

CLIMATE RISK ASSESSMENT AND MANAGEMENT REPORT FOR TRANCHE 2

I. Basic Project Information

Project Title: Second Rural Connectivity Investment Program Tranche 2
Project Cost: \$303 million
Location: State of Madhya Pradesh
Sector: Transport (road transport)
Theme: Inclusive economic growth, Environmentally sustainable growth
Brief Description: The Second Rural Connectivity Investment Program (RCIP 2) Tranche 2 will continue to support the upgrading of rural roads under the Pradhan Mantri Gram Sadak Yojana II (PMGSY-II) in Madhya Pradesh state with the reconstruction and upgrading of 204 rural roads to all-weather standard. The project consists of 168 packages and covers a total distance of about 2,800 kilometers (km), spread in 34 out of 51 districts of the state. ¹ Asian Development Bank (ADB) funding for Tranche 2 is \$110 million or about 37% of the total.

II. Summary of Climate Risk Screening and Assessment

1. Madhya Pradesh has three distinct seasons—winter, from December to February; followed by summer, from March to May; and the rainy season, from June to October. Average annual rainfall for the state is 1,160 millimeters (mm). Rainfall is heaviest in the southeastern part of the state and decreases toward the northwest. Balaghat, located in the south, receives maximum rains, with average rainfall above 1,600 mm, while the western districts, which include Shivpuri, only receive 800–1,000 mm of rain. Average annual rainfall in the southwestern tip of the state, which includes the southern half of Jhabua and the western half of Barwani district, is less than 800 mm. The northern districts of Bhind, Gwalior, and Morena also receive less than 800 mm of rain annually.

2. The Madhya Pradesh State Action Plan projects the average surface daily maximum temperatures to rise by 1.8–2.0°C throughout Madhya Pradesh, while the daily minimum temperature is projected to increase 2.0–2.4°C, in the 2030s. By the 2080s, maximum temperature is projected to rise from 3.4°C to 4.4°C, with the northern region experiencing warmer temperatures. Rainfall projections for 2021 to 2050, on the other hand, indicate that during the monsoon period, rainfall will increase by 1.25 times in most of Madhya Pradesh compared to the current period, but without noticeable change in Bhind, Gwalior, Morena, and Shivpuri. There will be more intense precipitation in the eastern parts of Hoshangabad, and in the northern and northeastern parts of Betul.

3. Based on the global climate models, climate risk maps were done specifically for the Madhya Pradesh state using geographic information system maps. Based on the climate risk maps for the proposed rural roads, the main risks identified were flooding and landslides triggered by precipitation.

¹ Alirajpur, Balaghat, Barwani, Betul, Bhind, Bhopal, Burhanpur, Chhatarpur, Damoh, Dewas, Dhar, Gwalior, Harda, Hoshangabad, Indore, Jhabua, Katni, Khandwa, Kargone, Mandsour, Morena, Neemuch, Panna, Raisen, Ratlam, Rewa, Sagar, Satna, Seoni, Shajapur, Shivpuri, Tikamgarh, Ujjain, and Vidisha.

A. Sensitivity of project component(s) to climate/weather conditions	
Project components 1. Roads 2. Cross and side drains 3. Protection works	Design of project components need to focus on sensitive weather parameters that are subject to a wide variety of changing climate/weather conditions in the future such as increased intensity and frequency of precipitation.
B. Climate risk screening	
Risk topic	Description of the risk
Precipitation and flooding	Madhya Pradesh: For the period 2021–2050, increase in precipitation by 1.25 times the current observed rainfall in most parts of Madhya Pradesh. No change in Bhind, Gwalior, Morena, and Shivpur. Increase in precipitation in eastern parts of Hoshangabad, northern and northeastern parts of Betul, and southern part of Sehore.
Summary of climate change risks	<i>A- temperature increase and heatwave: Medium risk</i> <i>B- drought and water availability: Medium risk</i> <i>C- increased frequency and intensity of precipitation: High risk</i> <i>D- increased flooding frequency and extent: High risk</i> <i>E- erosion of river banks: Low risk</i> <i>F- landslides in hilly regions: Medium risk</i> <i>G- sea level rise and coastal inundation and salination: No risk</i> <i>H- increased frequency and intensity of tropical cyclones: Low risk</i>
Climate Risk Classification: Medium	
C. Climate Risk Assessment	
As part of the initial environmental examination for Tranche 2 for Madhya Pradesh, a section on climate risk and vulnerability assessment has been prepared. Under this section, key climate change risks identified were increased frequency and intensity of rainfall and related flooding triggered by precipitation.	

III. Climate Risk Management Response within the Project

The following measures will be incorporated in the design of rural roads for Madhya Pradesh in consideration of the identified climate risks:							
<ol style="list-style-type: none"> Increase in embankment height in road sections located in low-lying and flood-prone areas Provision of new culverts and increase in capacity of longitudinal and cross drains Protection works 							
		Cost of Climate Adaptation Measures (\$ million)					
Number of Roads	Length Total, km	Unit cost of constructing 1 km of road (\$ million)	Increased embankment height	Increase in capacity of line drain	Increase in capacity of cross drain	Protection works	Total Adaptation Cost (\$ million)
204	About 2,800	0.1	7.05	4.11	4.68	1.13	16.97
The total cost of climate adaptation measures for Tranche 2 is \$16.97 million, representing 5.6% of the total project cost of \$303 million. The cost of adaptation to be financed by ADB for Tranche 2 (Madhya Pradesh only) is \$6.16 million.							

Source of Fund	Project Cost (\$ million)	%	Total Adaptation Cost (\$ million)	% of Adaptation to Total Project Cost
ADB	110.0	36.3	6.16	5.6
Government	193.0	63.7	10.81	5.6
Total	303.0	100.0	16.97	5.6