

## Climate Risk Assessment and Management Report

### I. Basic Project Information

<b>Project Title:</b> Integrated Road Investment Program – Project 1
<b>Project Budget:</b> \$235 million
<b>Location:</b> Southern Province, Sri Lanka
<b>Sector:</b> Transport (road transport)
<b>Theme:</b> Inclusive economic growth, Environmentally sustainable growth
<b>Brief Description:</b> <p>The impact of the investment program will be improved transport connectivity between rural communities and socioeconomic centers. The outcome will be enhanced road accessibility. The investment program will deliver two outputs: (i) improved road conditions between selected rural communities and socioeconomic centers, and (ii) enhanced capacity of road agencies. The investment program will comprise five projects: Project 1 is in Southern Province, Project 2 in Sabaragamuwa Province and the Kalutara District of Western Province, Project 3 in Central Province, Project 4 in North Central Province, and Project 5 in North Western Province.</p> <p>The first tranche will finance the first slice of Project 1, and deliver three outputs: (i) improved road conditions between selected rural communities and socioeconomic centers in Southern Province, and (ii) enhanced capacity of road agencies, including MOHPS, RDA and provincial and local road agencies in Southern Province, and (iii) project preparation of following tranches. About 560 km of rural access local roads and 130 km of national roads will be improved and/or maintained under Project 1.</p>

### II. Summary of Climate Risk Screening and Assessment

**1. Increased precipitation/increased intensity of precipitation flooding.** Heavy rains can cause disruption of the road networks, decreased accessibility, erosion of roads and embankments, surface water drainage problems, slope failures, landslides, among others. Increased river flow resulting from precipitation and storminess may result in damages to bridges. Bridge / culvert capacities are reduced or exceeded, causing upstream flooding to occur. Coastal areas are particularly vulnerable to flood risks due to additional risk of storm surge. All road sections along the coastline are prone to flooding. High risks are found for the sections within southern Matara. The remaining sections are prone to medium level of flood risks. Flooding occurs during the 2 rainy seasons (April-June, and September - November).

**2. Natural Hazards:** (a) Landslide Triggered by Precipitation. All roads and road sections 10km off the coastal areas within Galle and Matara, districts and road sections in western Hambantota bordering Matara are potentially susceptible to low to medium levels of landslide risk. Roads in northern and northeastern Galle and in northern and western Matara are potentially vulnerable to a medium level of risk. (b) Coastal Erosion. Coastal erosion has been identified as a major hazard in many coastal areas of Sri Lanka, particularly along the densely populated southwest coastline. There are 3 roads in Galle, 4 in Matara, and 2 in Hambantota are under low risk. (c). Tsunami. Tsunamis are infrequent in Sri Lanka but have caused severe damages, and recent understanding of the tectonics of the Indian Ocean region points to an increasing risk of earthquakes. The screening identified 4 roads in Galle, 3 roads in Matara, and 4 roads in Hambantota under low risk.

<b>A. Sensitivity of project component(s) to climate/weather conditions and sea level</b>	
<i>Project component</i> 1) The design of bridges and drainage features.  2). For coastal roads.	<i>Sensitivity to climate/weather conditions and sea level</i> 1. Consider future risks of flooding. Design Storm needs to be estimated based on projections of future climate scenarios.  2. Prone to the risks of sea level rise and coastal erosion.
<b>B. Climate Risk Screening</b>	
Risk topic  <i>Temperature (°C).</i>	Description of the risk  <i>Annual mean temperature is projected to increase by 1.760C, and the</i>

<i>Precipitation (mm).</i>	<p><i>increase is projected to be higher during the months from April to June (&gt;1.830C). Spatially, temperature rise is projected to be slightly lower in the south, and higher in the north.</i></p> <p><i>Annual precipitation is projected to increase by 5.1% or 108mm within the 3 project districts. Spatially, the districts of Galle and Matara are projected to experience &gt;110mm total annual precipitation, whereas &lt;110mm is projected for the district of Hambantota. In terms of percentage change, the eastern part of the project area (Hambantota) is projected to experience between 5 to 10% increase in annual precipitation, whereas only about 3% increase is projected for the western part (Galle and Matara) of the project area. Seasonally, monthly precipitation is projected to decrease by 5% (or 39mm) from December to April, and increase by 13.2% (147mm) from May to November i.e. precipitation pattern is projected to undergo drastic changes.</i></p>
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Climate Risk Classification: **Medium**

**C. Climate risk assessment**

1. Conduct hydrologic studies of Benthara Ganga and Gin Ganga in Galle District, and Nilwala River in Matara District.
2. Identify roads located along the coastal road that had history of flooding, erosion, and tsunami affected.
3. Compile historical data on rural roads that have suffered erosion.
4. Compile historical record of road submergence including high flood levels of all roads.
5. Review applicable national road design standards to address flooding, erosion, landslide, ground acceleration, and tsunami and ensure these are incorporated in the 1<sup>st</sup> level design.
6. Conduct transect walks and Environment checklist on all roads to identify vulnerabilities and risk and communicate with the design team.
7. During transect walk, conduct local consultations to validate findings and drawn recommendations on the road design and construction.
8. Prepare road specific environmental management plans that details road construction design and practices to address identified climate change risks.

**III. Climate Risk Management Response within the Project**

Project 1 will invest Rs389.3M to address climate change risk by increasing road embankment height on flood and tsunami prone areas, provision of side drains and new culverts, and construction of small bridges representing about 4% of the total civil work cost. Details are provided in the table below. In addition provisions have been made in the bidding documents for the contractor to prepare road specific EMP's based on the final detailed design to address a range of issues including climate related risks and vulnerabilities such as flooding, coastal erosion, and landslide.

District	Cost of Climate Adaptation Measures (in Rs million)				Total
	Increase Embankment Height	New side and lead away drains	New/ Widening Culverts	New Bridges	
Galle	18.321	18.015	11.187	1.5	49.023
Matara	47.486	16.516	82.779	0	146.781
Hambantota	47.087	0.548	140.859	5	193.494
Total	112.894	35.079	234.825	6.5	389.298