G20 CLIMATE RISK ATLAS

Impacts, policy, economics

cmcc

ARGENTINA

With the scientific contribution of Enel Foundation

How to read the Atlas: graphs, colours and scenarios.

The maps used in this Atlas are taken from **The World Bank Official Boundaries** - ***https://datacatalog.worldbank.org/search/dataset/0038272*** (accessed on May 28, 2021). For the section Energy, the maps are based on Panoply Data Viewer ***https://www.giss.nasa.gov/tools/panoply/credits.html***

Each sector of this Atlas contains data and information on various climate scenarios.

When reported in graphs, the **colour black** indicates data and information referring to the current state, the past or the baseline.

When the authors refer to **RCP (Representative Concentration Pathways)**, the 3 colours used across the factsheet refer to 3 scenarios, which are 3 different development options with different levels of greenhouse gas emissions, **respectively low emissions (green), medium emissions (orange), and high emissions (red)**. The same colour code is used when RCPs are associated with Shared Socioeconomic Pathways (SSP).

In some cases, the authors refer to global warming scenarios. In these cases, the 3 colours used refer to a temperature rise of **1.5°C (green), 2°C (dark green), and 4°C (red)**.

When the authors refer exclusively to **Shared Socioeconomic Pathways - SSPs** (Population affected by river floods in the section: "Water"), data related to **SSP3** - that encompasses, among other things, slow economic growth, material-intensive consumption, and persisting or worsening inequalities – **are reported in a lighter shade**; **SSP5** – which refers to social and economic development that is coupled with an energy-intensive lifestyle and the abundant exploitation of fossil fuel resources – is shown using a **middle shade of the colour**, whereas data related to **the present** conditions **are represented in a dark shade**.

Further details on scenarios, methodologies, and the full list of references are available at: **www.g20climaterisks.org**

Concept and graphic design by element6.eu

ARGENTINA CLIMATE

OVERVIEW

Argentina's climate ranges from tropical to polar. This variability is mainly due to the size, heterogeneity and orography of the country, which makes for extreme weather conditions and often leads to natural disasters. The country's climate features and seasonality are influenced by the presence of the Los Andes mountains, which extend along the west of the country, as well as the El Niño-Southern Oscillation and the Indian Dipole.

TEMPERATURE

The temperature regime of Argentina is quite heterogeneous with average values increasing from west to east. Lower temperatures are found along the Los Andes mountain range which runs down the west of the country.

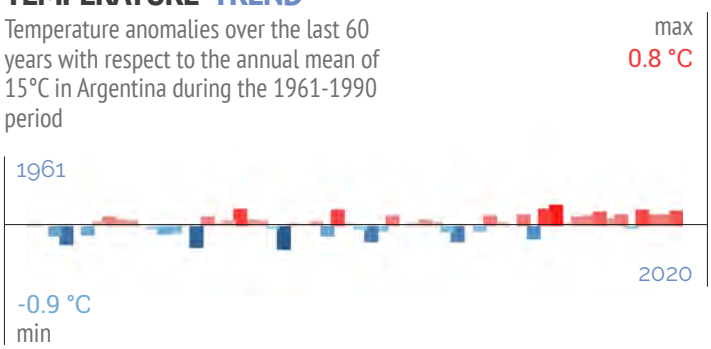
MEAN TEMPERATURE

-7 — 25

Celsius degrees / Over 1991-2020

TEMPERATURE TREND

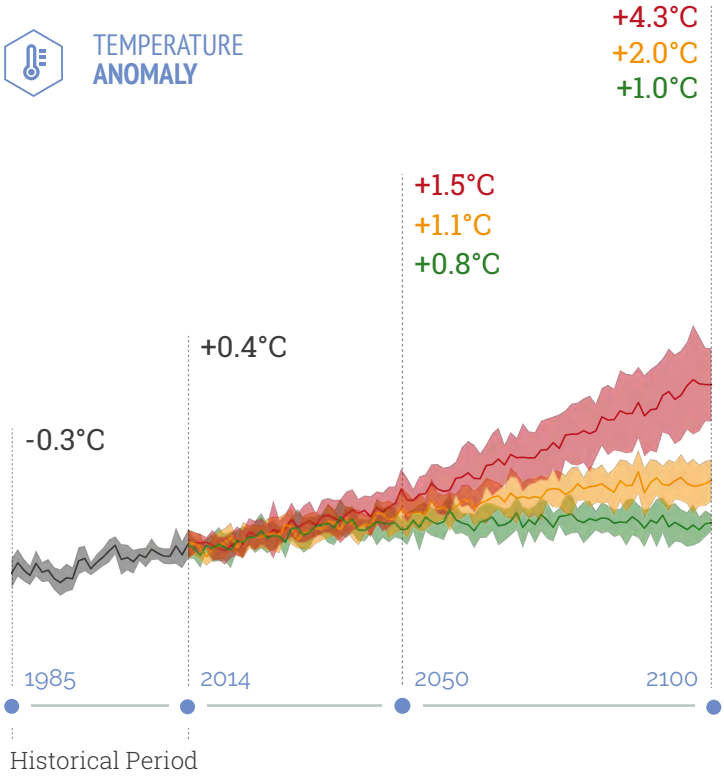
Temperature anomalies over the last 60 years with respect to the annual mean of 15°C in Argentina during the 1961-1990 period



TEMPERATURE PROJECTIONS

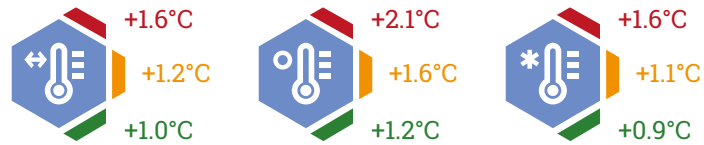
Under a low emissions scenario projected temperature variations will remain contained at around +1°C, both by 2050 and 2100.
Under a high emissions scenario, with no reduction in GHG emissions, much greater temperature anomalies are expected by both 2050 and 2100.

TEMPERATURE ANOMALY



EXPECTED VARIATION FOR TEMPERATURE AT 2050

The indicators show variations in selected temperature characteristics for a thirty-year period centred on 2050 (2036-2065) with respect to the reference period 1985-2014.



PRECIPITATION

Argentina's precipitation regime is highly variable. It ranges from very humid to arid areas, also showing relevant inter-annual and inter-decadal variations. Precipitation patterns over the Los Andes mountain range are also highly variable due to the effect of factors such as the interaction of mountains with humid air masses coming from the Pacific Ocean. In the south and central areas annual precipitation is generally lower. June to September is the season with least rainfall.

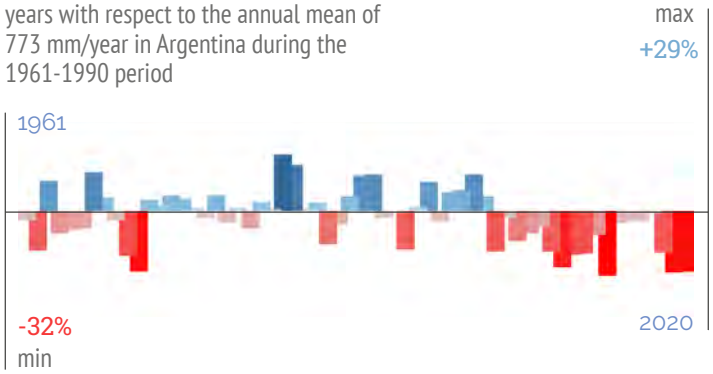
MEAN PRECIPITATION

81 — 5,562

mm/year / Over 1991-2020

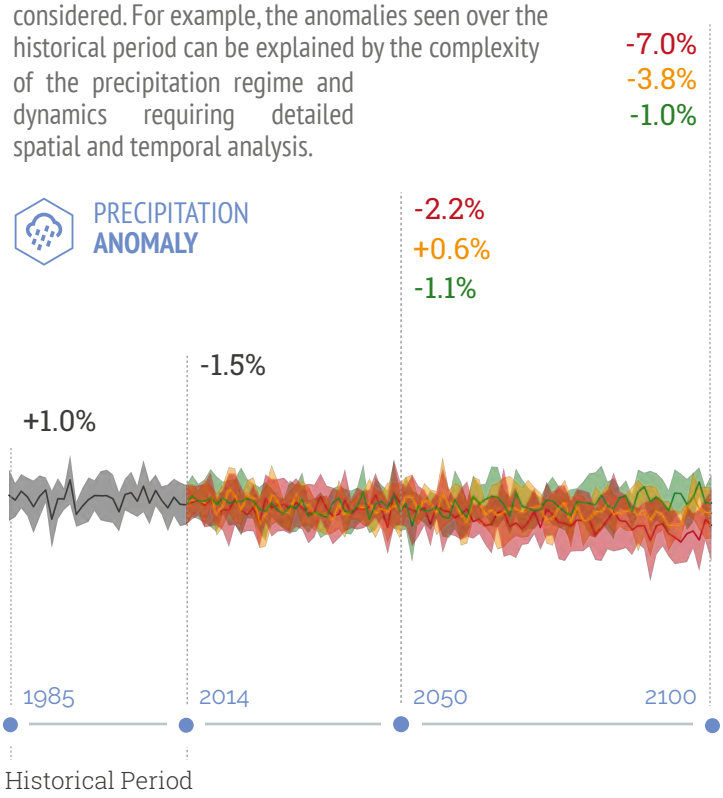
PRECIPITATION TREND

Precipiation anomalies over the last 60 years with respect to the annual mean of 773 mm/year in Argentina during the 1961-1990 period



PRECIPITATION PROJECTIONS

Precipitation trends are complex and reveal large variabilities based on the scenario and period considered. For example, the anomalies seen over the historical period can be explained by the complexity of the precipitation regime and dynamics requiring detailed spatial and temporal analysis.



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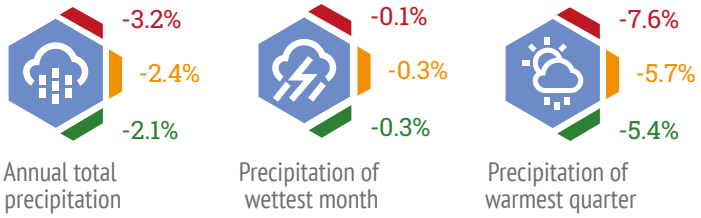
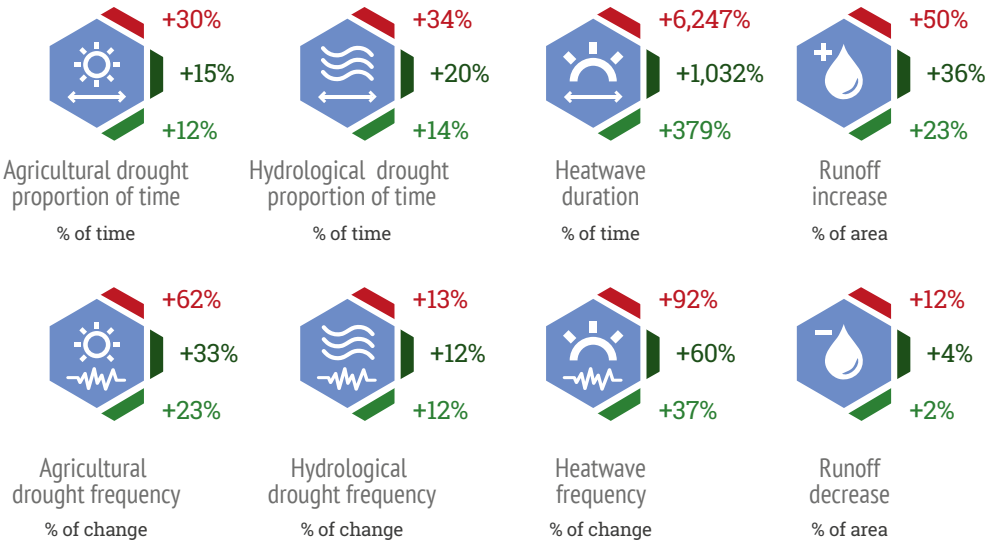


VARIATION OF SPECIFIC CLIMATE INDICATORS

Climate indicators variation showing impacts of climate change on sectors such as agriculture, health and water. Analysis considers 3 threshold average temperature increase: **+1.5°C**, **+2°C**, **+4°C**.



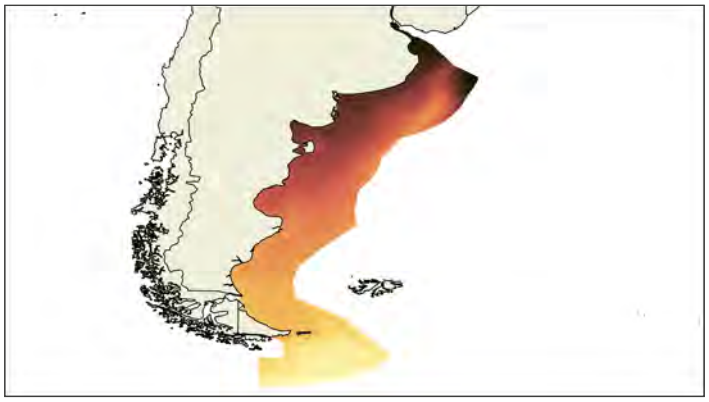
ARGENTINA OCEAN

OCEAN IN ARGENTINA

Argentina's marine exclusive economic zone (EEZ) includes a wide range of habitats, from the southern polar pelagic ecosystems to the temperate ones hosting nursery grounds for several species. The Atlantic coastal systems can be divided in two parts, namely the northern and southern marine regions.

CURRENT CLIMATE CONDITIONS

Mean sea surface temperatures reflects the different climate regimes, from the cold waters of southern Patagonia to the temperate regime of the northern coasts.

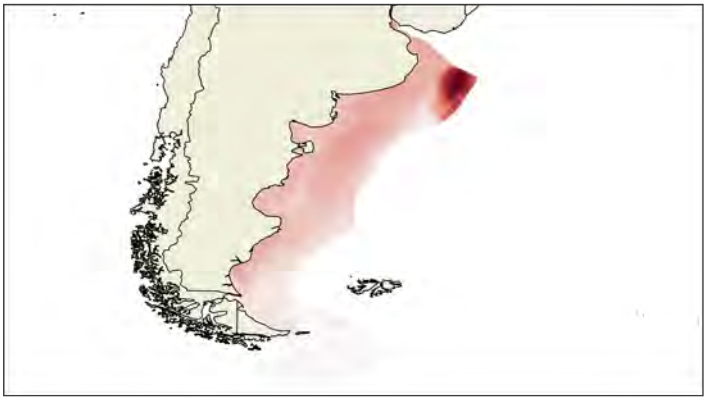


3 — 18 **MEAN**

SEA SURFACE TEMPERATURE

Celsius degrees / Over 1991-2020

0 — 0.7 **TREND**



Surface temperature trends indicate a general warming of 0.2°C per decade in all marine areas, with increased gains in the northernmost regions.

FUTURE PROJECTIONS

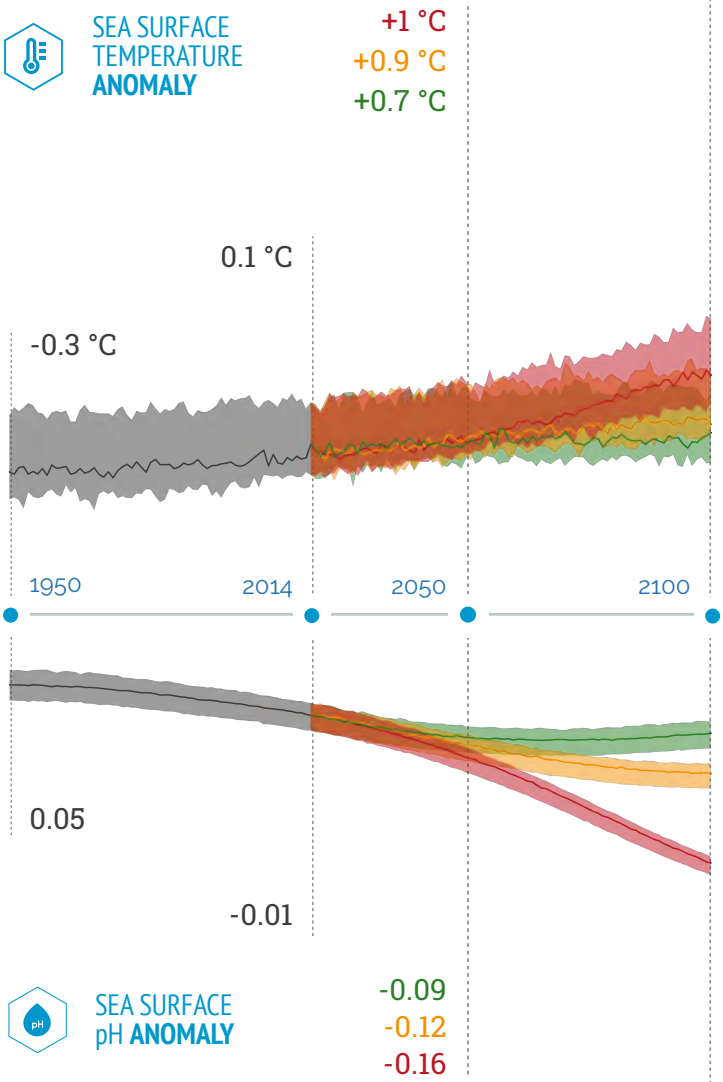
Projected annual changes within the marine EEZ for the two most significant marine indicators of climate change: sea surface water temperatures and pH.

Seawater temperature changes are in line with the definitions of each scenario, with maximum values in 2100 up to +3°C under a high emissions scenario.

+3 °C
+1.5 °C
+0.8 °C

SEA SURFACE TEMPERATURE **ANOMALY**

+1 °C
+0.9 °C
+0.7 °C



SEA SURFACE pH **ANOMALY**

-0.09
-0.12
-0.16

Seawater surface pH becomes more acidic in all scenarios, closely reflecting rising atmospheric CO_2 concentrations, and only a low emissions scenario leads to a stable condition by 2100.

-0.08
-0.18
-0.4

ECOSYSTEM INDICATORS AT 2050

Regional changes in key marine ecosystem indicators under projected future scenarios by mid-century (2036-2065) with respect to present climate conditions (1985-2014).

North

South

Temperature regulates the metabolism of marine organisms determining which habitats remain suitable. Excessive warming will likely push ecosystems beyond tolerance thresholds.

North		South	
12.95°C	+0.98 °C	6.40°C	+0.78 °C
	+0.67 °C		+0.77 °C

pH represents the acid/base status of marine waters, where a decreasing pH reflects the acidification of the ocean due to increased absorption of atmospheric CO_2.

North		South	
8.09	-0.12	8.08	-0.12
	-0.09		-0.09

Oxygen is fundamental to sustain marine life and its reduction can have a large impact on coastal ecosystem services including fisheries and aquaculture.

North		South	
275.35 mmol/m³	-2.04 %	306.27 mmol/m³	-0.84 %
	-1.84 %		-0.58 %

Chlorophyll is an indicator of the biomass available at the base of the marine food web supporting all ecosystem productivity.

North		South	
0.6 mg/m³	+14.77 %	0.63 mg/m³	+3.79 %
	+1.17 %		+2.37 %

FISH CATCH POTENTIAL

Fish catch potential is an estimate of the maximum fish catch achievable given the marine resources available over a sustained period. It is linked to the concept of maximum sustainable yield, meaning the maximum amount of fish that can be extracted from a system without causing a collapse in fish populations.

It is a characteristic of the natural system, which is substantially different from realized catch, and a direct result of the fishery policy in place.

Fish catch percentage change

2050

-3.3%

-1.3%

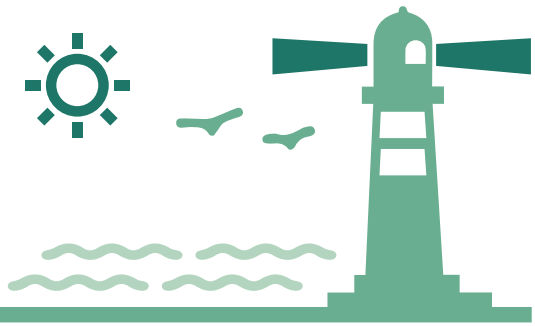
ANALYSIS DETAILS

All datasets were analysed using only data from within the marine EEZ and therefore excluding overseas territories, detached islands and any disputed or joint territories with other nations. In the assessment of current climate conditions, seawater surface tempererature data was obtained using satellite observations distributed in the framework of ESA Climate Change Initiative.

Future projections of marine indicators are represented by the combined analysis of results from 15 different Earth System models participating in the Coupled Model Intercomparison Project Phase 6 (CMIP6). These models include new and better representations of physical and biogeochemical processes, compared to previous IPCC assessment reports.

Fish catch potential data was obtained using the FAO's technical report and refers to the best and worst case climate scenarios from the Fifth IPCC Assessment Report. These mean estimates are subject to substantial uncertainties as discussed in the original work.

ARGENTINA COASTS



OVERVIEW

Argentina's coastline faces the Southern Atlantic Ocean and extends for 8,397 kilometres. The main coastal cities are Buenos Aires, Mar del Plata and Bahia Blanca. Three main regions can be distinguished running north to south: the fluvial region, with the estuaries of the Paraná and Uruguay rivers; the Plata River region, with the capital Buenos Aires which is the most densely populated, urbanized, and industrialized area; and the southern coastline, including the more pristine Pampean and the Patagonian regions.

Shoreline Length

8,397 km

Sandy Coast Retreat at 2050

-92.7 m

CLIMATE CHANGE HAZARDS

Coastal hazards such as erosion, storm tide inundation and permanent flooding, can have strong adverse impacts on coastal regions, with loss of sandy shores, damage to settlements, infrastructure and ecosystems. Climate change can exacerbate these impacts due to rising sea levels and increasing impacts of waves and storms. The populated shores of Argentina are generally on high ground with cliffs or steep terrain near the shore. For this reason, significant loss of land with high impacts on populated areas is not expected. However, some tidal islands south of the city of Bahia Blanca, in the extreme south of the Province of Buenos Aires, are the exception and may be affected.

SEA LEVEL RISE

Relative sea level rise has been observed over the past century around the coast of Argentina, with a yearly average increase of 1.42 millimetres per year since the 1990s. The latest IPCC projections indicate that, by 2050, global sea levels may rise between 0.18 metres, under a low emissions scenario, and 0.23 metres, under a high emissions scenario.

Observed and projected sea level rise at 2050

1.42 mm/year

0.23 m

0.18 m

EXTREME SEA LEVEL

Extreme sea levels are expected to increase in line with sea level rise, increasing the frequency of damaging high water level conditions. On average, one in 100 year extreme sea level events in Argentina are expected to rise from 3.60 metres at present day to 3.81 metres by 2050, under a medium emissions scenario.

Current and projected extreme sea level at 2050

3.6 m

3.88 m

3.81 m

OBSERVED STORMS

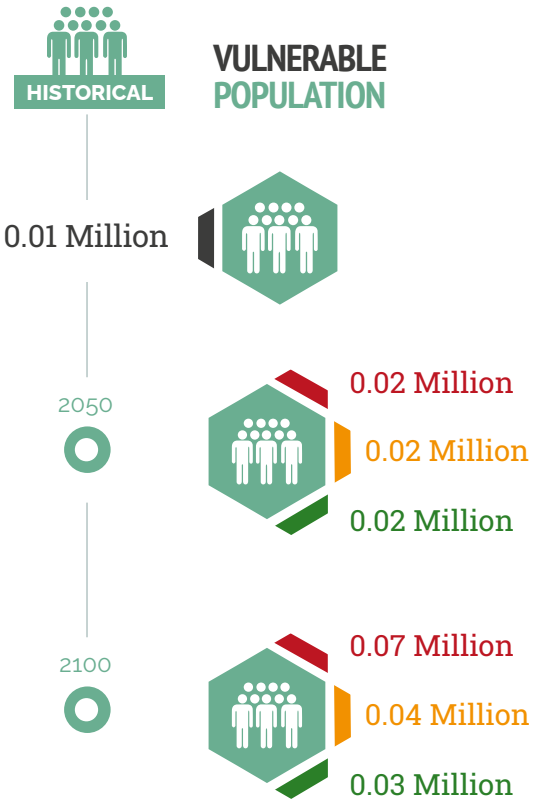
Argentina is mainly influenced by the South Atlantic wave climate, with most waves and wave energy coming from the south and south-east quadrants. Analysis of trends from the last few decades reveal an increment in the frequency, height and duration of the storm surges, in particular in the Río de la Plata region, with increasing erosion. The Río de la Plata estuary is also affected by significant storm surges several times per year.

FUTURE STORMS

A southward migration of tropical cyclones from the tropics due to warming water surfaces can be expected, with increasing exposure of Argentina's coast to tropical storms. Rising sea levels will also increase the frequency of extreme sea level events, such as the one in 100 year water level.

VULNERABILITY AND RISK

A significant portion of people living in Argentina reside in coastal zones, with about 3.6 million people living in low elevated lands below 10 metres above sea level, which amounts to approximately 1.9% of the land area of the country. Based on current projections the population of Argentina living in low lying coastal areas could grow to 7.6 million by 2060.



The coast of Argentina is at risk from the impacts of sea level rise and storm surges, in particular the urban areas around the Plata River, including Buenos Aires, and other smaller cities further South, such as Mar De Plata. Most coastal areas further south have relatively minor risk from coastal erosion and floods, given the lack of densely populated areas. More specifically, the population exposed to the annual coastal flood level is expected to increase from 10,000 to 20,0000 people under a medium emission scenario by 2050.

INFLUENCE OF SEA LEVEL RISE ON EXTREME SEA LEVEL

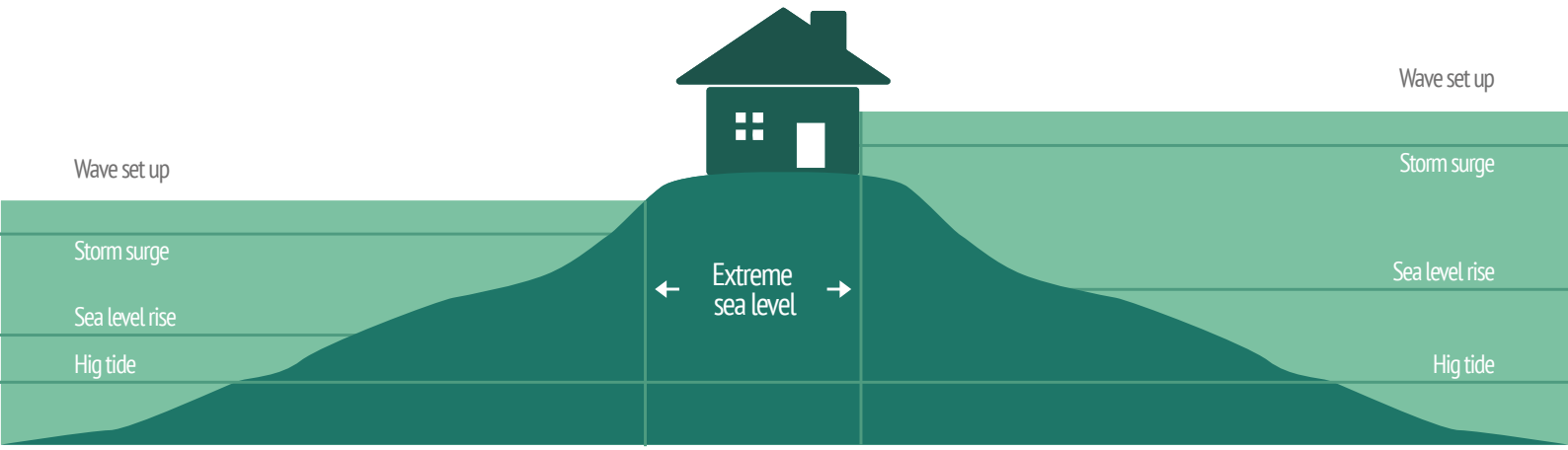
Present and future sea level rise are a consequence of carbon induced global warming causing melting ice and ocean expansion due to heat accumulation.

The extreme sea levels reported here are based on the 100-year storm surge + wave set up + sea level rise + high tide indicators. The first two parameters (storm surge + wave set up) are based on the 100-year value for the event; sea level rise is its projected value at 2050; and high tide is the absolute value of the highest tide calculated for a given locality, which won't be influenced by climate change.

+ Wave set up refers to the accumulation of water near the shore due to the presence of breaking waves.

+ Storm surge is an occasional increase in sea level driven by shoreward wind-driven water circulation and atmospheric pressure.

+ High tide is usually the highest tide reached in a given location based on tide records.



Present sea levels have risen globally by approximately 20 centimetres over the past century.

Future sea level rise is a projection based on different global warming scenarios, at approximately 100 centimetres by the end of 2100, with consequent inundation during extreme sea level events.

ARGENTINA WATER

OVERVIEW

Argentina can be divided into three climatic and hydrological regions: humid, semi-arid and arid.

Around 76% of the national territory is subject to conditions of aridity or semi-aridity, with average rainfall of less than 800 millimetres per year and 85% of surface water belonging to the La Plata River basin in the urbanized east. Argentina is a water-rich country with an uneven distribution of water resources.

Renewable internal freshwater resources
292 billion m^3

Renewable internal freshwater resources per capita
6,629 m^3

The Rio De La Plata Basin, which concentrates more than 85% of total national water resources, is the largest center for human settlements, urban development, and economic activity in the country.

CLIMATE CHANGE HAZARDS

Climate change can affect water resources due to increasing temperatures, higher rates of evapotranspiration and altered rainfall patterns. This leads to changes in the water cycle, including decrease of snow and ice coverage, alterations in surface runoff and groundwater storage, as well as drought and flood occurrence. In Argentina, precipitation patterns and temperatures are changing, affecting water resources. The highest increases in precipitation (from 1960-2010) occurred in the eastern parts of the country. In the northern regions, the increase in precipitation has led to more variability in precipitation annually, with a higher risk of droughts and consequently affecting agriculture.

KEY POINT RUNOFF

There is very little annual rainfall with less than 1% of available surface runoff in very arid and semiarid provinces, such as San Juan or La Rioja.

The Andes region is particularly at risk in terms of runoff, with most climate models projecting marked surface runoff decreases in the area. Instead, at a country scale, an average increase in surface runoff by approximately 21% and 6% is expected, respectively, under the low emissions and high emissions scenarios for the 2045 to 2055 period, compared to 2015 to 2025.

If temperatures rise by 1.5°C, 2°C or 4°C, 2%, 3.9% or 12% of the country will likely experience an increase in runoff, whereas 23%, 36.1% or 50% of the surface of the country will likely experience a respective decrease in runoff.

2050

Changes in annual runoff
% of change

+5.7%
+20.6%

2050

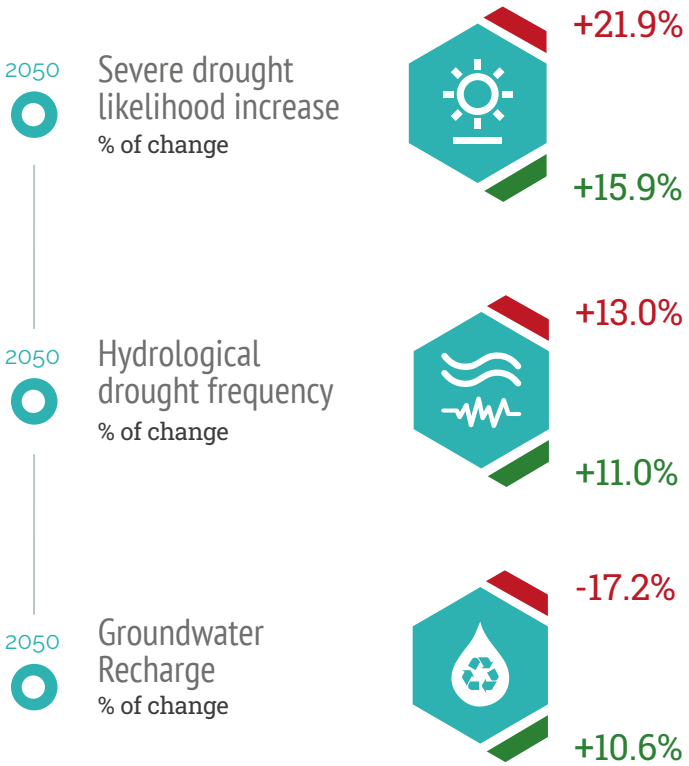
Runoff increase
% of area

+12.0%
+2.0%

KEY POINT DROUGHTS

The Salta province goes through periodic droughts and contributes to Argentina's desertification at a rate of 2,500 kilometres per year. Wide-scale clearing of forests in the Gran Chaco (covering southern Bolivia, western Paraguay, and northern Argentina) to make way for soybean planting has accelerated the process. The Pampas region is also severely affected by episodic drought events in 2008-2009 and 2017-2018.

These episodes are mainly driven by large-scale atmospheric circulation, such as El Niño, but likely strengthened by climate change. The likelihood of severe droughts in Argentina is expected to increase by 15.9%, 17,9% and 21,9% (2040-2059) under low, medium and high emissions scenarios. Similarly, If temperatures rise by 1.5°C, 2°C or 4°C, hydrological drought frequency is expected to increase by 11%, 12.2% and 13%, respectively.



KEY POINT GROUNDWATER

Argentina's groundwater use has increased significantly over recent decades due to its generalized presence, high reliability during droughts and decent quality in most cases. Current effects of climate change can be seen through the spatial variations of the groundwater availability, also compromised by the more frequent prolonged drought periods. In Argentina, the increase in evapotranspiration may significantly affect those aquifers with a water table close to the ground surface. The water demand is also expected to be higher due to the heat and lower availability of surface water.

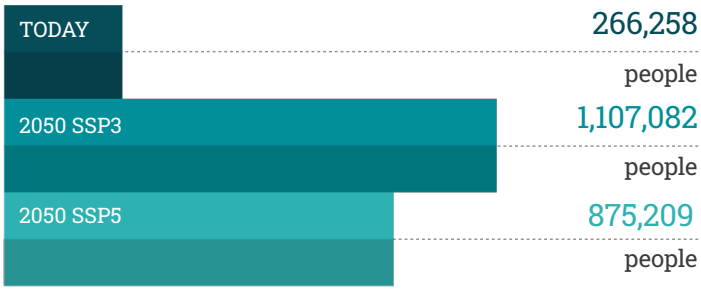
At the country level, a +10.5%, -3%, and -17.2% change of the annual groundwater recharge for 2045-2055 compared to 2015-2025 is expected under low, medium, and high emissions scenarios.

KEY POINT FLOODS

Floods affect some of the population and infrastructure and have a strong impact on agricultural productivity, one of the country's main economic activities. The fluvial systems in Argentina can be classified into three main groups: large tropical rivers, torrential rivers with headwaters in mountain areas, and flat-plain rivers with insufficient drainage efficiency.

In April 2013, the northeastern section of the Buenos Aires province experienced severe flash floods, leading to 101 casualties and extensive damage, with scientists agreeing on the important role of climate change in this disaster. Changes in the population exposed to floods are expected, with an increase from about 266,000 in the present day

POPULATION AFFECTED BY RIVER FLOODS



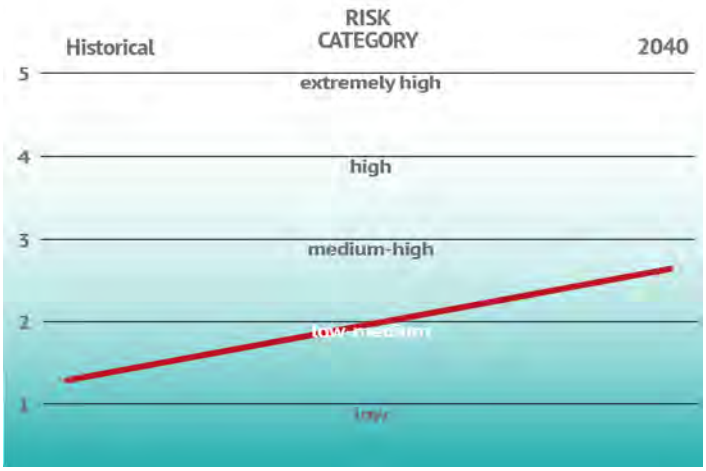
to 1,100,000 under SSP3 and 875.000 under SSP5 by 2050. As such, potential impacts related to river floods might increase.

RISK INDICATORS

The water stress index summarises current and future water related vulnerabilities and risks at the global level. Scores are based on the ratio of total water withdrawals, including agriculture, industrial and human consumption, to available renewable surface and groundwater supplies.

WATER STRESS

Argentina's water stress level is considered low-medium for the recent past (1960-2014 average), and it is expected to increase in the near future (2030-2050) based on climate change projections.



ARGENTINA AGRICULTURE

OVERVIEW

Argentina is a leading food producer that relies on abundant and fertile land, together with significant water resources. Recent decades have seen an expansion in the agricultural and irrigated area for the production of key agricultural commodities, mainly focused towards export.

Most grain and oilseed production (wheat, maize, soybean) is concentrated in the Pampas region, whereas the production of higher-value crops such as fruit, vegetables and sugarcane takes place outside of the Pampas.

Though water stress in the country is considered to be relatively limited (10.5%), agricultural sector water use to support irrigation is substantial, accounting for 74% of total water withdrawal in 2017.

43.5 Mt
Maize

37.8 Mt
Soybeans

18.5 Mt
Sugarcane

18.5 Mt
Wheat

3.5 Mt
Citrus

2.6 Mt
Grapes

Added Value of Agriculture, Forestry and Fishing

2000: 23,530 USD Million

2018: 28,024 USD Million

Share of Agriculture Value added in Total GDP

2000: 5.5 %

2018: 4.4 %

Agricultural land

2000: 28,640 Thousand HA

2018: 40,268 Thousand HA

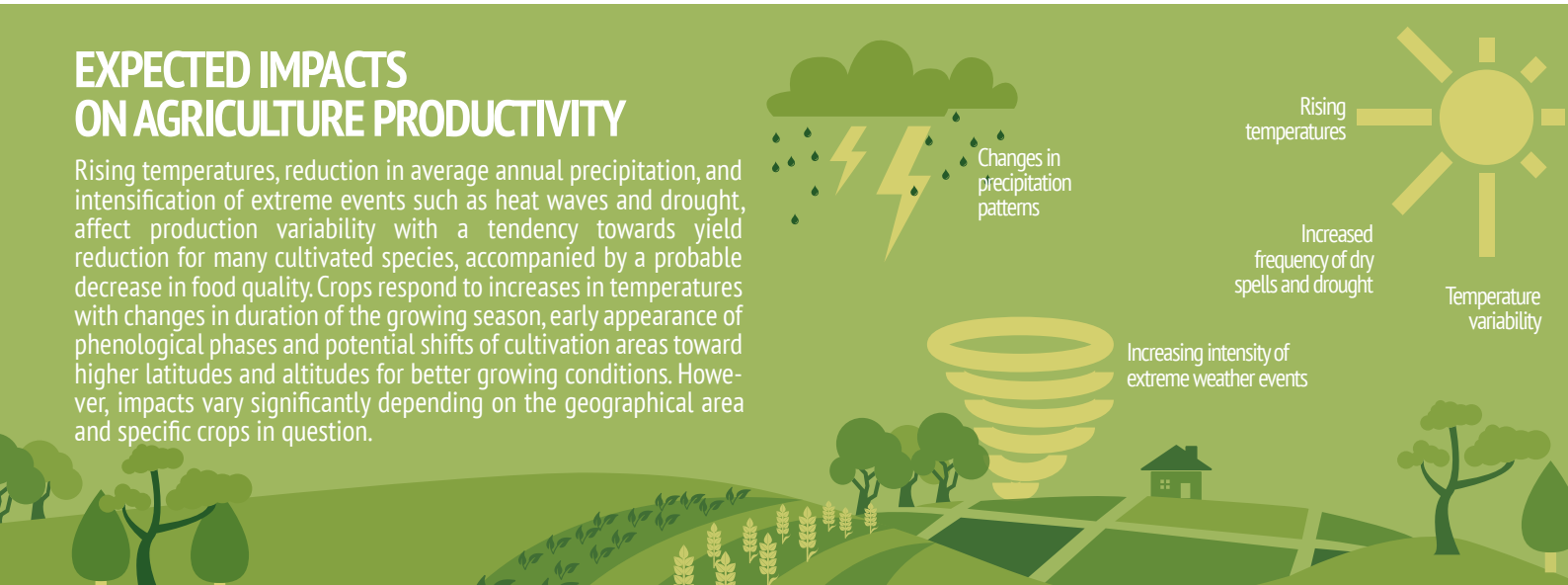
Area Equipped for Irrigation

2000: 1,565 Thousand HA

2018: 2,360 Thousand HA

EXPECTED IMPACTS ON AGRICULTURE PRODUCTIVITY

Rising temperatures, reduction in average annual precipitation, and intensification of extreme events such as heat waves and drought, affect production variability with a tendency towards yield reduction for many cultivated species, accompanied by a probable decrease in food quality. Crops respond to increases in temperatures with changes in duration of the growing season, early appearance of phenological phases and potential shifts of cultivation areas toward higher latitudes and altitudes for better growing conditions. However, impacts vary significantly depending on the geographical area and specific crops in question.

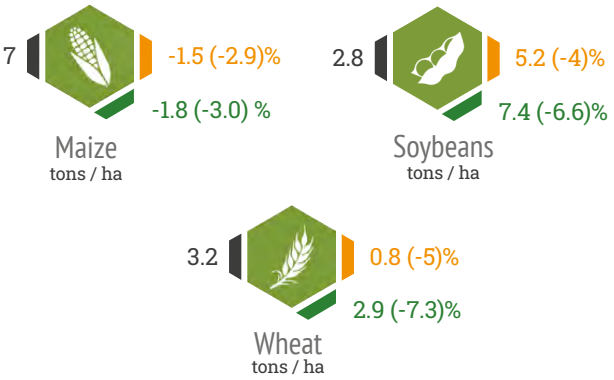


CROP PRODUCTIVITY

Crop productivity refers to the harvested yield of a crop per unit of land area. It is strongly influenced by climate and other environmental and management factors.

Climate change is expected to have an impact on the productivity of several major crops, although this may in part be offset by the fertilizing effect of higher CO_2.

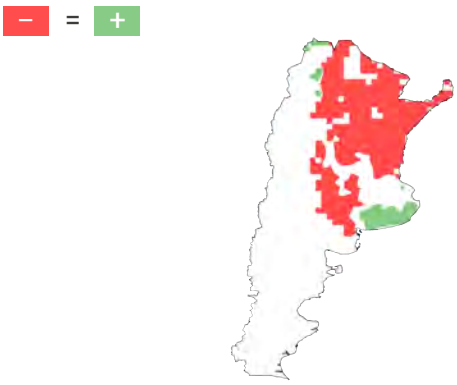
Impacts are estimated using a range of model projections based on low to high emission scenarios and reported as percentage changes between the 30-year average around the historical period and the 30-year average around 2050.



2050

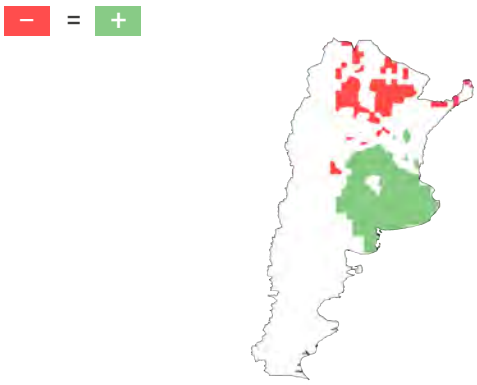
Productivity change with (without) the CO_2 fertilization effect. Estimates assume sufficient water and nutrient supplies, and do not include impacts of pests, diseases, or extreme events.

CHANGE IN MAIZE



Maize yield is projected to decrease in most areas, excluding some central coastal areas where precipitation patterns during the growing season remain consistent. Soybean cultivation may benefit from climate change, with consistent increases of up to 10% in productivity in the Pampas region where an increase in summer rainfall is expected. Wheat will witness some yield gains in the Pampas, and general decreases outside this region, particularly in the northern-

CHANGE IN WHEAT

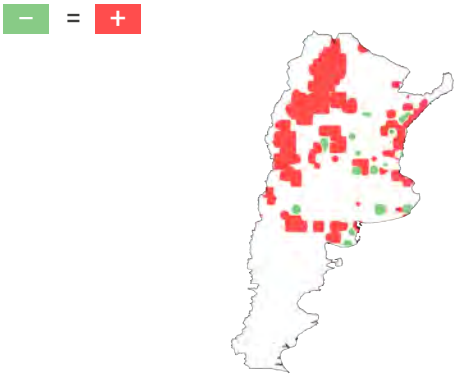


most areas. Projections highlight enhanced prolonged winter droughts and reductions in spring rainfall over central regions, this may pose significant risks to wheat productivity. Yield and quality of grapes may suffer diverse impacts, with colder climate wine-growing regions favoured. This may lead to shifts of wine-growing towards cooler areas (higher latitude or altitude).

ADAPTATION IN AGRICULTURE AND WATER RESOURCES

Climate change may have some positive effects on some of the most widely used crops. However, higher temperatures will generally require an increase in irrigation due to higher plant evapotranspiration and expansion of irrigated areas. This implies increased pressure on water withdrawal from the agricultural sector to maintain production and ensure food security. Currently, irrigation is relatively limited and covers around 5% of Argentina's agricultural lands. Irrigated farming systems (like grapevine cultivation in the West) have allowed for significant intensification of productivity. In the future, further expansion of irrigation in water stressed areas, together with changes in glacial melt and reduced river stream flows, could pose additional stress on freshwater resources prompting use of groundwater for irrigation.

CHANGE IN WATER DEMAND



2050

Agriculture
Water Demand
% of change

Increase in water demand, associated with the expansion of irrigated areas, will require adaptation practices that favour water-use efficiency and limit the increase of stress on water resources.

ARGENTINA FORESTS

FORESTS IN ARGENTINA

Given territorial and climatic conditions, Argentine forests (of which 6% are considered primary) are characterized by extreme variety.

In recent decades, deforestation has significantly limited the strategic ability of forests to fight the climate emergency through carbon dioxide absorption.

FORESTED AREA AND CARBON STORAGE

Argentinian forests cover no more than 10% of the country and in recent decades this area has been shrinking. According to the Argentinian Second Biennial Update Report (BUR), deforestation (albeit a decreasing rate) contributes to 14.5% of the country's total emissions.

1990

35 Mln ha
Million hectares
Forested area

154 Tons/ha
Tons of Carbon per hectare
Carbon stock

2020

29 Mln ha
Million hectares
Forested area

163 Tons/ha
Tons of Carbon per hectare
Carbon stock

FOREST PRODUCTIVITY

Forest productivity or Net Primary Production is the net carbon captured by plants. It is the difference between the carbon gained by Gross Primary Production - net photosynthesis measured at the ecosystem scale - and carbon released by plants' respiration. It is expressed per unit land area.

2050

Productivity anomaly
Tons of Carbon per hectare per year

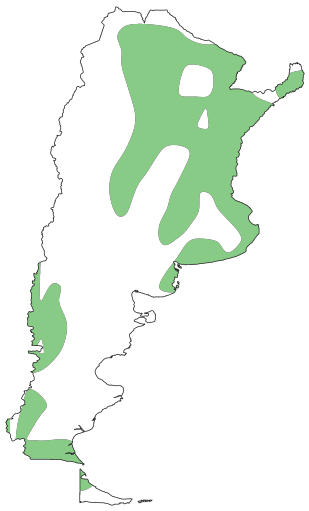
+0.52

+0.30

A generalized increase although weaker in the north. Potentially pronounced increase only in scarcely forested areas such as the Pampas.

Decrease expected in montane cloud forest production in the southernmost area of the Catamarca (24-27°C south).

+ Increase in the duration and severity of drought events which is not sufficiently balanced by the fertilizing effect of CO_2 whereby carbon dioxide stimulates photosynthesis



KEY SPECIES UNDER CLIMATE CHANGE

THERMOPHILIZATION
ANDEAN FORESTS
Pronounced thermophilization of Andean forests, leading towards a higher dominance of warm-adapted species

CONTRACTION
CLOUD FORESTS
Expected contraction of key species ranges

VULNERABILITY
NOTHOFAGUS
Increasing vulnerability of various Nothofagus species to droughts across their entire range of distribution

SHIFT
MONTANE FORESTS
Expected upward shifting of montane forest ecosystems

FIRES IN ARGENTINA

Fire is a structural ecological process that provides several types of ecosystem services and impacts on socio-ecological systems, including human health, carbon budgets, and climate change. Changes in global fire activity are influenced by multiple factors such as land-cover change, policies, and climatic conditions. Fire also releases large quantities of greenhouse gases into the atmosphere, contributing to a vicious cycle.

During the last two decades, the total land area affected by fire was approximately 21.5 million hectares of which 27% involving forests.

BURNING
21.5 MILLION HECTARES

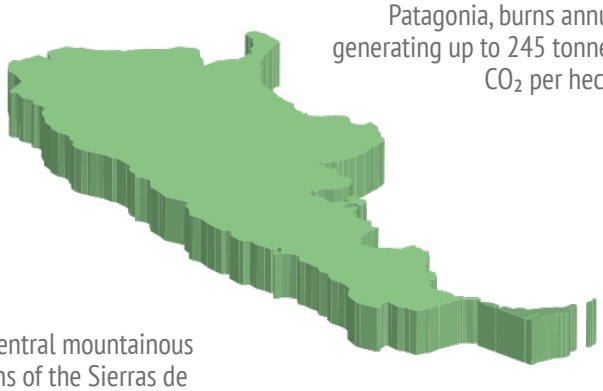
EMITTING
14 TERAGRAMMES OF CARBON PER YEAR

SAVANNA FIRE EMISSIONS CONTRIBUTED TO 53.5% OF TOTAL FIRE RELATED CARBON EMISSIONS

0.57 TERAGRAMMES OF CO_2 EMITTED ANNUALLY BY NATIVE FOREST FIRES IN CENTRAL AND SOUTHERN PATAGONIA

WHERE DO FIRES OCCUR?

2.5% of the Andean cypress forest, one of the most important tree species of central Patagonia, burns annually generating up to 245 tonnes of CO_2 per hectare.



The central mountainous regions of the Sierras de Córdoba and the Andean temperate forests are the most affected in terms of area burned and fire frequency.

FUTURE BURNED AREA

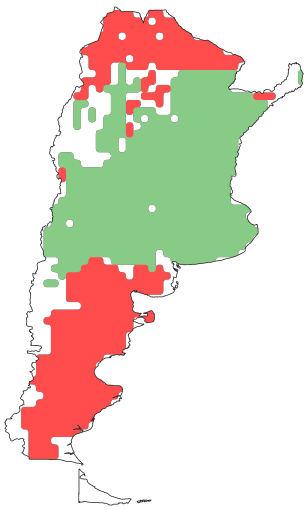
Under a low emission scenario, the burned area might potentially increase in the northern Montane Grasslands and Shrublands. Also south eastern Temperate Grasslands, Savannas, and Shrublands might experience a slight increase in burned area. Under a medium emission scenario, models project accentuated burned area in northern mountain areas.

Burned Area
km² per year

2050

+734

-314



Decrease in burned areas for a low emissions scenario

Increase in burned areas for a low emissions scenario

+ Increased risk of warming and drought in southern Argentina

WILDLAND URBAN INTERFACE

Wildfires are a major threat to people and property, particularly within the Wildland Urban Interface (WUI) which is the transition zone between houses and wild vegetation areas.
In central Argentina, around 15% of the territory is classified as WUI and a high percentage of buildings are located in the WUI. Furthermore, most of these buildings are found in areas with high burn probability and where historically fires have already occurred.
In this context, forest fires contribute significantly to urban air pollution and particulate matter. For example, during the winter and spring of 2013 there was a strong presence of PM2.5 concentrations as forest fires episodes occurred around Cordoba city in central Argentina.

FUTURE FIRE EMISSIONS

Under a low emission scenario fire emissions might increase in the north and west Temperate Grasslands, Savannas and Shrublands of the Humid Pampas, the Espinal and the Dry Chaco. Under a medium emission scenario, a generalized increase might be more intense throughout mountainous areas in the North.

Fire Carbon emission
Teragrams of Carbon per year

2050

-4.6

-12.8

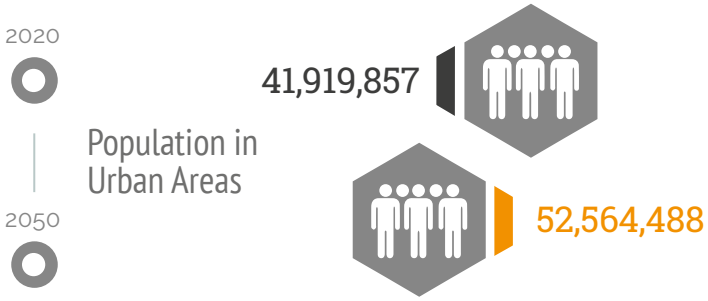
ARGENTINA URBAN

OVERVIEW

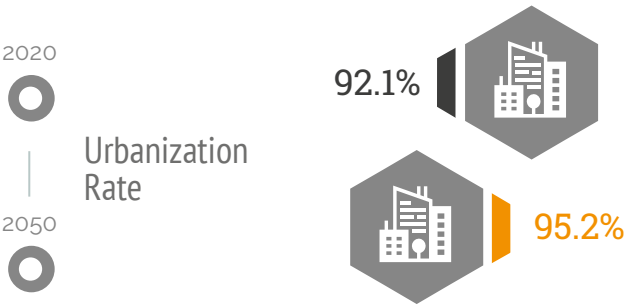
Over 92% of theA rgentine population lives in urban areas, and an urbanization rate of 95% is expected by 2050.

The urban population is unevenly distributed and highly concentrated. 35% of people live in the Greater Buenos Aires area and a few other large cities, whereas most others other inhabit smaller urban agglomerations around the country.

Built up areas cover 0.32% of the country (8,897.11 square kilometers).



Graphs refer to data provided by United Nations, Department of Economic and Social Affairs, Population Division (2018). World Urbanization



OVERVIEW OF KEY CLIMATE IMPACTS IN URBAN AREAS

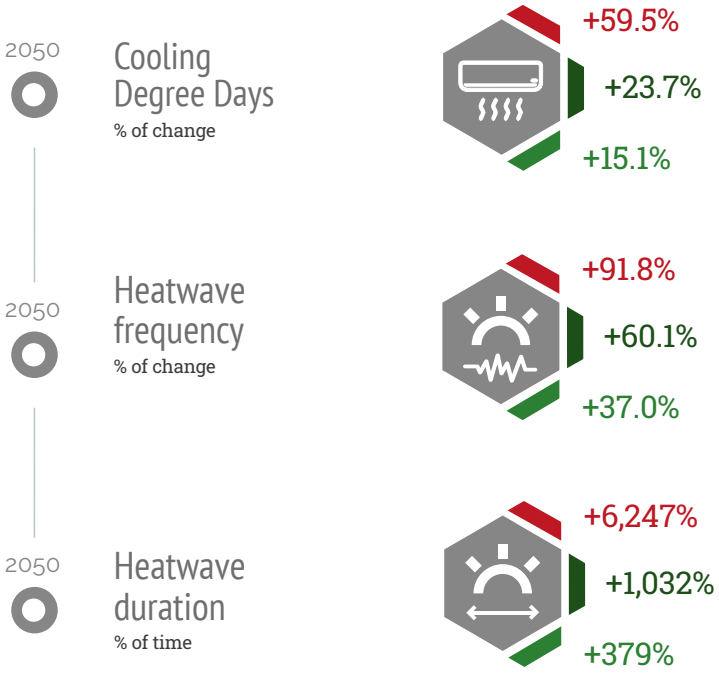
Key impacts on urban areas regard flooding from rivers and in urban areas and heat stress from increasing frequency and intensity of heatwaves.

HEATWAVES AND HEAT STRESS

Observations show a general increase in the number of warm nights, alongside an increasing frequency of heatwaves in particular in the most recent period.

This affects major urban centres the most. In Buenos Aires, a particularly intense and long heatwave in 2013, with daytime temperatures up to 40°C, caused an increase in daily deaths by 43%. The elderly were the most affected with mortality among over 84-year-olds rising by 51%.

Energy supply in the metropolitan area of Buenos Aires collapsed due to intense demand for air conditioning. With rising temperatures the frequency and duration of heatwaves is expected to increase. This will impact living conditions in urban areas significantly with higher temperatures due to the urban heat island (UHI) effect.



INTERACTIONS BETWEEN HEAT AND AIR QUALITY

Heat related health impacts from increasing air temperatures in urban areas are accentuated by air pollution. In Argentina, more than 90% of the urban population is exposed to unsafe levels of pollution such as PM2.5, which regularly exceed the threshold values recommended by the WHO.

In Argentina, more than 90% of the urban population is exposed to unsafe pollution levels, for instance of PM2.5, which exceed the threshold values recommended by the WHO.

COASTAL FLOODING

Despite decreasing annual precipitations an increase in frequency and intensity of extreme rainfall events will expose most urban areas tomore frequent flooding.

Flooding from sea level rise presents risks for the estuary of the Rio de la Plata and will also affect the capital city of Buenos Aires. If sea levels rise by 50 centimetres these cities woud triple their exposure to the risk of flooding.

EXTREME PRECIPITATION EVENTS

Argentina faces challenges related to changing precipitation patterns, with increasingly frequent extreme precipitation events exposing urban areas to flooding.

Although Argentina has invested in infrastructure to protect from flooding, precipitation events continue to cause damages. In Buenos Aires nearly 200,000 people and at least 32 other cities have recently been affected by floods with over one million people exposed to this risk. Despite decreasing annual precipitations an increase in frequency and intensity of extreme rainfall events will expose most urban areas tomore frequent flooding.

2017

Population exposed to air pollution

93.9%

2050

2100

Projected sea level rise

0.23 m

0.18 m

0.77 m

0.38 m

2050

Runoff increase

% of area

+12%

+4%

+2%

SURFACE SEALING AND FLOODS

Heavy precipitation in cities is problematic due to the high level of sealed surfaces. Soil sealing increases run off and reduces the amount of water absorbed by soil. Where there are large amounts of impervious ground cover, short duration extreme rainfall events can lead to increased flooding, even resulting in flash floods.

INEQUALITIES IN FLOOD RISK

Both low and high income households settle in flood prone areas or on steep ground. However, disadvantaged groups have less possibilities to apply flood protection measures to their homes, lobby for protective infrastructures or obtain flood insurance

2010

% of urban population

Population living in slums

14.7%

2018

% of total population

Urban population living in areas where elevation is below 5 meters

2.1%

ARGENTINA HEALTH

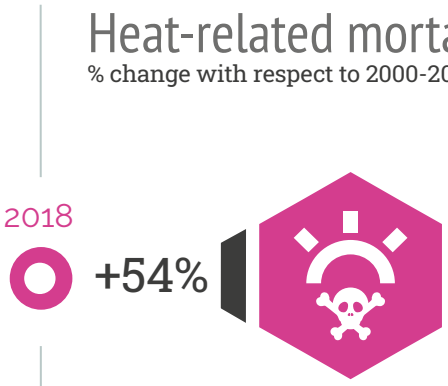
OVERVIEW

Argentina's sub-tropical climate is highly appropriate for the transmission of vector-borne diseases such as dengue, malaria, chikungunya, Zika, and leishmaniasis. Rising temperatures will expand the range, seasonality, and distribution of vector-borne illnesses such as malaria and Zika. Projections suggest that the potential spread of these diseases will result in the number of people exposed being tripled by the end of the century.

Mean annual temperature was seen to increase by 0.5°C and by 1°C in the Patagonia region over the past 50 years. This projects up to 2°C and 4°C increase in the south and north of the country. This is expected to bring higher levels of hydric stress and increased drought, and desertification. The incidence of waterborne diseases and the distribution of food and vectors may also be affected.

HEAT RELATED MORTALITY

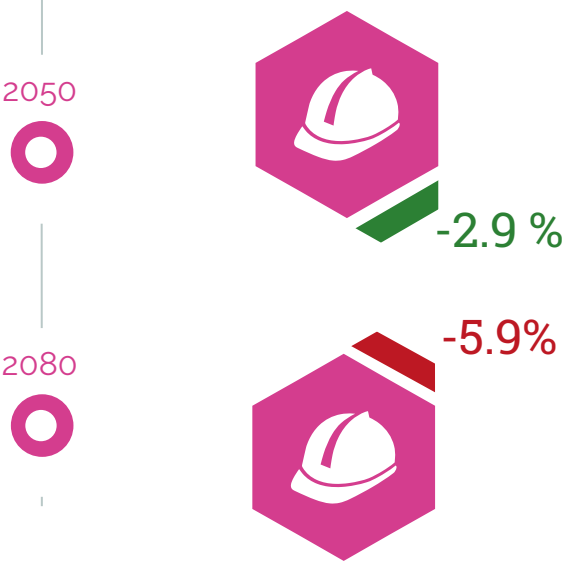
Warming and increased frequency and duration of heatwaves have resulted in an increase in excess mortality and mortality risk in Argentina over the last two decades. In 2018, there was a 54% increase in heat-related deaths from a 2000 to 2004 baseline. 20.5% of heat related mortality in Argentina during 1991 to 2015 can be attributed to human-induced climate change.



IMPACTS ON LABOUR

Labour is directly affected by changes in environmental conditions. Warming affects both the number of hours worked (labour supply) and on the productivity of workers during their working hours (labour productivity). Both labour supply and productivity are projected to decrease under future climate change in most parts of the world, and particularly in tropical regions. Parts of sub-Saharan Africa, south Asia, and southeast Asia are at highest risk under future warming scenarios. Future climate change will reduce global total labour in the low-exposure sectors by 18 percentage points and by24.8 percentage points in the high-exposure sectors under a 3°C warming scenario

Warming and heatwaves are projected to affect labour in high-exposure sectors in Argentina. In the agriculture and construction sectors, there was a 49.7% decline in potential hours of labour in 2019 compared to a 1990s baseline. Total labour in Argentina is expected to decline by 2.9% under a low emissions scenario, and by 5.9% under a medium emissions scenario.



CLIMATE CHANGE AND DENGUE

Dengue has spread throughout the tropical world over the past 60 years and now affects over half the world's population. Globally, vectorial capacity for both dengue vectors (A. aegypti and A. albopictus) has been rising steadily since the 1980s, with nine of the ten highest years occurring since 2000.

Climatic stressors are one important driver of the current distribution and incidence of dengue. Climate change is likely to expand the geographical distribution and suitability of several vector-borne human infectious diseases including dengue. The risk of dengue transmission is increased by warming climates, as the growth and development of mosquitoes are significantly influenced by temperature, precipitation, and humidity.

CLIMATE CHANGE AND ZIKA

Zika virus has spread to at least 49 countries and territories since 2013. Climate change impacts on transmission suitability risk have increased over the years and future warming over 1.3 billion additional people could face suitable transmission temperatures for Zika by 2050.

DENGUE AND ZIKA: POPULATION AT RISK

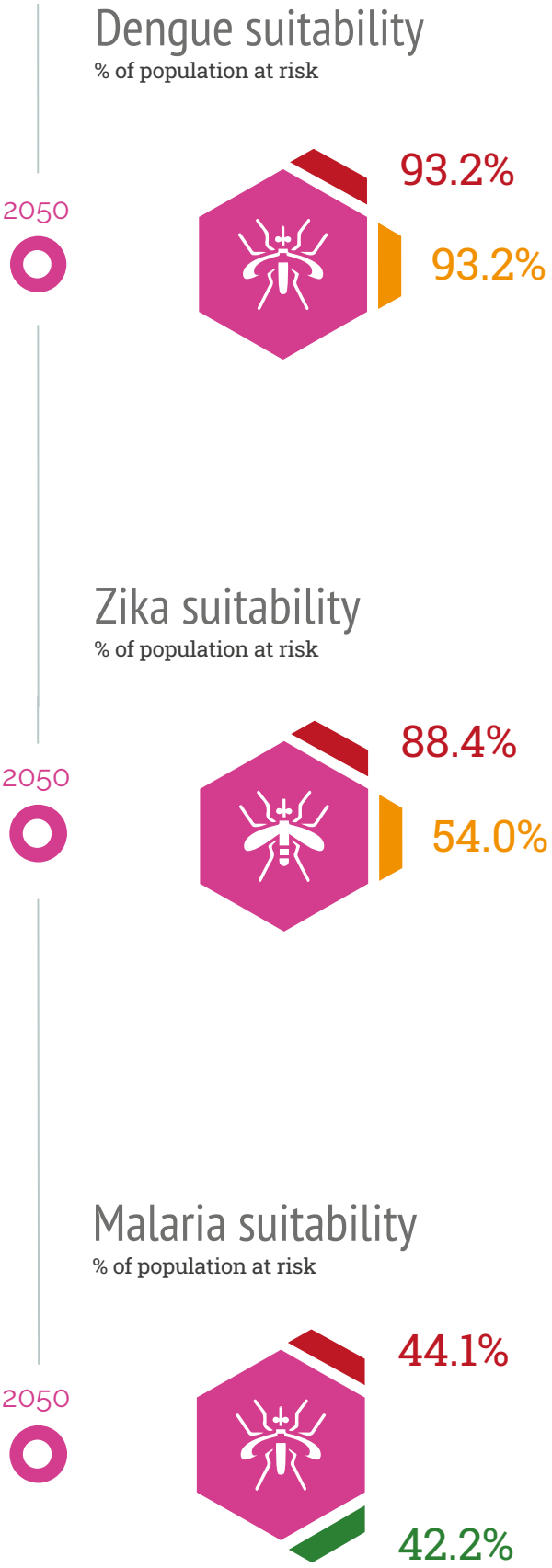
Argentina is already at risk of an increase in climate-induced infectious diseases and these risks will increase due to future climate change. Climate change may extend suitability conditions for vectors and help them spread southwards.

Under a medium emissions scenario, 93.2% of the population will be at risk of transmission-suitable mean temperature for dengue by 2050, whereas 92.5% will be at risk under a high emissions scenario.

In the case of Zika, 54% of the population will be at risk by 2050 under medium emissions, whereas 88.4% will be at risk under high emissions.

CLIMATE CHANGE AND MALARIA

Rising temperatures will expand the range, seasonality, and distribution of vector-borne illnesses such as malaria and Zika. Under a low emissions scenario, 42.2% of the population will be at risk of malaria in 2050. Under a high emissions scenario, this will increase to 44.1% of the population.



ARGENTINA ENERGY

ENERGY SYSTEM IN A NUTSHELL

Argentina's energy mix is dominated by oil (for transportation) and natural gas (for electricity generation). Domestic production of oil is almost entirely absorbed by the internal market.

Over 25% of electricity generation comes from renewable sources. The country's geographic features result in a wide variety of climates and hence of heating and cooling needs.

0.10
ktoe/US$
Energy intensity

5.4%
AC Share in electricity consumption

9%
Import dependence ratio

CLIMATE CHANGE TODAY

HEATING

Temperatures have increased on average by 1°C during the last century with uneven patterns across the country, with minimum temperatures increasing more than maximum temperatures, pointing to decreasing heating needs.

HYDROPOWER

Hydropower is already under threat due to water scarcity in the north, north-east and Cuenca de La Plata, and the marked shrinking of Andean glaciers is hinting to an intensification of this pattern in central and southern regions as well.

ENERGY SUPPLY

The current (2019) energy mix of total primary energy supply in Argentina is strongly dominated by fossil fuels (32.8% oil, 54.9% natural gas, 1.74% coal, totalling 89.4% of total primary energy supply), followed by renewable sources (8.3%). There is also some residual nuclear power generation (2.3% of total primary energy supply). Imports are negligible, as the country is largely self-sufficient. Electricity generation relies mostly on natural gas (69% of electricity fuel mix in 2018) and hydropower (12%).

ENERGY DEMAND

In Argentina, energy is used mainly for transport (31.6% of final demand in 2018), industrial uses (29.5% including 6.5% for non-energy uses) and residential (24.7%), followed by commercial use (8.1%), and agriculture (6.1%). Air conditioning's contribution to residential electricity demand is still moderate (5,4% in 2017).

FUTURE ENERGY DEMAND

Argentina has a variety of climates ranging from the freezing polar tundra of the Tierra del Fuego and alpine in the Andes, to temperate in Buenos Aires, and a subtropical climate in the north.

Hence both effects on heating and cooling needs are expected to be significant. Overall, cooling needs will prevail, leading to an increase of 111 PJ (or 31 million KWh) by 2050 under a medium emissions scenario.

Net change in energy demand due to changes in HDD/CDD

Billion KWh

2050

+ 30.84

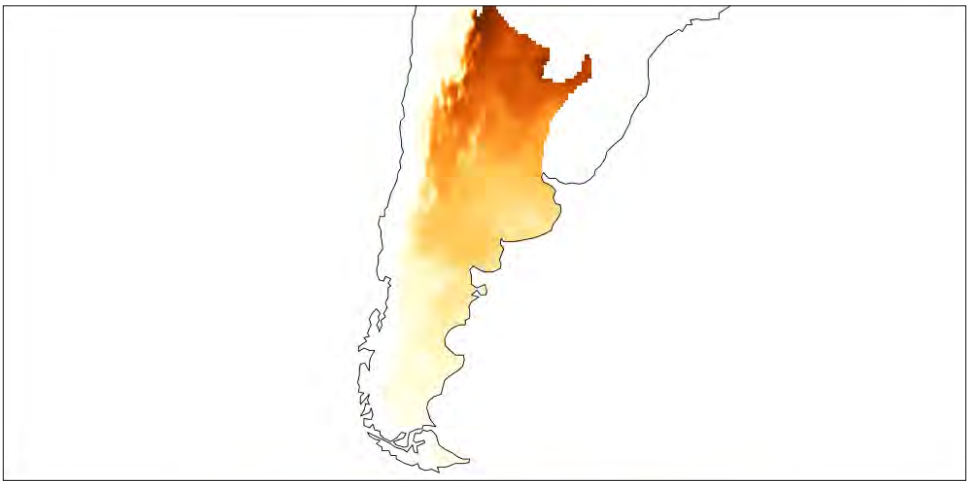
COOLING NEEDS

Cooling degree days will undergo very marked increases along the northern border, and loose intensity along the north-south axis, although with significant magnitude on the northeast coast (where Buenos Aires lies).

Negligible variations in the sparsely inhabited south and on the mountains.

COOLING DEGREE DAYS

0 — 613



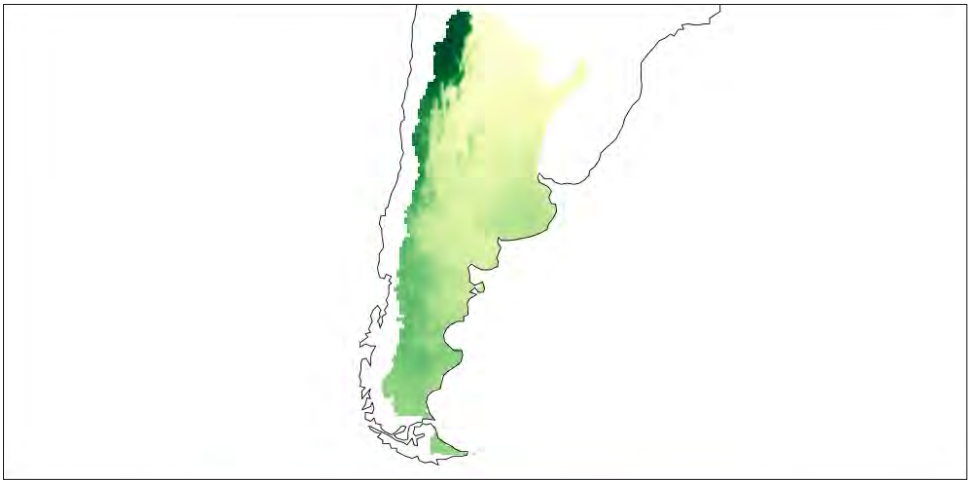
HEATING NEEDS

Highest decrease in heating degree days in the Andean regions in the north of the country, followed by the southern, cold regions of Patagonia and Tierra del Fuego.

Moderate decreases in the central/east coast, including the Buenos Aires area. Negligible changes on the northern border.

HEATING DEGREE DAYS

-742 — 0



FUTURE ENERGY SUPPLY

The future configuration of Argentina's energy mix is likely to be determined by the evolution of climate mitigation policies and hence is outside the scope of this report. At the time of writing, there were no confirmed long term decarbonization commitments in place.

Change in Hydropower generation

% of change

2050

-3.69%

-2.99%

EXPECTED IMPACTS OF CLIMATE CHANGE

The main concern regards water availability reduction for hydropower and cooling of thermal power generation plants. However, there is a lack of quantitative estimates of expected impacts.

ARGENTINA ECONOMY

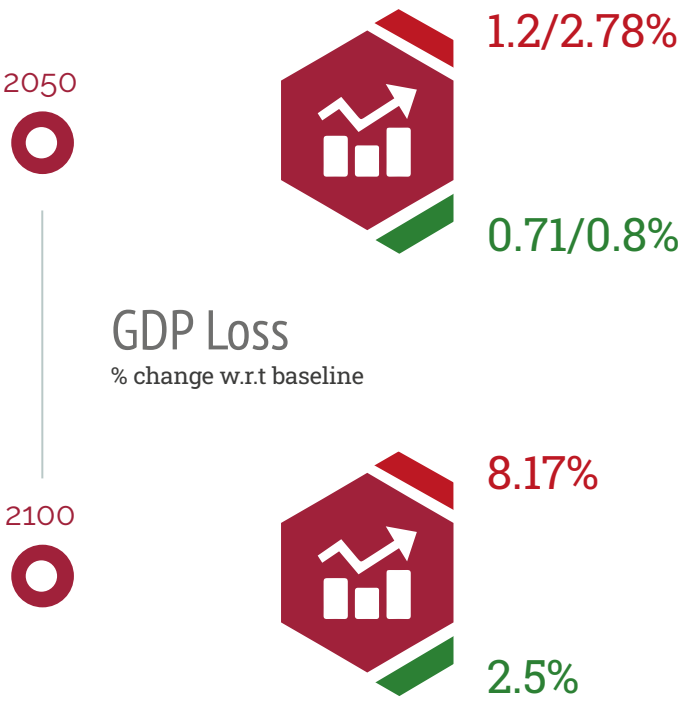
OVERVIEW

Argentina ranks 19th in terms of GDP in the G20 group. Although badly hit by the COVID 19 pandemic, recording a 10% decline in real GDP in 2020, the trend has reversed in 2021, with 5.8% growth in real GDP.

IMPACTS ON GDP

Argentina could experience systemic losses and negative growth impacts due to climate change. GDP losses by mid century could be up to 2.8% of GDP or 8.8 billion EUR under a high emissions scenario.

By the end of the century, GDP is projected to decline by 2.5% or 7.9 billion EUR under a low emissions scenario and by 8.2% of GDP or 25 billion EUR under a high emissions scenario.



SECTORAL ECONOMIC IMPACTS

IMPACTS ON AGRICULTURE

With 47% of land used for agriculture, and almost 7% of GDP produced by agriculture, forestry and fishing, climate change impacts on agriculture present a significant risk to the overall economy.

It is estimated that a temperature increase consistent with a medium emissions scenarios (between 2°C and 3°C) may decrease agricultural net revenues by 20% to 50%.

However, Argentina is also the world's third largest exporter of soybeans, and the second largest exporter of maize, two crops that, all other factors equal, respond well to rising temperatures. As a matter of fact, yields of both crops are projected to increase under both a medium and high emissions scenario.

Wheat production is more volatile: delines are expected by mid-century, but potential gains could be registered at the end of the century under a high emissions scenario due to the CO_2 fertilization effect.

IMPACTS ON ENERGY

As with all other economic sectors, energy supply and energy networks in Argentina will undergo more intense stress from extreme weather events.

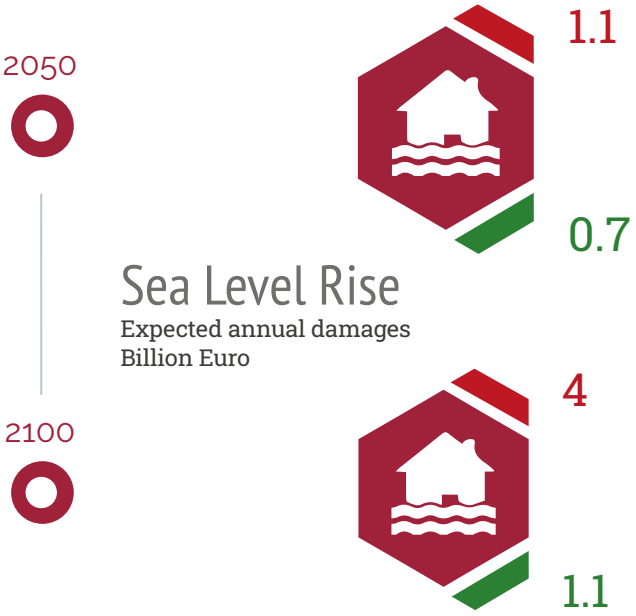
Economic impacts of shifts in household and firm energy demand (see chapter on energy) are difficult to predict and will mostly lead to redistribution effects.

In the case of Argentina, the magnitude of the increase in demand for cooling is expected to slightly exceed the one of decrease in heating demand, leading to a moderate increase in energy bills.

SEA LEVEL RISE DAMAGES

Under current levels of coastal protection, by mid century, sea-level rise and coastal flooding may cost the country 0.7 to 1.1 billion EUR in terms of expected damages to assets in low and high emissions scenarios respectively.

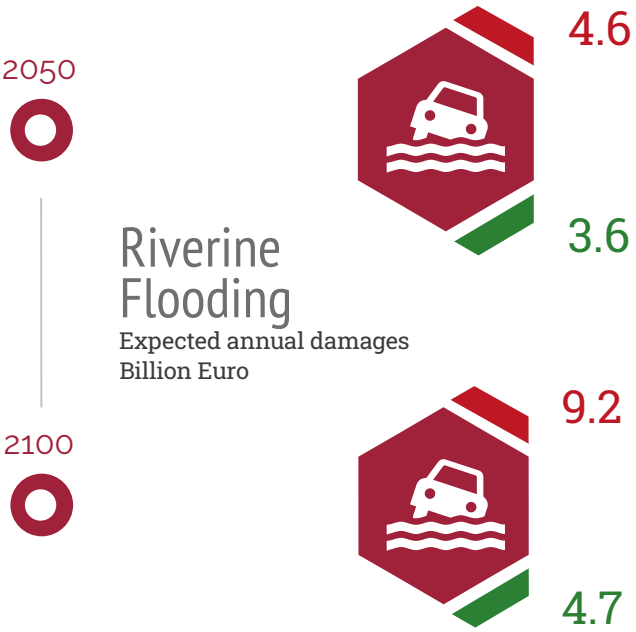
By the end of the century, expected losses can increase to 1.1 billion EUR in the low emissions scenario and to 4 billion EUR under a high emissions scenario.



RIVER FLOODING DAMAGES

River flooding may cause damage that has the potential to be even more severe than that arising from sea-level rise.

By mid century total asset losses could reach 3.6 to 4.6 billion EUR, and in the second half of the century 4.7 to 9.2 billion EUR under a low and high emissions scenario, respectively.



IMPACTS ON TOURISM

In recent decades there has been a progressive trend towards prolonged summer climatic conditions during the first part of autumn in most of Argentina.

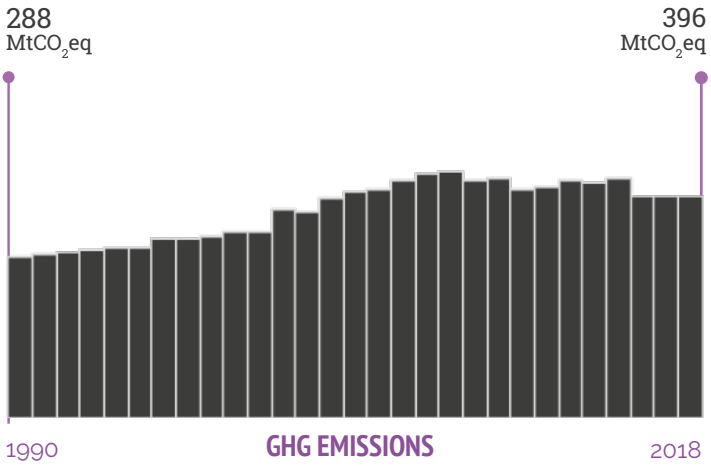
Climate projections show a similar trend for the rest of the century. Both highest summer temperatures and extension of the warm period would favor an increase in domestic tourism to beach areas and the maritime coast.

However Patagonia will probably experience a reduction in the tourism linked with mountains and winter sports, due to the retreat of glaciers and the decreasing trend in precipitation and snow.

ARGENTINA POLICY

OVERVIEW

Although Argentina is the world's 8th largest country by surface, it has a low population density and accounts for only 0.8% of global emissions. In recent years the emissions trend has been unsteady, but in general emissions are still lower than the peak level registered in 2005.



INTERNATIONAL COMMITMENTS

Argentina ratified the Paris Agreement and submitted its first NDC in 2016, committing to a maximum level of yearly emission of 483 $MtCO_2eq$ by 2030. In 2020, Argentina then submitted a second more ambitious NDC, whereby yearly emission cannot exceed 359 $MtCO_2eq$ by 2030.

CLIMATE POLICY COMMITMENTS CHRONOLOGY

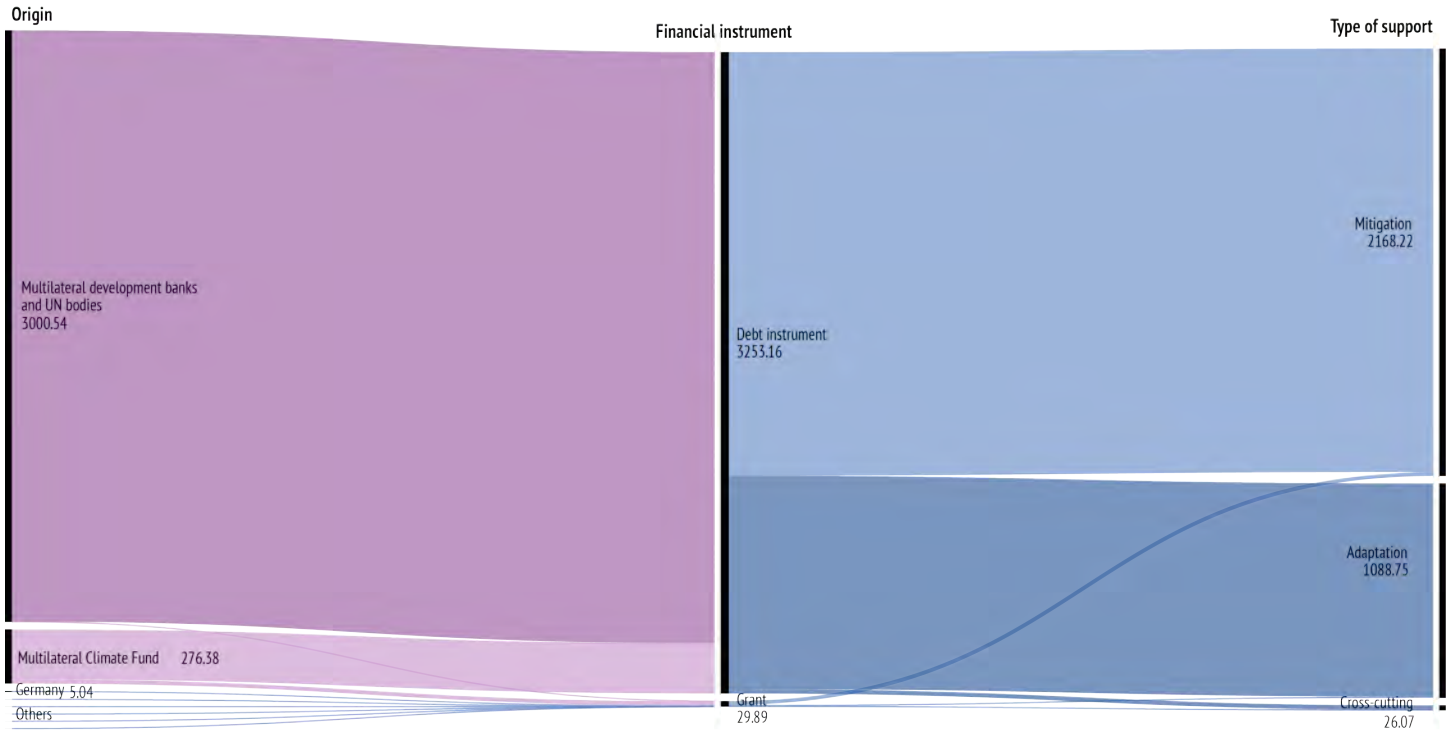
2001 — **KYOTO PROTOCOL - 1ST PERIOD**
No target

2016 — **PARIS AGREEMENT - 1ST NDC**
483 $MtCO_2eq$ as the maximum level of yearly emissions by 2030

2020 — **PARIS AGREEMENT - 2ND NDC**
359 $MtCO_2eq$ as the maximum level of yearly emissions by 2030

INTERNATIONAL CLIMATE FINANCE ASSISTANCE

The OECD DAC's climate-related development financial data show that Argentina has received 3.2 billion USD. Almost all of it is provided in the form of debt instruments and comes from multilateral institutions. Mitigation is the main purpose.



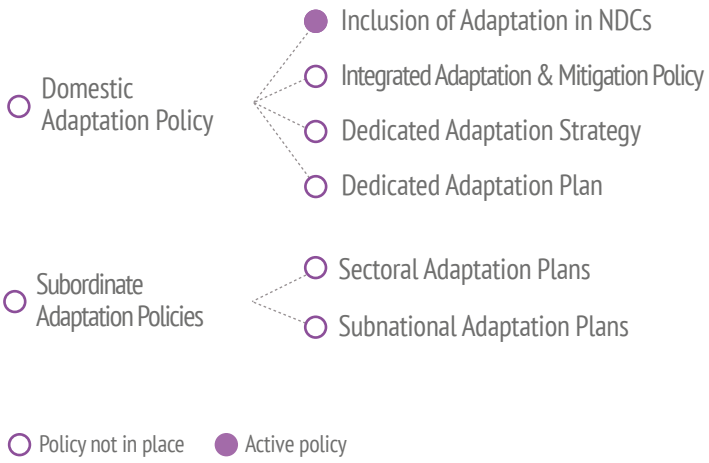
SUSTAINABLE RECOVERY POLICY

According to the Global Recovery Observatory, in 2020 Argentina invested 7.34 billion USD in recovery. Post-covid policies were not particularly green, with a negligible amount of sustainable investments.

23.44 billion $	7.34 billion $	0.10 billion $
Total Spending	Recovery Spending	Green Spending

DOMESTIC ADAPTATION POLICY

Argentina has a specific adaptation objective in its NDC. Nevertheless, the country did not adopt an adaptation strategy or plan. There is no legal framework for adaptation planning at a sub-national or sectoral level.



ADAPTATION POLICY HIGHLIGHTS

TRANSNATIONAL INITIATIVES

Regional and local climate risk management in Brazil and Argentina

The objective is to build climate resilience in vulnerable populations in Sao Paulo in Brazil and Cordoba in Argentina, reducing the risk of floods and droughts

Climate change adaptation in vulnerable coastal cities and ecosystems of the Uruguay River

The project aims to build resilience in coastal cities and ecosystems throughout the Uruguay River, both in Argentina and Uruguay by developing shared instruments and tools for planning

NATIONAL INITIATIVES

National Forestry and Climate Change Action Plan

The plan aims to reduce GHG emissions and increase removals in the forestry sector, through a sustainable use of native forests for the reduction of vulnerability

System for Climate Change Risk Maps (SIMARCC)

The SIMARCC is a GIS that allows to visualize the risk maps of the whole Argentinian territory. The platform targets local decision-makers for the development of local adaptation plans

SUBNATIONAL INITIATIVES

Buenos Aires Climate Change Action Plan 2050

The Climate Action Plan 2050 sets out targeted measures to cut greenhouse gas emissions (53% by 2030 and 84% by 2050) and increase resilience

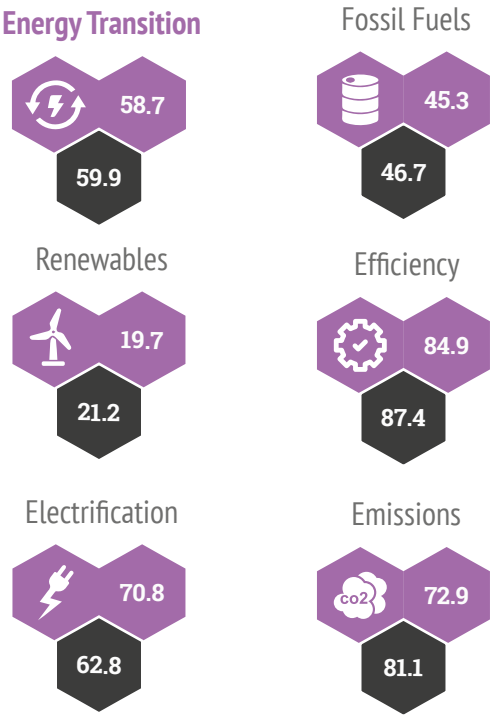
Enhancing the Adaptive Capacity and Increasing Resilience of Small-size Agriculture Producers of the Northeast of Argentina

The project aims to increase the adaptive capacity of smallholders in the face of climate variability impacts, particularly floods and droughts

ENERGY TRANSITION

Argentina shows an overall energy transition indicator a little over the average value with respect to G20 countries. In particular, this position is due to its poor performance in Electrification, 8 points below the average, whereas the Renewables and Fossil Fuels indicators are just above the G20 average.

The transition pathway is well sustained by indicators such as Emissions and Efficiency, where performance is definitely above average. Finally, Argentina shows indicators in line with the G20 average, with a wider margin for improvement.



Only actively pursuing an energy transition based on decarbonization and electrification – from policy and regulation, to health and education – will enable countries to benefit the most from future opportunities and fight climate change whilst ensuring an equitable distribution of wealth.

The Energy Transition indicators were developed by Enel Foundation in cooperation with SACE, and provide a retrospective analysis based on historical data.