

# **Climate and Disaster Risk Screening Report for Road Project in Mozambique: Hypothetical Roads Project for Mozambique<sup>1</sup>**

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<sup>1</sup> This is the output report from applying the World Bank Group's Climate and Disaster Risk Screening Project Level Tool. The findings, interpretations, and conclusions expressed from applying this tool are those of the individual that applied the tool and should be in no way attributed to the World Bank, to its affiliated institutions, to the Executive Directors of The World Bank or the governments they represent. The World Bank does not guarantee the accuracy of the information included in the screening and this associated output report and accepts no liability for any consequence of its use.

## 1. Introduction

The project level **Climate and Disaster Risks Screening Tool** provides due diligence on climate and disaster risks at an early concept stage. The tool uses an **exposure - sensitivity - adaptive capacity framework** to consider and characterize risks from climate and geophysical hazards, based on key components of a project and its broader development context (Annex 1). The tool helps inform consultation, dialogue, and further work to be done in the course of project design.

The results of applying the project level tool to screen for climate and disaster risks for "Hypothetical Roads Project" in Mozambique are summarized below.

## 2. Climate and Disaster Risk Screening Results Summary

### 2.1 Project Information Summary

Table 1 below provides key project information.

**Table 1: Project Information**

<b>PROJECT INFORMATION</b>	
<b>Title</b>	Hypothetical Roads Project
<b>Number</b>	P116767
<b>Region</b>	Sub-Saharan Africa
<b>Country</b>	Mozambique
<b>Type of Assessment</b>	Road Projects
<b>Purpose of Screening</b>	Screen a Project at the Concept Stage
<b>Current Project Phase</b>	Concept (Identification)
<b>Funding Source</b>	IDA
<b>Keywords</b>	Feeder, Secondary and Rural Roads, Metropolitan Transport Planning, Metropolitan Public Transport, Expressways and highways
<b>Location</b>	Two sections of the highway to be rehabilitated under this project are located in the middle of the country, from Pambara to Muxungue, and the third section is located in the southern part of the country, from 3 de Fevereiro to Incoluane. The location of the rural roads pilot project has not been identified in the Project Concept Note. The capacity building components of this project are assumed to be at the national level.
<b>Physical Components</b>	The project intends to rehabilitate and upgrade a total of 250 kilometers of the N1 Highway. The three sections run from Pambara to Rio Save, Rio Save to Muxungue, and 3 de Fevereiro to Incoluane. The initial estimated cost of these civil works is about US\$197 million, about 80 percent of the total project fund.

## 2.2 Summary of Exposure to Climate and Geophysical Hazards

Table 2 presents a summary description of exposure to climate and geophysical hazards at the project location for the Historical/Current and Future time frames. The Future time frame is based on changes projected to occur between the 1980-1999 average and a future average. This future average is most likely the 2040-2059 average (i.e., the default in the Climate Change Knowledge Portal - CCKP), but the range is dependent upon the specific time frame that the user applied using the CCKP or other climate information. Again, these descriptions, if based on information in the CCKP, may be supplemented by national data sets.

**Table 2: Summary of Exposure to Climate and Geophysical Hazards at Project Location**

HAZARD	TIME FRAME	DESCRIPTION OF HAZARDS FOR YOUR LOCATION
<b>Extreme Temperature</b>	Current	The highest monthly average maximum daily temperature is 33 C. The number of 'hot days' per year, defined as the upper end of the range of maximum temperature values, has increased by 25 in the last 40 years.
	Future	Annual average temperature is expected to increase by 1°C to 2.8°C by 2060 relative to current conditions. The number of hot days (>90th percentile in the control run) is expected to increase by approximately 10 days in October by 2060.
<b>Extreme Precipitation and Flooding</b>	Current	Mean monthly rainfall has decreased in recent decades. However, the proportion of rainfall falling in heavy events has increased at an average rate of 2.6%, and that 5-day annual rainfall maxima have increased by 8.4 mm per decade, with the largest increases in the wet season. There is no past experience with flooding in the project location.
	Future	The starting point for this rating is the Historical/Current rating of Slightly Exposed. The proportion of rain that falls in heavy events is projected to increase by approximately 15%. Wet season (Dec - Feb) rainfall is also projected to increase, and the wet season may become longer.
<b>Sea Level Rise</b>	Current	Sea level in the project region has increased by roughly 90 mm over the past three decades.
	Future	Sea level in the project region is expected to increase by 250 - 1000mm over the expected investment life of 50 years.
<b>Storm Surge</b>	Current	The project location has only rarely experienced storm surges in recent history. There is no data available on the height of past storm surges, but the cyclone mortality rate is low.
	Future	Storm surge height is expected to increase, but estimates are highly uncertain
<b>Strong Winds</b>	Current	Yes, the project area has been exposed to tropical cyclone winds in the past few decades.
	Future	The maximum wind speed from tropical cyclones is expected to increase, but estimates are highly uncertain. The intensity of future storms is generally expected to increase, although the details of these changes are highly uncertain. The frequency of future severe storms is even more uncertain.
<b>Earthquake</b>	Current	The project location has experienced earthquakes in the past
<b>Landslide</b>	Current	The project location has experienced landslides in the past
<b>Other Hazard (Wildfires)</b>	Current	No information available

## 2.3 Summary of Overall Project Risk

Tables 3A and 3B below summarize ratings for project components and/or project subsectors, and outcome/service level for *Historical/Current* and *Future* time frames. The ratings are derived on the basis of the hazard information, subject matter expertise, contextual understanding of the project, and the larger development context.

The results indicate where risks may exist and where further work may be required to reduce or manage these climate and geophysical risks. An ongoing process of monitoring risks, refining climate and other information, and regular impact assessment may also be appropriate.

### 2.3.1 Results Summary - by Component

Table 3A summarizes the ratings for the project. The results provide a characterization of risks caused by climate and geophysical hazard on project sub-sector and components. The potential impact due to exposure from hazards is modulated by the project's non-physical components (enabling and capacity building activities) and the larger development context to determine overall risk to the intended project outcome.

**Table 3A: Results Summary - by Component**



HAZARD	Project Components						Development Context				Outcome/Service Delivery	
	Location		Physical Components		Non-Physical Components (Overall)		Transport Sector		Broader Context (Overall)			
Time Frame	Current	Future	Current	Future	Current	Future	Current	Future	Current	Future	Current	Future
Extreme Temperature	Orange	Red	Orange	Orange	Data gathering and information management system Significantly Reduces Impact				Overall	Slightly Increases Impact	Orange	Red
Extreme Precipitation and Flooding	Yellow	Orange	Orange	Red							Orange	Red
Sea Level Rise	Yellow	Orange	Yellow	Orange	Long-term strategic planning Slightly Reduces Impact		Slightly Increases Impact	Overall	Slightly Increases Impact	Orange	Red	
Storm Surge	Yellow	Orange	Yellow	Red						Orange	Red	
Strong Winds	Yellow	Orange	Yellow	Orange	Overall Significantly Reduces Impact						Orange	Red
Earthquake	Yellow	X	Yellow	X							Orange	X
Landslide	Yellow	X	Orange	X							Red	X
Other Hazard (Wildfires)	Yellow	X	Yellow	X							Yellow	X

### 2.3.2 Summary - by Time Frame

The matrix below depicted in Table 3B displays the same results as Table 3A, but does so by time frame.

**Table 3B: Results Summary - by Time Frame**

Time Frame	Current						Future												
	Hazard	Location	Physical Components	Non-Physical Components	Development Context		Outcome / Service Delivery	Location	Physical Components	Non-Physical Components	Development Context		Outcome / Service Delivery						
					Transport Sector	Broader Context (Overall)					Transport Sector	Broader Context (Overall)							
Extreme Temperature				Data gathering and information management system Significantly Reduces Impact	Slightly Increases Impact	Overall Slightly Increases Impact				Data gathering and information management system Significantly Reduces Impact	Slightly Increases Impact	overall Slightly Increases Impact							
Extreme Precipitation and Flooding																			
Sea Level Rise																			
Storm Surge																			
Strong Winds																			
Earthquake																			
Landslide																			
Other Hazard (Wildfires)																			

Insufficient Understanding	Not Exposed No Potential Impact No Risk	Slightly Exposed Low Potential Impact Low Risk	Moderately Exposed Moderate Potential Impact Moderate Risk	Highly Exposed High Potential Impact High Risk
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## 2.4 Key Drivers of Risks

Based on the results above, Table 4 highlights the key drivers of risks for each project component and/or subsector ratings. Specific consideration should be given to those which have high/moderate ratings. Specific consideration should be given to those which have high/moderate ratings. Note also the overall modulating effects of non-physical components and the broader development context to the project outcome.

**Table 4: Key Drivers of Risk**

	Historical/Current Drivers	Future Drivers
<b>Hazards and Location</b>	<div style="border: 1px solid black; background-color: #FFD700; padding: 2px; display: inline-block;">Extreme Temperature</div>	<div style="border: 1px solid black; background-color: #FF0000; padding: 2px; display: inline-block;">Extreme Temperature</div> <div style="border: 1px solid black; background-color: #FFD700; padding: 2px; display: inline-block;">Extreme Precipitation and Flooding</div> <div style="border: 1px solid black; background-color: #FFD700; padding: 2px; display: inline-block;">Sea Level Rise</div> <div style="border: 1px solid black; background-color: #FFD700; padding: 2px; display: inline-block;">Storm Surge</div> <div style="border: 1px solid black; background-color: #FFD700; padding: 2px; display: inline-block;">Strong Winds</div>
<b>Physical Components</b>	<div style="border: 1px solid black; background-color: #FFD700; padding: 2px; display: inline-block;">Extreme Temperature</div> <div style="border: 1px solid black; background-color: #FFD700; padding: 2px; display: inline-block;">Extreme Precipitation and Flooding</div> <div style="border: 1px solid black; background-color: #FFD700; padding: 2px; display: inline-block;">Landslide</div>	<div style="border: 1px solid black; background-color: #FF0000; padding: 2px; display: inline-block;">Storm Surge</div> <div style="border: 1px solid black; background-color: #FFD700; padding: 2px; display: inline-block;">Strong Winds</div> <div style="border: 1px solid black; background-color: #FFD700; padding: 2px; display: inline-block;">Extreme Temperature</div> <div style="border: 1px solid black; background-color: #FF0000; padding: 2px; display: inline-block;">Extreme Precipitation and Flooding</div> <div style="border: 1px solid black; background-color: #FFD700; padding: 2px; display: inline-block;">Sea Level Rise</div>
<b>Outcome / Service Delivery</b>	<div style="border: 1px solid black; background-color: #FFD700; padding: 2px; display: inline-block;">Strong Winds</div> <div style="border: 1px solid black; background-color: #FFD700; padding: 2px; display: inline-block;">Extreme Temperature</div> <div style="border: 1px solid black; background-color: #FFD700; padding: 2px; display: inline-block;">Extreme Precipitation and Flooding</div> <div style="border: 1px solid black; background-color: #FFD700; padding: 2px; display: inline-block;">Sea Level Rise</div> <div style="border: 1px solid black; background-color: #FFD700; padding: 2px; display: inline-block;">Storm Surge</div> <div style="border: 1px solid black; background-color: #FFD700; padding: 2px; display: inline-block;">Earthquake</div> <div style="border: 1px solid black; background-color: #FF0000; padding: 2px; display: inline-block;">Landslide</div>	<div style="border: 1px solid black; background-color: #FF0000; padding: 2px; display: inline-block;">Storm Surge</div> <div style="border: 1px solid black; background-color: #FF0000; padding: 2px; display: inline-block;">Strong Winds</div> <div style="border: 1px solid black; background-color: #FF0000; padding: 2px; display: inline-block;">Extreme Temperature</div> <div style="border: 1px solid black; background-color: #FF0000; padding: 2px; display: inline-block;">Extreme Precipitation and Flooding</div> <div style="border: 1px solid black; background-color: #FF0000; padding: 2px; display: inline-block;">Sea Level Rise</div>

Key: High Risk



Moderate Risk



\* No high or moderate risks identified for this particular portion of the project.

- Overall, the Non-physical Components : **Significantly Reduces Impact**
- The Transport Sector : **Slightly Increases Impact**
- The Broader Development Context : **Slightly Increases Impact**

### 3. Next Steps

Table 5A provides some general guidance on follow-up based on the risk ratings for the Outcome/Service Delivery. Table 5B lists some climate risk management measures for your consideration. Visit the "Next steps" page of the tool for guidance and a list of useful resources.

Please recall that that this is a high-level due diligence tool, and the characterization of risks should be complemented with more detailed work.

**Table 5A: General Guidance Based on Risk Ratings for Outcome/Service Delivery**

<b>Insufficient Understanding</b>	Gather more information to improve your understanding of climate and geophysical hazards and their relationship to your project.
<b>No Risk</b>	If you are confident that climate and geophysical hazards pose no risk to the project, continue with project development. However, keep in mind that this is a high-level risk screening at an early stage of project development. Therefore, you are encouraged to monitor the level of climate and geophysical risks to the project as it is developed and implemented.
<b>Low Risk</b>	If you are confident that climate and geophysical hazards pose low risk to the project, continue with project development. However, keep in mind that this is a high-level risk screening at an early stage of project development. Therefore, you are encouraged to monitor the level of climate and geophysical risks to the project as it is developed and implemented. You may also consider gathering additional information to increase your level of confidence in your rating.
<b>Moderate Risk</b>	For areas of Moderate Risk, you are encouraged to build on this screening through additional studies, consultation, and dialogue. This initial screening may be supplemented with a more detailed risk assessment to better understand the nature of the risk to the project.
<b>High Risk</b>	For areas of High Risk, you are strongly encouraged to conduct a more detailed risk assessment and to explore measures to manage or reduce those risks.

**Table 5B: Types of Climate Risk Management Measures for typical Road Projects**

CATEGORY	PROS	CONS	EXAMPLES
Accommodate and Manage	<ul style="list-style-type: none"> <li>• Flexible</li> <li>• Typically low-cost</li> <li>• Useful when risk is low, but projected to rise in the future</li> </ul>	<ul style="list-style-type: none"> <li>• Temporary solution</li> <li>• Can be insufficient in preventing losses</li> </ul>	<ul style="list-style-type: none"> <li>• Increasing repair and maintenance budgets</li> <li>• Instituting policies for proactive rerouting during severe weather</li> </ul>
Protect and Harden	<ul style="list-style-type: none"> <li>• Can be used for existing and new assets</li> <li>• Responds to immediate risks</li> </ul>	<ul style="list-style-type: none"> <li>• High cost</li> <li>• Inflexible</li> <li>• Effectiveness may decrease over time</li> </ul>	<ul style="list-style-type: none"> <li>• Elevating a roadway</li> <li>• Expanding buffer zones</li> <li>• Designing roads with larger drainage systems</li> <li>• Engineering bridges with elements of seismic-resistant design</li> </ul>
Retreat and Relocate	<ul style="list-style-type: none"> <li>• Long-term solution</li> <li>• Responds to immediate risk</li> </ul>	<ul style="list-style-type: none"> <li>• High cost</li> <li>• Inflexible</li> </ul>	<ul style="list-style-type: none"> <li>• Moving a road alignment away from a river</li> <li>• Moving infrastructure further inland or onto higher ground</li> </ul>

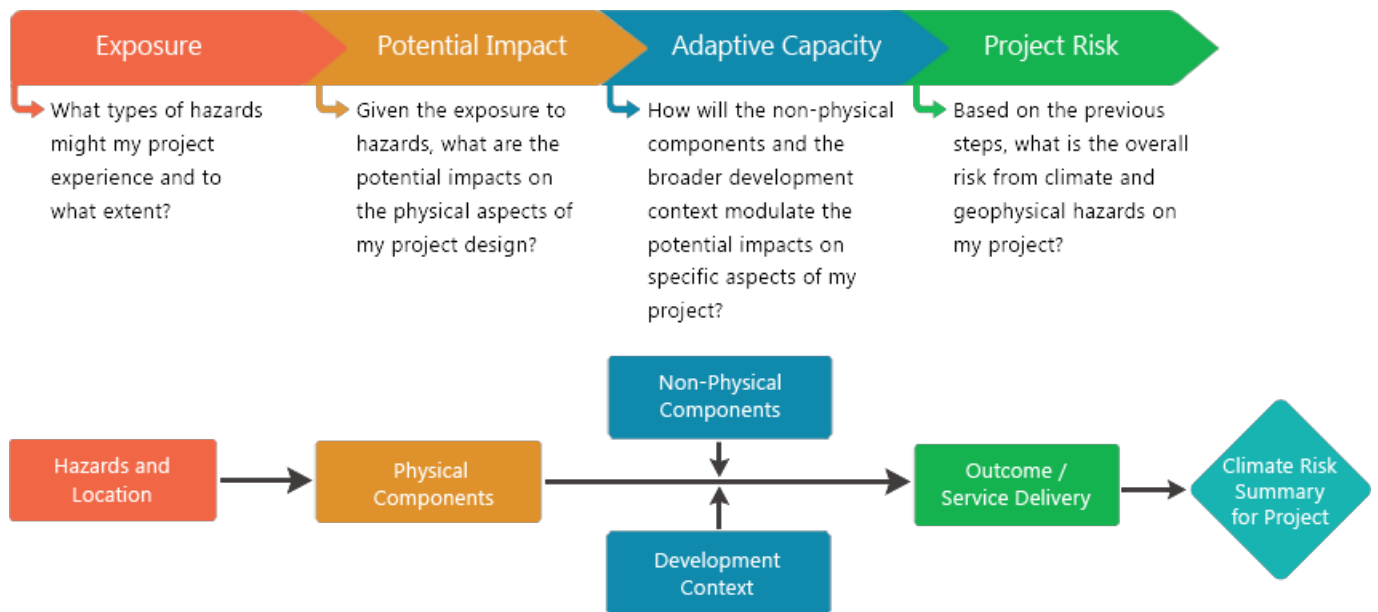


# Annex 1: Tool Approach

## Tool Approach

The framework below describes the approach taken to screen the project. Climate and natural hazards information used to screen the project is most likely obtained from the World Bank's Climate Change Knowledge Portal, which houses numerous global data sets with historical records and future projections as well as country-specific adaptation profiles.

**Figure 1: Project Level Climate and Disaster Risk Screening Tool: Approach for Roads Project**



## Annex 2: Notes

Table A2-1 summarizes the sub-national locations of high risk noted during the assessment, if the user entered these sub-national locations. Table A2-2 summarizes all the notes entered by user for each section while completing the assessment, if the user elected to enter notes. These notes can help shed light on specific ratings as well as considerations and limitations of the user's expertise

**Table A2-2 Summary of Comments by Section**

Section		Notes
<b>Hazards and Location</b>	Other Hazard (Wildfires)	There's no information on future fires in Mozambique. However fire events might increase due to projected increases in temperature
<b>Non-physical Components</b>	Data gathering and information management system	the project shall support: (a) developing and setting up of organization wide (ANE) system to enhance its program management and operational efficiency in the areas of project design, preparation, procurement, financial management and contract management; (b) defining the role and arrangements for Public Private Participation in the transport sector in general and road sector in particular; and (c) training of key stakeholders in road sector and technical assistance.
	Long-term strategic planning	Under the proposed component, the plan is to take a structured approach to develop a holistic policy and strategy for the transport sector in Mozambique focusing on all modes of transport, for a medium (5-10 years) to long term horizon (25 years).