Regional Programme on Climate Change Statistics and Indicators

Sixth Meeting of the Expert Group on Environment Statistics
Session Three: Climate Change Statistics – Wednesday 22nd 2019

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1 CC statistics and indicators

Emissions
Concentrations
Evidence of CC occurrence
Mitigation
Adaptation
“The Latin American and Caribbean region is in an asymmetrical position in relation to climate change. The region has made a historically small contribution to climate change yet it is highly vulnerable to its effects and will, moreover, be involved in the possible solutions in several ways.” (ECLAC, 2014)
Atmospheric CO$_2$ levels higher than any point since evolution of humans – May 2019

Correspondence between temperature increase (blue) and atmospheric CO$_2$ concentration (white), 1880 – 2016.

<table>
<thead>
<tr>
<th>Temperature Anomaly</th>
<th>CO$_2$ Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2°C</td>
<td>420 PPM</td>
</tr>
<tr>
<td>1.0°C</td>
<td></td>
</tr>
<tr>
<td>0.8°C</td>
<td></td>
</tr>
<tr>
<td>0.6°C</td>
<td></td>
</tr>
<tr>
<td>0.4°C</td>
<td></td>
</tr>
<tr>
<td>0.2°C</td>
<td></td>
</tr>
<tr>
<td>0.0°C</td>
<td></td>
</tr>
<tr>
<td>-0.2°C</td>
<td></td>
</tr>
</tbody>
</table>

1880 2016

Mauna Loa Observatory reported an atmospheric CO$_2$ concentration of over 415.70 parts per million (PPM), far higher than any point in the last 800,000 years.

LAC region: GHG emissions by sector, 1990-2014
(en millones de toneladas de CO2 equivalente (MtCO2eq)

Fuente: Cepal, basado en el Instituto de Recursos Mundiales (WRI), Climate Analysis Indicator Tool [en línea] http://cait.wri.org
LAC region: Energy intensity of regional GDP

Total energy consumption (thousands of barrels of oil equivalent) per millions of dollars of GDP (constant 2010 US$)

LAC: Carbon intensity of GDP (tCO2 / Million $ PIB)
LAC: Material and energy intensity 2000-2015

LAC share of renewable in primary energy supply, 2016

Source: ECLAC, based on OLADE, Sistema de Información Económica Energética (SIEE) [en línea] http://sier.olade.org
Climate change regional patterns

Variation of average temperature in the southern summer months for the year 2100 compared to baseline (1951-1980) under climate change two scenarios of climate change (° Celsius)

Climate change regional patterns

Variation of the area affected by extreme temperatures in the southern summer months for the year 2100 compared to the baseline (1951-1980) under two scenarios of climate change (Percentage)

Climate change regional patterns

Percentage change in annual precipitation for the year 2100 compared to the baseline (1951-1980) under two scenarios of climate change

(Percentage)

LAC temperature variation, subregions

Variación de Temperatura Media

Source: FAO, based on GISTEMP data, the Global Surface Temperature Change data, distributed by the National Aeronautics and Space Administration Goddard Institute for Space Studies (NASA-GISS) [online] http://www.fao.org/faostat/en/#data/ET
LAC: Permanent snow and glaciers area (in square kilometres)

Regional impacts that are already taking place
## Likely regional impacts

### Potential impacts and risks associated with climate change in Latin America

<table>
<thead>
<tr>
<th>Impacts</th>
<th>Key risks</th>
<th>Climatic factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>Decreases in food production and quality, lower revenues and rising prices</td>
<td>Temperature extremes, Precipitation extremes, CO₂ concentration, Precipitation</td>
</tr>
<tr>
<td>Water</td>
<td>Water supply in semi-arid and glacier-melt-dependent regions; flooding in urban areas associated with extreme precipitation</td>
<td>Upward trend in temperature, Increased droughts, Snow cover</td>
</tr>
<tr>
<td>Biodiversity and forests</td>
<td>Land-use changes, disappearance of forests, coral reef bleaching, loss of biodiversity and ecosystem services</td>
<td>Increased deforestation, CO₂ concentration, Upward trend in temperature, Acidification of the oceans</td>
</tr>
<tr>
<td>Health</td>
<td>Spread of vector-borne diseases to other altitudes and latitudes</td>
<td>Upward trend in temperature, Temperature extremes, Precipitation extremes, Precipitation</td>
</tr>
<tr>
<td>Tourism</td>
<td>Loss of infrastructure, rising sea levels, extreme events in coastal areas</td>
<td>Rising sea levels, Temperature extremes, Precipitation extremes and flooding</td>
</tr>
<tr>
<td>Poverty</td>
<td>Reductions in the incomes of vulnerable groups, especially in the agricultural sector; increased income inequality</td>
<td>Temperature extremes, Increased droughts, Precipitation</td>
</tr>
</tbody>
</table>

Likely regional impacts: Mean Sea Levels, 2010-2040 and 2040-2071 (millimetres per year)

## Likely regional impacts: Agriculture

### Key risks

Decreases in food production and quality, lower revenues and rising prices

### Climatic factors

- Extremes temperature and precipitation
- CO2 concentration

### Marginal impacts of climate change on agriculture

<table>
<thead>
<tr>
<th>Countries and authors</th>
<th>Farms</th>
<th>Temperature</th>
<th>Precipitation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Marginal/Elasticity</td>
<td>Marginal/Elasticity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(ha/°C)</td>
<td>(ha/mm/month)</td>
</tr>
<tr>
<td><strong>Argentina (Lozano and Cap, 2006)</strong></td>
<td>Family farms</td>
<td>1.638/0.64</td>
<td>-184/-1.04</td>
</tr>
<tr>
<td></td>
<td>Commercial agriculture</td>
<td>1.364/1.43</td>
<td>-136.8/-1.82</td>
</tr>
<tr>
<td><strong>Brazil (Mendelsohn and others, 2007)</strong></td>
<td>Agriculture (i)</td>
<td>-0.97/2.32</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Agriculture (ii)</td>
<td>-0.31/0.03</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Agriculture (iii)</td>
<td>-0.18/0.01</td>
<td></td>
</tr>
<tr>
<td><strong>Argentina, Bolivarian Republic of Venezuela, Brazil, Chile, Colombia, Ecuador and Uruguay (Seo and Mendelsohn, 2008a)</strong></td>
<td>Agriculture</td>
<td>-0.7/0.53</td>
<td>-49.9/-2.16</td>
</tr>
<tr>
<td></td>
<td>Livestock</td>
<td>-1.17/2.47</td>
<td>-1.9/-0.15</td>
</tr>
<tr>
<td></td>
<td>Mixed farms</td>
<td>0.88/-0.99</td>
<td>-34.6/-2.32</td>
</tr>
<tr>
<td></td>
<td>Total sample</td>
<td>-0.7/0.68</td>
<td>-22.5/-1.22</td>
</tr>
<tr>
<td></td>
<td>Expectation</td>
<td>-0.9/0.85</td>
<td>-35.2/-1.91</td>
</tr>
<tr>
<td><strong>Argentina, Bolivarian Republic of Venezuela, Brazil, Chile, Colombia, Ecuador and Uruguay (Seo and Mendelsohn, 2008b)</strong></td>
<td>Family farms</td>
<td>-22.1/1.61</td>
<td>-3.1/-0.13</td>
</tr>
<tr>
<td></td>
<td>Commercial agriculture</td>
<td>-14.4/1.51</td>
<td>-52.6/-3.31</td>
</tr>
<tr>
<td></td>
<td>Dry farming</td>
<td>-14.3/1.46</td>
<td>-39.9/-2.42</td>
</tr>
<tr>
<td></td>
<td>Irrigated farming</td>
<td>-40.8/2.63</td>
<td>36.7/1.29</td>
</tr>
<tr>
<td></td>
<td>Total sample</td>
<td>17.5/1.55</td>
<td>-30.3/-1.60</td>
</tr>
<tr>
<td><strong>Argentina, Bolivarian Republic of Venezuela, Brazil, Chile, Colombia, Ecuador and Uruguay (Mendelsohn, 2009)</strong></td>
<td>Family farms</td>
<td>-1.55/14</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Family farms (unirrigated)</td>
<td>-1.01/55</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Family farms (irrigated)</td>
<td>-1.98/-1.25</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Commercial agriculture</td>
<td>-1.57/45</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Commercial agriculture (dry farming)</td>
<td>-1.70/35</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Commercial agriculture (irrigated)</td>
<td>-1.17/253</td>
<td></td>
</tr>
</tbody>
</table>
## Likely regional impacts: Water

<table>
<thead>
<tr>
<th>Key risks</th>
<th>Climatic factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water supply in semi-arid and glacier-melt-dependent regions; flooding in urban areas associated with extreme precipitation</td>
<td>• Upward trend in temperature</td>
</tr>
<tr>
<td></td>
<td>• Increased droughts</td>
</tr>
<tr>
<td></td>
<td>• Snow cover</td>
</tr>
</tbody>
</table>

**Rapid retreat of glaciers in the Cordillera Blanca, Peru**

The Cordillera Blanca glacier cover has decreased by over 15% since the 1970s.

Sources: Peru National Communication to the UNFCCC, 2001; UNEP/GRID-Arendal
Source Needs Checking

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**Climate change: scenarios of water demand impacts**

- ***Baseline scenario***
- ***Climate change scenario***

**Graph**:

- X-axis: Time
- Y-axis: Water demand

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**Legend**:

- **Today**
- **1948**
- **1970**
- **1981**
- **1996**
## Likely regional impacts: Biodiversity and forests

Key risks

| Land-use changes, disappearance of forests, coral reef bleaching, loss of biodiversity and of ecosystem services |

Climatic factors

- Increased deforestation
- CO2 concentration
- Upward trend in temperature
- Acidification of the oceans

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## Likely regional impacts: Health

<table>
<thead>
<tr>
<th>Key risks</th>
<th>Climatic factors</th>
</tr>
</thead>
</table>
| Spread of vector-borne diseases (i.e. dengue fever, zika) to other altitudes and latitudes | • Upward trend in temperature  
• Temperature extremes  
• Precipitation extremes |

### Dengue fever incidence

**Trinidad and Tobago**

- [Graph showing reported cases of dengue fever from 1981 to 2001](image)

*High temperatures and El Niño events (El Nino +1)*

*Source: Source Needed*
## Likely regional impacts: Tourism

### Key risks

- Loss of infrastructure, rising sea levels, extreme events in coastal areas

### Climatic factors

- Rising sea levels
- Temperature extremes
- Precipitation extremes and flooding

### Sea level rise:

Costa Rica coastal communities under threat

- + 100 cm rise
- + 30 cm rise

A. Coastal impacts

- >2-3 mm/yr in extreme flooding

Generalized beach erosion due to SLR from 0.16 to 0.3 m/yr

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**Source:** Costa Rica National Communication to the UNFCCC


**Generalized beach erosion due to SLR from 0.16 to 0.3 m/yr**
## Likely regional impacts: Poverty

### Key risks

- Reductions in the incomes of vulnerable groups, especially in the agricultural sector; increased income inequality

### Climatic factors

- Temperature extremes
- Increased droughts
- Precipitation

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**Figure A:** Up to 720 million people are at risk of facing extreme poverty from climate impacts between 2030 and 2050

Authors' calculations based on data from multiple sources (see section 3.2.b for citations and method)

Opaque bars show main estimates; transparent bars show highly conservative estimates.

Source: Overseas Development Institute, Zero emissions, zero poverty, 2015
The economic cost of climate change

• Estimated cost of climate change in 2100 = 137% of 2007 GDP of Latin America and the Caribbean (ECLAC)

• Heterogeneous region:
  • Temperate countries -> loss equivalent to about 1% of the GDP between 2010 and 2100
  • Much higher cost in the Andean countries, Central America and the Caribbean.

• Despite being the second region of the world that least emits greenhouse gases (GHGs), the Latin America and Caribbean region faces:
  • Significant risks of loss in the agricultural sector, in biodiversity: e.g. depending on the countries, degraded lands would range between 22% and 62% of the territory by 2100.
  • Strong pressures on the infrastructure of the region.

The economic cost of climate change in LAC

Regional estimate for a 2.5 °C increase (c2050): -1.5% to -5% of current GDP

Impacts of climate change on the Latin American and Caribbean region assuming a 2.5°C temperature increase, second half of the twenty-first century

(Percentages of regional GDP)

- IDB/ECLAC/WWF (2013)
- AD-WITCH Model (Bosetti and others, 2009)
- ICES Model (Bosello and others, 2009)
- Mendelsohn and others (2000)
- Nordhaus and Boyer (2000)
- Pierce and others (1996)
- Tol (Fankhauser and Tol, 1996)

Note: Estimates are highly uncertain, conservative, limited to certain sectors and regions and have various methodological limitations (difficulty of incorporating adaptation processes and potential effects of extreme weather events, Stern, 2013).

Economic cost of climate change: SIDS

Total cumulative costs of damage from natural disasters from 1990 to 2013 and as percentage of cumulative GDP

Sources: World Bank and EM-DAT
The economic cost of climate change

<table>
<thead>
<tr>
<th>URBAN AGGLOMERATION</th>
<th>20 CM SEA-LEVEL RISE AND SUBSIDENCE (NO ADAPTATION)</th>
<th>40 CM SEA-LEVEL RISE AND SUBSIDENCE (NO ADAPTATION)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MEAN ANNUAL LOSS (M$)</td>
<td>MEAN INCREASE DUE TO SLR AND SUBSIDENCE COMPARED TO CURRENT LOSSES</td>
</tr>
<tr>
<td>La Habana (Cuba)</td>
<td>9</td>
<td>5939%</td>
</tr>
<tr>
<td>Port-au-Prince (Haiti)</td>
<td>8</td>
<td>1090%</td>
</tr>
<tr>
<td>San Juan (Puerto Rico)</td>
<td>1,680</td>
<td>2386%</td>
</tr>
<tr>
<td>Santo Domingo (Dominican Republic)</td>
<td>283</td>
<td>1186%</td>
</tr>
<tr>
<td>Bahía Santísta (Brazil)</td>
<td>274</td>
<td>3041%</td>
</tr>
<tr>
<td>Barranquilla (Colombia)</td>
<td>87</td>
<td>1782%</td>
</tr>
<tr>
<td>Belém (Brazil)</td>
<td>90</td>
<td>898%</td>
</tr>
<tr>
<td>Buenos Aires (Argentina)</td>
<td>181</td>
<td>253%</td>
</tr>
<tr>
<td>Panama City (Panama)</td>
<td>431</td>
<td>915%</td>
</tr>
<tr>
<td>Fortaleza (Brazil)</td>
<td>52</td>
<td>2023%</td>
</tr>
<tr>
<td>Grande Vitória (Brazil)</td>
<td>2,843</td>
<td>1299%</td>
</tr>
<tr>
<td>Guayaquil (Ecuador)</td>
<td>31,288</td>
<td>1012%</td>
</tr>
<tr>
<td>Lima (Peru)</td>
<td>39</td>
<td>1009%</td>
</tr>
<tr>
<td>Maceló (Brazil)</td>
<td>54</td>
<td>387%</td>
</tr>
<tr>
<td>Maracalá (Venezuela)</td>
<td>87</td>
<td>1088%</td>
</tr>
<tr>
<td>Montevideo (Uruguay)</td>
<td>50</td>
<td>258%</td>
</tr>
<tr>
<td>Natal (Brazil)</td>
<td>150</td>
<td>1003%</td>
</tr>
<tr>
<td>Porto Alegro (Brazil)</td>
<td>71</td>
<td>541%</td>
</tr>
<tr>
<td>Recife (Brazil)</td>
<td>259</td>
<td>1279%</td>
</tr>
<tr>
<td>Rio de Janeiro (Brazil)</td>
<td>411</td>
<td>1088%</td>
</tr>
<tr>
<td>Salvador (Brazil)</td>
<td>245</td>
<td>4903%</td>
</tr>
<tr>
<td>San José (Costa Rica)</td>
<td>10</td>
<td>551%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>27,688.8</strong></td>
<td><strong>6164.4</strong></td>
</tr>
</tbody>
</table>


Projected economic losses due to sea level rise under two different scenarios of sea level rise by 2050
Demands for regionally relevant climate change-related metrics and work program
Increased Demand for Climate Change-related Statistics

- Climate change poses considerable challenges to statistical metrics, both for Member-States and UN entities.
- The statistical community faces a growing demand for statistics and data from various stakeholders:

  **National Climate Change Public Policies**
  - Emissions, Impact, Adaptation, Mitigation.
  - Need to develop and strengthen capacities to statistically describe climate change
  - Nationally Determined Contributions (NDCs)

  **Sustainable Development Goals**
  - Goal 13: Take urgent action to combat climate change and its effects.
  - 5 targets will be monitored through indicators that require statistics for their measurement.

  **Paris Agreement**
  - Reduction of emissions
  - Temperature increase under 2 °C (compared to the pre-industrial era)
  - Mobilize resources for adaptation
  - Towards less carbon-intensive economies
Climate change data demands in LAC

Current situation

• The demand for climate change-related data, especially regarding environmental aspects, is greater than supply.

• The gap is broader in developing and less developed countries, because they face scarcity of resources, limited technical capacities, institutional weakness and lack of coordination in national institutions.

• Most of the climate change literature focuses on analytical and political aspects and very little on statistics.

• Statistical guidance is mostly available for one topic, i.e. GHG emissions estimation.

• The development of methodologies in other relevant aspects of climate change, such as evidence and impacts, occurrence of disasters and adaptation efforts, has increased.
Regional consultation about climate change-related statistics

• Meeting of Regional Experts on Environmental Statistics (ECLAC, Santiago de Chile, September 5-7, 2017)

15 regional experts with a vast experience in environmental statistics and indicators

Joint United Nations Expertise (3 ECLAC Divisions, UN-Environment)
Regional experts recommendation: Strong support to build a regional programme on climate change-related indicators

Objectives of the environmental and climate change-related indicators programme:

– Technical support to develop regional harmonized methodologies on environmental and climate change-related indicators
  • Assess the feasibility of developing highly relevant climate change-related indicators to better monitor the SDGs

– Institutional support to environmental and climate change-related statistics:
  • Creating and launching a Regional Network of Experts on climate change indicators
  • Incorporate the geospatial community to the community of practice

Core cross-cutting outcome: Capacity building on climate change-related indicators

- Develop a blended training program with online modules for introductory level and in-person workshops for advanced level
- Leveraging the heterogeneous capacities of LAC countries through South-South cooperation
Recommendations: towards a regional programme on climate change-related statistics

— ECLAC

- Producing regional CC indicators, focusing on impact and adaptation (region and subregion)
- Building a list of regionally relevant indicators for climate change reporting (keeping in mind the UNECE list)
- Focusing on occurrence and impact of disasters, environmental health, impact on agriculture and tourism, loss of mangroves and coral bleaching
- Fund raising for a first 3 to 4-year regional program
- Some countries have already expressed their interest to be considered as pilot countries (Brazil, Colombia, El Salvador, Mexico)

— Member-States: ECLAC and Regional Experts will support national production of climate change statistics

- Assess data availability on climate change to build on the existing
- Develop CC indicators starting with the most relevant issues for the region (i.e. disasters, agriculture, tourism and adaptation)
Regional work program on Climate Change stats

Working with countries and experts to Produce Regional framework for CC and disaster statistics and indicators
  – Adapting the list of CC indicators
  – Producing projections on CC indicators

Main challenges
• Developing mitigation statistics other than renewables, electromobility, etc)
• Developing indicators to relate natural resource use with climate change and development
• Developing adaptation indicators as they are spatially specific (potential collaboration with UBA Germany)
Thank you

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http://www.cepal.org/es/temas/estadisticas-ambientales