters, key challenges persist in institutional and technical capacity to effectively prepare for, respond to, and recover from disasters. Since the establishment of INGC in 1999, its institutional structure, staff, and equipment have been consolidated and it has achieved commendable improvements in emergency response, including the engagement of and coordination between relevant ministries and agencies through the Technical Council for Disaster Risk Management (CTGC), and, as needed, the National Emergency Operations Center (CENOE). Yet, INGC continues to face capacity constraints, particularly at the province and district levels, and the division of labor vis-à-vis sectors, especially in the transition from emergency response to post-disaster recovery and reconstruction, can be further improved. There are also gaps in the process to collect disaster damage and loss data following a disaster to guide recovery efforts, as well as difficulties in tracking disaster-related expenditure due to disparate sources of funding and off-budget assistance. Moreover, the low capacity of some sectors involved in post-disaster recovery and reconstruction to effectively and timely execute their budget allocations is another challenge, often induced by

lengthy procurement processes. In 2013 and 2014, the overall execution of funds allocated to post-disaster recovery and response only reached 29 percent.

Mozambique's evolving approach to managing risk and enhancing resilience

Recognizing the magnitude and impacts caused by climate and other shocks, the GoM made disaster prevention and mitigation a policy priority and has achieved considerable improvements in DRM policy and institutional frameworks. In 1999, the GoM adopted its first Disaster Management Policy (Resolution No. 18/99) introducing proactive measures for DRM and established the National Institute for Disaster Management (INGC) to lead coordination of DRM. The Disaster Management Law (No. 15/2014), adopted in 2014 and complemented by regulations in 2016, pushes for comprehensive DRM embedded into national, sectoral, and local development planning and budgeting. It calls for active engagement of all stakeholders from Government, civil society, private sector, individuals and development partners. The Law also recognizes the need for dedicated financial protection instruments against disasters. Reducing the vulnerability of the economy, infrastructure, and communities to climate and disaster risks was included as a key strategic objective in the Government's Five-Year Development Program 2015-2019 (*Programa Quinquenal do Governo 2015-2019*). The Program recognizes that climate resilience not only mitigates the negative impact of disasters but is also inextricably linked to poverty reduction of populations who are most exposed to such disasters.

To operationalize the DRM policy framework, the GoM has adopted consecutive Master Plans. The first Master Plan (*Plano Director para Prevenção e Mitigação das Calamidades Naturais* – PDPMCN, adopted in 2006) focused on prevention and mitigation, emphasizing the importance of disaster preparedness through the implementation of early warning, information management, communication, and capacity for search and rescue. The second Master Plan (PDRRD), adopted in October 2017, sets forth an ambitious and comprehensive DRM program for 2017-2030 to promote Mozambique's resilient development through disaster prevention, preparedness, response, and recovery, as well as mainstreaming of DRM in public financial management, investments, and development planning across sectors, while building capacity at all levels. In addition, Mozambique published a *National Adaptation Programme of Action* in 2007 and its *National Climate Change Adaptation and Mitigation Strategy 2013 – 2025* in 2012. This strategy presents a holistic approach to climate change alongside the pillars of (1) adaptation and reduction of risk; and (2) mitigation and the development of a low-carbon economy. The PDRRD is well-aligned with the adaptation priorities of the climate change strategy.

The government's DRM program for 2017-2030, constituted by the PDRRD, is in line with international good practice and sound DRM principles. The five strategic objective areas and corresponding actions of the DRM program were defined in alignment with the African disaster reduction commitment and international agendas, particularly with the priorities for action set forth by the Sendai Framework for Disaster Risk Reduction 2015-2030 and the Sustainable Development Goals (SDGs). The development of the government program also benefitted and incorporated findings from extensive non-lending technical assistance on strengthening DRM, particularly to INGC and the Ministry of Economy and Finance (MEF), supported by the World Bank over the past years. The DRM Master Plan for 2017-2030 promotes the integration of disaster risk reduction into the various planning instruments, and more particularly in the Five-Year Plan

and the respective annual Economic and Social Plans (*Planos Econômicos e Sociais*, PES), to foster program implementation and monitoring of sectoral activities that contribute to increasing resilience to climate and disaster risks.

In the face of key challenges, the government program strives to advance three priority areas over the coming years to improve disaster response and recovery, and to enhance resilience of vulnerable education infrastructure:

- First, the GoM has started to take important steps towards improving financial protection against disasters. The operationalization and recurrent capitalization of the Disaster Management Fund (DMF), legally established in July 2017, will ensure stability and predictability of financing for disaster preparedness, response, and recovery in the country and provide a solid basis for the mobilization of resources from various national and international partners. The GoM is currently finalizing the regulations that will govern the DMF and which require annual audits on the use of funds and establish the possibility of ex-ante contracting for defined standard goods and services needed in emergency response. The DMF is also designed to enable GoM to purchase sovereign parametric risk transfer instruments, which would rapidly provide additional resources to respond to large-scale disasters. The GoM seeks to make use of this provision and will use the PforR as a catalyst to place a sovereign risk transfer product for either drought and/or cyclone risk on international capital/insurance markets in FYs 2022, 2023, and 2024. The GoM will follow a structured approach to ensure any transaction meets its policy objectives in a cost-effective manner, while minimizing risks. In particular, it will take the following steps, which will be supported with TA from the World Bank. First, the GoM will develop a DRF strategy, which clarifies the Government's overarching policy objectives with respect to risk financing and identifies a sequenced set of priorities to meet them. In parallel, the GoM will review existing available risk models in the market for risk transfer products for Mozambique. Based on the outputs of the review, a series of investments will be made to strengthen risk modeling data for Mozambique. This can include investments in exposure databases, hazard modules, and vulnerability functions. In addition to reviewing risk models, the GoM will (i) review risk transfer products offered by the market and ascertain their adequacy given the Mozambican context and the GoM's policy objectives and/or design a sovereign risk transfer product which aligns with their DRF Strategy; and (ii) develop a procurement plan for purchasing insurance.
- Second, the GoM wants to continue strengthening the capacity for disaster preparedness, response, and recovery across all levels to ensure the effective and efficient use of disaster risk financing. In addition to consolidating the institutional and technical capacity of INGC as the key DRM coordinating agency, establishing Local Disaster Risk Management Committees in all risk-prone communities and ensuring the sustainable functioning of existing Committees has become a priority for strengthening local capacity for emergency preparedness and response. Relatedly, the GoM has started efforts to strengthen and consolidate early warning systems for cyclone and river flooding, with a particular focus on ensuring last-mile communication and helping affected communities to take adequate actions based on early warning information.

Third, the GoM wants to mainstream new approaches to retrofit and repair existing school buildings and class rooms in areas exposed to cyclone winds to reduce vulnerabilities in

the education sector. These activities will build on technical assistance that the Bank has been providing to the GoM to support the integration of risk considerations into school construction processes, which delivered improved hazard and exposure data (including a new set of maps for all major perils and return periods produced by GFDRR) and identified retrofitting options for winds and floods. With support from the World Bank and technical assistance from UN-Habitat, the GoM has started testing these retrofitting approaches under the Emergency Resilient Recovery Program (ERRP) and is looking to scale them up in cyclone-affected provinces.

Technical Soundness

Program ownership, focus, and design

The Program builds on strong government ownership, is technically sound, and fully aligned with international good practices. The Program directly responds to the GoM's request to support, within the implementation of the overall government DRM program, the capitalization and operationalization of the recently established DMF, the placement of sovereign risk insurance, the improvement of preparedness and response capacities at all levels, and the development of more resilient education infrastructure. The Program follows core principles for effective disaster risk management, including consolidating disaster risk financing and insurance strategies, empowering local communities to engage in good disaster risk management practices, enhancing disaster preparedness for effective response, and investing in disaster risk reduction for resilience.

Under Results Area 1, the establishment and operationalization of the DMF follows international best practices and benefited from hands-on technical expertise from a global leader in this field, Mexico⁵. The DMF will focus on financing immediate disaster preparedness and response activities to enhance readiness for imminent events and emergency response (and financing the purchase of sovereign risk transfer).⁶ The objective of the DMF is to finance materials necessary in the case of rapid-onset disasters for search and rescue operations, acquisition, transportation, and distribution of essential goods and services for the relief or assistance of victims of disasters. Humanitarian assistance activities include the provision of shelter and sanitation, food, medical care, and evacuation of areas affected by disasters. State institutions directly involved in the disaster preparedness and emergency response will benefit from the DMF through in-kind support, based on a positive list of goods and services. As a standard process, the procurement of goods and services will be carried out in advance by INGC at the beginning of each year (through open or ex-ante contracts). All DMF fiduciary management responsibilities will remain with INGC. To this end, a Fund Management Unit will be set up, with a coordinator, who will report directly to the Director General of INGC.

⁵ FONDEN, Mexico's Fund for Natural Disasters, was established in the late 1990s to finance: (i) emergency assistance to affected populations in the aftermath of a natural disaster; (ii) post-disaster rehabilitation and reconstruction of public infrastructure; and (iii) the rehabilitation and reconstruction of low-income housing. It has established itself as a global reference for efficient and transparent ex-ante mechanism for post disaster response.

⁶ For the Fund to support other activities in the future, complementary regulations would need to be adopted by the GoM.

To complement the National Disaster Fund, the Program will finance insurance premiums for sovereign risk transfer products. This builds on lessons learned from working in the area of disaster risk financing by the World Bank, which highlights the importance of developing comprehensive risk financing strategies combining multiple financial protection instruments. Known as a ‘risk layering’ approach, multiple instruments enable Governments to mobilize resources for shocks of different severity (higher probability/lower impact disaster events for the DMF to lower probability/higher impact disaster events for the sovereign risk transfer products). The Program will provide substantial and sustained technical assistance to ensure Government officials fully understand the benefits as well as the limitations of sovereign risk transfer solutions; and fully own the decision to purchase any particular risk transfer product.

Under Results Area 2, the Program builds on lessons learned and good practices in community-based disaster risk management which show that the ownership of disaster preparedness, response and prevention by communities is a determining factor in reducing their vulnerability. INGC has supported the establishment and strengthening of local DRM committees (CLGRC) for more than 15 years. Recently, under Bank-financed technical assistance, INGC worked with Civil Society Organizations (CSOs) to harmonize the process of creating, capacity building and equipping CLGRCs.

The design of the DLI related to Early Warning Systems (EWS; DLI 4 in Result Area 2) builds on lessons learned from previous donor-funded projects and international innovations. The specification of the DLI is based on an assessment of key bottlenecks in the early warning results chain. Recent engagements of the World Bank and its partners on early warning, including a Bank lending project on hydro-meteorological services⁷ and a recently completed study on early warning information flows⁸, have shown that these bottlenecks are institutional coordination and information dissemination more so than equipment. Currently, technical analyses conducted by the National Institute for Meteorology (INAM) and the National Directorate for Water Resources Management (DNGRH) are not efficiently used to produce actionable early warnings and those early warnings do not reach communities in a structured way. As a result, INGC cannot track how many communities receive early warning information for flood and cyclone and whether those messages are accurate. Several pilots have been conducted to identify more efficient information flows between agencies and to disseminate early warnings to communities using SMS-based systems. However, none of these pilots have been institutionalized and operationalized on a national level. The technical design of DLI 4 addresses these issues by (1) re-establishing MOUs and solidifying information flows between INGC, INAM and DNGRH, (2) establishing a centralized system for information sharing and early warning dissemination for flood and cyclone, and (3) connecting all Local DRM Committees in priority areas to the system. Priority areas are defined as the Limpopo and Zambezi basin for flood, and the Inhambane province for cyclone. Alongside the DLI, technical assistance activities will be conducted benefiting INAM and DNGRH to strengthen the technical capacities for flood and cyclone modelling. The priorities for

⁷ Enhancing Spatial Data for Flood Risk Management Project (P149629)

⁸ República De Moçambique Ministério Da Planificação E Desenvolvimento Ministério Da Administração Estatal (2014). Rules, Procedures and Standards for the Flow of Information on Disasters

technical assistance will be linked to ongoing international assistance to INAM and DNGRH under the PPCR-funded Transforming Hydro-Meteorological Services Project and the Nordic Development Fund financed hydrometeorological services project. Whereas the PPCR project is focusing on strengthening observation and modelling capacities, the proposed Program will focus on the improved use and dissemination of that information in a centralized warning system.

For Results Area 3, the Program builds on a strong Bank-executed Technical Assistance Program (TAP) conducted in 2 phases between 2012 and 2018 (Mozambique Safe School Program Phase 1 and Phase 2 – TF012406/TF016899/TF019061). As part of this TAP, a catalogue of hazard resistant construction types and architectural models with adaptive measures for building resilient schools was developed with technical support from UN-Habitat, following international best practices. This was further complemented by a building assessment methodology and survey instrument. Under the IDA financed Emergency Resilient Recovery Project (ERRP - P156559), the Government has piloted the rehabilitation and retrofitting of close to 400 classrooms, which were affected by strong winds and flooding in 2015, using the assessment methodology and instrument as well as the construction standards developed under the TAP. Resilient rehabilitation costs under ERRP averaged \$7,000-8,000 per classrooms. The resilient rehabilitation package also included the construction of toilets, handwashing facilities and water tanks when these were non-existent prior to the retrofitting activity. For this scale-up under the Program, the Government would follow the same approach and use the newly updated cyclone hazard zoning map.

The retrofitting program will address the main structural and construction failures identified in previous resilient reconstruction projects, which include: (i) inadequate architectural models; (ii) low quality of materials or under-dimensioned construction components; (iii) lack or inadequate connections between structural parts; (iv) errors of technical execution; and (iv) lack of regular maintenance of the school buildings. The main steps in this retrofitting approach are focused on reinforcing the roof structure, ensuring a better connection between the wood rafters and the improvement of the connection between the walls and the trusses, and improving the quality of the zinc sheets.

While MINEDH already has the experience and expertise in managing the reconstruction/retrofitting of classrooms under ERRP, the Technical Assistance component will continue to finance technical expertise focused on: (i) quality of design and bidding documents; (ii) quality of construction through oversight and training of contractors and supervision firms.

Program Institutional Arrangements

The Program builds on on-going experience of implementation of Programs for Results. With support from the Ministry of Economy and Finance (MEF), over the last five years, Mozambique has been successfully implementing two Programs for Results operations on Public Finance Management and on Health Services Delivery. The DRM and Resilience Program will count with the participation and active role of the MEF in support of the delivery of program results, by the two implementing agencies, namely the National Institute for Disaster

Management (INGC) and Ministry of Education and Human Development (MINDH), at central level. At local level, the Provincial representation and technical operations units of INGC (*Centros Operativos de Emergencias*, COE - Provincial Emergency Operation Centers) and MINEDH (*Unidade de Construções Escolares* - School Construction Unit) will support the implementation, oversight and supervision of delivery of Program activities under their respective areas. Technical support will be provided to help INGC, MEF, INAM, and MINEDH deliver the intended results in all Results Areas.

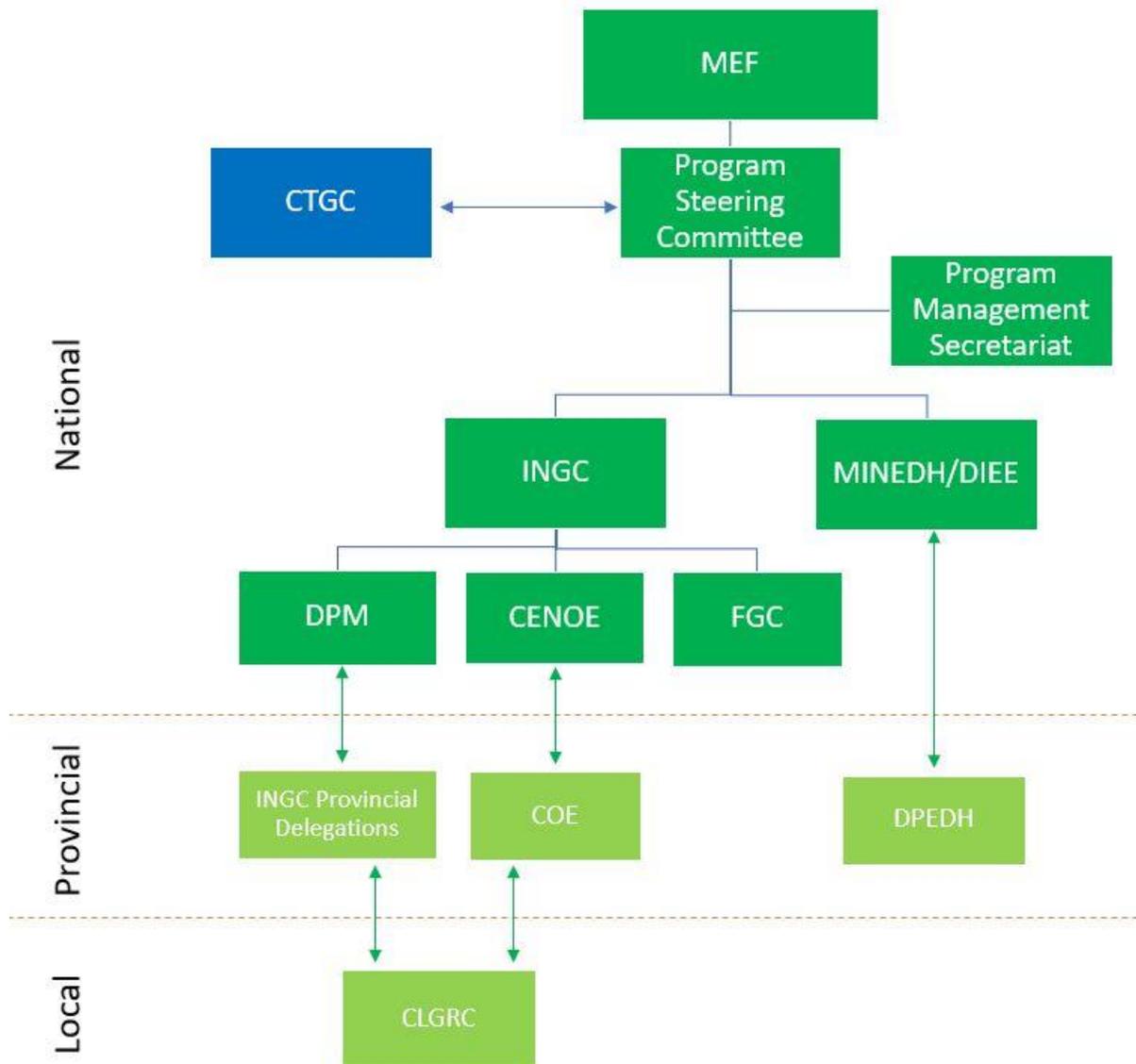
A Program Steering Committee (PSC) will be established to provide political leadership on Program implementation. To respond to the multi-sector nature of the Program, the PSC will be chaired by MEF and will include representatives from the implementing agencies INGC and MINEDH, as well as participation of representatives from INAM and DNGRH given their role on flood and cyclone information and warning products. The main tasks of the PSC include: (i) review and approval of the Program annual workplan and budget; and (ii) review and approval of biannual program reports and additional result verification documentation presented by implementing agencies and independent verification agents. Key Program decisions made by and reports approved by the PSC will be presented to the Disaster Management Technical Council (CTGC) for information sharing purposes.

A Program Management Secretariat (PMS) will be created to ensure day-to-day coordination and management of the Program. The PMS will be established under the Director General of INGC. It will be responsible for the day-to-day overall coordination, management, monitoring and reporting of the Program in line with the Program Operations Manual (POM) and will serve as the Bank's interface for the Program. While housed at INGC, it will ensure coordination with and technical involvement of MINEDH (Results Area 3) and other relevant government agencies as necessary, including MEF (sovereign catastrophe risk insurance), INAM and DNGRH (consolidation of early warning systems). The PMS will also provide technical support to ensure the effective functioning of the PSC. The PMS will be staffed by a coordinator, a financial management specialist, a procurement specialist, and an environmental and social safeguards specialist (financed through the IPF component) and an assistant (financed by the GoM under the Program).

The Program will follow a clear and lean institutional implementation structure by all relevant institutions. Only INGC and MINEDH will oversee the fiduciary management for their respective components of the Program. INGC will be responsible for financial management and procurement of resources for activities and the Technical Assistance component required for delivery of results under Results Areas 1 and 2. At the local level, the Provincial delegations of INGC and the Provincial Emergency Operation Centers managed by INGC, will provide support, and oversight of early warning and information dissemination and strengthening of local Committees. MINEDH will manage resources allocated for activities under Results Area 3 (resilient retrofitting and rehabilitation of classrooms), including the Technical Assistance necessary for results delivery. Through its provincial Offices for Schools Infrastructure and Equipment, the Provincial Directorates of Education and Human Development will support the central MINEDH in: (i) the assessment of school infrastructure damage and vulnerability; (ii) the

assessment of tenders; (iii) oversight and supervision of training of contractors, and (iv) implementation of contracts for resilient rehabilitation of conventional classrooms in their respective provinces. Using their institutional vertical information flow, all institutions involved in the Program will provide regular information to the Program Management Secretariat for global monitoring and reporting.

Figure 6: Institutional Arrangements



All key implementing agencies have sufficient and sustainable budgets for the implementation of the Program. Both INGC and MINEDH are regularly funded by the Annual State Budget at both national and local levels, in accordance with the Government fiscal capacity. Resources for activities under Results Area 1 will be channeled to INGC through the DMF that will receive: i) an allocation equivalent to 0.1% of the Annual State Budget plus US\$9 million in

Program years 1 and 2 and US\$5 million in Program years 3, 4, and 5; and ii) an allocation for the placement of sovereign risk transfer products with capital and/or insurance markets. MEF will be closely engaged in preparing the technical analysis required to inform Government decisions on purchasing a suitable risk transfer product from capital/reinsurance markets. Resources for activities under the Result Area 2 are channeled to INGC through specific budgets lines in the Annual State Budget for improvement of early warning systems and establishment, equipment, and training of Local Disaster Risk Management Communities and simulation exercises. In Result Area 3, the State Budget of the Ministry of Education and Human Development (MINEDH) for 2019 only includes a budget line for retrofitting of conventional classrooms with funding from external resources. From 2020 and onwards, MINEDH will include in this budget line, a provision of domestic resources to finance the retrofitting of conventional classrooms in the targeted provinces. Financial sustainability and predictability for these activities for the achievement of annual results, will be guaranteed for each three-year budget cycle, starting in 2020, during the preparation by MEF, of the Mid-Term Fiscal Scenario (*Cenário Fiscal de Médio Prazo*) 2020-2022 to inform the preparation of Annual State Budget. It also anticipated that the PforR activities covered by the three results areas will be included in the next 2020-2024 Five Year Government Program and implemented through the respective annual Social and Economic Plans and state budgets.

Decision makers and appropriate accountability structures have been identified for all Result Areas of the Program. The overall accountability for the Program will lie with MEF in its capacity of the chair of the Program Steering Committee. Therefore, in Result Area 1, INGC will be fully responsible for the management of the DMF and for purchasing sovereign risk transfer products, with close involvement of MEF for the placement of sovereign risk transfer products. An INGC/MEF technical working group reporting to MEF Permanent Secretary and INGC Director General will be established to provide day-to-day coordination between the two institutions regarding sovereign risk insurance. In Result Area 2, the decision-making power lies with the Director General of INGC, who will count on the technical support from the Director General of INAM and the National Director of DNGRH, all accountable to the Technical Council for Disaster Management (CTGC) and the Disaster Management Coordination Council for DRM issues. In Result Area 3, decision power is held by the National Director for Schools Infrastructure and Equipment who is accountable to the Minister of Education and Human Development (MINEDH) but will also be accountable to the CTGC in future.

D. Program Expenditure Framework (description and assessment)

Mozambique has a functional Public Financial Management System, despite recent major budget management issues. An assessment of Public Financial Management Systems in Mozambique, published in 2015, showed that the Public Financial Management System has been robust enough to ensure fiscal discipline for most of the past decade. The coverage of the electronic State Financial Management System (e-SISTAFE) system has been extended, the predictability and control of budget execution has improved with the introduction of electronic systems e-FOLHA for payroll and e-CAF for personal system management, financial accounting and reporting, including quarterly expenditure reports and comprehensive coverage of revenues. The

quality and coverage of internal audits by the Finances General Inspection and the external audits by the Administrative Tribunal (TA) has improved. The credibility of budget remained good (score A) for control of deviations between budgeted revenues and expenditures and their actual levels but was found problematic (Score D) for controlling the discrepancies between budgeted and actual expenditures at the institutional level. The comprehensiveness and transparency recorded modest improvement (Score B) as the quality of the budget classification system and the public access to information remained stable from 2010 to 2015. Major concerns are associated with the low quality of medium term planning and budgeting under the Medium Term Fiscal Scenario (CFMP) and its weak links to the annual plan (PES) and Budget (Score D). This will need further improvement.

The Program's financial sustainability is not at risk from the identified budget issues. The State Budget will continue to increase, and the Government remains committed to allocate resources to priority areas that include investment in infrastructure development and disasters risk management. In 2019, the budgeted expenditures are set to increase by 2.8pp to reach 33.3% of the GDP, when compared to amounts budgeted in 2018. State revenues are expected to increase by 1.4% to reach 23.9% of the GDP. The budget allocated for investments is set to expand in 1.8pp to reach 10% of the GDP, while the recurrent budget will increase by 0.7pp to reach 19.3% of the GDP. Structural reforms to improve domestic revenue mobilization, particularly through implementation of electronic tax payment systems, a reduction in tax exemptions, and improvements in revenue administration, coupled with recurrent expenditure tightening will enable Government to mobilize domestic resources to finance investment in key development areas, including financing for climate and disaster resilience activities.

Overall Program expenditure is expected to increase to reflect Government budget allocation to program activities under INGC and MINEDH. Over the period 2016-2018, the Government of Mozambique has allocated on average a total of US\$6.6 million per year to INGC for the disaster preparedness and response activities to be supported by the Program. These expenditures include an annual budget of US\$0.96 million for operational costs and US\$1.12 million for investments, which include equipment and training of local DRM committees and establishment and operation of Early Warning and information systems. In addition, over the same period, INGC has received an annual contingency allocation of US\$2.4 million to prepare for the cyclone season and response to disaster situations during the year.

As of 2019, and in accordance with Decree 53/2017, of October 18, which created the Disaster Management Fund, a new budget line will be introduced under the INGC investment budget to channel Government resources allocated to the Fund. The Fund will benefit from an annual allocation of 0.1% of the Government's Budget, corresponding to roughly US\$5 million in 2019, and will benefit during the duration of the Program, from an additional allocation of US\$9 million in Program years 1 and 2 and US\$5 million in Program years 3, 4, and 5. In addition, from 2020, the Fund will also benefit from an expected US\$3 million allocation to finance insurance premium under the Program. Due to the nature of the Fund, additional financial resources could be supplemented in the years of occurrence of disasters that overwhelm the DFM capacity. The use of these resources is subject to the rules defined in the Manual of Financial and Administrative

Procedures of the DMF (DMF regulations), to be jointly approved by the Ministers of Economy and Finance (MEF) and State Administration and Public Service.

INGC expenditure will gradually increase to reach a total allocation of US\$96.6 million at the end of the Program. To increase the magnitude and spatial coverage of INGC disaster preparedness and response interventions, the Program will allocate additional resources to INGC investment budget for local DRM committees, simulations, EWS and information system. In addition, INGC will be responsible for the management of funds allocated to the DMF. The Investment Budget of INGC will increase from US\$2.72 million in 2018, to a new minimum annual allocation of US\$14.67 million, in 2019, and a maximum allocation of US\$20.73 million in 2020.

Under this Program, MINEDH expenditure will gradually increase to reach a total of US\$28.67 million at the end of the Program. Over the period 2016-2018, the Government of Mozambique has not allocated any resources to MINEDH for the retrofitting of classrooms since this is a new approach under this Program. MINEDH implemented a resilient school reconstruction component for an amount of \$10 million under an IDA financed IPF (P156559 – Mozambique ERRP). Under the program, MINEDH will create a new budget line under domestic resources which will finance all the Program activities at both central and provincial level. This new budget line will encompass the investment budget of US\$25.0 million estimated for the retrofitting of 3,000 classrooms, including the costs for preparing the building damage and vulnerability assessment, drafting the regulation for resilient construction, purchase of vehicles and hiring of the program manager. This will also finance the operating costs estimated at US\$3.67 million to support the day-to-day management of the Program at central and provincial levels, which include the payment of salaries, travel costs of staff, equipment, fuels and others. Through this budget line, MINEDH will ensure a total allocation of US\$28.67 million for the overall implementation of program activities by DIEE, DAF and Executive Procurement Management Units (UGEA), at Ministerial level, and by the Unit for School Construction and Equipment (UCEEs) in all provinces.

The expenditures for MINEDH reflect the implementation costs of the program at provincial level. The program activities will be carried out on a centrally-based management model but will rely on strong participation of provincial UCEEs for field and onsite supervision activities. Therefore, the Program implementation will require an estimated allocation of US\$3.67 million for operating costs, of which the major portion US\$1.83 million (50%) will be allocated to the provinces to support staff and travel costs, fuel and vehicles maintenance, necessary for day-to-day supervision by the UCEE's staff, of the classrooms retrofitting at district level, while DIEE, DAF and UGEA will allocate the remainder US\$1.83 million for program management, procurement and financial management and safeguards assurance activities.

Table 3: Overall Program Expenditure (in Million Meticaïs) 2019-2023

	2016	2017	2018	2019	2020	2021	2022	2023	TOTAL 2019-2023
INGC TOTAL BUDGET	593	243	361	972	1,340	1,147	1,164	1,173	5,796
1. OVERALL OPERATING COSTS	575	222	197	92	96	100	106	110	504
1.1.1. SALARIES	31	36	37	67	69	71	74	76	357
1.1.2. TRAVEL COSTS	1	0	1	1	1	1	2	2	7
1.1.3. GOODS	5	9	9	10	11	12	13	14	60
1.1.4. SERVICES	16	13	13	14	15	16	17	18	80
1.1.5. ANNUAL CONTINGENCY PLAN	521	162	137						
2. INVESTMENTS	18	21	163	880	1,244	1,047	1,058	1,063	5,292
2.1. LOCAL DRM COMMITTEES	10	10	7	30	110	110	110	110	470
2.2. EARLY WARNING	0	3	5	4	55	79	86	86	310
2.3. SIMULATIONS	6	2	4	2	55	40	40	40	177
2.4. INFORMATION SYSTEM	2	6	7	4	4	38	42	47	135
2.5. DISASTER MANAGEMENT FUND			141	840	1,020	780	780	780	4,200
MINEDH TOTAL BUDGET	25	24	26	94	300	422	424	480	1,720
1. OVERALL OPERATING COSTS	25	24	26	40	42	44	46	48	220
1.1. DIEE OPERATING COSTS	7	6	6	20	21	22	23	24	110
1.2. PROVINCES OPERATING COSTS	18	19	19	20	21	22	23	24	110
2. INVESTMENT				54	258	378	378	432	1,500
2.1. SCHOOL RETROFITTING PROGRAM				54	258	378	378	432	1,500
TOTAL PROGRAM COST				1,066	1,640	1,569	1,588	1,653	7,516

Table 4: Total Program Expenditure (in USD Million, exchange rate US\$1 = Mtn 60) 2019-2023

	2016	2017	2018	2019	2020	2021	2022	2023	TOTAL 2019- 2023
INGC TOTAL BUDGET	9.88	4.05	6.01	16.20	22.34	19.12	19.39	19.54	96.60
1. OVERALL OPERATING COSTS	9.58	3.69	3.29	1.54	1.61	1.67	1.76	1.83	8.40
1.1.1. SALARIES	0.52	0.60	0.61	1.12	1.15	1.18	1.23	1.27	5.95
1.1.2. TRAVEL COSTS	0.02	0.01	0.01	0.02	0.02	0.02	0.03	0.03	0.12
1.1.3. GOODS	0.08	0.16	0.16	0.17	0.18	0.20	0.22	0.23	1.00
1.1.4. SERVICES	0.27	0.22	0.22	0.23	0.25	0.27	0.28	0.30	1.33
1.1.5. ANNUAL CONTINGENCY PLAN	8.69	2.71	2.28						
2. INVESTMENTS	0.30	0.35	2.72	14.67	20.73	17.45	17.63	17.72	88.20
2.1. LOCAL DRM COMMITTEES	0.17	0.17	0.12	0.50	1.83	1.83	1.83	1.83	7.83
2.2. EARLY WARNING	0.00	0.05	0.08	0.07	0.92	1.32	1.43	1.43	5.17
2.3. SIMULATIONS	0.10	0.04	0.07	0.03	0.92	0.67	0.67	0.67	2.95
2.4. INFORMATION SYSTEM	0.03	0.10	0.12	0.07	0.07	0.63	0.70	0.78	2.25
2.5. DISASTER MANAGEMENT FUND			2.34	14.00	17.00	13.00	13.00	13.00	70.00
MINEDH TOTAL BUDGET	0.42	0.40	0.43	1.57	5.00	7.03	7.07	8.00	28.67
1. OVERALL OPERATING COSTS	0.42	0.40	0.43	0.67	0.70	0.73	0.77	0.80	3.67
1.1. DIEE OPERATING COSTS	0.11	0.09	0.10	0.33	0.35	0.37	0.38	0.40	1.83
1.2. PROVINCES OPERATING COSTS	0.31	0.31	0.32	0.33	0.35	0.37	0.38	0.40	1.83
2. INVESTMENT				0.90	4.30	6.30	6.30	7.20	25.00
2.1. SCHOOL RETROFITTING PROGRAM				0.90	4.30	6.30	6.30	7.20	25.00
TOTAL PROGRAM COST				17.77	27.34	26.16	26.46	27.54	125.27

Budget execution capacity is strong at INGC while MINEDH will require strengthening particularly for execution of investment budget. The assessment of historical performance of the two implementing agencies shows that over the last three years (2015-2017) INGC has demonstrated high absorption capacity for both recurrent budget, including resources allocated to the Annual Contingency Plan (which will be replaced by the DMF) and the investment budget, around 97-100% of the total annually allocated budget. The execution capacity of MINEDH is relatively modest - below 61% of the total budget allocated over the last two years (2016-2017), and below 57% of the investment budget, partially due to a mostly decentralized school construction program with low capacity at local level. Therefore, INGC seems that have capacity to absorb the increased investment proposed under the Program, while MINEDH will require strengthening. Under the PforR, and as currently done under the ERRP, the procurement process and financial management will be centralized, and strong TA will be provided to increase the absorption capacity of the investment budget and ensure stability of the performance of INGC.

Table 5: Budget Execution (in USD and %) by MINEDH and INGC (2015-2017)

Budget categories	2015			2016			2017		
	Allocated	Executed	% of Execution	Allocated	Executed	% of Execution	Allocated	Executed	% of Execution
1.1. Investment	57.91	37.05	72.0	74.32	41.74	56	86.06	48.65	57
1.2. Operating costs	8.66	8.66	100	9.54	8.24	83	9.34	8.85	95
TOTAL MINEDH	66.57	45.72	68.68	83.87	49.98	59.59	95.40	57.50	60.27
2.1. Investment	2.14	1.97	92	1.32	1.15	87	1.08	1.08	100
2.2. Operating costs	1.08	1.08	100	1.10	1.10	100	1.01	1.01	100
2.3. Contingency Plan	4.34	4.34	100	8.69	8.69	100	2.71	2.71	100
TOTAL INGC	7.56	7.39	97.8	11.10	10.94	98.49	4.80	4.80	100

The Program proceeds will be mobilized and spent as part of the Budget of the State, and will follow the same rules, processes, controls and reporting obligations, except for resources allocated to the DMF. The management of and reporting on DMF resources will follow the regulations governing the DMF. The annual Stage Budget is presented to Parliament for official approval, while quarterly and end-year budget execution reports are submitted to the Administrative Tribunal (TA) for external audit and to Parliament for review and follow-up of Parliament and TA recommendations. The Administrative Tribunal will act as an Independent Verification Agent to provide independent confirmation of the results reported for DLIs 1, 2, and 5. The TA will verify all DLIs through a desk review. An independent NGO or consulting firm will act as Independent Verification Agent for DLIs 3 and 4, while an independent engineering firm will be hired to verify the achievement of DLIs 6, by combining desk review and physical inspection of random samples in the field. The findings from the independent verification will accompany any disbursement request from the Recipient to the World Bank.

Transfers from State Budget to implementing agencies will use the regular Public Financial Management Systems. All transfers from Government to the implementing agencies will use the electronic State Financial Management System (e-SISTAFE) to channel resources from the Single Treasury Account (CUT) to the implementing agencies designated accounts. All implementing agencies will perform financial transactions under the e-SISTAFE. The resources of the DMF will be managed with a stand-alone, specific financial management system as per the DMF regulations. This system is expected to be implemented by INGC before any DMF resources are used. The implementation of the system is being considered a crucial part of the effective operationalization of the Fund and included as a prior result under DLI 1. The Government has already opened a dedicated account at the Central Bank for the DMF. This account will be linked with the Single Treasury Account (CUT) to receive the State budget resources and will channel resources to the ordinary accounts to be opened in well-reputed commercial banks for daily operations of the Fund.

Table 6: Program Financing 2019-2024 (US\$ million)

Source	Amount (USD Million)	% of Total
Counterpart Funding	36.27	27.5
Borrower	36.27	
International Development Association (IDA)	90.00	68
IDA Grant	90.00	
Trust Funds	6.00	4.5
Global Facility for Disaster Reduction and Recovery	6.00	
Total Program Financing	132.27	100.0

E. Program Results Framework and M&E (including DLIs)

Program progress will be monitored building on Government systems. A detailed Results Framework will provide the basis on which the Program Management Unit will measure and report on progress of Program implementation. The Program supports the following three interrelated results areas in support of the PDO:

- **Results Area one: Increasing financial protection against disasters.** This Results Area focuses on increasing financial protection against disasters. This will be achieved through (i) the operationalization and recurrent capitalization of the DMF; and (ii) enabling the placement of sovereign catastrophe insurance coverage for cyclones and/or drought with capital or insurance markets.

DLI 1: Operationalization and recurrent capitalization of the national Disaster Management Fund (with 0.1% of the annual state Budget or equivalent)

To meet this DLI, GoM will need to operationalize the DMF. First, this requires the adoption of comprehensive regulations which will govern the operations of the DMF, and which the GoM has been developing with technical assistance from the World Bank. Per the draft regulations of the DMF that the GoM has prepared and is expected to adopt as a prior result, the Fund can only support immediate disaster preparedness and response activities, as well as finance the purchase of sovereign risk transfer.⁹ Support from the DMF for preparedness and response will be provided in-kind and will be procured through pre-agreed contracts in accordance with a positive list. For rapid-onset disasters this list includes materials necessary for search and rescue operations; acquisition, transportation and distribution of essential goods and services for the relief or assistance of victims of

⁹ For the Fund to support other activities in the future, complementary regulations would need to be adopted by the GoM.

disasters; provision of temporary shelter and sanitation, food, medical care and temporary evacuation of areas affected by disasters. A separate positive list for drought response specifies food items; agricultural inputs to support farmers; and materials necessary for water supply as eligible expenditures. A small cash reserve (“extraordinary reserve”), capped at 7.5% of the DMF, can be used to purchase goods that need to be acquired on the spot locally (i.e. on the ground) during disaster response operations, such as charcoal, firewood, foodstuff, hygiene products, accommodation, fuel, perdiems, travel tickets, and local transport. The regulations also specify, amongst other things, the mechanism for triggering the use of DMF resources; the rules for requesting resources from the DMF; requirements to pre-negotiated contracts for the delivery of specified goods (as per the above); requirements for auditing the use of funds and transparency; and the concentration of fiduciary responsibility for the DMF at INGC. The regulations also include articles on the purchase of sovereign risk transfer instruments, which provide for the close involvement of MEF in the technical proposal for any insurance transaction, while detailing INGC’s responsibility to sign any risk transfer purchase. In addition to official approval of the regulations, two further key steps for operationalizing the DMF include: (i) setting up a Fund Management Unit within INGC responsible for handling DMF transactions, book keeping, and reporting; and (ii) putting in place an appropriate financial management system to manage the DMF’s resources. Per the draft regulations of the DMF, its non-allocated and/or non-committed financial resources can only be invested in low risk and highly liquid financial instruments after the GoM has developed and adopted an Investment Strategy for DMF resources, which must be approved by the World Bank. Under the Program, the World Bank will provide technical assistance to the GoM in developing this investment strategy.

To ensure recurrent capitalization of the DMF, the *Decree No. 53/2017* states that the GoM shall allocate 0.1 percent of the annual state budget each year to the DMF. This would represent an increase of ex-ante resources for disaster preparedness and response from around US\$2 million to around US\$5 million per annum. To incentivize the initial capitalization of the DMF, the Program will disburse an additional annual amount of US\$9 million in Program years 1 and 2 and US\$5 million in Program years 3, 4, and 5 directly into the DMF account at the Bank of Mozambique in each Program year upon verification that the GoM transferred at least the minimum annual amount prescribed in the decree (0.1 percent of the annual state budget or equivalent) into the DMF in each Program year. To obtain disbursements under DLI 1 in the Mozambican FY 2020 and FY 2021, the GoM must therefore transfer to the DMF at least the minimum amount prescribed in the decree (0.1 percent of the annual state budget or equivalent). In FYs 2022, 2023, and 2024, meeting DLI 1 also requires that the GoM has implemented recommendations made in the audit of the DMF’s operations from two years before. In other words, audit recommendations regarding the DMF’s operations in FY 2020 must be implemented by FY 2022 in order to receive a disbursement against DLI 1 in FY 22; and so forth. The reason for the lag is that implementing audit recommendations requires some time. The funds available each Program year to disburse under DLI 1 will follow a ‘use-it-or-lose-

it' principle, i.e. will not roll over into the next Program year if the GoM fails to meet the requirements for this DLI in any given Program year.

DLI 2: Placement of sovereign catastrophe insurance coverage for cyclone and/or drought with capital or insurance market, in accordance with national Disaster Risk Finance Strategy

The GoM will work toward the placement of a sovereign catastrophe risk transfer product through the following steps. First, it will prepare and adopt a National Disaster Risk Finance strategy (NDRFS), detailing the strategic priorities of the MEF for financing disaster response. Next, an assessment of potential insurance industry standard risk models will be carried out to ascertain their relevance and alignment with the NDRFS, particularly with regards to developing a sovereign risk transfer product. Then, the GoM will undertake a technical exercise to: (i) review risk transfer products offered by the market and ascertain their adequacy given the Mozambican context and the GoM's policy objectives and/or design a sovereign risk transfer product which aligns with the NDRFS, and; (ii) develop a procurement plan for purchasing insurance. Finally, the GoM will purchase a risk transfer product from the capital or insurance markets. It is envisaged that the first transaction will take place in year 2 of the Program. Up to US\$12 million are expected to be disbursed to GoM over the life of the Program against the cost of a placed risk transfer product which is in accordance with the GoM's NDRFS, with an annual maximum of US\$4 million. Thus, the disbursement of any funds under DLI 2 is contingent upon the GoM having developed and adopted a NDRFS. The total DLI for insurance premium (US\$12m) is based on an assumed level of payouts required to top-up the DMF under a moderate (1-in-7 year) and extreme (1-in-20-year disaster). Using standard actuarial assumptions, the payouts for these events equate to approximately 100% and 300% of the annual allocation to the DMF foreseen in the decree.

- **Results Area two: Strengthening Capacity for Disaster Preparedness and Response.** The new DRM program stresses the need for improving access to accurate information and early warning for local communities, and capacity development for preparedness and response planning. This results area will support the GoM, particularly INGC, to improve capacity, systems, standards, and procedures for emergency management at the national and local levels, focusing on making local DRM committees and early warning systems for flood and cyclone functional. Whereas previous World Bank funded projects focused on the strengthening of observation and modelling capacities, the proposed Program will enable the improved centralized use of that information and the dissemination of early warning alerts to the local level.

DLI 3: Number of functional local DRM Committees in risk-prone areas established or strengthened

At the local level, Local Committees for Disaster Risk Management (CLGRC) play a key role in community preparedness and early response to disasters. Existing CLGRCs will be strengthened and new CLGRCs will be established in priority hazard-prone areas. The

local DRM Committees will be operationalized with necessary equipment and training. In addition, they will be supported in preparing annual emergency response plans, based on updated hazard maps, and in conducting regular disaster simulations in collaboration with INGC's provincial and district representations. To ensure gender parity, the Program will also support strengthening the participation of women in local DRM committees, aiming to achieve a female participation rate of 50 percent.

An in-depth assessment of the current functioning of each committee will be conducted across the country by a firm. The assessment will include the composition, leadership and active membership, status of equipment, training, ability to prepare emergency plans, and perform early evacuation and the sustainability of the committees. The result of this assessment will inform the development and implementation of a strategy setting the criteria for assessing the functionality of the DRM committees and the action plan for the creation of new and revitalization of existing committees by NGO's.

DLI 4: Number of people in risk-prone areas reached by functional flood and cyclone early warning system

At the national level, this DLI will be linked to the improvement of access to actionable information and early warnings by the populations at risk from floods and cyclones. Although information and early warnings are produced by the INAM and DNGRH and alerts issued by INGC, these are still limited in their accuracy and geographic coverage, institutional integration, and communication across stakeholders and administrative levels, particularly regarding last-mile connectivity to people at risk. The Program will support INGC, National Meteorology Institute (INAM), National Directorate of Water Resources Management (DNGRH) in further enhancing the production of actionable early warning information and in effectively disseminating accurate warnings for preparedness and early response at the district and community levels.

An integrated system for dissemination of flood and cyclone warning information will be developed, tested and implemented covering priority rivers basins and coastal districts of the Gaza, Inhambane, Sofala, Zambezia and Cabo Delgado provinces. The system will connect INGC with the local DRM Committee Members and will ensure that all populations at risk receive clear, timely and actionable flood and cyclone warning information.

- **Results Area three: Building Climate Resilience in Vulnerable Education Infrastructure.** This results area will support the MINEDH to increase resilience of vulnerable education infrastructure in priority hazard-prone areas in Mozambique, which are often damaged, destroyed, or rendered temporally inoperable due to adverse hydro-meteorological events. The education sector was chosen because it is the social sector most affected by disasters in Mozambique and it has already piloted the use of new approaches to retrofit and rehabilitate vulnerable classrooms.

DLI 5: Ministerial diploma adopting technical norms for climate-resilient education infrastructure in place

MINEDH will improve and officially adopt climate-resilient technical norms and construction guidelines that it has started using for the construction of new school building. These build on the catalogue of hazard resistant construction types and architectural models with adaptive measures for building resilient schools which was developed with technical support from UN-Habitat and follows international best practices.

DLI 6: Number of classrooms in risk-prone areas retrofitted or reconstructed in accordance with climate-resilient technical norms under the Program

MINEDH, using updated hazard zoning, will conduct a structural building assessment of existing classrooms located in high risk areas in the coastal provinces of Maputo, Gaza, Inhambane, Zambezia, Nampula, Cabo Delgado, and Niassa (with a focus on those classrooms built between 2005-2009 before more appropriate building standards were adopted). Such an assessment will inform a risk-based retrofit prioritization process and preparation of detailed design for the retrofitting works.

The retrofitting program will address the main structural and construction failures identified in previous resilient reconstruction projects, which include: (i) inadequate architectural models; (ii) low quality of materials or under-dimensioned construction components; (iii) lack or inadequate connections between structural parts; (iv) errors of technical execution; and (v) lack of regular maintenance of the school buildings. The main steps in this retrofitting approach are focused on reinforcing the roof structure, ensuring a better connection between the wood rafters and the improvement of the connection between the walls and the trusses, and improving the quality of the zinc sheets. In addition, the retrofitting program will also consider disability-inclusive design principles, to the extent possible given the nature of such interventions, and include improvement of sanitary facilities, which will particularly benefit girls.

Under this results area, the GoM will first create a budget provision for resilient rehabilitation or retrofitting of existing classrooms at MINEDH. Output units under this results area address increasing the resilience of existing infrastructure through targeted retrofitting. Finally, MINEDH will also upgrade and update its national school building database and develop and implement maintenance arrangements for the rehabilitated school infrastructure.

The Program Development Objective (PDO) is to strengthen the Government of Mozambique's program to finance and prepare for disaster response and to increase the climate resilience of vulnerable education infrastructure in risk-prone areas.

The PforR Program will achieve these objectives by supporting three results areas that are linked to the Government's broader DRM program: (i) improving financial protection against disasters;

(ii) strengthening capacity for disaster preparedness and response; and (iii) building climate resilience of vulnerable education infrastructure. These result areas are linked to the Disbursement-linked Indicators (DLIs) to be achieved under the Program.

The proposed PDO-level Results Indicators are as follows:

PDO-Level Result	PDO-Level Results Indicator
Improved financial protection against disasters	(i) Amount of ex-ante resources immediately available annually for disaster preparedness and response (ii) Sovereign catastrophe insurance coverage for at least one peril (cyclone and/or drought) placed with capital or insurance market, in accordance with National Disaster Risk Finance Strategy (NDRFS)
Strengthened capacity for disaster preparedness and response	(iii) Number of people in risk-prone areas covered by functioning local DRM committees (iv) Number of people in risk-prone areas reached by flood and cyclone early warning information under the Program
Improved climate resilience of vulnerable education infrastructure	(v) Number of children provided with access to climate-resilient education infrastructure under the Program

Nearly 93 percentage of the funding for the overall operation will be disbursed against Disbursement-linked Indicators (DLIs) and prior results under the PforR Program. The Program will have a total of six DLIs summarized in the table below. These DLIs have been carefully selected to ensure that they: (i) are fully aligned with government priorities and implementable by the responsible implementation agency; (ii) are achievable yet challenging at the same time; (iii) are clearly measurable and independently verifiable; (iv) allow for a smooth disbursement profile over the Program implementation period; and (v) are mutually supportive to reinforce the overall Program objective. The Results Chain displays the theory of change of the Program’s interventions (see table 6).

Table 7: Program’s Results Chain

Issues	Activities/Inputs	Outputs	Outcomes	Related DLI
<i>Results Area 1: Improving Financial Protection Against Disasters</i>				
Lack of availability and predictability of resources for emergency	Operationalization and annually recurrent capitalization of national Disaster Management Fund	Regulations governing DMF adopted Unit responsible for managing DMF created/operational within INGC	Increased availability and improved execution of resources for emergency	DLI#1

response and recovery		Financial Management System for DMF resources in place Stand-by contracts for disaster response are signed Annual independent audits on use of funds completed and recommendations implemented	response and recovery	
Lack of availability and predictability of funds to respond to major disasters	Develop capacity of the GoM to place sovereign catastrophe insurance coverage for cyclone and/or drought with capital or insurance markets	Disaster Risk Finance Strategy adopted Available risk models have been reviewed Risk transfer product for cyclone and/or drought risk has been selected/developed after undergoing an external technical review [for each product considered for placement] Procurement plan for sovereign risk transfer product [for each product considered for placement]	Risk transfer product for cyclone and/or drought risk has been placed on insurance or capital markets in Program years 3, 4, and 5	DLI #2
<i>Results Area 2: Strengthening Capacity for Disaster Preparedness and Response</i>				
Limited local capacity of vulnerable communities to prepare for and respond to emergencies	Creation, training, and equipment of local DRM committees in vulnerable communities	Number of committees established Number of trainings conducted Equipment acquired and distributed to committees Simulation exercises carried out at community and district level	Number of people covered by a functional local DRM committee	DLI #3
Lack of effective early warning systems for major perils (especially lack of last-mile connectivity in existing EWS)	Supporting the institutional coordination for early warning; improving communication and dissemination of early warning information to affected population	Comprehensive assessment of early warning dissemination system completed MoUs between INAM, DNGRH, and INGC established or revised	Timely and effective early warnings for cyclone and/or river flooding Early warning systems strengthened and consolidated	DLI #4
<i>Results Area 3: Building Climate Resilience in Vulnerable Education Infrastructure</i>				

Existing classrooms/ school buildings are vulnerable to cyclones and strong winds	<p>Conducting building assessment for classrooms located in cyclone risk areas, with detailed designs prepared for all classrooms to be rehabilitated under the Program</p> <p>Technical assistance for the finalization of construction standards and maintenance manuals</p> <p>Retrofitting and repairing of existing vulnerable schools/classrooms in areas exposed to cyclone winds</p> <p>Supporting maintenance arrangements</p>	<p>National risk mapping and risk-based retrofit prioritization completed</p> <p>Schools/classrooms retrofitted against cyclone winds</p> <p>Resilient construction guidelines prepared and integrated into national school construction planning</p> <p>Technical norms for climate-resilient education infrastructure adopted in ministerial diploma</p>	Number of children provided with access to cyclone-resilient education infrastructure under the Program	DLI #5 & DLI #6
---	---	--	---	-----------------

Reporting progress on the Results Framework will be the responsibility of the Program Steering Committee chaired by MEF.

F. Program Economic Evaluation

The Program’s economic impact will be beneficial and significant. Natural hazards caused on average US\$153 million economic losses per year between 2000 and 2014 in Mozambique. The Program addresses some of the key government interventions aimed at reducing the economic and human impact of disasters. The results of the economic analysis performed show an overall net present value (NPV) of US\$437 million and benefit cost ratio (BCR) of 6.2 for the Program (see Annex 1 for more details). A 5% discount rate is assumed throughout the analysis¹⁰, however the intervention will be beneficial and significant even at a 10% discount rate.

Table 8: Summary Table of Estimated Cost-benefit Analysis Result

Result areas	Discount rate		
	0%	5%	10%
1. Improving financial protection against disasters			
<i>a. Cost</i>	51	45	40
<i>b. Benefits</i>	78	65	55

¹⁰ World Bank (2017). *Risk-Adjusted Discount Rates in Economic Analysis of Investment Projects*. Mahul et al.

<i>c. NPV</i>	26	20	15
<i>d. BCR</i>	1.5	1.4	1.4
<i>e. ERR</i>		49%	
2. Strengthening National Capacity for Preparedness and Response			
<i>a. Cost</i>	16	15	15
<i>b. Benefits</i>	399	275	275
<i>c. NPV</i>	382	260	260
<i>d. BCR</i>	24.4	18.5	18.5
<i>e. ERR</i>		88%	
3. Building Resilience in Public Investment			
<i>a. Cost</i>	28	25	21
<i>b. Benefits</i>	364	181	101
<i>c. NPV</i>	336	157	80
<i>d. BCR</i>	12.9	7.4	4.7
<i>e. ERR</i>		45%	
Overall Program			
<i>a. NPV</i>	745	437	276
<i>b. BCR</i>	8.8	6.2	4.7
<i>c. ERR</i>		68%	

NPV: Net Present Value (US\$ millions), BCR: Benefit-Cost Ratio and ERR: Economic Rate of Return.

The interventions in disaster risk finance and insurance (Results Area 1) increase liquidity availability during and after disasters, reducing their impacts. The proposed financial component is expected to generate several social and economic benefits. For the government, having rapid access to resources to meet surge demand for emergency assistance can deliver significant gains due to cost efficiencies generated by early procurement and response. For beneficiary households, early relief when delivered through targeted interventions support can defend them from adopting negative coping strategies which can have long term consequences for household welfare (such as preventing malnutrition and diseases). An investment of US\$51 million over 5 years for the operationalization and capitalization of the Disaster Management Fund and the placement of sovereign insurance would enable government's early response, while achieving discounted benefits from US\$65 million, equivalent to a BCR of 1.4 and an Economic Rate of Return (ERR) of 49%.

Improving early warnings system and strengthening DRM committees (Results Area 2) increase responsiveness capacity, reducing human and economic losses. The provision of timely and effective information, through identified institutions and mechanisms, allow individuals exposed to a hazard and government's institutions to prepare for an effective response. DRM committees are the last and key link in the chain connecting the early warning information with individuals at risk. In addition, DRM committees play a role in strengthening the awareness and resilience of communities throughout the year. This can be translated in reduced number of people affected and assets damaged, and lower search and rescue expenditures by the government. The investment of US\$16 million over 5 years to improve early warnings system and to strengthen/establish 800 DRM committees would partly protect over 3.7 million people, reducing

injuries and trauma and achieving discounted benefits from US\$275 million over 10 years. This is equivalent to a BCR of 18.5 and ERR of 88%.

Building disaster resilience in schools (Result Area 3) protect children and improve access to education. The intervention in schools aims to generate cumulative and long-term benefits. Floods and cyclones directly put children and infrastructure at risk. Additionally, such events affect access to education as many children are impeded from attending school and some never return. For the government, the proposed intervention can generate savings by reducing the physical impacts on classrooms. For the community, it can protect children and prevent long-term impacts on wages. An investment of US\$28 million over 5 years to retrofit 3,060 classrooms would protect approximately 300,000 children per year and achieve discounted benefits from US\$181 million over 25 years, equivalent to a BCR of 7.4 and ERR of 45%.

International experiences reinforce these findings. Disaster risk reduction projects combined with available liquidity to provide early response can achieve high BCR and have significant economic spin-off effects. In Table 8 a summary of studies is presented.

Table 9: Summary of BCR Values in Disaster Risk Financing and Reduction Projects¹¹

Country	Intervention	Hazard	Max. BCR
Bangladesh	Early response and building resilience	Flood and Cyclone	11.9
Ethiopia	Early response and building resilience	Drought	3.1
Kenya	Early response and building resilience	Drought	3.0
Mozambique	Early response and building resilience	Drought	55.9
Nigeria	Early response and building resilience	Drought	31.5
Austria	Early warning system	Flood	9.0
Bangladesh	Early warning systems and structural measures	Flood and Cyclone	4.9
Fiji	Early warning systems	Flood	1.7
Pakistan	Early warning systems and structural measures	Flood	9.3
Nepal and India	Early warning systems and structural measures	Flood	2.5
World	Retrofitting schools	Earthquake	13.0
World	Building resilience	Wind damage	6.1
Austria	Building resilience	Flood	6.7
Peru	Building resilience	Flood	3.8
Indonesia	Building resilience (water)	Flood	2.5

Supporting the Program through the provision of public funds is appropriate. There is a clear rationale for public intervention as in general disaster risk management investments mitigate market failures and provide public goods. Structural and non-structural disaster risk reduction interventions such as the ones implemented under the Program involve projects with wide public welfare benefits and without market mechanisms, the classic case for public funding. Clear

¹¹ Shreve, C. M., and I. Kelman. (2014). *Does Mitigation Save? Reviewing Cost-Benefit Analyses of Disaster Risk Reduction*. International Journal of Disaster Risk Reduction; United Kingdom [Department for International Development](#) (DFID). (2013). *The Economic of Early Response and Resilience: Summary of Findings*.

examples are early warnings system and hazard protection structures, in which benefits are difficult to restrict to only those who pay. Despite the implementation of adequate prevention measures, the intervention in disaster risk finance and insurance is appropriate as in the aftermath of a disaster the government will require timely funds for supporting the most vulnerable segments of society by providing them public goods.

The World Bank value added is significant. The World Bank has a longstanding policy dialogue with Mozambique and extensive lending and non-lending technical assistance on Disaster Risk Management. The World Bank has extensively supported Mozambique in developing its approach to risk management and risk financing, including the development of the second DRM Master Plan, the assessment of the fiscal impact of disasters, a national-level risk assessment for the education sector and a strategy for safer school construction. In addition, the World Bank has been providing investment financing on urban resilience in the city of Beira and on emergency recovery across regions impacted by flooding. Each of the chosen pillars of the proposed Program follows logically from this engagement and builds upon lessons learned over the years. Based on the Bank's in-depth engagement, as well as its global experience in disaster risk management programming, the Bank is uniquely positioned to support Mozambique on this agenda.

G. Technical Risk Rating and Mitigation Measures

Technical risk is assessed as **(Substantial)**.

Risk related to Results Area 1:

Overall, the risks associated with Results Area 1 are assessed to be substantial and are related to fiduciary risks related to the DMF, including the procurement of a risk transfer product; and limited technical capacity on sovereign risk transfer.

Fiduciary risk includes the possibility that resources intended for disaster response could be spent for other purposes and/or without complying with internal rules and controls. This risk is considered substantial as financial pressures of public entities in the wake of the undisclosed debt scandal remain high. The operational design and implementation framework of the PforR includes measures to mitigate these risks. Initial disbursements to the DMF under DLI 1 are linked to the adoption of adequate regulations governing its operations, including necessary fiduciary provisions such as a requirement for annual external audits and the full implementation of any actions recommended by these audits. The procurement of a sovereign insurance products is also subject to fiduciary and basis risk. The fiduciary risk arises from the fact that the GoM has no previous experience with procuring such products. Basis risk is present for all index-based insurance contracts. These risks are also considered substantial because the technical capacity to procure and carry out a full scrutiny on sovereign risk transfer products is currently limited in MEF. To mitigate against this risk, the WB team will provide intensive, hands-on TA to build MEF's and INGC's capacity on sovereign insurance, and to assist in the development of an

adequate procurement plan for a risk transfer product and in the placement of any product on international markets.

Limited technical capacity of the MEF and INGC is considered a second risk under Results Area 1 in general, and the (already mentioned) very limited knowledge on insurance in particular. The WB team will provide significant TA to build the capacity of the relevant counterparts in both MEF and INGC.

Risk related to Results Area 2:

The technical risk related to Result Area 2 is assessed to be substantial, especially due to institutional and technical risks around the early warning systems (EWS) activities.

The activities around the establishment and strengthening of local DRM committees have moderate technical risks, because the implementing agency INGC has strong experience and processes in place to achieve the results. In addition, the costing and contracting of the activities will be relatively transparent since the implementation will largely be outsourced to NGOs and partners. There remains a fiduciary risk around the correct use of equipment and the comprehensive recording of results achieved at a local district level. This will be mitigated using transparent and evidence-based monitoring systems that collect information from each of the established DRM committees.

A substantial risk is estimated for the sub-activities on the establishment of early warning systems. The achievement of the DLIs requires substantial collaboration between three agencies – INGC, INAM and DNGRH – of which only one agency (INGC) gets direct financing through the PforR. Additional technical risks result from the successful upscaling of the early warning dissemination system itself, which is based on pilot studies but has yet to prove effectiveness on a national level. The risk is mitigated as much as possible by (1) targeted technical assistance activities to INGC, INAM and DNGRH; (2) strong collaboration with ongoing programs that benefit the three agencies, including World Bank, Nordic Development Fund and Red Cross projects on early warning; and (3) best practices from other countries where results as specified in the DLIs have been successfully obtained.

Risk related to Results Area 3:

The risks related to Results Area 3 are estimated to be Moderate. The main risks are associated with fiduciary and quality control issues.

The implementing agency (MINEDH) has a strong experience and an on-going engagement with the World Bank on the reconstruction and retrofitting of school buildings as planned under this Result Area. As part of the Emergency Resilient Recovery Project (P156559), MINEDH is overseeing the retrofitting and rebuilding of 400 classrooms following international best-practice building standards. The Program will use the same systems for implementation albeit at a larger scale.

Technical design risks exist around the effective prioritization of schools. The budget allocated to the Result Area is not sufficient to retrofit all schools in risk-prone areas, which means that a prioritization scheme will need to be applied based on, amongst other factors, school exposure to risk, building quality, poverty levels and school attendance rates. A lack of correct prioritization could steer resources to areas where school retrofit is less urgent than other areas. The World Bank will provide substantial technical assistance to MINEDH to conduct all required assessments to mitigate this risk.

Fiduciary risk includes the possibility that resources allocated to school construction are spent for other purposes or that lower quality and cheaper construction standards are used. This would lead to fewer schools retrofitted, or a lower resilience level of constructed buildings. The risk will be mitigated through technical assistance to MINEDH in the design and implementation of the program, and a careful monitoring and verification protocol using external supervision consultants.

H. Inputs into the Program Action Plan

A Program Action Plan (PAP) has been developed to identify key actions required to ensure successful Program implementation, including in light of the key risks identified.

Table 10: Technical Input into Program Action Plan

Action Description	DLI#	Responsibility	Recurrent	Frequency	Due Date	Completion Measurement
Complete the Program Operation Manual (POM) covering main aspects of Program management, including technical, social, environmental and fiduciary issues, and including a chapter on the IPF Component.		INGC	No		Within 6 months of Program effectiveness	POM
Establish the Program Steering Committee		INGC; MEF	No		Within 3 months of Program effectiveness	Letter from MEF confirming establishment of Program Steering

						Committee, including TOR and composition
Establish the Program Secretariat that will oversee and monitor all Program activities		INGC	No		Within 3 months of Program effectiveness	PMS TOR
Establish the Fund Management Unit with representatives from INGC and MEF	Operationalization and recurrent capitalization of the Disaster Management Fund	INGC; MEF	No		Included as prior result	contracts for key staff in the Financial Management Unit are signed (Coordinator, two planning officials, accountant, treasurer, financial specialist, and administrative assistant)
Improvement of monitoring and evaluation system for local DRM committees		INGC	No		Within 12 months of Program effectiveness	Database is improve
Audits completed for Disaster Fund and Program expenditures	Operationalization and recurrent capitalization of the Disaster Management Fund	INGC	Yes	YEARLY		Verification by Administrative Tribunal
Non-Governmental Organizations (NGOs) contracted for the establishment and strengthening of local DRM committees (CLGRCs)	Strengthening of local DRM Committees	INGC	No		01-Oct-2019	Verification by Secretariat

Preparation of procurement plan for purchase of sovereign risk transfer product	Placement of sovereign catastrophe insurance coverage for cyclone and/or drought with capital or insurance market, in accordance with national Disaster Risk Finance Strategy	INGC; MEF	No		01-Apr-2020	Procurement plan finalized
Creation of a dedicated budget line for school retrofitting for internal funds	Number of classrooms retrofitted or reconstructed in accordance with climate-resilient technical norms under the Program	MINEDH/ MEF	No		01-Jul-2019	Verification by Secretariat
Program Manager for School Retrofitting Program shall be mobilized with a Terms of Reference and qualifications satisfactory to the Association	Number of classrooms retrofitted or reconstructed in accordance with climate-resilient technical norms under the Program	MINEDH	No		Within 3 months of Program effectiveness	TOR and CV
Development of Investment Strategy for the unallocated and uncommitted resources of the Disaster Management Fund		INGC, MEF	No		01-Jun-2021	Investment Strategy finalized

I. Inputs to the Program Implementation Support Plan

The objectives of the Implementation Support Plan are to monitor the implementation progress across the Program's Result Areas, including the implementation of risk management measures, and to provide technical advice necessary to facilitate the achievement of the DLIs and PDO.

The Bank will provide continuous implementation support to implement the Program Action Plan and the wider Program. Formal implementation support missions will be carried out twice per year. The main focus of the implementation support is summarized below.

Table 11: Main Focus of Implementation Support

<i>Time</i>	<i>Focus</i>	<i>Skills Needed</i>	<i>Resource Estimate (US\$)</i>	<i>Partner Role</i>
<i>First twelve months</i>	Task Team Leadership and Program supervision	Project management	150,000 BB	Advisory and collaborative role in implementing school retrofit investments and early warning component (UN Organizations); advisory and collaborative role in implementing risk financing component through GRIF (DFID); Collaboration on early warning systems and local DRM committees (GIZ)
	Technical support and capacity building	Risk management		
	M&E support and capacity building	M&E		
	Procurement support and capacity building	Procurement		
	FM support and capacity building	FM		
	Social development support and capacity building	Social development		
	Environmental supervision	Environment		
	Technical support to risk modelling and risk financing agenda	Risk Finance		
	Technical support to Safer Schools agenda	Risk Reduction & Retrofit		
	Technical support to early warning agenda	Hydromet & Early Warning		
Technical support on gender & human capital mainstreaming	Gender and human capital			
	Task Team Leadership and Program Supervision	Project management		

<i>12-48 months</i>	Technical support and capacity building	Risk management	100,000 BB per year	Advisory and collaborative role in implementing school retrofit investments and early warning component (UN Organizations); advisory and collaborative role in implementing risk financing component through GRiF (DFID); Collaboration on early warning systems and local DRM committees (GIZ)
	Procurement supervision	Procurement		
	FM supervision	FM		
	Social development supervision	Social development		
	Environmental supervision	Environment		
	Technical support to risk modelling and risk financing agenda	Risk Finance		
	Technical support to Safer Schools agenda	Risk Reduction & Retrofit		
	Technical support to early warning agenda	Hydromet & Early Warning		
	Technical support on gender & human capital mainstreaming	Gender and human capital		

Annex 1: Economic Analysis

1. **A cost-benefit analysis was conducted to assess the economic feasibility of the main pillars under the Mozambique Disaster Risk Management and Resilience Program.** The analysis relies on the net present value of the cost and benefits to assess the net returns accruing from the implementation of the three pillars of the proposed Program. Based on a recent comparative assessment of discount rates¹², a discount rate of 5% is assumed throughout the three components.
2. **The program's economic impact will be beneficial and significant.** The results of the economic analysis performed show an overall net present value (NPV) of US\$437 million and benefit cost ratio (BCR) of 6.2 for the Program. Results are summarized in Table 1, regardless of the discount rate chosen (5%), the Net Present Value (NPV) and Benefit-Cost Ratio (BCR) are estimated for 0% and 10% discount rate.

Table 1: Summary table of estimated cost-benefit analysis result (US\$ million)

Result areas	Discount rate		
	0%	5%	10%
1. Improving financial protection against disasters			
<i>a. Cost</i>	51	45	40
<i>b. Benefits</i>	78	65	55
<i>c. NPV</i>	26	20	15
<i>d. BCR</i>	1.5	1.4	1.4
<i>e. ERR</i>		49%	
2. Strengthening National Capacity for Preparedness, Response and Recovery			
<i>a. Cost</i>	16	15	15
<i>b. Benefits</i>	399	275	275
<i>c. NPV</i>	382	260	260
<i>d. BCR</i>	24.4	18.5	18.5
<i>e. ERR</i>		88%	
3. Building Resilience in Public Investment			
<i>a. Cost</i>	28	25	21
<i>b. Benefits</i>	364	181	101
<i>c. NPV</i>	336	157	80
<i>d. BCR</i>	12.9	7.4	4.7
<i>e. ERR</i>		45%	
Overall Program			
<i>a. NPV</i>	745	437	276
<i>b. BCR</i>	8.8	6.2	4.7
<i>c. ERR</i>		68%	

NPV: Net Present Value (US\$ millions), BCR: Benefit-Cost Ratio and ERR: Economic Rate of Return.

¹² World Bank (2017). *Risk-Adjusted Discount Rates in Economic Analysis of Investment Projects*. Mahul et al.

Pillar 1: Improving financial protection against disasters

3. Pillar 1 consist of two main activities to support the GoM to improve its financial protection against disasters through the operationalization and capitalization of the recently created Disaster Management Fund (DMF) and the placement of sovereign catastrophe insurance coverage for cyclone and/or drought. The strategy for financial protection against disasters is assumed to be composed by the DMF and an insurance instrument.
4. Ex-ante financial instruments smooth disaster impacts by providing rapid access to funds to governments, enabling them to meet surge demand for emergency assistance. Intervening early is critical to protect the lives and livelihoods of affected households, through emergency response and the provision of food and non-food aid. Evidence has shown that this can reduce the instance of affected households resorting to negative coping strategies, which can have long-term, sometime intergenerational impacts on household welfare¹³. While, regarding recovery the availability of funds when needed is crucial to limit secondary losses.
 - i. **Cost.** The total investment is assumed as US\$51 million over 5 years, including the fund capitalization (US\$33 million: US\$9 million in the two first years and US\$5 million per year for 3 years), the insurance premium (US\$12 million: 3 million per year for 4 years) and technical assistance (including PfoR and IPF: US\$6 million).
 - ii. **Early relief.** Literature regarding the economic value of early response estimates the benefits by considering cost efficiencies generated by early procurement of emergency items and avoided impacts on households (i.e. income reduction, malnutrition, diseases and distress sales of assets). Evidence in Ethiopia¹⁴, Kenya¹⁵, Mozambique¹⁶, Niger¹⁷ and Somalia¹⁸ suggest that US\$1 secured ahead of time for early drought response generated benefits ranging between US\$2.3 to more than US\$55.9. Moreover, evidence in Bangladesh¹⁹ and Mozambique²⁰ suggest that US\$1 secured ahead of time for early cyclone and flood response generated benefits from US\$1.7 to US\$11.9²¹. Higher ratios add up avoided impacts generated due to malnutrition, diseases and distress sales of assets. Based on the literature review, we assume a conservative scenario: in drought events US\$1 secured ahead leads to a US\$2.3 benefit; in cyclone and flood events US\$1 secured ahead leads to a US\$1.7 benefit.

¹³ Painter, Osmond, Gluckman, Hanson, Phillips and Roseboom. (2008). *Transgenerational effects of prenatal exposure to the Dutch famine on neonatal adiposity and health in later life*. International Journal of Obstetrics and Gynaecology.

¹⁴ Hess U. and W. Wiseman. (2007). *Ethiopia: Integrated Risk Financing to Protect Livelihoods and Foster Development*. USAID. (2018). *Economics of resilience to Drought: Ethiopia Analysis*. Cabot V. and L. Sida. (2017). *The Value for Money of Multi-Year Humanitarian Funding: Emerging Findings Valid International*, Oxford, 44p.

¹⁵ USAID. (2018). *Economics of resilience to Drought: Kenya Analysis*.

¹⁶ DFID. (2013). *The Economic of Early Response and Resilience: Summary of Findings*.

¹⁷ DFID. (2013). *The Economic of Early Response and Resilience: Summary of Findings*.

¹⁸ USAID. (2018). *Economics of resilience to Drought: Somalia Analysis*.

¹⁹ DFID. (2013). *The Economic of Early Response and Resilience: Bangladesh Country Study*.

²⁰ DFID. (2013). *The Economic of Early Response and Resilience: Mozambique Country Study*.

The insurance average payout is assumed as US\$2.1 million. The short-term liquidity provided by the insurance will enable the government to provide early drought and cyclone response²², then generating US\$14.4 million discounted benefits. Meanwhile, assuming i) every year the DMF has a full disbursement in emergency relief ²³ (50% floods, 25% cyclones and 25% drought) and ii) the DMF has operating cost of about 0.1% of the fund²⁴. The early response provided through DMF will generate US\$50.7 million discounted benefits.

5. The component is expected to generate a positive net present value of US\$20 million with a 1.4 benefit-cost ratio and an economic rate of return (ERR) of 49%²⁵.
6. The key assumption of the performed economic analysis relies on the benefit multiplier. We carry out a sensitivity analysis for ERR by considering different benefit multipliers for drought, cyclone and floods. ERR can reach a high of 182% if US\$1 secure ahead of time generates US\$5 benefit for early drought response and US\$4 benefit for early flood and cyclone response.

Table 2: ERR for different benefit multiplier in early relief

Benefit multiplier (drought)	Benefit multiplier (flood and cyclone)				
	1.0	1.7	2.0	3.0	4.0
1.0	-22%	20%	36%	83%	123%
2.3	12%	49%*	63%	106%	143%
3.0	29%	63%	77%	117%	153%
4.0	51%	82%	95%	133%	168%
5.0	71%	100%	112%	149%	182%

* Actual scenario: An ERR of 49% is obtained if US\$1 secured ahead of time generates US\$2.3 benefit for early drought response and US\$1.7 benefit for early flood and cyclone response.

Pillar 2: Strengthening National Capacity for Disaster Preparedness and Response

7. Regarding this pillar, the Program will support the GoM to improve the access to accurate information and provide early warning to local communities through two main activities. These activities include: i) enhancing the production and effective dissemination of actionable early warning information and ii) strengthening and establishing DRM committees by providing training, equipment and simulation exercises.
8. The provision of timely and effective information, through identified institutions and mechanisms, allow individuals exposed to a hazard to prepare for effective response to avoid

²² Assuming every year, both hazards have the same probability to occur.

²³ In Mozambique the annual needs in emergency response range from US\$ 9 to US\$ 22 million between 2010 and 2015 (World Bank, 2018).

²⁴ Assuming the salary of three staff equal to the minimum wage in the private financial sector in Mozambique (the equivalent to Meticais 10,400 monthly).

²⁵ For both instruments, is assumed the benefits are realized 1 year forward the investment.

or reduce their risk and. In that sense, an effective early warning system combined with functional DRM committees will allow the evacuation of people and their goods and possessions before a cyclone or a flood strikes. This is translated in a reduced number of people affected and assets damaged, and lower search and rescue expenditures by governments.

- i. Cost.* The cost of implementing the 800 DRM committees (500 strengthened and 300 implemented) is being commuted as US\$8 million over 5 years, meanwhile, the cost to support the improvement of early warning system totalize US\$6 million over 5 years. Every year, both sub-components have a 20% cost structure. In addition, the cost of technical assistance (IPF component) totalize US\$2.3 million over 5 years.
- ii. Reduction of human losses and trauma.* Even when there is not a proper methodology to estimate the economic value due to human losses and trauma produced by hazards, we expect the intervention will reduce the number of affected people by 3.7 million over 10 years. Assuming: i) one equipped committee reach 1,000 people and ii) 200 DRM committees are implemented or improved each year.
- iii. Reduced damages.* A national level disaster risk assessment has been carried out by the World Bank in Mozambique. Preliminary results indicate that on average floods affect 122,000 inhabitants and inflict US\$360 million in building and crop damages. Likewise, cyclone surge on average affect 561,000 inhabitants and inflict US\$91 million in building damages. The typical approach to assessing the economic feasibility of early warning systems is based on calculating the potential reduced damages. In a recent study, by an extensive literature review, the authors estimated in Europe a percentage of avoided flood damages of 36% considering an early warning system which includes flood defense operations, watercourse capacity maintenance, community-based operations, warning dependent measures and content moved and evacuated²⁶. However, we assume the intervention can generate 10% of avoided damages considering: i) the damage that can be prevented in Europe is higher in economic terms and ii) there is much better connectivity, making it easier and cheaper to reach people.

The estimated benefits of the component are evaluated based on the amount of reduced damages due to the intervention. Considering the intervention will reduce the number of affected people by 3.7 million over 10 years, we assume that every year: i) the percentage of avoided damage depends on the type of intervention on the DRM committees, strengthen an existing committee generates a 5% of avoided damage and establish a new one generates a 10% of avoided damage, ii) in flood events the intervention reduce damages by US\$147 and US\$294 per person, ii) in cyclone events (surge) the intervention reduce damages by US\$8 and US\$16 per person, iii) the benefits are realized 1 year forward the investment, and iv) the benefits are obtained gradually, 10% until year 3 when EWS start being implemented and then increase until they reach 100% in year 10. Efficient early warnings system throughout DRM committees would reduce damages equivalent to at least US\$270 million over 10 years.

²⁶ Pappenbergen, F; Cloke, H; Parker, D; Wetterhall, F. 2015. The monetary benefits of early flood warnings in Europe. *Environmental Science and Policy* 51, 278-291.

Although the estimation only considers flood and cyclone surge avoided damages, DRM committees would respond in multiple hazards and thus the overall benefit are expected to be higher.

iv. Lower search and rescue expenditures. In Mozambique, a study estimates a search and rescue cost of US\$2.4 per person in flooding events²⁷. International experience in the effectiveness of early warnings system show that for different reasons people do not always evacuate, we assume 50% of the people reached by DRM committees evacuate and therefore the government reduce search and rescue expenditures. The intervention will generate US\$5.2 million discounted benefits over 10 years.

9. The component is expected to generate a positive net present value of US\$260 million with a 18.5 benefit-cost ratio and an economic rate of return (ERR) of 88%.

10. A sensitivity analysis for Pillar 2 looks at the effect on ERR for different levels of reduced damages and the number of people reached by one established DRM committee.

Table 3: ERR for reduced damages and people reached by DRM committees

% reduced damages	Number of people reached by 1 committee			
	200	600	1000	1400
1.0%	23%	50%	67%	80%
3.0%	27%	55%	73%	86%
5.0%	30%	59%	78%	91%
7.0%	33%	63%	82%	96%
10.0%	37%	69%	88%*	102%

* Actual scenario: An ERR of 88% is obtained when damages are reduced by 10% and an equipped committee reach 1,000 people.

Pillar 3: Building Resilience in Public Investment

11. Pillar 3 consists primary in supporting to increase resilience of vulnerable education infrastructure in priority hazard-prone areas in Mozambique. The construction of resilient schools would save lives and contribute to the objective of improved access to high quality education. Disasters reduce school enrollment: children are pulled out schools to help with more pressing tasks or because schools have been disrupted. Indeed, in Mozambique enrollment rates for children aged 5–15 fell by about 8% after a flood event in 2007 and by the same proportion after cyclone Jokwe in 2008²⁸.

12. Vulnerable schools can be strengthened by retrofitting them to withstand flood waters and extreme wind speeds. This is usually accomplished by reinforcing the walls, roof and general structure using additional material and labor. Deltares conduct an assessment for the school infrastructure in Mozambique and found that retrofitting schools against flood and cyclones

²⁷ DFID. (2013). *The Economic of Early Response and Resilience: Mozambique Country Study*.

²⁸ World Bank (2018). *Extreme Weather and Household Well-Being: Evidence from Multiple Shocks in Mozambique*. Preliminary Study

risk is generally economically feasible²⁹. We built our analysis including the costs and the benefits estimated by Deltares.

- i. Costs.* The program is expected to retrofit 3,060 classrooms with a total cost of US\$26 million over 5 years, by assuming 50% classrooms are retrofitted against floods and 50% against cyclones (see Table 4 below). In addition, the cost of technical assistance (IPF component) totalize US\$2.3 million over 5 years.

Dry flood proofing (i.e. by sealing the portion of structure below flood level and by closing of the doors and windows with permanent or removable vales) can be applied to make schools resilient to riverine and coastal flooding. Retrofitted roof (i.e. by improving connection between wall, frame and roof and including additional fixations for the roof cover and for the roof frame) are effective against cyclones. Fully retrofitted roofs, in addition to the previous by placing pillar to support roof extension has been proposed for cyclones in the Inhambane province. Two additional retrofitting options for cyclones and earthquakes were evaluated but they were not cost-efficient.

- ii. Reduced damages.* The national-level assessment shows that school infrastructure suffers more than US\$2 million damage on average per year. This corresponds to 550 classrooms and 50,000 students affected each year. Among the hazards, cyclone winds affected the highest number of pupils (72%) followed by river and coastal flooding (15% and 13%, respectively).

The typical approach to assessing the economic efficiency of risk reduction measures is based on the average expected annual damage. The stock damages are combined to determine the Annual Expected Damages (AED) by including the actual hazard exposure for each individual classroom. Based on the Deltares study, we assume benefits are replacement cost, and those are estimated on an average construction cost of US\$8,500.

Table 4: Cost and benefits (per classroom)

Option	Benefit (25 years)	Cost
1. Dry flood proofing	US\$142,514	US\$8,500
2. Retrofitted roof	US\$14,245	US\$8,500
3. Fully retrofitted roof (Inhambane province)	US\$8,474	US\$8,500

Present value of avoided damages estimated at a 5% discounted rate using the avoided AED estimated by Deltares.

Retrofitting 3,060 classrooms would reduce stock damages in US\$16 million per year, leading a discounted value of US\$166 million by assuming: i) 612 classrooms are retrofitted per year, ii) the intervention is effective for 25 years before replacement, iii) the benefits are realized 1 year forward the investment and , iv) the benefits are obtained gradually, increasing by 20% every 2 years until reach 100% in year 10.

²⁹ World Bank (2018). *Multi-Hazard Assessment for the Schools Sector in Mozambique*. Deltares.

iii. Income impacts. Additionally, retrofitting classrooms will likely avoid lower enrollment rates in pupils affected per disasters, with a subsequent benefit in their future income. In Mozambique, one year of additional schooling yields to a return of 12.4% in earnings³⁰. Retrofitting 3,060 classrooms would benefit an approximate of 300,000 students per year, of which without the intervention we assume 8% (23,990 students) will dropout school and reduced their future income in 12,4%. The discounted benefits from avoiding lower wages over 25 years are estimated at US\$657 per pupil³¹, in total US\$16 million.

iv. Expenditure and employment. The project will bring a significant amount of resources to the country which will increase its national expenditure. Moreover, it will boost local employment.

13. The component yields a positive net present value of US\$157 million with a 7.4 benefit-cost ratio and an economic rate of return (ERR) of 45%.

14. The ERRs for Component 3 remain positive for the various combinations of avoided damages, and the component yields stable dividends for the different combinations.

Table 5: ERR for avoided damages

Avoided damages	ERR
4 million	16%
8 million	21%
12 million	34%
16 million	45%
20 million	53%

³⁰ World Bank (2015). *Skills and Employability in Mozambique: Implications for Education and Training Policies*. Cho et al.

³¹ Using the GNI per-capita at US\$ 480 provided by the World Bank data.