

Online Annex 6. On Economic Losses from Slow-Onset Climate Events in Latin America and the Caribbean¹

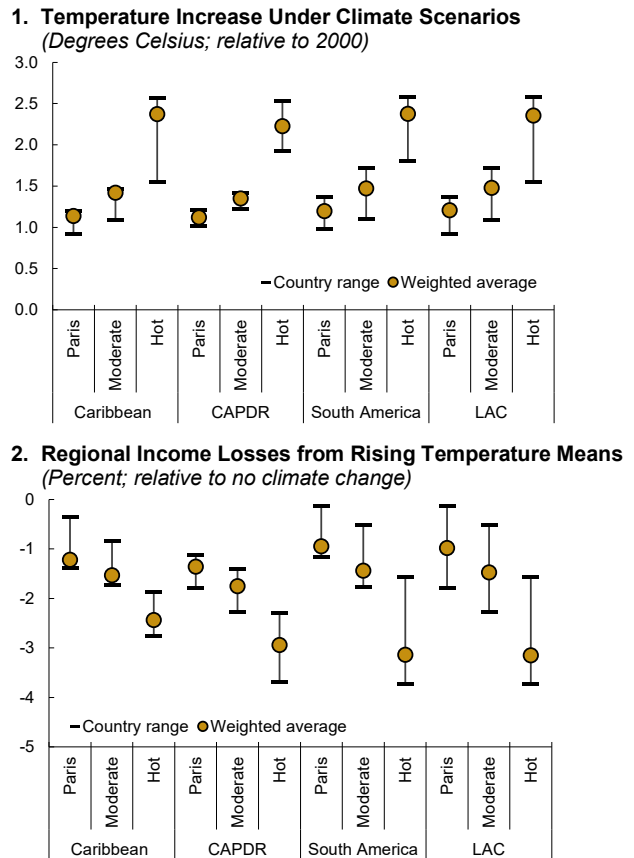
Climate change is expected to impact Latin America and the Caribbean (LAC) by raising temperatures and altering precipitation patterns, leading to permanently lower incomes. If greenhouse gas (GHG) emissions accelerate and adaptation falls short, per capita income losses could reach 9 percent by 2050 and 21 percent by 2100. Adaptation policies can play an important role in reducing these losses.

The average temperature in LAC increased by about 0.4 degrees Celsius (°C) in the second half of the 20th century, although with marked differences across countries. The rise in temperature in CAPDR countries ranges from +0.3°C to +0.7°C, with an area-weighted average of +0.6°C. In the Caribbean, temperatures rose by +0.4°C, ranging between +0.3°C and +0.8°C across countries. Similarly, South America’s average temperature rose by +0.4°C, although some countries avoided significant warming as individual changes ranged from -0.1°C and +0.6°C.

Rising temperatures have already had a wide array of effects across the region. According to the Intergovernmental Panel on Climate Change (2022), global warming has altered precipitation patterns and intensified droughts, especially in CAPDR’s Dry Corridor and the tropical Andes. In the Caribbean, CAPDR, and the eastern coast of Mexico, climate change has intensified storm surges and tropical cyclones. Additionally, it has disrupted plankton communities and reduced coral abundance and density in the Caribbean Sea and the Gulf of Mexico, affecting underwater food web structures. Andean glaciers, important long-term water resources, have lost over 30 percent of their area. Rising temperatures have also increased the incidence of dengue fever in Peru, Mexico, and Brazil and have contributed to sea level rise.

Climate models project that temperatures will rise further, exacerbating the impact seen so far (Online Annex Figure 6.1, panel 1). By 2050, temperatures are projected to be 1.2°C higher than at the end of the last century even if the Paris agreement goals are met (‘Paris’ scenario). Temperatures increases could reach 1.5°C under present trends (‘Moderate’ scenario) and 2.4°C under an accelerated GHG emission scenario (‘Hot’ scenario). These temperature increases would intensify already visible effects and bring new ones, including exacerbating the effects of El Niño on the region (IMF 2023). Overall, climate change could hinder economic growth by reducing labor productivity, amplifying infrastructure damage, and reducing crops and fishery yields.² Losses under

Online Annex Figure 6.1. Climate Trends and Expected Economic Losses by 2050



¹ Prepared by Zamid Aligishiev, Ilya Stepanov, and Damaris Garza Escamilla.

² Some areas in LAC may experience enhanced catch and higher production of certain crops due to climate change.

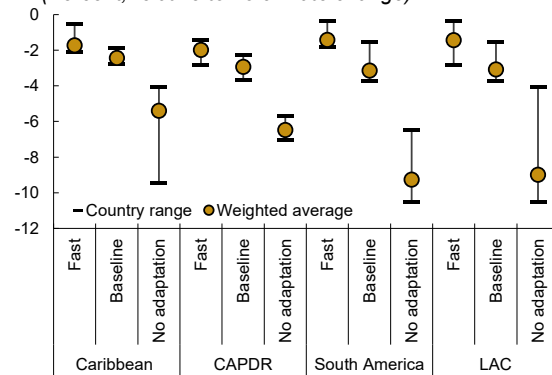
various climate change scenarios can be estimated using the empirical model of Mohaddes and Raissi (2024),³ which links income losses to temperature anomalies, allowing to distinguish between the impact from long-term shifts in temperature means (upward temperature trend) and from weather variability (interannual and interdecadal climate fluctuations).

Economic losses are expected to be commensurate with future GHG emissions, continue rising throughout the century if Paris agreement goals are not met (Online Annex Figure 6.1, panel 2). Focusing on the impact of long-term shifts in temperature means, average per capita GDP loss in LAC would amount to 1 percent by 2050 if Paris agreement goals are met. These losses could increase to 1½ percent if emissions continue to rise according to present trends, and 3⅓ percent if GHG emissions accelerate. Unless net zero is achieved globally in the next few decades, average income losses from climate change in LAC will also rise over time, to 2½–7 percent by 2100 ('Moderate' and 'Hot' scenarios). These estimates of impact from slow-onset climate events do not account for extreme climate shocks, which place the heaviest burden on countries in the Caribbean and CAPDR (IMF 2021). Moreover, these projections likely underestimate economic losses, as they assume that all countries in the region demonstrate steady progress with adaptation to climate change throughout the 21st century.

Adaptation policies will be key to limit economic losses (Online Annex Figure 6.1, panel 3). Without significant adaptation efforts, average income losses in LAC under accelerated GHG emissions could rise to 9 percent of per capita GDP by 2050 and 21 percent by 2100, comparing to a baseline of 3⅓ and 7 percent, respectively. Rapid adaptation, on the other hand, could contain these losses to just 1½ percent of per capita GDP by 2050 and 2½ percent by 2100.⁴ This underscores the importance of public investment in adaptation, as well as policies to close climate finance gaps and improve territorial planning. The recent IMF book, "[Climate Change Challenges and Opportunities in Latin America and the Caribbean,](#)" provides an in-depth analysis of the returns on adaptation policies in LAC. Countries with higher poverty, weaker infrastructure, and limited financial resources are likely to have less adaptive capacity and, thus, likely to face larger economic losses.

Online Annex Figure 6.1. (continued)

3. 'Hot' Scenario: Income Losses and the Pace of Adaptation (Percent; relative to no climate change)



Sources: FADCP Climate Dataset (Massetti and Tagkzis 2023), using CRU data (Harris and others 2020) and CMIP6 data; and Mohaddes and Raissi (2024).

Note: Temperature changes are based on 30-year running means to capture long-run climate normals. 'Paris' (SSP1-2.6) scenario is in line with the Paris goal to keep global mean temperature increase below 2 °C with respect to pre-industrial times. 'Moderate' (SSP2-4.5) represents the continuation of present trends. 'Hot' scenario uses the 90th percentile of the SSP3-7.0 ensemble of model projections to provide a high-emission, fast-warming, pessimistic case; CO2 emissions approximately double by 2100 under this scenario. The baseline scenario assumes that adaptation to an increment of global warming takes 30 years, while the fast adaptation scenario assumes a 10-year period. Regional temperature averages are weighted by country area, and regional GDP losses are weighted by GDP at purchasing-power-parity (PPP). Due to data limitations, the Caribbean group only includes The Bahamas, Belize, Guyana, Haiti, and Jamaica. CAPDR = Central America, Panama, and the Dominican Republic; LAC = Latin America and the Caribbean.

³ Estimates should be viewed cautiously, especially for distant horizons and extreme scenarios, as income losses based on Mohaddes and Raissi (2024) do not account for potential non-linearities related to tipping points and assume the past average relationship between economic growth and temperature anomalies will hold in the future. These income losses also likely underestimate the future impact of sea level rise on small island states in the LAC region.

⁴ Mohaddes and Raissi (2024) model adaptation by varying the period used to calculate a temperature norm—a moving average temperature profile against which anomalies are calculated. Shorter periods imply faster adaptation.

References

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