

CLIMATE CHANGE ASSESSMENT

I. BASIC PROJECT INFORMATION

Project Title: Rural Connectivity Improvement Project – Additional Financing
Project Cost (in \$ million): \$163.93 million
Location: People's Republic of Bangladesh
Sector: Agriculture, Natural Resources and Rural Development
Theme: Rural Market Infrastructure
Brief Description: The project will deliver three outputs: rural road conditions between the selected rural communities, productive agricultural areas, and socioeconomic centers improved; capacity of rural infrastructure agency and road users in project areas enhanced; and rural road master planning. The rural roads will be improved to all-weather standards with safety features, climate proofed ¹ and maintained for 5 years. ² The additional financing will scale up the first output of the current project by adding approximately 930 kilometers (km) of rural roads. Changes in the variability and magnitude of temperature, precipitation, rising sea levels, and extreme weather events can affect road infrastructures if not properly designed and built.

II. SUMMARY OF CLIMATE CHANGE FINANCE

Project Financing (\$ million)		Climate Finance (\$ million)	
Source	Amount	Adaptation	Mitigation
Asian Development Bank			
Ordinary capital resources (concessional loan)	100.00	9.90	0.00
Cofinancing	0.00	0.00	0.00
None			

Source: Asian Development Bank estimates.

III. SUMMARY OF CLIMATE RISK SCREENING AND ASSESSMENT

Trend analysis of the mean and extreme annual daily rainfall and temperature including spatial and temporal variation were carried out at the project level using 16 downscaled Global Climate Models customized for the project area using World Bank's Climate Wizard. These were overlaid with the existing natural hazards based on the historical damage records. Based on projected climate change and extreme climate, the rural roads are vulnerable to flooding, erosion, and landslides. Vulnerabilities of each road were identified and confirmed through transect survey. Both engineering and non-engineering measures were incorporated in the detailed project reports to address the vulnerabilities to enhance climate resilience.

A. Sensitivity of Project Component(s) to Climate/Weather Conditions and Sea Level	
Project component 1. Rural Roads	Sensitivity to climate/weather conditions and sea level 1. Flood, erosion and landslide
B. Climate Risk Screening	
Risk topic 1. Temperature (°C) and precipitation	Description of the risk 1. Between 2046–2065, GCM ensemble indicates change in maximum and minimum monthly temperature anomalies (difference between the baseline and predicted value) in project area ranging from 0.89-2.8°C. Increase in maximum annual rainfall could reach 372 mm.

¹ Structural and non-engineering measures to cope with the predicted increase in intensity and variability in rainfall and temperature and resulting occurrence climatic induced disasters that includes floods and storm surge flows.

² Maintenance will be undertaken for 5 years after construction as a pilot under the current project.

2. <i>Flooding and storm surge</i>	<p>2. The implications of the projected increases in temperature and rainfall coupled with the existing natural hazards in the districts magnify the risks to the project roads induced by climate change variability and extremes. For example, increased rainfall intensity can lead to an increase in potential erosion on the sides of the road, and increased temperatures may have effects on the physical structure of the macadam / tarmac, thus all-weather standards design and more frequent maintenance are required.</p> <p>3. The most dominant natural hazards to the project roads that can be exacerbated by climate change are flooding and storm surge. For the additional financing, the project districts that are at risk from flooding (25-year return period depth of >3.6m) are Dinajpur, Nilphamari, Bogra, Cumilla, Madaripur, and Gopalganj, but no districts are at risk from storm surge (25-year return period).</p>
Climate Risk Classification: MEDIUM	
<p>C. Climate Risk and Adaptation Assessment</p> <p>(i) Conducted climate change assessment.</p> <p>(ii) Conducted risk mapping using the Bangladesh Department of Disaster Management Multi-Hazard Risk.</p> <p>(iii) Conducted vulnerability assessment modeling and mapping.</p> <p>(iv) Conducted assessment of temperature and precipitation future trend high A2 scenario using the World Bank's Climate Wizard.</p> <p>(v) Coordinated with the social assessment team and conducted transect survey of all roads to identify flood and erosion/landslide-prone areas based on local knowledge. The information was included in the engineering detailed project report.</p> <p>(vi) Ensured that adequate budget is incorporated in the bill of quantities of the bidding documents.</p>	
<p>D. Climate Risk Screening Tool/Procedure Used</p> <p>Sieve-mapping or map overlays using GIS of the following:</p> <p>1) Projected change in rainfall and temperature from 16 downscaled Global Climate Models customized for the project area using Climate Wizard.</p> <p>2) Geographic data on the project area's natural hazards like past hazardous events, human and economical hazard exposure and risk from natural hazards from tropical cyclones and related storm surges, floods, landslides and tsunamis from the UN Global Assessment Report on Disaster Risk Reduction (GAR) and replace the previous PREVIEW platform already available since 2000 as provided in the UN Global Risk Data Platform.</p> <p>3) Use of thematic maps from Bangladesh Department of Disaster Management's Multi-Hazard Risk and Vulnerability Assessment, Modelling, and Mapping.</p>	

IV. CLIMATE ADAPTATION PLANS WITHIN THE PROJECT

Roads that are at risk from climate change variability and weather extremes were climate-proofed by increasing road embankment height on flood-prone areas; provision of side drains and new culverts; construction of bridges; introducing wet mix macadam; and gabion retaining walls at a cost of \$13.2 million, representing about 10% of the total civil work cost of these roads. Innovative contractual arrangements to extend the responsibility of the contractors on mandatory maintenance for a period of 5 years after road construction are piloted under the current project to address the need for more frequent maintenance and repairs exacerbated by climate change.

Climate adaptation is estimated to cost \$13.2 million. ADB will finance 75% of climate adaptation costs.

Adaptation Activity	Target Climate Risk	Estimated Adaptation Costs (\$ million)	Adaptation Finance Justification
To address climate change	Risk of flooding	13.2	A comprehensive approach to

impacts, the project has adopted climate resilience road designs to mitigate the risk of flooding, and the risk of erosion and landslides.	Risk of erosion and landslides		build climate and disaster resilience was applied during the design. The project builds on the success of ADB-supported rural road programs in India, Nepal, and Sri Lanka. To enhance operational efficiency and reduce the ensuing burden of maintaining roads, the project has adopted climate resilient designs, quality control, bioengineering approaches (such as using of plants for engineering purposes to enhance stability of the slopes), rigid pavements of reinforced concrete at submersible road sections leading to cyclone shelters, and enhanced cross and side drainage systems.
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V. CLIMATE MITIGATION PLANS WITHIN THE PROJECT

Using the ADB's Transport Emissions Evaluation Model for Projects (TEEMP), the improvement in road surface and converting the 0.8-meter earth into hard shoulder will increase lane width traffic capacity. Improvements in road surface enable vehicles to travel at higher speed while increased capacity avoids congestions both of which results to lower fuel consumption and lower carbon dioxide emissions. The projection of traffic growth on the 96 roads under the additional financing indicates that there will be an average increase in traffic from 2019 to 2032 of 92%, which is not significant.

Bangladesh RCIP-Additional Financing CO₂ Emission Intensity Indicators, with- and without project scenarios and without induced traffic

Details	CO ₂	
	Business-As-Usual	Project (without induced traffic)
ton/km	2,414.76	2,361.32
ton/year	165,556.20	161,892.44
ton/km/year	96.59	94.46
g/pkm	45.65	44.63
g/tkm	54.88	53.67