Climate Centre

Region-level | Climate fact sheet

The Americas

1. Region overview

The Americas expands across most habitable latitudes and therefore represents a variety of climates – from the arctic tundra of Alaska to the tropical rainforest of Brazil. This fact sheet focuses on Central America, the Caribbean and South America.

Figure 1. Encyclopædia Britannica, Inc.

1.1 Climate

Central America and the Caribbean

Central America and the Caribbean are in the tropics and therefore have nominal fluctuations in temperature. Rainfall, however, does show distinct seasonal variation. The winter months are generally dryer and the summer months wetter (Taylor and Alfaro 2005). This climate seasonality has been classified as dry-winter tropical (Rudloff 1981).

On a sub-regional scale, temperature variation is much larger across elevations. The geography and topography of the region – from island chains to mountain ranges – interacts with large-scale circulation patterns, creating unique microclimates (Taylor and Alfaro 2005).

The El Niño Southern Oscillation (ENSO), including La Niña, is the major driver of climate variability (shifts from year to year) in Central America and the Caribbean (Alfaro 2002). The figure on the following page highlights how La Niña and El Niño events impact rainfall in this region. The trade winds also play a strong part in seasonal variability.

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South America

The continent of South America extends from 10°N to 55°S and has a wide range of topographical features from the Andean Mountains to the Amazon Basin. Within this variety there is also significant variation in climate (Jiminez and Oliver 2005).

Much of the continent's land mass resides in tropical latitudes and tapers off towards the higher latitudes. Due to its shape, the large regional climates are driven primarily by the bordering oceans as well as the Intertropical Convergence Zone – a band of low pressure around the Earth, which generally lies near to the equator; and the Westerlies – prevailing winds from the west towards the east in the middle latitudes (Jiminez and Oliver 2005).

ENSO, including La Niña, is the major driver of climate variability in South America. The image to the right highlights the impact of ENSO on precipitation.

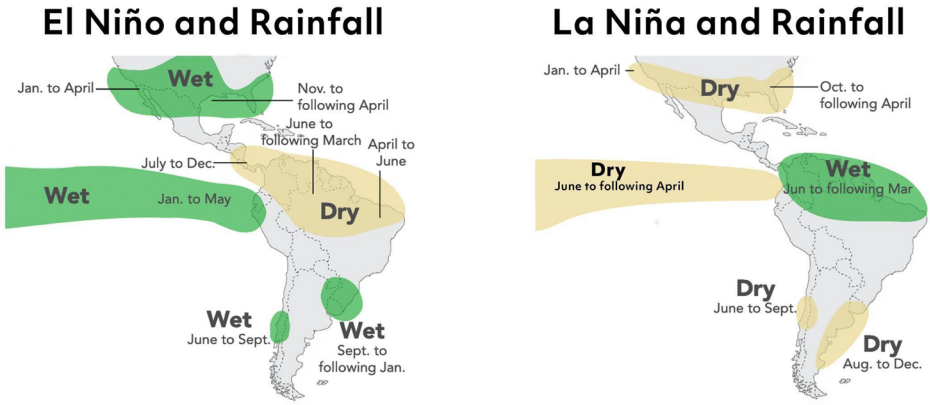

Figure 2. *ENSO rainfall maps.*

1.2 Climate change

Observed changes

Like every region of the world, the Americas have already experienced climatic changes. Increasing temperatures and changing rainfall patterns endanger the area's biodiversity and agriculture. Temperature increases, particularly at higher latitudes, have also accelerated glacial retreat (Magrin 2007).

Precipitation increases in south-east Brazil, Paraguay, Uruguay, the Argentinean Pampas and some areas of Bolivia have impacted land use and crop yields and increased flooding. Conversely, southern Chile, south-west Argentina, southern Peru and western Central America have seen a decline in rainfall, straining water availability in areas without well-developed water sanitation infrastructure (Magrin 2007).

Projected future changes

Previously observed trends are expected to continue. In general, projections across Latin America indicate the dry areas will get dryer and the wet areas will get wetter. By 2100, temperatures may increase by more than 2°C in Latin America and the Caribbean (Economic Commission for Latin America and the Caribbean (ECLAC) 2015, Food and Agriculture Organization of the United Nations (FAO) 2017). Rising temperatures and increasing droughts will likely further deplete water supplies, affecting most ecosystems, agriculture and access to water (World Bank Climate Change Knowledge Portal (CCKP)). Increasing temperatures have already impacted Andean glaciers; but, by 2100 – even with low or intermediate emissions – a volume reduction of 78–97 per cent is expected in tropical glaciers. Under high emissions scenarios, a near-total melting is expected (FAO 2017).

The Caribbean region is considered extremely vulnerable to climate impacts due to its geography and socioeconomic status (Cashman and Nadgee 2017). Most projections anticipated Caribbean agriculture, infrastructure and the tourism industry to suffer substantial impacts (World Bank CCKP).

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2.Humanitarian sectors and climate change

2.1 Water and habitat

Water and sanitation systems

Latin America is home to a tremendous amount of water resources, including four of the world's 25 largest rivers with a combined runoff of 5,470 cubic miles, and the largest supply of freshwater in the world (Barlow and Clark 2007). 20 per cent of global runoff comes from the Amazon itself (World Bank (2) 2015). Despite this abundance, millions of people do not have access to adequate water resources (World Bank (1) 2015). In 2010, more than 118 million people living in Latin America and the Caribbean did not have access to improved sanitation facilities, and 35 million people obtained drinking water from unimproved water sources (Centers for Disease Control and Prevention (CDC) 2012). Access to water is also skewed by region – for example, Mexico only has an allocation of 13,000 cubic feet per person, compared to Brazil's 110,500 cubic feet. Additionally, due to geography, pollution and social inequity, most individuals do not get anywhere near this allotment (Barlow and Clark 2007).

In South America, including large areas in Peru, Bolivia and north-western Argentina, human-caused salination is causing desertification (Barlow and Clark 2007). At least 25 per cent of the region is now considered arid or semi-arid.

These issues have been exacerbated by an influx of for-profit water companies entering the region in the 2000s. In 2007, the three largest private water companies controlled the delivery of water and wastewater services to nearly 300 million customers in 130 countries (Barlow and Clark 2007).

Municipal power

The Caribbean energy sector is particularly vulnerable to climate change. An increase in the frequency and severity of storms destroys power infrastructure and disrupts the fossil fuel trade; heatwaves and cold snaps increase peak demand; and changes in wind and cloud cover decrease the potential energy from renewables (Contreras-Lisperguer 2008, Schaeffer 2019). Changes in water availability also puts pressure on hydropower production, which accounts for 13,872 terajoules per year (Contreras-Lisperguer 2008).

Incorporating detailed climate planning into renewable energy plans and production is essential to account for these risks (de Queiroz 2019). These considerations are relevant in areas with significant renewable energy production, such as Brazil. 75 per cent of Brazil's energy comes from renewables, predominantly hydropower, although the wind and solar sectors are expanding (Carbon Brief 2018). The use of renewables is rapidly expanding in Latin America; the region had an installed capacity of 22,000 megawatts from renewables in 2017 (Sawyer 2018).

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Infrastructure

Since the 1960s, the Caribbean has seen significant land use change from agricultural land to land for tourism, commerce and urbanization. The new infrastructure, and associated wealth, is concentrated in coastal regions. As a result of these shifts, upwards of 70 per cent of the population now lives within 5 kilometres of the coast. Climate change impacts, such as sea level rise, cyclones, ocean acidification, and coastal flooding, already threaten these coastal areas. These risks will be compounded by a projected sea level rise of 1.4 metres by the end of the century (Cashman and Nadgee 2017, Lewsey 2004).

Increased temperatures affect the durability of construction materials; for example, the asphalt used for roads can buckle during a heatwave if not designed with rising temperatures in mind. Roads are also susceptible to floods, and climate change adaptation strategies include techniques for permeability and drainage (Willway *et al.* 2008).

From the indirect and direct impacts of climate change on the region, Latin America is estimated to experience an annual loss of Gross Domestic Product (GDP) of 1.5–5 per cent by 2050 (ECLAC 2014). As a response, many proposed adaptation strategies in the region focus on developing technology and infrastructure to withstand climate impacts and improve crop yields (ECLAC 2014).

2.2 Economic security

Agriculture

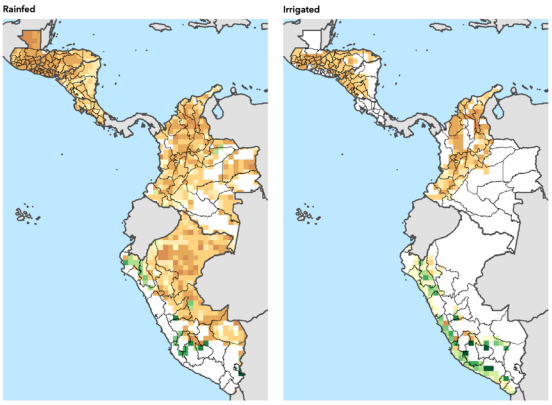

Figure 3. Spatial distribution of changes in projected in crop yield (differences in per cent between 2010 and 2050), RCP8.5 scenario for maize (Thomas *et al.* 2018).

Agriculture plays an important role in Latin America and the Caribbean. The sector occupies a significant portion of land in this region, ranging from 19 per cent in Peru to 75.6 per cent in El Salvador (Thomas *et al.* 2018). It is also highly dependent on rainfed systems for both subsistence and export crops, making these areas vulnerable to climatic variations such as droughts as well as changing precipitation patterns (World Bank CCKP). Across the region, changes in precipitation, increases in temperature, climate variability and extreme events are leading to, and projected to cause, changes in areas' agricultural potential, crop yields and the types and density of pests and diseases (FAO 2017).

Heavy losses in agricultural productivity are projected in Central America and the Andes due to decreased precipitation and increased temperatures caused by anthropogenic climate change (Thomas *et al.* 2018).

Under high emissions scenarios, one model found that Guatemala and Costa Rica could expect an almost 17 per cent loss in rainfed maize yields, Honduras around 12 per cent and around 8 per cent losses for Colombia, El Salvador, Nicaragua and Peru. Other crops grown throughout the region, such as sorghum and wheat, face similar projections. Barley and sugarcane can expect even higher losses in some regions (Thomas *et al.* 2018).

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In addition to the direct impacts on crop growth and productivity, climate change will also impact the availability and quality of natural resources. For example, regular glacial melt – a staple in some communities as a source of drinking water and crop irrigation – is expected to increase as temperatures rise. This can cause flooding or the destruction of water facilities in the near-term. In areas where the glaciers melt entirely, this could result in reduced or no water access for crops or livelihoods thereafter (FAO 2017).

Livelihoods

Particularly in many rural areas, livelihoods are linked with agriculture. For example, in 2019 Madre de Dios, Peru, experienced rising temperatures and rainforest wildfires followed by high winds and heavy rains, which significantly impacted local agricultural output; and, as a result, increased the area's climate vulnerability. Rural communities, like those in Madre de Dios and across Latin America, have historically adaptive subsistence practices which are closely tied to their livelihoods. Climate change threatens those practices and livelihoods (Michaelsen 2020).

The overall impact of climate change on Latin America's GDP is expected to be significant, and in many areas those losses fall disproportionately on the poor – including indigenous peoples who rely on climate-vulnerable resources and activities. In the region, indigenous peoples constitute about 6.5 per cent of the population and are among the region's poorest and most vulnerable (Hall and Patrinos 2006, Kronik and Dorge 2010).

2.3 Health

Climate impacts will likely aggravate public health concerns in Latin America: from heat- and air quality-related diseases and illness in large cities to increased cholera transmission in low-lying tropical areas. Other health risks posed by climate change in the region include: respiratory issues from increased wildfires, physical damage from hazards, malnourishment from agricultural losses, contamination of food and water sources, and changes in the risk and spread of infectious and vector-borne diseases (Moreno 2006). Increases in temperature and precipitation have been shown to change the geographical distributions of vector-borne diseases, such as malaria and dengue fever, in Argentina, Brazil, Colombia and Honduras, as well as infectious diseases, such as cholera and meningitis in Cuba and Peru (Basso 2014). Projected increases in extreme weather events (storms, flooding, droughts) will likely increase death and morbidity rates from injuries, infectious diseases, social problems and damage to sanitary infrastructure (Basso 2014).

Many of these health risks are already a concern in Latin America – particularly those living in poverty. The severity of impacts of climate change on health in Latin America highly depends on the size, density, location and wealth of the area (Basso 2014). The projected impacts of climate change would further stress the region's health system and expand the number of people living under critical conditions (Moreno 2006).

The effects of possible changes in ENSO may also have serious impacts on the region's health. In general, some of the strongest impacts of El Niño, for example, are felt in the countries (many of which are in Latin America) least equipped to handle weather extremes (Moreno 2006). ENSO has been shown to change disease-vector populations and the incidences of water-borne diseases in Argentina, Bolivia, Brazil, Peru and Venezuela (Basso 2014). For example, outbreaks of salmonella, malaria and gastrointestinal distress have all been associated with El Niño events (Basso 2014).

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Due to climate variability, not all health impacts will be negative, dryer years may lead to a lower transmission of mosquito-borne diseases like malaria (Moreno 2006). Understanding how sub-regional variability in weather and climate impacts health outcomes is complicated, but necessary for providing the resources and response that will be needed.

2.4 Protection

The vulnerability of populations in Latin America can be significantly impacted by socioeconomic status, gender and geography. Certain geographical areas are more at risk of physical climate impacts, for example, as the number of informal settlements in flood plains or on steep hillsides increase, these communities are vulnerable to flash flooding.

The modes of migration in Latin America are urban to urban (predominant), rural to urban and intra-urban flows (Adamo 2013). Economic and health issues related to climate change impacts in particularly vulnerable areas increase migrations from rural and peri-urban areas into major cities. This migration can give rise to additional stress on systems at the national level and in neighbouring countries (Basso 2014).

Recent migrants from rural areas into cities have greater vulnerability due to language barriers, distrust of government, lack of networks and low socioeconomic status (Adamo 2013, Donner and Rodríguez 2008). Cities are not immune to climate and environmental impacts; and a large event, like Cyclone Catarina in Brazil in 2004 or the 2011 floods and landslides in Rio de Janeiro, can trigger secondary migrations (Adamo 2013).

Colombia has the largest number of internally displaced persons, with more than 7.7 million registered. The majority were displaced between 1995 and 2008 due to paramilitary violence. However, even in recent years, thousands have been forced from their lands through violence (United Nations High Commissioner for Refugees 2017). While the sources of this displacement are not directly linked to climate, migrants and people who are displaced face increased climate risks.

Gender also plays a role in vulnerability in Latin America. In general, rural women in developing countries are most vulnerable to climate impacts. This is primarily due to gendered differences in labour: women are often in charge of 'climate sensitive tasks' like finding food and water (Andersen 2017). However, culture and gender roles can be highly regionally and geographically specific. A study in Brazil, Mexico and Peru found that on average women-led households tended to be less vulnerable and more resilient than households headed by men (Andersen 2017). But within these countries there were exceptions, for example, women-led households in rural Peru and urban Brazil were more vulnerable than their male counterparts (Andersen 2017).

Around the world, prisoners frequently have heightened vulnerability to natural disasters due to: spatial marginalization resulting from the location of prisons on hazard-prone land and/or isolation from emergency evacuation services; limited to no connections to social networks which are crucial aspects to hazard resilience; and, political marginalization, including lack of policies and services to prevent disaster impacts on imprisoned populations (Gaillard and Navizet 2012). These existing vulnerabilities, coupled with more frequent and intense disasters due to climate change may leave prison populations particularly vulnerable to climate-related hazards, such as extreme heat, extreme cold, floods and cyclones.

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2.5 Policy

All countries in Central America, the Caribbean and South America have signed and ratified the Paris Agreement 2016.

The Caribbean

Across the region, the Nationally Determined Contributions (NDCs) for most countries prioritize adaptation plans for the agriculture and water sectors as well as health, human settlements and tourism (United Nations Development Programme (UNDP) 2019).

Belize, Guyana, Saint Lucia, Saint Vincent and the Grenadines, and Suriname have all begun the process of creating and implementing National Adaptation Plans (NAPs). In 2019, only Grenada's NAP process was in the advanced stages (UNDP 2019).

Some countries have embraced the importance of incorporating gender into their climate policies, for example, Grenada's Ministry of Social Development includes a Gender and Family Affairs Division. However, in most of the region, the incorporation of gender issues, particularly in ministries operating in climate-vulnerable areas, is not yet realized (UNDP 2019).

South America

All countries in South America have submitted an NDC to the United Nations. These NDCs include strategies to contribute to reductions in global greenhouse gas emissions as well as adapt to climate change impacts on various sectors such as agriculture, water and health. (United Nations Framework Convention on Climate Change (UNFCCC) n.d.)

Most countries in the region have created some form of national climate policy or strategy, such as the Paraguayan National Climate Change Policy (2011) and the Uruguayan National Response Plan to Climate Change (2010) (Warn 2013).

Brazil's national climate policy was first implemented in 2010; and, since 2004, the country had seen success in forestry emissions mitigation. However, in 2018 and 2019, under the new government, deforestation has increased alongside a growth in greenhouse gas emissions. Now, Brazil will likely miss its 2020 least-ambitious target by 47.3 million tons (US short) or 42.9 million tonnes (metric ton) of CO_2-equivalent (Angelo & Rittl 2019).

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