Climate Change Risk Management Options for the **Transportation Sector**

Inter-American Development Bank

Introduction

The Latin America and Caribbean (LAC) region has a long history of coping with natural hazards such as hurricanes, floods, and coastal storm surges. However, climate change is expected to exacerbate the threat of natural hazards and pose new ones. As a result of climate change, average temperatures and sea levels are known to be rising, precipitation patterns might change, and hurricanes could intensify. Many of these changes are already occurring, and are projected to become more severe in the future.

The Inter-American Development Bank (IDB) supports a wide-range of projects in the LAC region. Climate change-related risks could adversely affect the financial, economic, environmental, and social performance of current and future IDB investments in the region. This factsheet identifies climate change risks and risk management options that can be incorporated into IDB-investments for the transportation sector.

These climate change risk management measures range widely in scope, scale and time frame. It is anticipated that the user will consider the applicability of these measures and refine based on the project or region of interest. In general, it is recommended that

all projects should include disaster preparedness measures, such as measures to issue timely and effective early warnings, evacuation and safety plans, and business continuity plans. A review of the insurance scheme is also recommended as a means to minimize post disaster losses. For new projects, selecting risk management measures during the feasibility and design phase can help avoid costly retrofits and maximize resilience to climate change impacts throughout the project life.

Climate Change Risk Management Options for the Transportation Sector

Climate Change Risk Management Options	How the Option Addresses Hazard	Relative Cost	Implementation Feasibility
Hazard and Impact to Sector **Sea Level Rise** Flooding of airports, ports, and roads			
Move facilities further inland	Moves facilities out of flood zone	$$$	Difficult to implement; requires social and political will and could result in adverse impacts
Install barriers to route floodwaters away from facilities	Protects facilities from floodwaters	$$	Moderately easy to implement; could result in adverse impacts
Elevate key facilities using new land or by raising level	Move roads, bridges, above expected sea level	$$$	Moderately easy to difficult to implement, depending on site conditions
Develop alternative critical transportation paths	Provides resilience for events that occur infrequently (such as very high tides)	$	Moderately easy to implement; could result in adverse impacts
Hazard and Impact to Sector **Storm Surge** Flooding of airports, ports, and roads			
Use modular sea walls and flood walls along streets	Routes floodwater away from facilities	$$$	Moderately difficult to implement; could require social and political will and could result in adverse impacts
Install pumping systems for low areas and underpasses	Reduces flooding	$$	Easy to implement
Enhance building codes to increase setback distances	Reduces flooding	$	Ranges from easy to difficult to implement depending on scale; could require political will and new legal authority for community level changes
Install tide gates to prevent combination of high tide and runoff	Reduces potential flooding	$$$	Moderately easy to difficult to implement; could result in adverse impacts
Hazard and Impact to Sector **Hurricane Winds** Damage by wind			
Improve building codes to handle higher wind gusts	Prevents structural damage	$$	Ranges from easy to difficult to implement depending on scale; could require political will and new legal authority for community level changes

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Install back-up generators to maintain pumping systems and other critical facilities	Prevents loss of ability to pump water, communication, and other critical operations	$	Easy to implement
Hazard and Impact to Sector **Flooding** Damage to facilities, such as roads, bridges, bridge piers, and culverts from high flows and sediment transport; possible roadway erosion through undermining			
Improve levees along major rivers	Reduces flooding of roads near rivers	$$	Ranges from moderately easy to difficult to implement depending on the size of the levee
Upgrade pumping systems to handle higher runoff for low areas and underpasses	Reduces impact of flooding	$$	Easy to implement
Install walls to route floodwaters away from facilities	Prevents flooding	$$$	Moderately easy to difficult to implement; could result in adverse impacts
Enhance infiltration systems such as using porous pavement or bioretention ponds	Reduces flooding	$$	Moderately easy to difficult to implement; requires capacity (maintenance)
Install raised roads with rock-filled drainage ditches along the sides to increase infiltration	Reduces flooding of roads	$$	Easy to implement
Armor bridge piers and culverts	Reduces impacts of floods and high sediment loads	$$$	Easy to implement
Hazard and Impact to Sector **Drought** Damage to landscaping			
Install or modify irrigation system	Protects health of vegetation	$	Easy to moderately easy to implement, depending on site conditions
Hazard and Impact to Sector **Extreme Temperatures** Damage to pavement by buckling or asphalt softening			
Increase maintenance for pavement surface	Covers spots where asphalt melted	$–$$	Easy to implement
Install concrete pavement to avoid problems with asphalt	Reduces holes in pavement	$$	Easy to implement

Table Guide

The relative costs and implementation feasibility are indicated for each option based on the professional judgment of the authors, and only to be taken as an ***approximate starting point*** for additional analysis. The costs have been broadly categorized into four levels (identified as **$** to **$$$$**) with the following general meaning:

$ = Relatively straightforward to implement, either simple changes on the ground or adoption of new regulations/guidelines etc.

$$ = Relatively small scale projects on the ground that can be implemented with modest design and planning requirements.

$$$ = Intermediate scale efforts, more spatially extensive, and or requiring more engineering design, scientific development, and or planning/institutional changes than in the above two categories.

$$$$ = Major new infrastructure development with significant new design, planning and permitting requirements.

The relative degree of difficulty is indicated for each option using the following four broad categories (difficult, moderately difficult, moderately easy, and easy) with the following general meaning:

Easy = Relatively straightforward to implement, provides long-term benefits, has no adverse secondary impacts.

Moderately easy = Minimal demands on capacity (staffing, funding, and maintenance capabilities), option is not expected to result in significant social or environmental impacts.

Moderately difficult = Intermediate scale efforts required to implement; option could require further assessment of environmental and social impacts, additional regulatory requirements, or capacity and technical expertise.

Difficult = Major effort would be needed to implement; option could result in adverse environment/social impacts, or could require significant expenditures, capacity, technical expertise, political will, or legal authority.

Other fact sheets in this series include climate change risk management options for the:

- Agriculture Sector
- Energy Sector
- Tourism Sector
- Water and Sanitation Sector
- Urban Infrastructure Sector

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For more information

IDB Environmental Safeguards Unit has mandated a more in-depth document to accompany this factsheet. To obtain a copy, or for more information on IDB Environmental Safeguards Unit's climate change risk assessment process, contact Hilary Hoagland-Grey, Lead Environmental Protection Specialist, at hilaryhg@iadb.org.