Sixth Meeting of the Expert Group
on Environment Statistics
New York, 21-23 May 2019

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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División de Estadísticas, Comisión Económica para A. Latina y el Caribe

Naciones Unidas

CEPAL

United Nations

ECLAC

1 CC statisticss and indicators

Emissions

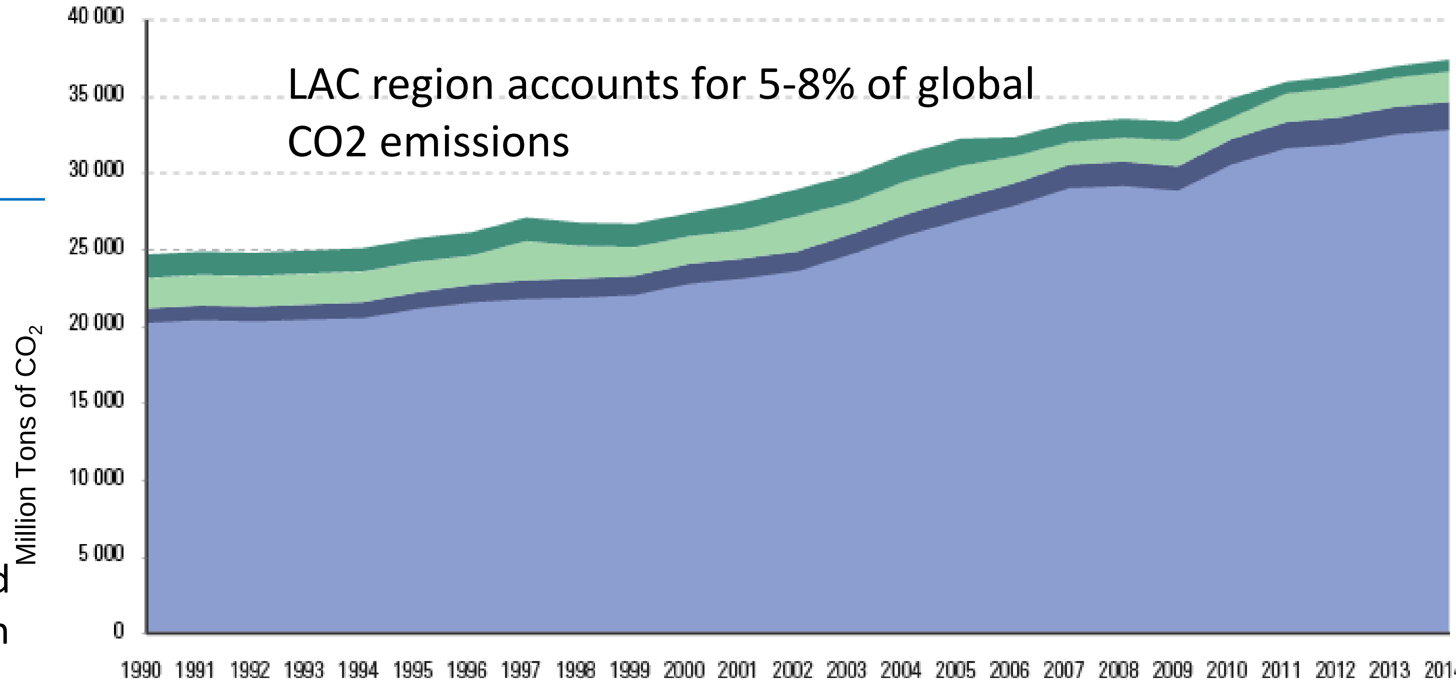
Concentrations

Evidence of CC ocurrence

Mitigation

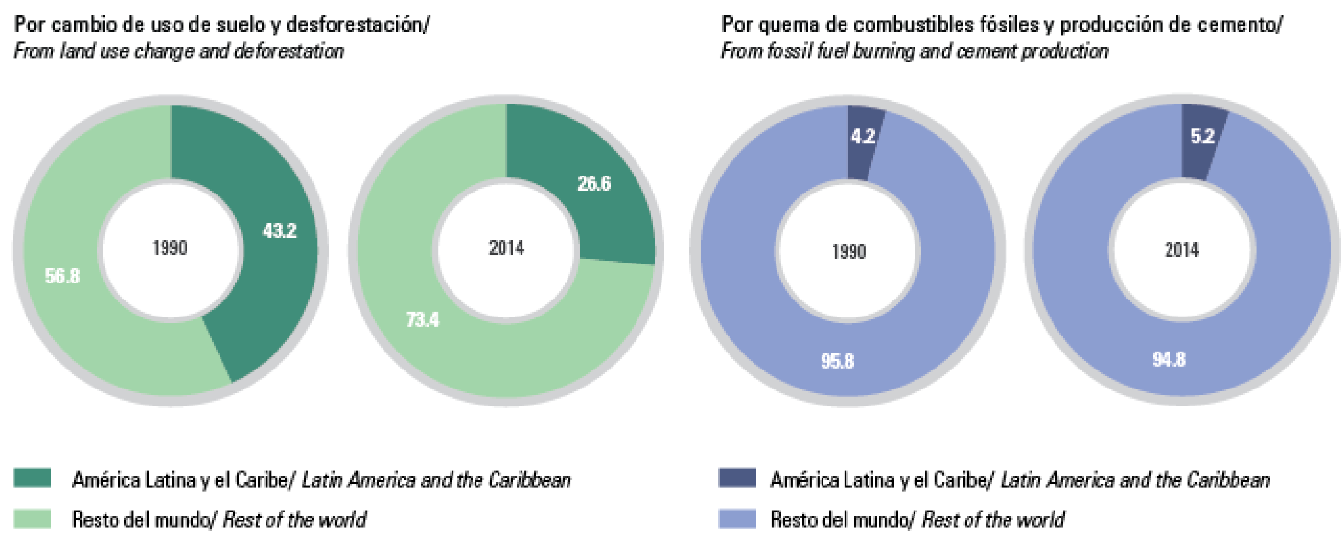
Adaptation

Latin America & the Caribbean and World: Carbon Dioxide emissions (CO_2) by source, 1990 – 2014



"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)

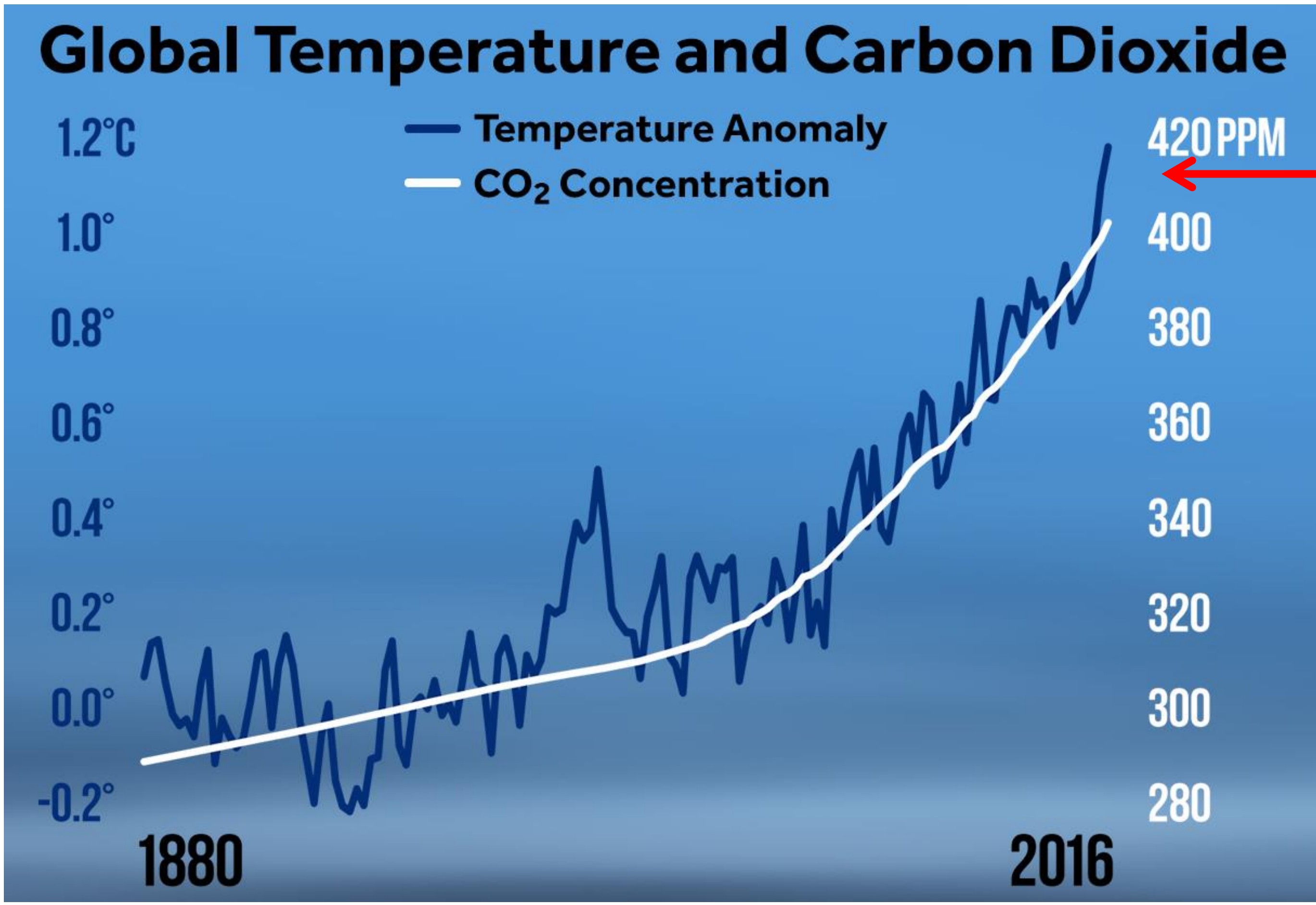
Participación regional en las emisiones totales, 2014/ *Regional share in total emissions, 2014* (En porcentajes)



Source: ECLAC, based on information from the Climate Analysis Indicator Tool (CAIT), basado en CDIAC, IEA, EIA y FAO. [en línea] http://cait.wri.org

Atmospheric CO_2 levels higher than any point since evolution of humans – May 2019

Correspondance between temperature increase (blue) and atmospheric CO_2 concentration (white), 1880 – 2016.



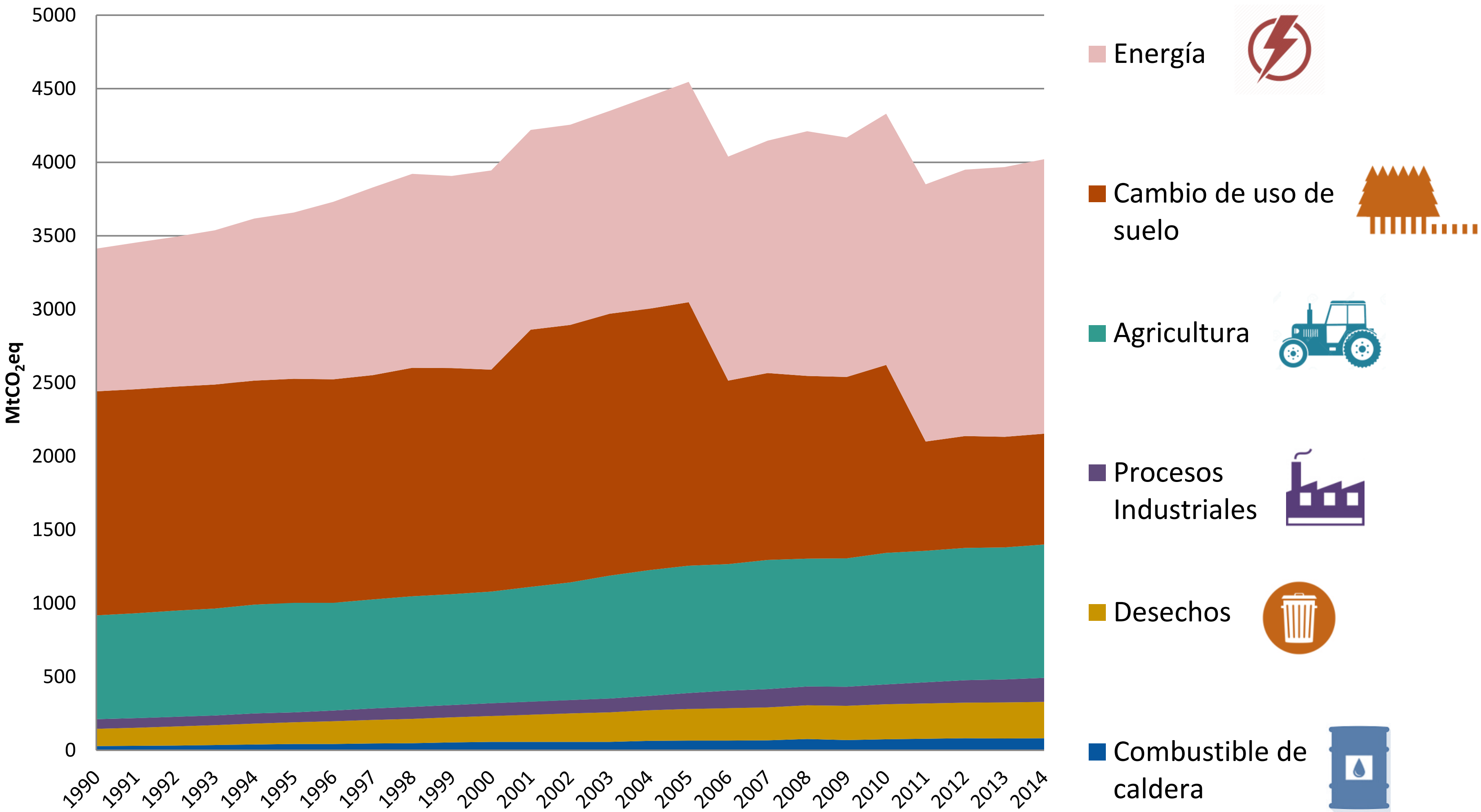
415.70 ppm
May 019

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.

Fuente: Climate Central [en línea] http://www.climatecentral.org/gallery/graphics/co2-and-rising-global-temperatures

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

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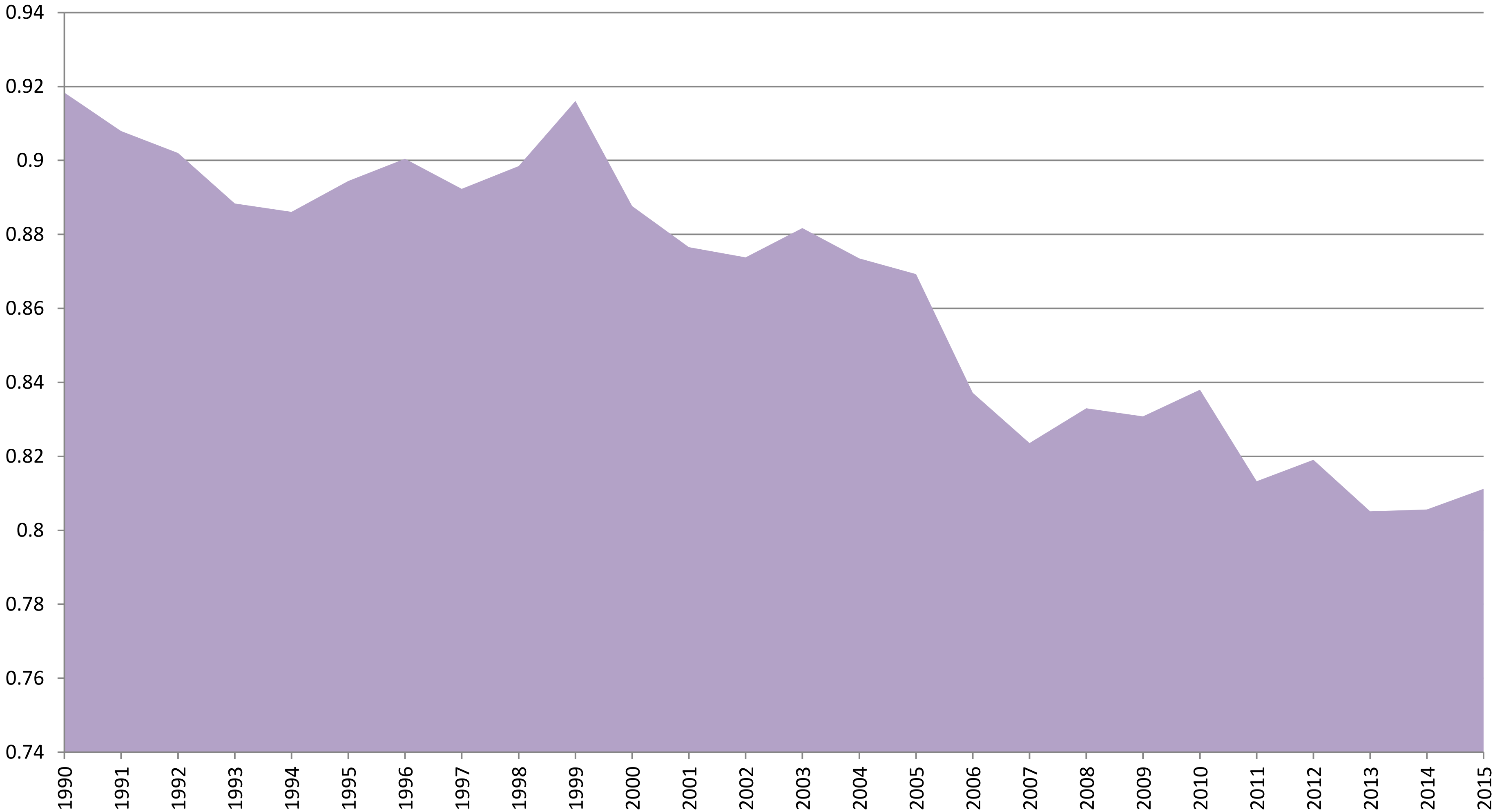
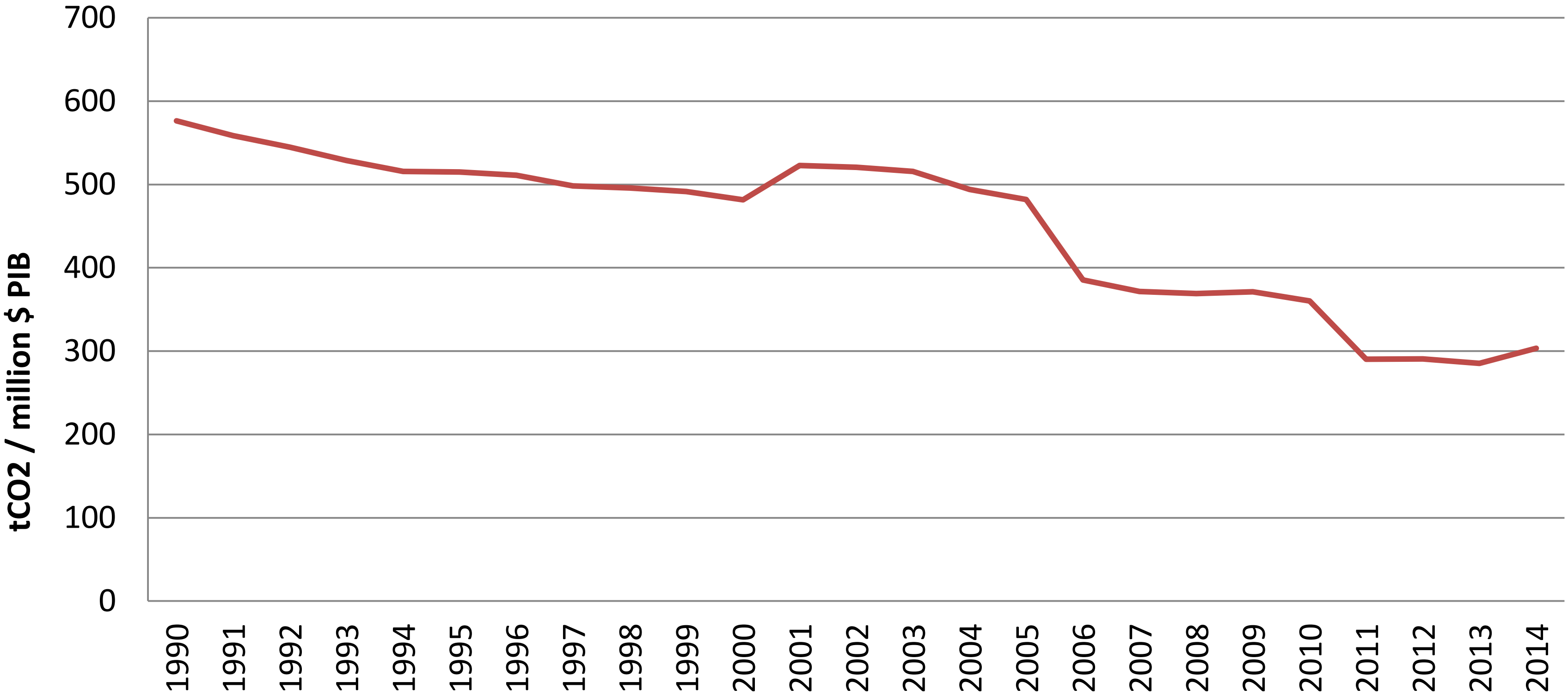
Total energy consumption (thousands of barrels of oil equivalent) **per millions of dollars of GDP** (constant 2010 US$)



Fuente: CEPAL, calculado sobre la base de OLADE, Sistema de Información Económica Energética (SIEE) [en línea] http://sier.olade.org

LAC : Carbon intensity of GDP (tCO2 / Million $ PIB $_{kte}$)



Source: World Resource Institute (WRI), Climate Analysis Indicator Tool [en línea] http://cait.wri.org

LAC: Material and energy intensity 2000-2015

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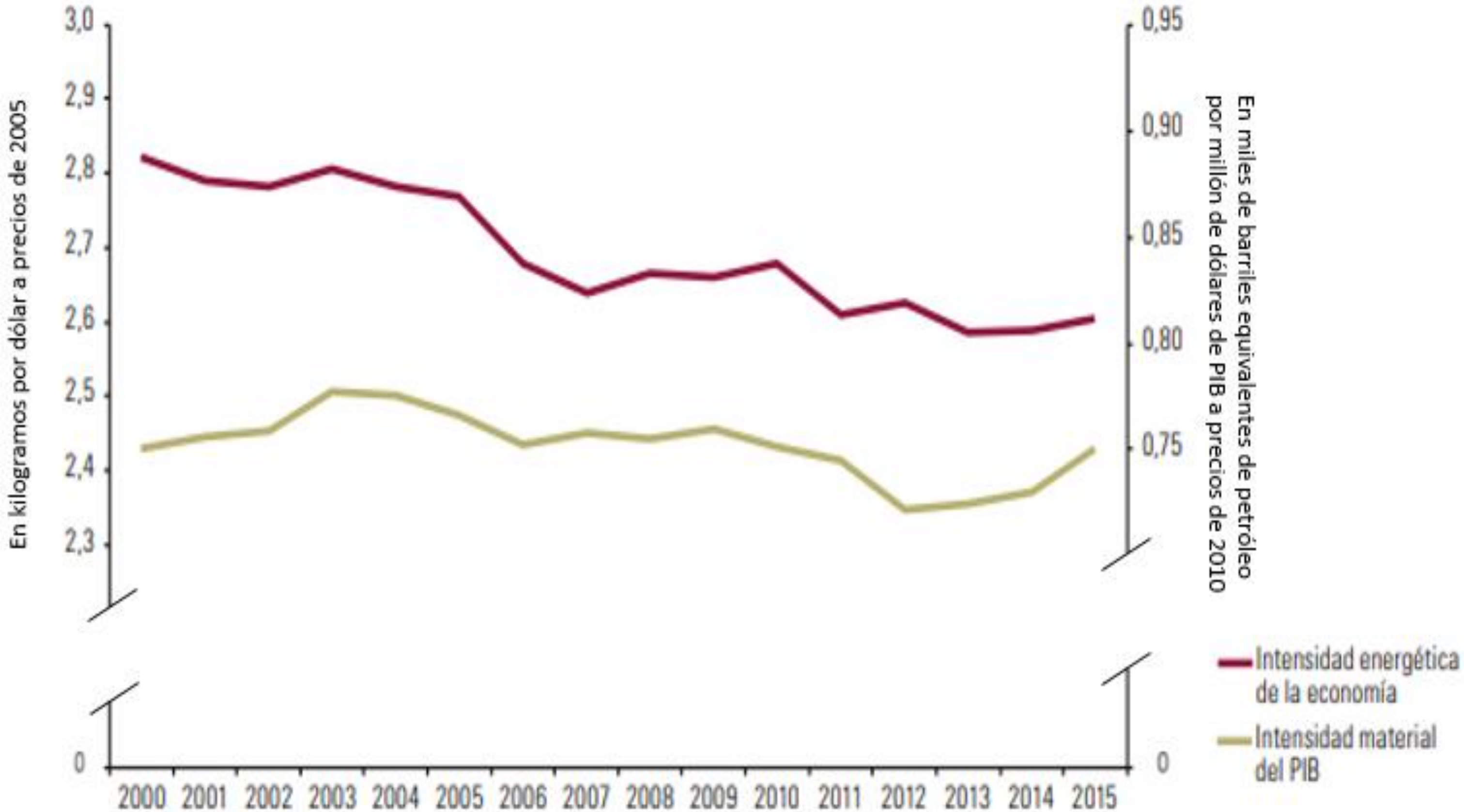
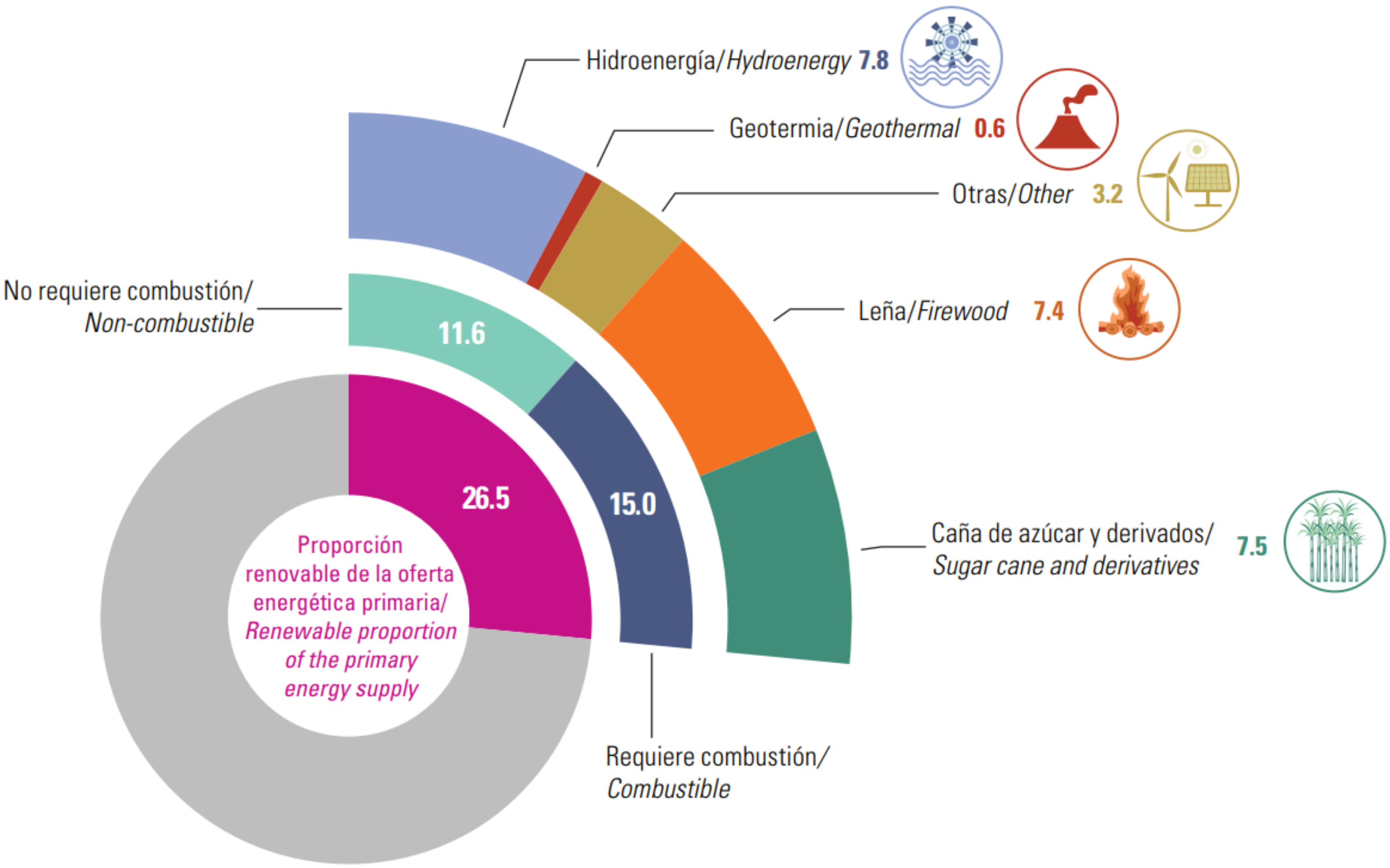


Fuente: Panel Internacional de Recursos, Global Material Flows Database [base de datos en línea] http://www.resourcepanel.org/global-material-flows-database [fecha de consulta: julio de 2018]; y Comisión Económica para América Latina y el Caribe (CEPAL), CEPALSTAT [base de datos en línea] http://estadisticas.cepal.org.

LAC share of renewable in primary energy supply, 2016

(Percentajes)

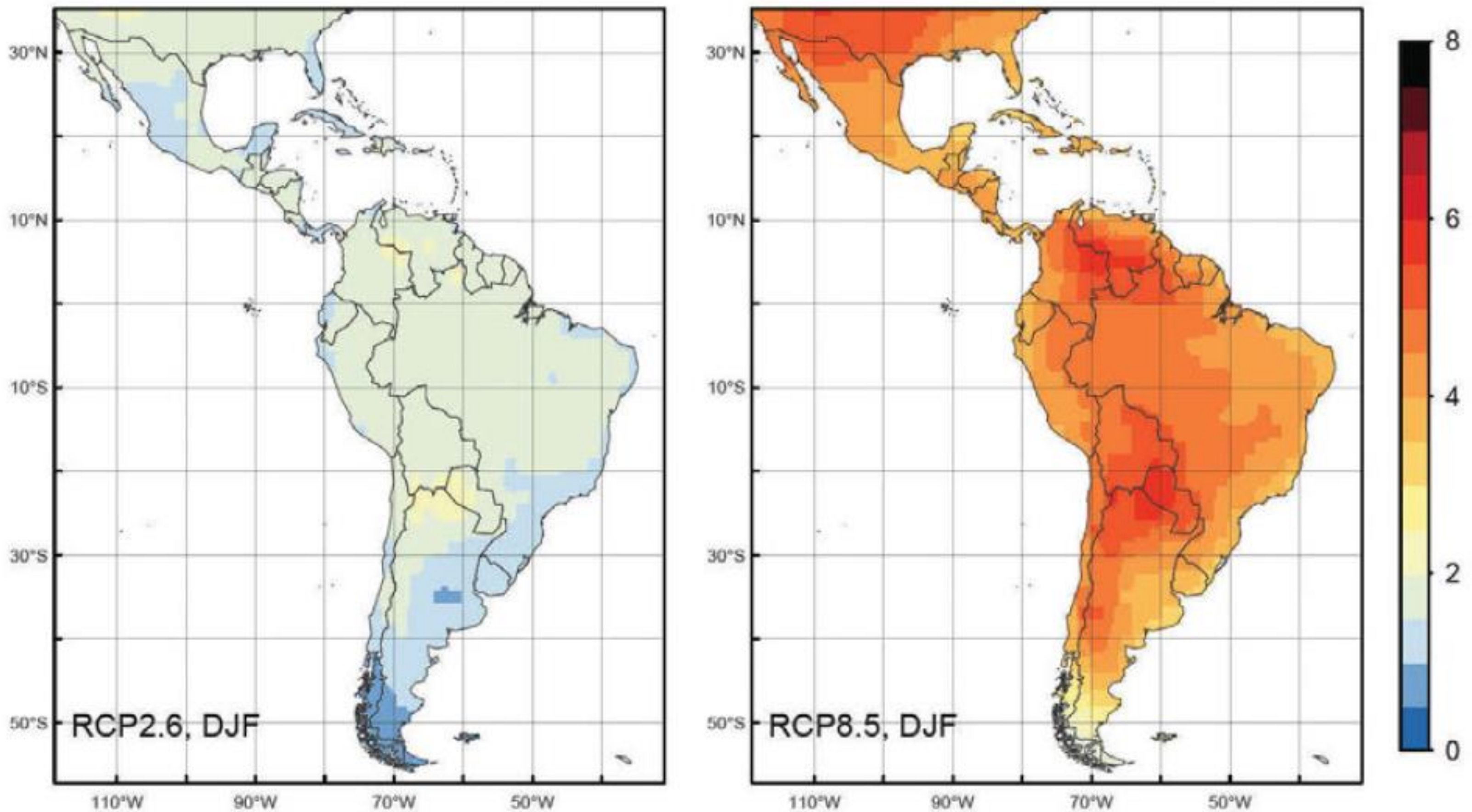


Source: ECLAC, based on OLADE, Sistema de Información Económica Energética (SIEE) [en línea] http://sier.olade.org

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)

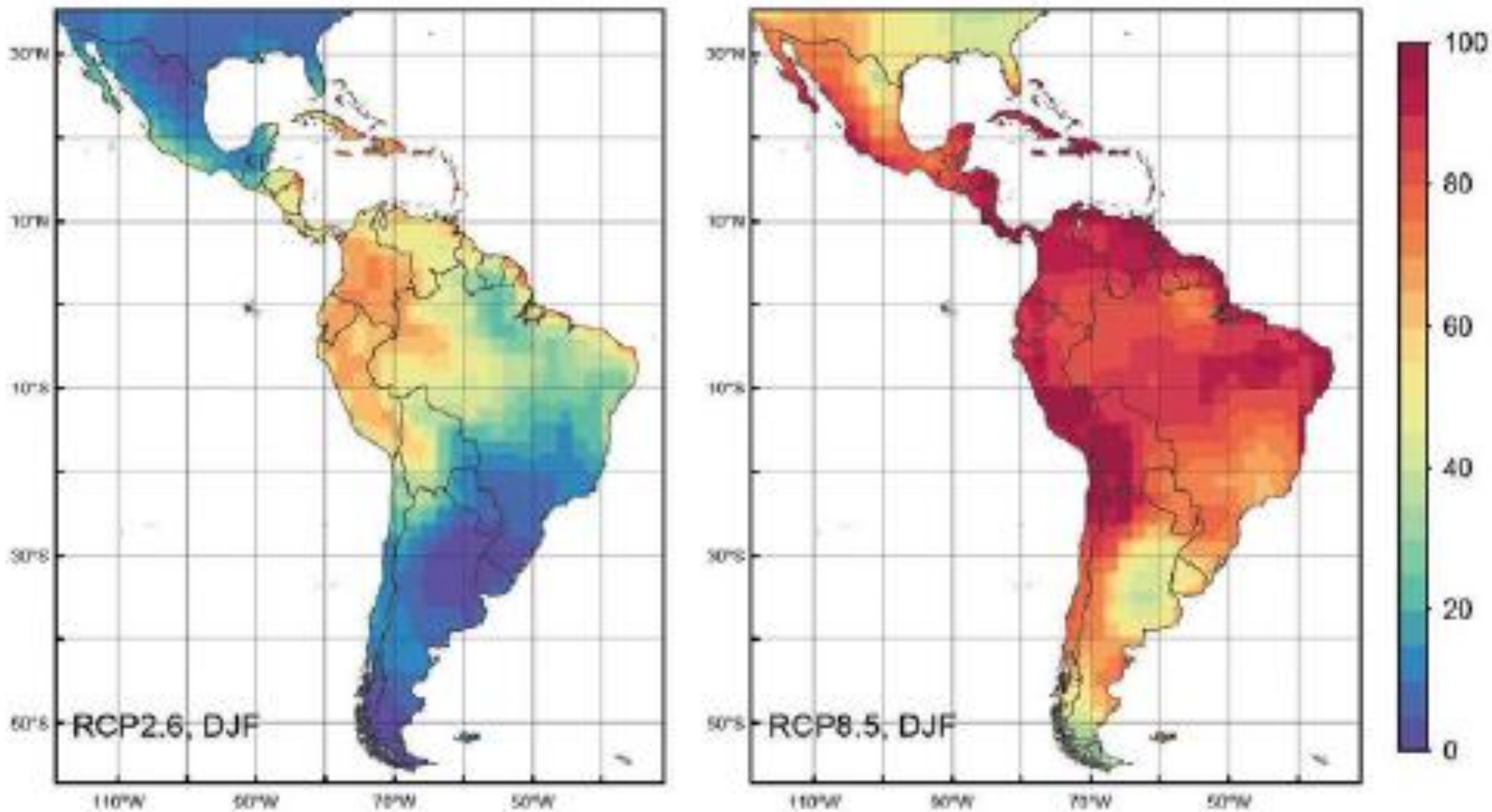


Source: World Bank, 2014; Reyer et al, 2015.

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)

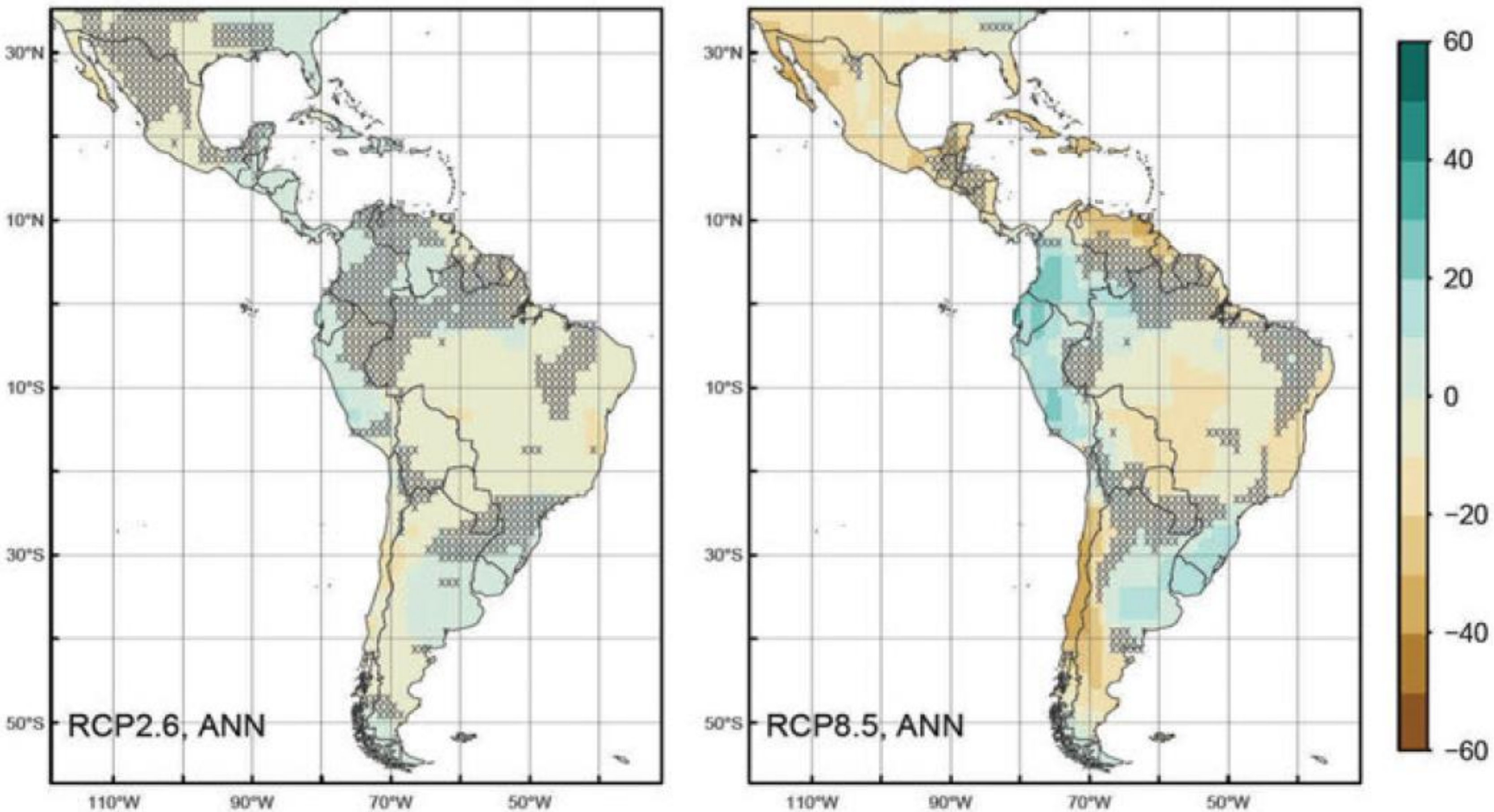


Source: World Bank, 2014; Reyer et al, 2015.

Climate change regional patterns

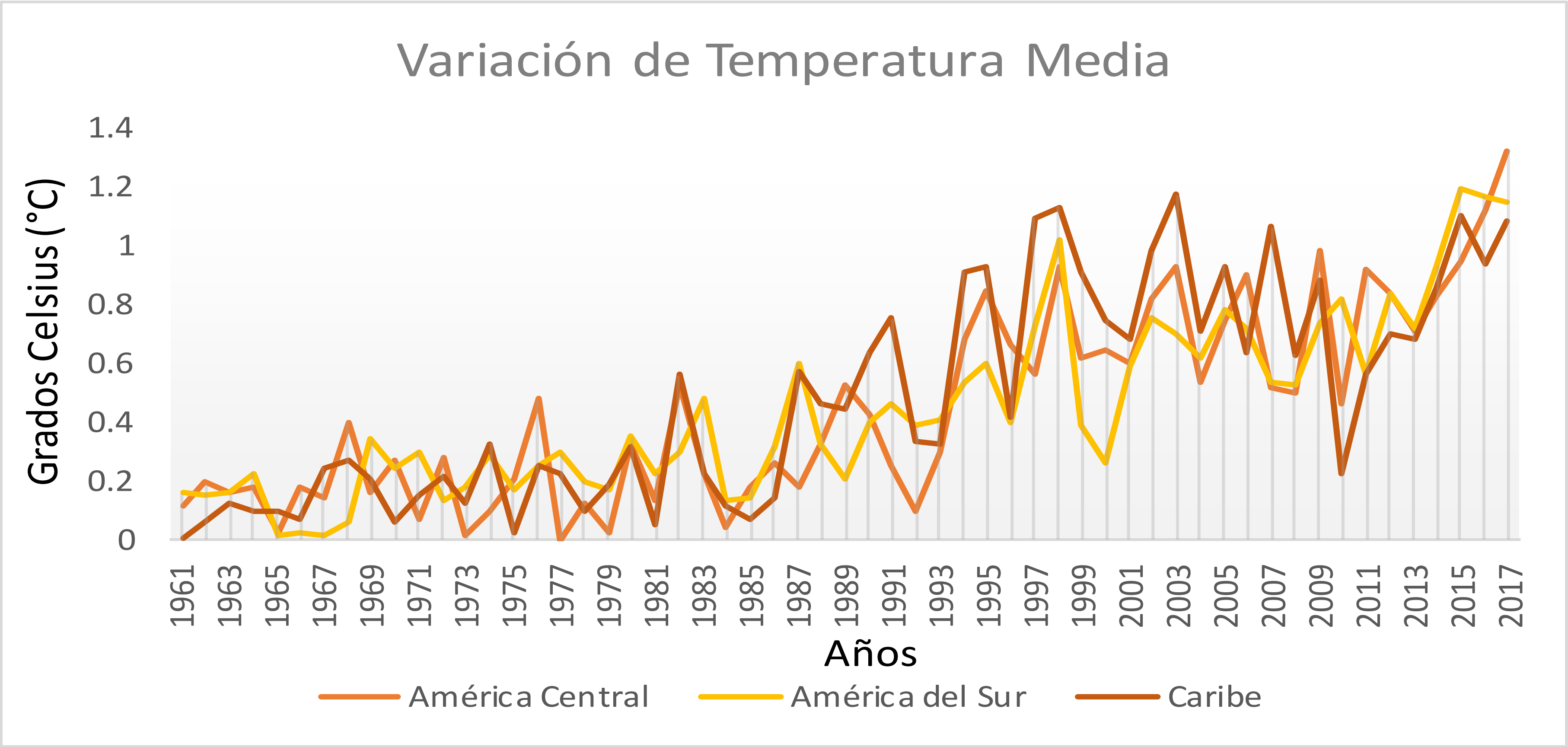
Percentage change in annual precipitation for the year 2100 compared to the baseline (1951-1980) under two scenarios of climate change

(Percentage)



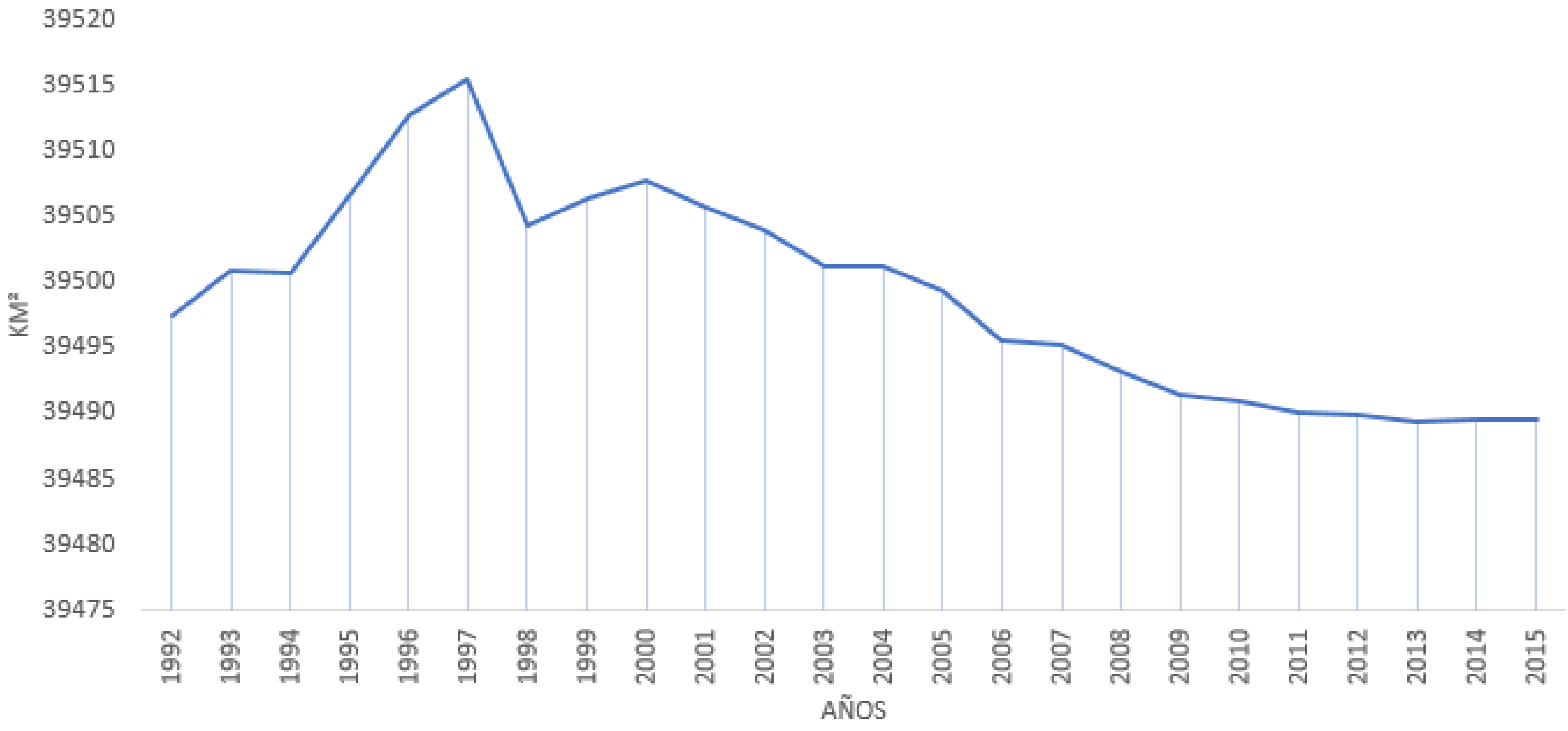
Source: World Bank, 2014; Reyer et al, 2015.

LAC temperature variation, subregions



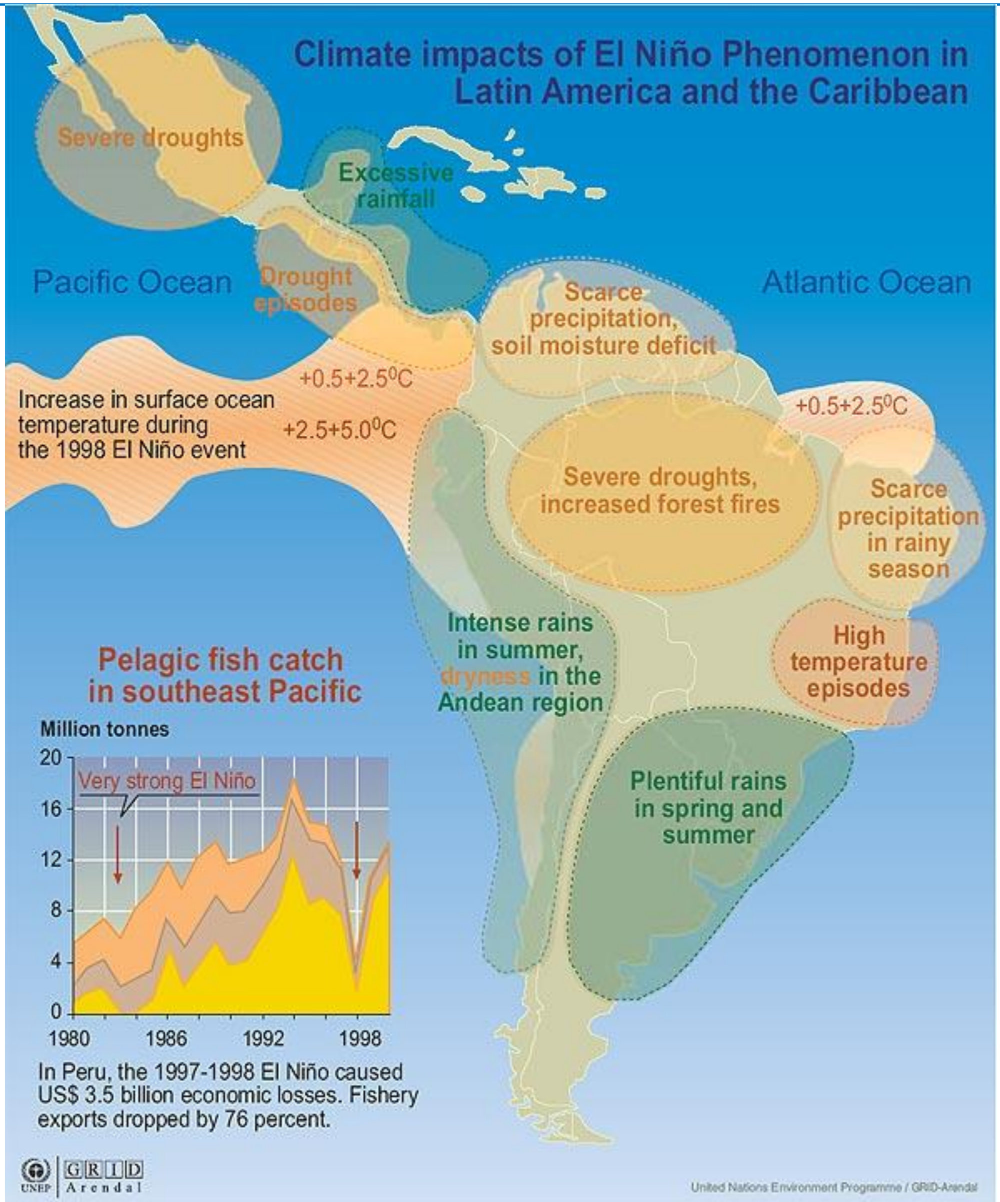
Source: FAO, based on GISTEMP data, the Global Surface Temperature Change data, distributed by the National Aeronautics and Space Administration Goddard Institute for Space Studies (NASA-GISS) [online] http://www.fao.org/faostat/en/#data/ET

LAC: Permanent snow and glaciers area (in square kilometres)



Source: ECLAC, based on FAOSTAT data, 2018 http://www.fao.org/faostat/en/#data/LC

Regional impacts that are already taking place



Sources: IPCC 2001, FAO 2002,UNEP 2003

Likely regional impacts

Potential impacts and risks associated with climate change in Latin America

Impacts	Key risks	Climatic factors
Agriculture	Decreases in food production and quality, lower revenues and rising prices	• Temperature extremes • Precipitation extremes • CO_2 concentration • Precipitation
Water	Water supply in semi-arid and glacier-melt-dependent regions; flooding in urban areas associated with extreme precipitation	• Upward trend in temperature • Increased droughts • Snow cover
Biodiversity and forests	Land-use changes, disappearance of forests, coral reef bleaching, loss of biodiversity and of ecosystem services	• Increased deforestation • CO_2 concentration • Upward trend in temperature • Acidification of the oceans
Health	Spread of vector-borne diseases to other altitudes and latitudes	• Upward trend in temperature • Temperature extremes • Precipitation extremes • Precipitation
Tourism	Loss of infrastructure, rising sea levels, extreme events in coastal areas	• Rising sea levels • Temperature extremes • Precipitation extremes and flooding
Poverty	Reductions in the incomes of vulnerable groups, especially in the agricultural sector; increased income inequality	• Temperature extremes • Increased droughts • Precipitation

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of Intergovernmental Panel on Climate Change (IPCC), "Chapter 27. Central and South America" in *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, V.R. Barros and others (eds.), Cambridge, Cambridge University Press, 2014.

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

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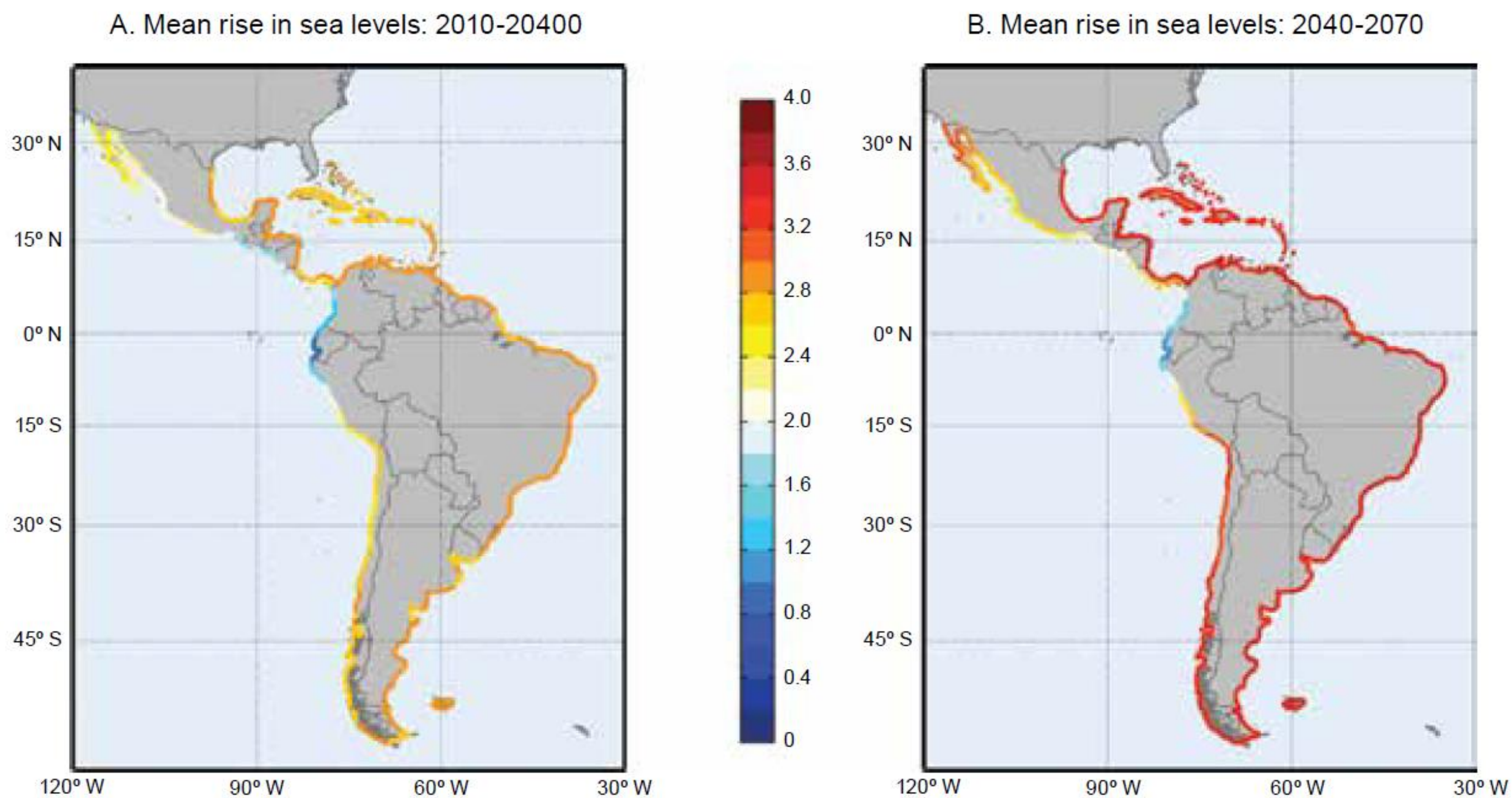


Source: Economic Commission for Latin America and the Caribbean (ECLAC), "Efectos del climate change en la costa de América Latina y el Caribe: Dinámicas, tendencias y variabilidad climática", *Project Documents* (LC/W.447), Santiago, Chile, 2011.

Likely regional impacts: Agriculture

United Nations

ECLAC

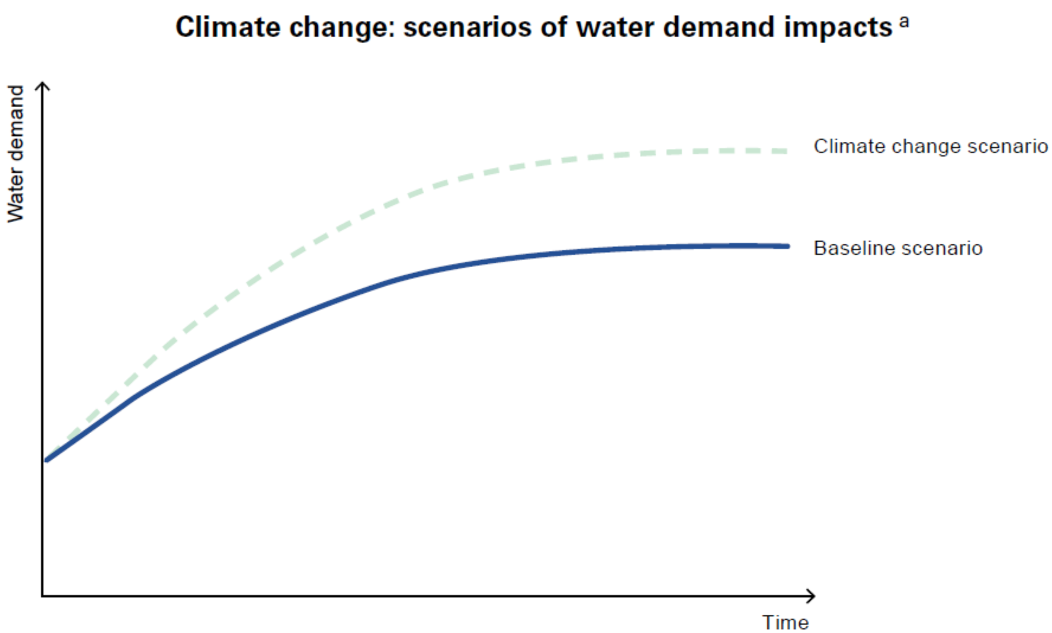
Key risks	Climatic factors
Decreases in food production and quality, lower revenues and rising prices	• Extremes temperature and precipitation • CO_2 concentration

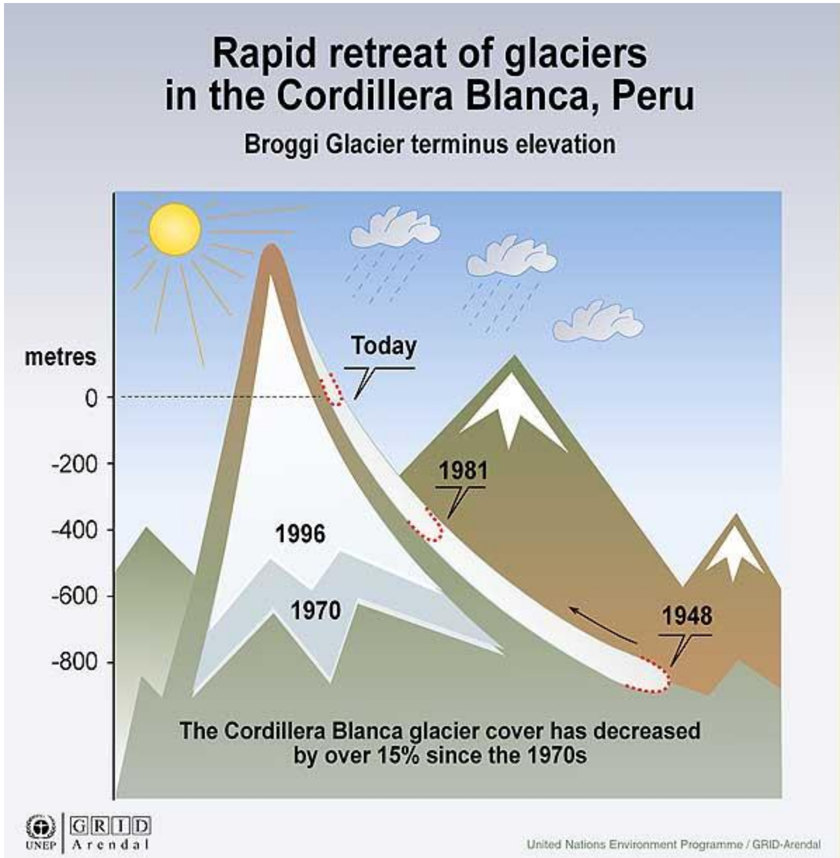
Marginal impacts of climate change on agriculture [a]

Countries and authors	Farms	Temperature		Precipitation	
		Marginal (ha/°C)	Elasticity	Marginal (ha/mm/month)	Elasticity
Argentina (Lozanoff and Cap, 2006)	Family farms	1 638	0.64	-184	-1.04
	Commercial agriculture	1 364	1.43	-136.8	-1.82
Brazil (Mendelsohn and others, 2007) [b]	Agriculture (i)		-0.97		2.32
	Agriculture (i)		-0.31		0.03
	Agriculture (iii)		-0.18		0.01
Argentina, Bolivarian Republic of Venezuela, Brazil, Chile, Colombia, Ecuador and Uruguay (Seo and Mendelsohn, 2008a)	Agriculture	-74	-0.53	-49.9	-2.16
	Livestock	-175	-2.47	-1.9	-0.15
	Mixed farms	-88	-0.99	-34.6	-2.32
	Total sample	-76	-0.68	-22.5	-1.22
	Expectation	-94.7	-0.85	-35.2	-1.91
Argentina, Bolivarian Republic of Venezuela, Brazil, Chile, Colombia, Ecuador and Uruguay (Seo and Mendelsohn, 2008b)	Family farms	-221.84	-1.61	-3.12	-0.13
	Commercial agriculture	-144.32	-1.51	-52.62	-3.31
	Dry farming	-143.59	-1.46	-39.91	-2.42
	Irrigated farming	-408.71	-2.63	36.78	1.29
	Total sample	-175.28	-1.55	-30.37	-1.60
Argentina, Bolivarian Republic of Venezuela, Brazil, Chile, Colombia, Ecuador and Uruguay (Mendelsohn, 2009)	Family farms	-155		14	
	Family farms (unirrigated)	-101		55	
	Family farms (irrigated)	-198		-125	
	Commercial agriculture	-157		45	
	Commercial agriculture (dry farming)	-170		35	
	Commercial agriculture (irrigated)	-117		253	

Likely regional impacts: Water

Key risks	Climatic factors
Water supply in semi-arid and glacier-melt-dependent regions; flooding in urban areas associated with extreme precipitation	• Upward trend in temperature • Increased droughts • Snow cover





Sources: Peru National Communication to the UNFCCC, 2001; UNEP/GRID-Europe.

Sources Needs Checking

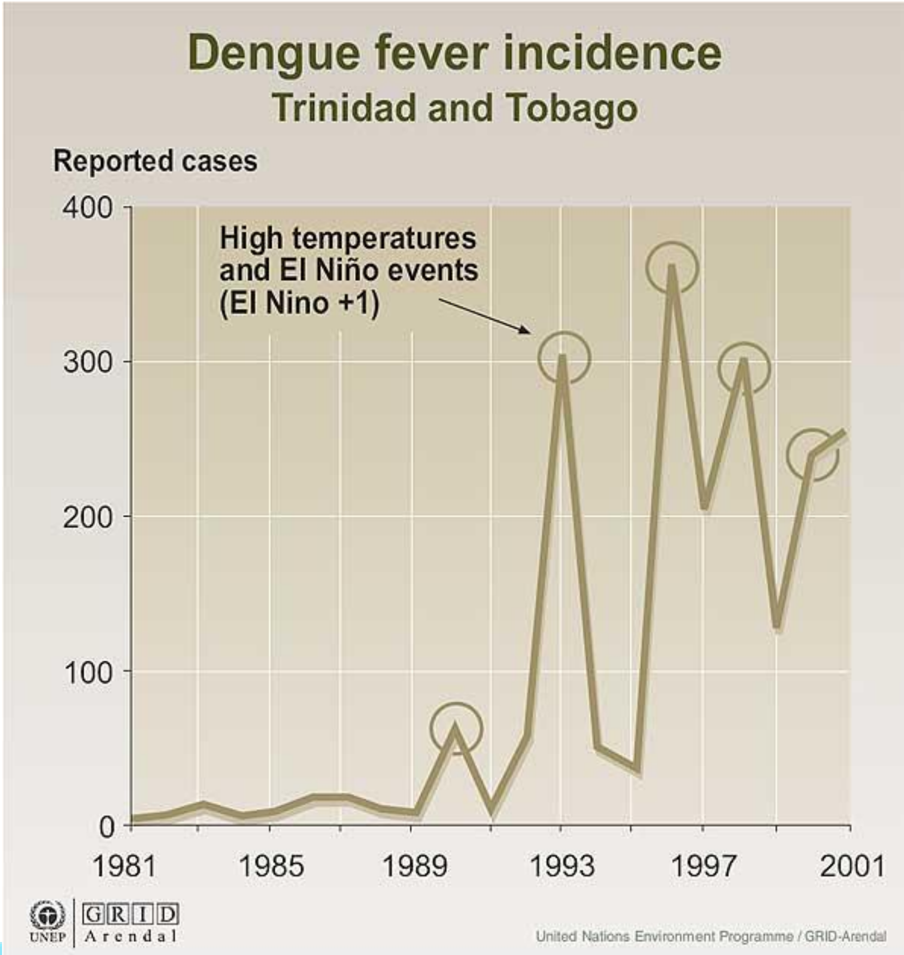
Likely regional impacts: Biodiversity and forests

Key risks	Climatic factors
Land-use changes, disappearance of forests, coral reef bleaching, loss of biodiversity and of ecosystem services	• Increased deforestation • CO2 concentration • Upward trend in temperature • Acidification of the oceans

Fuente: Song X-P, Huang C, Saatchi SS, Hansen MC, Townshend JR (2015) Annual Carbon Emissions from Deforestation in the Amazon Basin between 2000 and 2010. PLoS ONE 10(5): e0126754. https://doi.org/10.1371/journal.pone.0126754

Likely regional impacts: Health

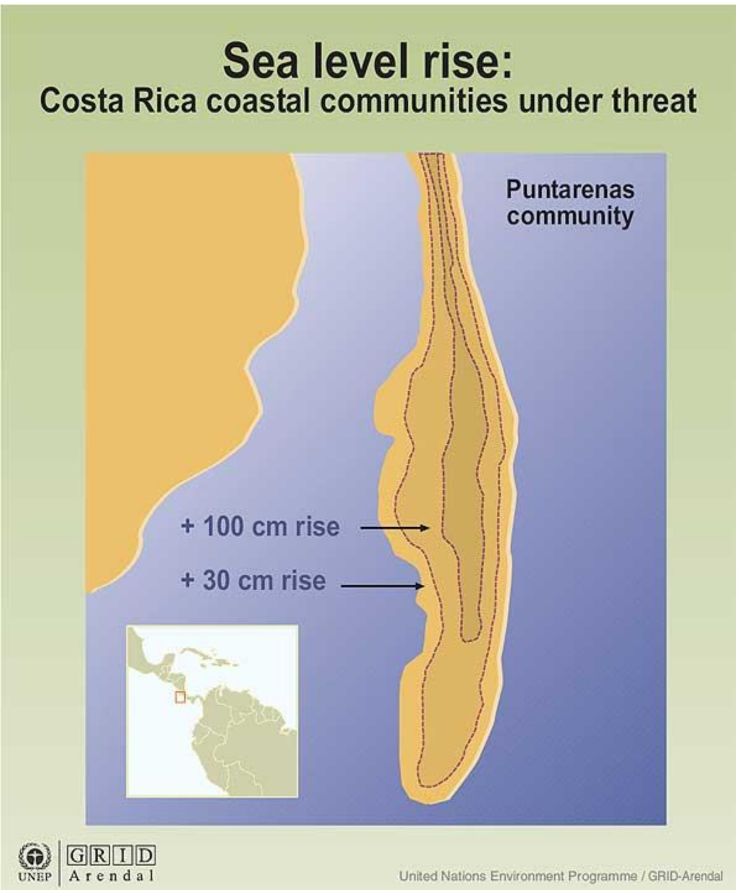
Key risks	Climatic factors
Spread of vector-borne diseases (i.e. dengue fever, zika) to other altitudes and latitudes	• Upward trend in temperature • Temperature extremes • Precipitation extremes



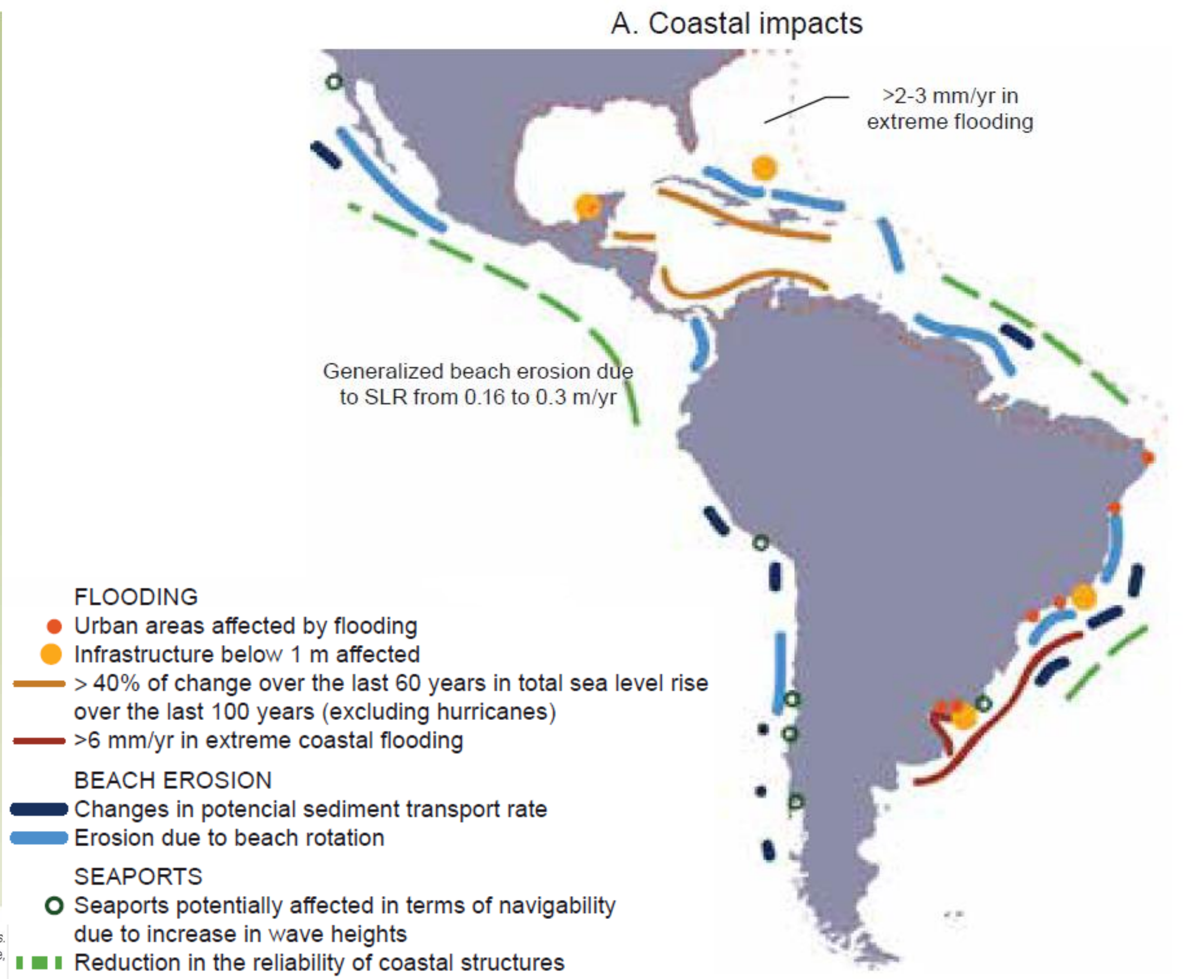
Source: Source Needed

Likely regional impacts: Tourism

Key risks	Climatic factors
Loss of infrastructure, rising sea levels, extreme events in coastal areas	• Rising sea levels • Temperature extremes • Precipitation extremes and flooding



Source: Costa Rica National Communication to the UNFCCC

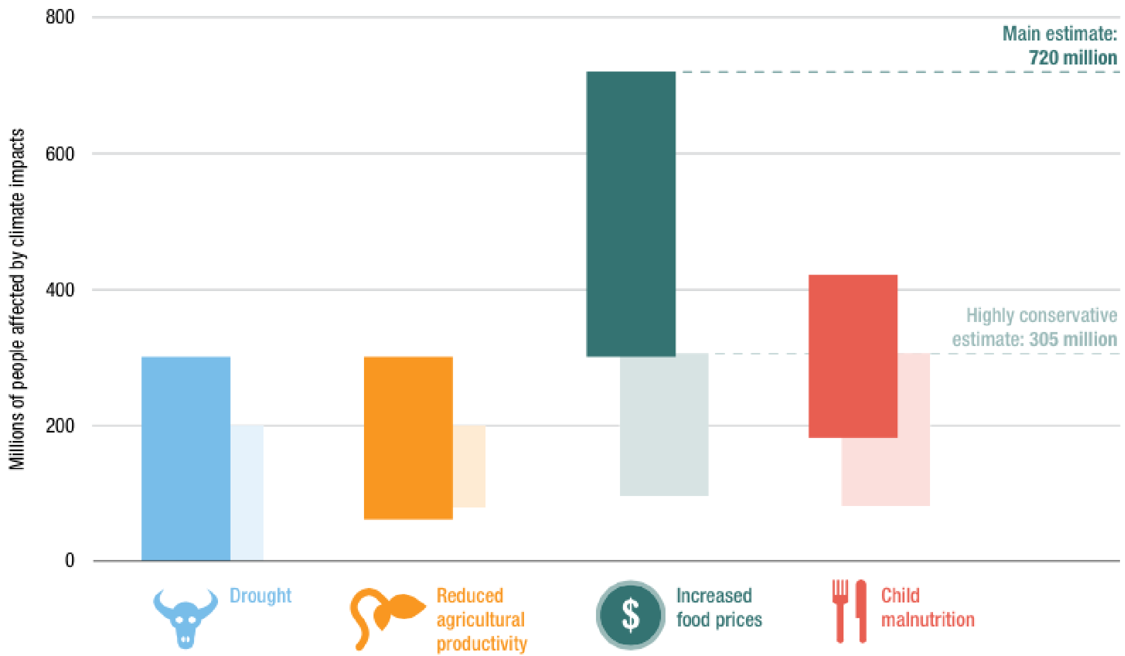


Source: Graciela Magrin and others, "Chapter 27. Central and South America", *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, V.R. Barros and others (eds.), Cambridge, Cambridge University Press, 2014.

Likely regional impacts: Poverty

Key risks	Climatic factors
Reductions in the incomes of vulnerable groups, especially in the agricultural sector; increased income inequality	• Temperature extremes • Increased droughts • Precipitation

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.

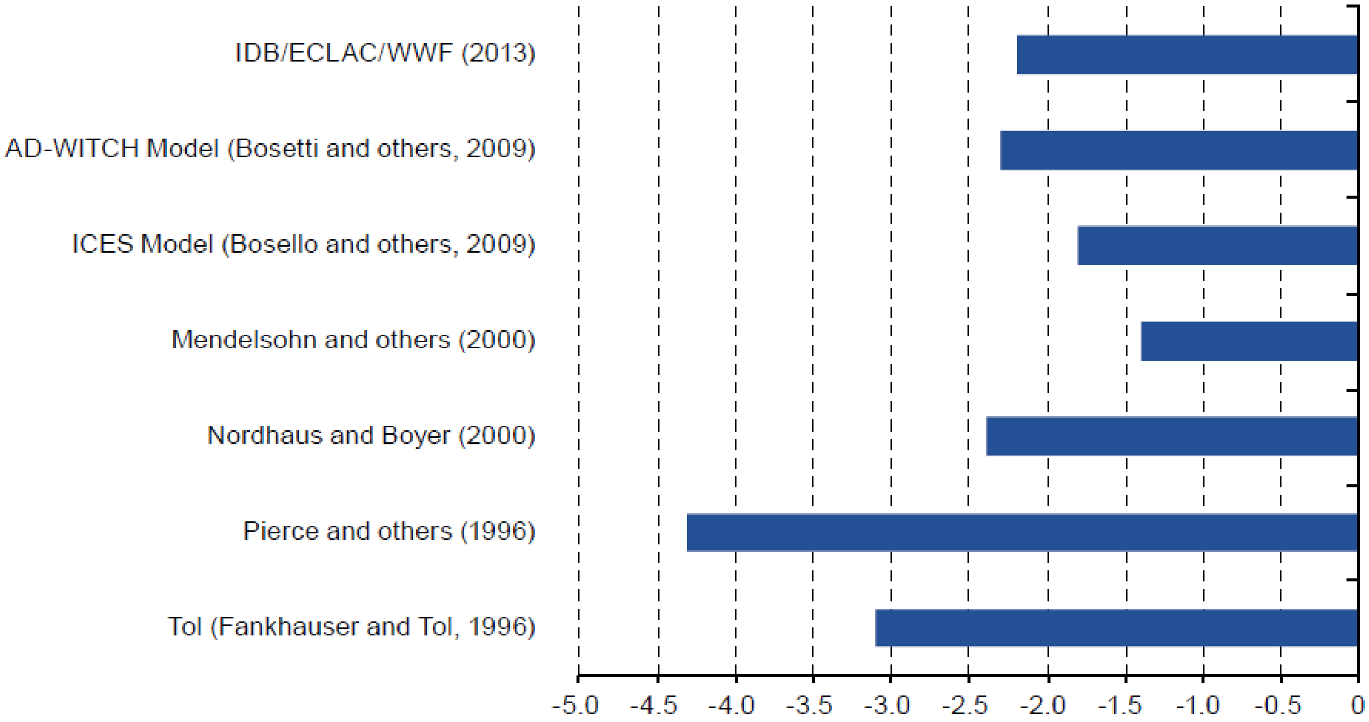
Source: ECLAC , *The economics of climate change*, United Nations, February 2015.

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 [a]

(Percentages of regional GDP)



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).

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of F. Bosello, C. Carraro and E. De Cian, "Market- and policy-driven adaptation", in *Smart Solutions to Climate Change: Comparing Costs and Benefits*, Bjørn Lomborg (ed.), Cambridge University Press, 2010.

Economic cost of climate change: SIDS

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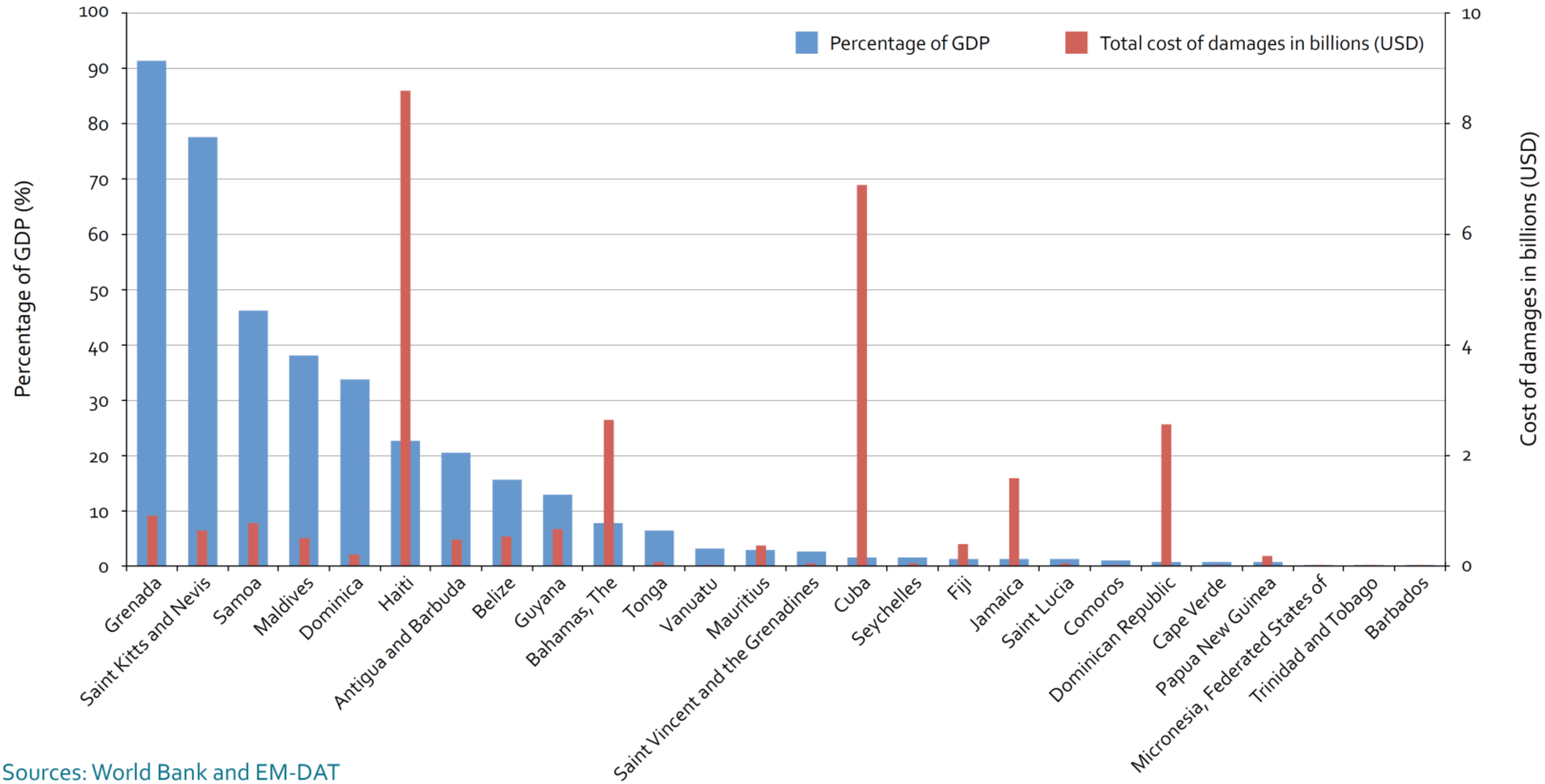
Total cumulative costs of damage from natural disasters from 1990 to 2013 and as percentage of cumulative GDP



Sources: World Bank and EM-DAT

The economic cost of climate change

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URBAN AGGLOMERATION	20 CM SEA-LEVEL RISE AND SUBSIDENCE (NO ADAPTATION)		40 CM SEA-LEVEL RISE AND SUBSIDENCE (NO ADAPTATION)	
	MEAN ANNUAL LOSS (M$)	MEAN INCREASE DUE TO SLR AND SUBSIDENCE COMPARED TO CURRENT LOSSES	MEAN ANNUAL LOSS (M$)	MEAN INCREASE DUE TO SLR AND SUBSIDENCE COMPARED TO CURRENT LOSSES
La Habana (Cuba)	9	5939%	21	13660%
Port-au-Prince (Haiti)	8	1090%	11	1482%
San Juan (Puerto Rico)	1.680	2365%	4.238	6118%
Santo Domingo (Dominican Republic)	263	1166%	410	1880%
Baixada Santista (Brazil)	274	3041%	467	5256%
Barranquilla (Colombia)	87	1782%	102	2106%
Belém (Brazil)	93	698%	586	4955%
Buenos Aires (Argentina)	161	268%	592	1257%
Panama City (Panama)	431	916%	451	962%
Fortaleza (Brazil)	52	2762%	108	5814%
Grande Vitória (Brazil)	2.643	1289%	10.096	5208%
Guayaquil (Ecuador)	31.288	1012%	32.267	1047%
Lima (Peru)	39	1009%	48	1254%
Maceió (Brazil)	54	887%	283	5025%
Maracaibo (Venezuela)	67	1086%	588	10238%
Montevideo (Uruguay)	50	258%	180	1181%
Natal (Brazil)	150	1505%	487	5100%
Porto Alegre (Brazil)	71	641%	483	4918%
Recife (Brazil)	259	1279%	970	5063%
Rio de Janeiro (Brazil)	411	1088%	1.803	5108%
Salvador (Brazil)	245	4903%	262	5248%
San Jose (Costa Rica)	10	551%	67	4133%
Total	2769.6		6164.4	

Projected economic losses due to sea level rise under two different scenarios of sea level rise by 2050

Source: World Bank, 2014; Reyer et al, 2015.

2 Demands for regionally relevant climate change-related metrics and work program

Climate change data demand in LAC

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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)

13 CLIMATE ACTION

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.

COP21 · CMP11 PARIS 2015 UN CLIMATE CHANGE CONFERENCE

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)

Recommendations 2017: towards a regional programme on climate change-related statistics

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, turism 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)

Sixth Meeting of the Expert Group on Environment Statistics
New York, 21-23 May 2019

Thank you

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