Climate Change Risk Management Options for the **Energy 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 energy 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.

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Climate Change Risk Management Options	How the Option Addresses Hazard	Relative Cost	Implementation Feasibility
Hazard and Impact to Sector **Sea Level Rise**	Facilities, e.g. ports and refineries, flooded and not accessible		
Install seawalls to prevent inundation in areas that are more vulnerable to flooding/storm surge because of rising sea level	Protects facilities	$$$ depending on size	Ranges from moderately easy to difficult depending on the size of the seawall, could result in adverse impacts
Install movable docks to accommodate variable sea levels	Maintains ability to transfer products	$$$	Moderately easy to difficult to implement, depending on capacity of proponent
Update facility master plans to retreat from areas at risk of sea level rise and storm surge	Careful planning prevents creation of new assets in areas of higher risk	$	Easy to moderately easy to implement in pre-construction phases
Elevate energy and transport infrastructure, such as roadways, railways, pipelines, transmission lines	Protects ability to transfer products/ access to facilities	$$$	Moderately easy to difficult to implement, depending on site conditions
Hazard and Impact to Sector **Storm Surge**	Damage to operations, and long-term damage to facilities from flooding		
Install hardscape along levees or soft/green vegetation as buffer zone to prevent flooding	Protects facilities	$$$ depending on size	Moderately easy to difficult to implement, requires capacity (maintenance)
Have emergency back-up pumping system	Provides the ability to dewater flooded areas following a storm surge event	$$	Easy to implement
Move critical facilities to higher ground; elevate roadways/railways	Reduces flooding	$$$	Moderately easy to difficult to implement, depending on site conditions
Install tide gate if on coastal river	Reduces tidal inflow	$$$$	Moderately difficult to difficult to implement; requires technical expertise and could result in adverse impacts
Install barriers to route floodwaters away from facilities	Reduces flooding	$$	Moderately easy to implement; could result in adverse impacts
Hazard and Impact to Sector **Hurricane Winds**	Damage to buildings and exposed infrastructure by wind and flooding		
Update building codes for appropriate hurricane risk categories in relevant region	Provides a higher standard for future design	$$	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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Develop plans to identify weaknesses and protect existing infrastructure during hurricane (Continuity of Operations Planning)	Improves preparedness and attempts to limit damage during an event	$	Moderately easy to implement; requires capacity
Add wind breaks along shore, such as vegetation or creating islands	Reduces impacts of hurricane wind	$–$$	Moderately easy to implement; could result in adverse impacts
Hazard and Impact to Sector **Flooding**	Damage to buildings and subsurface facilities by flooding		
Install barriers to route floodwaters away from facilities	Reduces flooding	$$	Moderately easy to implement; could result in adverse impacts
Have emergency back-up pumping system	Reduces flooding	$$	Easy to implement
Create a system of locks and barriers to prevent water intrusion into subsurface infrastructure	Limits damage to cables, transformers and related subsurface infrastructure	$$$	Moderately easy to difficult to implement; could result in adverse impacts
Move critical facilities to higher ground	Protects critical facilities	$$$	Moderately difficult to difficult to implement, depending on site conditions
Hazard and Impact to Sector **Drought**	Reduced water for processing and cooling uses		
Shift to dry cooling system for existing thermoelectric infrastructure	Eliminates water used for cooling process of power plants	$$$	Moderately difficult to difficult to implement; requires technical expertise
Shift to renewable energy technologies such a solar photovoltaic and wind that require nearly no water	Removes processes that require water	$ (Many renewable energy technologies are cost competitive)	Moderately difficult to difficult to implement; depends on size of installation and state grid; integration in electricity system has to be secured
Implement water recycling systems for municipal and industrial wastewater streams, such that these can be used as a source of cooling water	Reduces need for freshwater	$–$$	Depends on site setting and availability of wastewater streams
Implement water conservation and recycling programs	Reduces need for freshwater	$-$$	Ranges from easy to difficult to implement; requires social and political will
Hazard and Impact to Sector **Extreme Temperatures**	Less efficient cooling for power systems, reduced power production		
Check efficiency of cooling system for power and air conditioning in buildings	Increases worker comfort and increases plant efficiency	$$	Moderately easy to implement
Update design criteria for critical infrastructure to operate safely under higher temperatures	Allows for sustained operation during critical periods	$$	Moderately easy to implement
Install Cool Roofs with reflective materials	Reduces energy requirements for cooling	$	Moderately difficult to implement; requires technical expertise, capacity

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
- Tourism Sector
- Water and Sanitation Sector
- Urban Infrastructure Sector
- Transportation 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.