CLIMATE RISK COUNTRY PROFILE

TIMOR-LESTE

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This profile is part of a series of Climate Risk Country Profiles developed by Climate Change Group of the World Bank Group (WBG). The country profiles aim to present a high-level assessment of the climate risks faced by countries, including rapid-onset events and slow-onset changes in climate conditions, many of which are already underway, as well as summarize relevant information on policy and planning efforts at the country level.

The country profile series are designed to be a reference source for development practitioners to better integrate detailed climate data, physical climate risks and need for resilience in development planning and policy making.

This effort is managed and led by MacKenzie Dove (Technical Lead, CCKP, WBG) and Pascal Saura (Task Team Lead, CCKP, WBG).

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Unless otherwise noted, data is sourced from the WBG's Climate Change Knowledge Portal (CCKP), the WBG's designated platform for climate data. Climate, climate change and climate-related data and information on CCKP represents the latest available data and analysis based on the latest Intergovernmental Panel on Climate Change (IPCC) reports and datasets. The team is grateful for all comments and suggestions received from climate and development specialists, as well as climate research scientists and institutions for their advice and guidance on the use of climate related datasets.

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FOREWORD

Development progress has stalled in many countries amid low growth, increased fragility and conflict, pandemic-related setbacks, and the impacts of climate change. Droughts, extreme heat, flooding and storms push millions into poverty annually, causing unemployment and risking unplanned internal and cross-border migration. Every year, an estimated 26 million people fall behind due to extreme weather events and natural disasters. These shocks have the potential to push a total of 130 million into poverty by 2030.

The World Bank Group (WBG) is supporting countries to meet these challenges. As part of our vision to end poverty on a livable planet, we are investing in development projects that improve quality of life while creating local jobs, strengthening education, and promoting economic stability. We are also helping people and communities adapt and prepare for the unpredictable and life-changing weather patterns they are experiencing, ensuring that limited development resources are used wisely and that the investments made today will be sustainable over time.

Having access to data that is accurate and easily understandable is of course critical to making informed decisions. This is where the report you are about to read comes in.

Climate Risk Country Profiles offer country-level overviews of physical climate risks across multiple spatiotemporal scales. Each profile feeds into the economy-wide Country Climate and Development Reports and draws its insights from the Climate Change Knowledge Portal, the WBG's 'one-stop-shop' for foundational climate data.

Guided by World Bank Group data and analytics, developing countries can conduct initial assessments of climate risks and opportunities that will inform upstream diagnostics, policy dialogue, and strategic planning. It is my sincere hope that this country profile will be used to inform adaptation and resilience efforts that create opportunities for people and communities around the world.

Valerie Hickey, PhD
Global Director
Climate Change Group
World Bank Group

KEY MESSAGES

Timor-Leste is highly vulnerable to a range of natural hazards, including droughts, floods, landslides, and soil erosion. The impacts of climate change are intensifying these risks, with increasing temperatures and more frequent heavy rainfall events.

Over the past few decades, mean surface air temperatures have increased significantly, with a trend of 0.14°C per decade from 1971 to 2020. In the future, the projected temperature increase from 2000 to 2050 is projected to be 0.25°C per decade (under SSP3-7.0).

Historical annual precipitation ranges from 1250 to 2250 mm (ERA5), exhibiting high variability, with no discernible historical trends. Timor-Leste is located in a region where minimal changes in total precipitation are projected in the future.

The number of hot days (Tmax > 30°C) is projected to increase significantly, particularly during November and the surrounding months, driven by rising temperatures. During the historical period, there were 26 hot days per year. Under the SSP3-7.0 scenario, this number is expected to rise to 86 days during 2040–2059. The number of hot nights, or tropical nights (Tmin > 26°C), is rising rapidly. Historically, the country experienced only 10 tropical nights per year. By 2040–2059, this is projected to increase to 36 nights annually. The number of days with a Heat Index of 35°C or higher (humid heat) is only expected to become significantly relevant by the end of the 21st century, with 54 days per year by 2080–2099.

By the end of the 21st century, 100-year extreme precipitation events are projected to occur 3.28 times more frequently, happening every 31 years instead of every 100 years. Similarly, 20-year, 25-year, and 50-year events are expected to occur at least twice as often—2.00, 2.13, and 2.62 times more frequently, respectively.

Finally, the marine ecosystems and coastal communities will be impacted by rising temperatures affecting coral reefs and fisheries, along with rising sea levels, which, combined with more extreme precipitation events, will result in higher sea level surges and an increased risk of coastal inundation.

COUNTRY OVERVIEW

Timor-Leste is a small country in South-East Asia, north of Australia, with a population of approximately 1.36 million in 2023[1] and a land area of 14,874 km^2. It comprises the eastern half of Timor Island, the small enclave of Oecussi located within West Timor, and the minor islands of Atauro and Jaco. The country lies between 8°15′S and 10°30′S latitude, and 125°50′E and 127°30′E longitude. Characterized by rugged terrain, Timor-Leste's central mountains rise to 3,000 meters (**Fig. 1**), and nearly half of the country has slopes greater than 40%[2], which contributes to soil erosion during heavy rainfall. Coastal plains are found in the less mountainous southern region[3]

FIGURE 1. Topography of Timor-Leste (in meters)[4]. The Island's Topography Plays a Crucial Role in Shaping Wind Patterns, Climate, and the Impacts of Sea Level Rise. The Municipality Oecussi is Located within West Timor.

[1] World Bank Development Indicators https://databank.worldbank.org/source/world-development-indicators

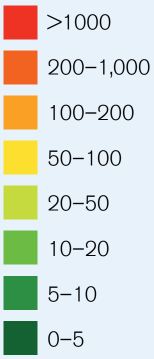
[2] Barnett, Jon & Dessai, Suraje & Jones, Roger. (2007). Vulnerability to Climate Variability and Change in East Timor. Ambio. 36. 372–8. 10.1579/0044-7447(2007)36[372:VTCVAC]2.0.CO;2. URL: https://pubmed.ncbi.nlm.nih.gov/17847801/

[3] Molyneux, Nicholas & Rangel da Cruz, Gil & Williams, Rob & Andersen, Rebecca & Turner, Neil. (2012). Climate Change and Population Growth in Timor Leste: Implications for Food Security. Ambio. 41.URL: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3492559/

[4] Wikipedia

FIGURE 2A. ADM-1 Regions in Timor-Leste–World Bank Cartography

FIGURE 2B. Population Density (per square km), 2020[5]



Timor-Leste's economy is predominantly agrarian, with around 68% of the population living in rural areas (2023) (**Fig. 2B**) and 39% of the workforce employed in agriculture[6]. Key exports include coffee, sandalwood, and marble.

Timor-Leste is highly vulnerable to a range of natural hazards, including droughts, floods, landslides, and soil erosion. The impacts of climate change are intensifying these risks, with increasing temperatures, changing precipitation patterns, and more frequent heavy rainfall events. The country is also at high risk of cyclones, earthquakes, and tsunamis. These hazards are further exacerbated by limited infrastructure and inadequate social welfare systems[7].

Timor-Leste submitted its First Nationally Determined Contribution (NDC) in 2016. The country's Second National Communication to the UNFCCC in 2020[8] and the updated NDC, 2022–2030[9], identify the agriculture, water resources, forestry and public health sectors to be the most vulnerable to climate change.

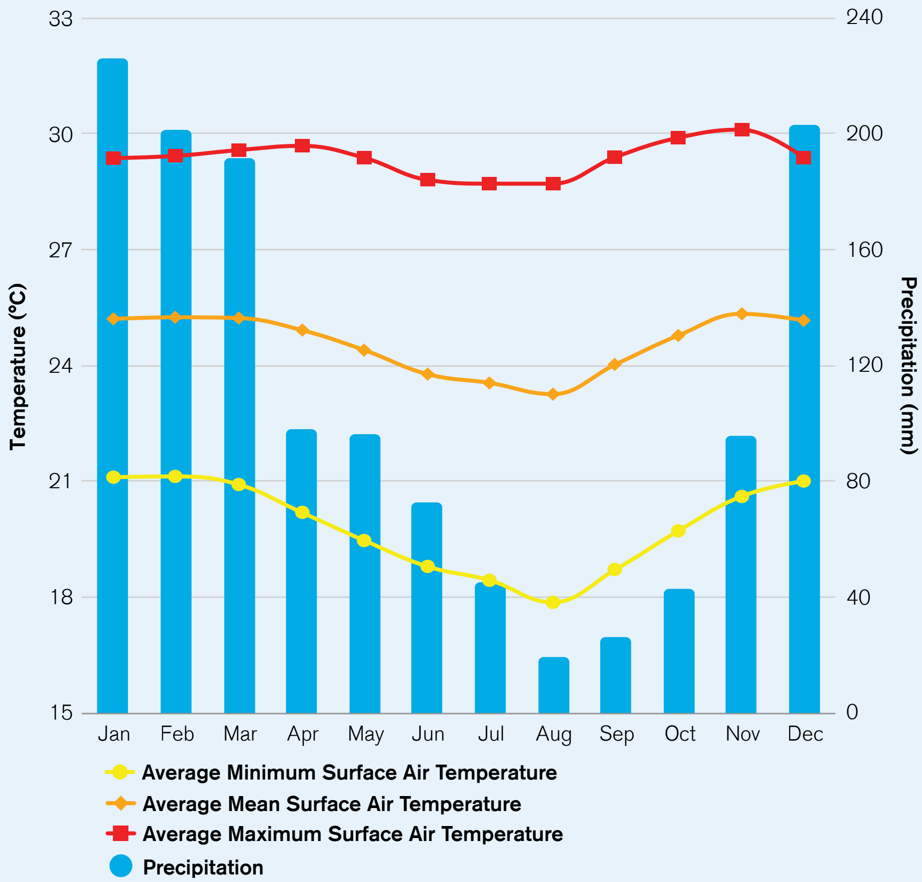
[5] Population dataset: Gridded Population of the World, Version 4: GPWv4; Revision 11, 30 sec resolution (1 km)
[6] World Bank Development Indicators https://databank.worldbank.org/source/world-development-indicators
[7] USAID (2017). Timor-Leste Climate Change Risk Profile. URL: https://www.climatelinks.org/resources/climate-change-risk-profiletimor-leste
[8] Second National Communication https://unfccc.int/sites/default/files/resource/Second%20National%20Communication%2C%20Timor-Leste.pdf
[9] Updated National Determined Contribution 2022–2030 https://unfccc.int/documents/622331

CLIMATE OVERVIEW

Data overview: Historically, observed data is derived from the Climatic Research Unit, University of East Anglia (CRU), CRU TS version 4.08 gridded dataset (data available 1901–2023) - stations data -, and from the ERA5 reanalysis collection from ECMWF (1950–2023).

Timor-Leste's tropical climate is influenced by both the West Pacific Monsoon and the Australian Monsoon, as well as its proximity to the sea and varied topography. The wet season typically occurs from November to May, when westerly winds associated with the West Pacific Monsoon bring moisture and rainfall[10]. The dry season takes place from May to October, driven by southeasterly trade winds and the Australian Monsoon, which bring dry air from the southeast. This seasonal shift between the monsoons results in a distinct wet and dry period, with the country's diverse landscapes amplifying local variations in rainfall. Average monthly precipitation varies throughout the year, ranging between approximately 19–26 millimeter (mm) during the driest months of August and September and between 190–225 mm in the wettest months of December to March (**Fig. 3**).

FIGURE 3. Monthly Historical Climatology of Average Temperature (minimum, average, and maximum) and Total Precipitation (1991–2022) for Timor-Leste (CRU dataset)



[10] Weather Spark https://weatherspark.com/

Like many other countries with a tropical climate, there is little seasonal variation in temperature (**Fig. 3**), ranging between a minimum of 23.2°C in August and maximum of 25.3°C in November. The minimum temperatures deep to 17.8°C in August and reach a maximum of 21.1°C in January. The maximum temperatures stay around 28.5°C to 30°C all year round.

Temperatures decrease progressively towards the mountainous regions, accompanied by an increase in precipitation. Historically, the mean annual temperatures range from 25°C to 27.5°C along the coastal areas, while at the mountain range temperatures drop to 22.3°C (at the 0.25deg resolution, for ERA5) (**Fig. 4**). Annual rainfall also varies considerably, with some locations on the northern coast receiving less than 800 mm (note the pixel on the coast of Liquica), whereas the mountainous areas and the eastern regions receive around 2000 mm of precipitation annually (green pixels in **Fig. 4b**).

FIGURE 4A. Historical Averaged Surface Air Temperature (1991–2022) in °C for Timor-Leste (ERA5-dataset). ADM-1 Municipalities are Overlayed.

High: 28

Low: 22

FIGURE 4B. Averaged Annual Total Precipitation (1991–2022) in mm for Timor-Leste (ERA5-dataset). ADM-1 Municipalities are Overlayed.

High: 2,200

Low: 800

Table A1 presents the spatially aggregated values across municipalities. The lowest average minimum air surface temperatures are observed in the mountainous Ermera and Aileu (around 19°C), while the highest maximum temperatures (above 28°C) are recorded in Oecussi, Covalima, Dili, Manatuto, Baucau, Viqueque, and Lautem. The lowest average annual precipitation occurs in Dili (1266 mm), while the highest precipitation is found in Ermera and Baucau (exceeding 1800 mm).

It is important to note that the data used in this report has a resolution of 0.25°, approximately 25 km, which is similar in scale to the size of the municipalities in Timor-Leste (see **Fig. 4**). Therefore, caution should be exercised when interpreting the reported differences across municipalities, as resolution is too rough to clearly distinguish between these. For example, temperatures in the mountains drop below 20°C, and precipitation can exceed 2400 mm annually[11]. However, this variation is not fully captured and is smoothed out in the ERA5 data.

Timor-Leste's climate is influenced by several cyclical climate phenomena, most notably the El Niño Southern Oscillation (ENSO), along with the Indian Ocean Dipole (IOD), Pacific Decadal Oscillation (PDO), and Madden-Julian Oscillation (MJO). These factors affect precipitation and water availability on intra-annual, inter-annual, and inter-decadal timescales. El Niño typically results in drier conditions, reduced rainfall during the wet season, and delays in the start of the wet season by 2–3 months. This leads to drought, reduced groundwater availability, and significant impacts on agriculture and food security.

TEMPERATURE AND PRECIPITATION HISTORICAL AND PROJECTED TRENDS

Data overview: Historical observed data is derived from the ERA5 reanalysis collection from ECMWF (1950–2023). Modeled climate data is derived from CMIP6, the Coupled Model Intercomparison Project, Phase 6. This risk profile focuses primarily on SSP3-7.0[12], which projects a doubling of CO2 emissions by 2100, a global temperature change of approximately 2.1°C by mid-century (2040–2059) and 2.7°C (likely 2.1°C to 3.5°C) by the end of the century (2080–2099), with respect to pre-industrial conditions (1850–1900).

Historical Temperature Changes

Over the past few decades, mean surface air temperatures have increased significantly, with a trend of 0.14°C per decade from 1971 to 2020 (ERA5, **Fig. 5**). The largest temperature increase has occurred during the hotter rainy season (Dec–Feb), with a trend of 0.24°C per decade from 1951 to 2020, while the dry season, from June to August, has experienced a lower trend of 0.05°C per decade. The trend is similar across municipalities (**Table A1**)[13].

[11] Molyneux, N., da Cruz, G.R., Williams, R.L. *et al.* Climate Change and Population Growth in Timor Leste: Implications for Food Security. *AMBIO* 41, 823–840 (2012). https://doi.org/10.1007/s13280-012-0287-0 (Fig. 4)

[12] Climate scientists may prioritize SSP4.5 and SSP8.5 to cover a range of potential futures, but SSP8.5 is frequently avoided in policy discussions due to its extreme nature. SSP3-7.0 is understood as a balanced compromise—sufficiently pessimistic yet in line with current policies. Note that patterns of change are generally consistent across scenarios, differing only in timing and impact intensity. For example, impacts projected under SSP3-7.0 by 2070 (2.8°C warming) are projected to occur by 2060 under SSP5 8.5, given the same level of warming. This approach allows scenarios to be translated by focusing on the warming signal rather than specific timelines. Please see the attached tables, which illustrate the relationship between warming levels and future periods for different scenarios. For more information see: IPCC AR6 https://data.ceda.ac.uk/badc/ar6_wg1/data/spm/spm_08/v20210809/panel_a

[13] It is important to note that most of the data used in this paper has a resolution of 0.25°, approximately 25 km, which is similar in scale to the size of the districts in Timor-Leste. Therefore, caution should be exercised when interpreting the reported differences across regions, as resolution is too rough to clearly distinguish between these.

Projected Temperature Changes

Timor-Leste's temperatures are projected to increase further into the future for all the scenarios. Under SSP3-7.0, the mean air surface temperature nationwide increases from 24.86°C during the historical reference period of 1995–2014 to 25.44°C (25.2°C, 10th percentile, 25.81°C, 90th percentile) for the period 2020–2039, and to 26.03°C (25.66°C, 26.59°C) for the period 2040–2059. The minimum temperature nationwide increases from 21.94°C during the historical reference period to 22.53°C (22.23°C, 22.91°C) for the 2020–2039 period, and 23.11°C (22.7°C, 23.67°C) for 2040–2059. Maximum temperature increases from 27.79°C to 28.34°C (28.12°C, 28.72°C) for the 2020–2039 period, and 28.94°C (28.59°C, 29.51°C) for 2040–2059. Projected warming under SSP2-4.5 and SSP1-2.6 is lower, and under SSP5-8.5, higher (**Fig. 6**).

The projected temperature increase from 2000 to 2050 is 0.25°C per decade (under SSP3-7.0), a rate higher than historical trends. This warming is expected to occur at similar rates for both minimum and maximum temperatures, and equally across municipalities.

FIGURE 5. Timor's Leste Annual Mean Surface Air Temperature Time Series and Decadal Trends for Different Periods between 1951 and 2020 as indicated, ERA5 Data

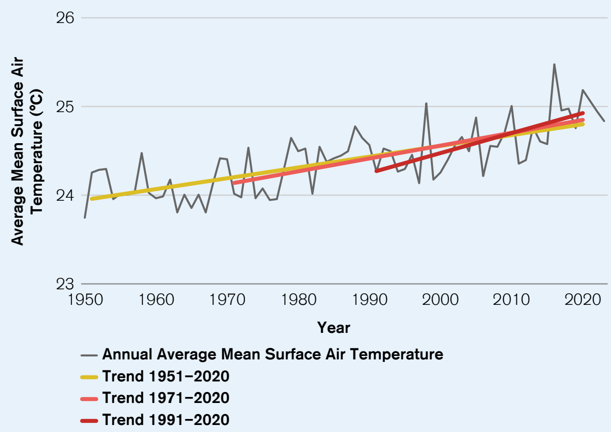
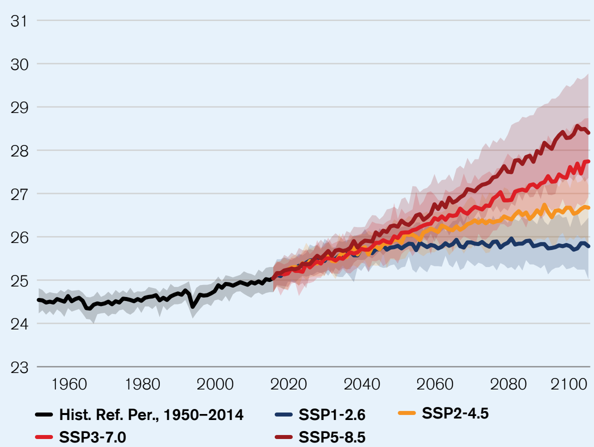


FIGURE 6. Projected Average Mean Surface Air Temperature for Different Climate Change Scenarios as Labeled, Along with the 10th–90th Percentile Dispersion Across Models



Historical Precipitation Changes

Historical annual precipitation ranges from 1250 to 2250 mm (ERA5), exhibiting high variability, with no discernible historical trends identified at the national level (**Fig. 7**) nor by municipality.

Projected Precipitation Changes

Timor-Leste is located in a region where minimal changes in total precipitation are projected. Under SSP3-7.0, Timor-Leste's average annual precipitation is predicted to change nationwide from 1631.92 mm (1477.13 mm, 10th percentile, 1790.61 mm, 90th percentile) during the historical period (1995–2014, historical scenario) to

FIGURE 7. Timor-Leste's Annual Precipitation Time Series and Decadal Trends for Different Periods between 1951 and 2020 as Indicated, ERA5 Data

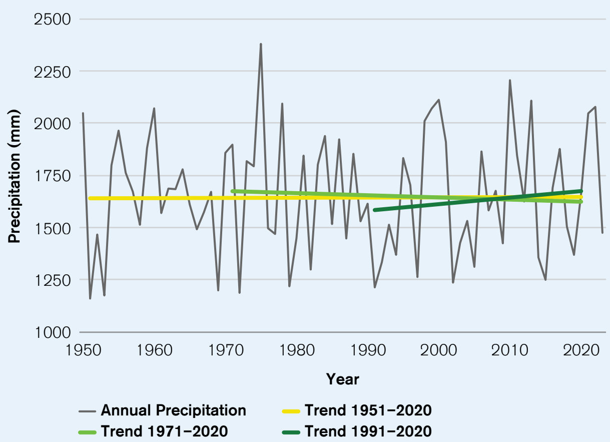
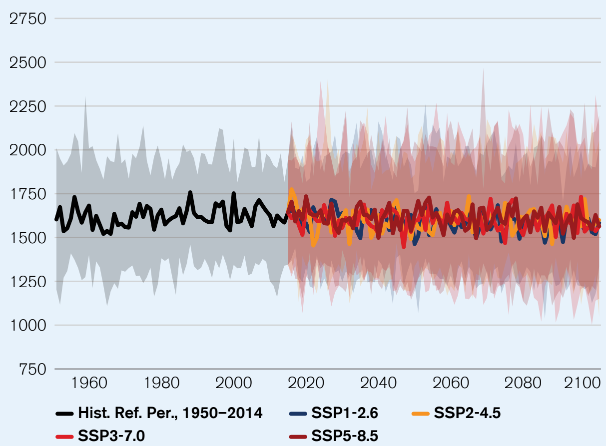


FIGURE 8. Projected Annual Precipitation for Different Climate Change Scenarios as Labeled, Along with the 10th–90th Percentile Dispersion Across Models



1629.27 mm (1359.4 mm, 1888.87 mm) for 2020–2039, and to 1633.87 mm (1375.71 mm, 1892.38 mm) for 2040–2059 (**Fig. 8**).

Projections suggest a slight increase in precipitation during the December-February wet season, while a small decrease is expected for the remainder of the year, though these changes are not significant. The largest projected decrease in precipitation is for the June–August dry season, with a reduction of nearly 1% per decade from 2001 to 2050. Between 1995–2014 and 2040–2059, a total decrease of 6.9% in precipitation is expected during these months, although not significant above interannual variability. Minimal changes are projected across all municipalities.

IMPACTS OF A CHANGING CLIMATE

Hot Days

Hot days pose significant risks to both human and animal health, increasing the likelihood of heat-related illnesses, while also heightening the threat of wildfires, damaging crops, straining water supplies, increasing irrigation needs, and driving up energy demand, all of which can disrupt infrastructure, ecosystems, food security, and livelihoods.

In the future, the number of hot days (Tmax > 30°C) is projected to increase significantly, particularly during November and the surrounding months, driven by rising temperatures. During the historical period (1995–2014), there were 26 hot days per year (CMIP6 models). Under the SSP3-7.0 scenario, this number is expected to rise to 46 days per year during 2020–2039, 86 days during 2040–2059, and by the end of the century (2080–2099), it could reach 206 days per year, nearly seven months. The risk is highest in the coastal areas, particularly in Oecussi and Covalima, as well as in the municipalities to the east of the island, including Manatuto, Baucau, Viqueque, and Lautem (**Table A2**). By the period 2040–2059, projections indicate that Oecussi will experience 143 days per year with Tmax > 30°C (almost 5 months), Covalima will see 126 days (>4 months), while Baucau and Lautem will have 110 and 118 days, respectively (almost 4 months). Viqueque is projected to have 97 days per year with Tmax > 30°C (>3 months).

From 2000 to 2050, Timor-Leste is projected to experience 11.45 more yearly hot days per decade. The trend for Oescusi, Covalima, and Lautem is even higher, over 15 additional hot days/decade.

Even though the country will suffer more hot days (Tmax > 30°C), it will not suffer from extreme hot days (Tmax > 35°C) throughout the 21st century and so population is not expected to be affected by extremely hot temperatures during the 21st century in any municipality.

Hot Nights

Hot nights pose risks to sleep quality, human health, and agricultural crops, as the lack of cooling during the night can exacerbate heat stress on plants, hindering growth and reducing yields, while also increasing the risk of heat-related illnesses, higher energy consumption, and greater strain on power grids.

The number of hot nights, or tropical nights (Tmin > 26°C), is projected to rise. Historically (1995–2014), the country experienced only 10 tropical nights per year (CMIP6 models). By 2040–2059, this is projected to increase to 36 nights annually, with the trend continuing at an additional 16 days per decade from 2050 to 2100, reaching 96 nights by the end of the century (2080–2099). Tropical nights at a lower threshold (Tmin > 23°C) are also projected to rise, from 132 days in the historical period (over 4 months) to 201 days by mid-century (almost 7 months), and 261 days by the end of the century (8 months and a half) (**Fig. 9**).

FIGURE 9A. Projected Monthly Number of Tropical Nights at Different Temperature Thresholds by 2040–2059 Under SSP3-7.0

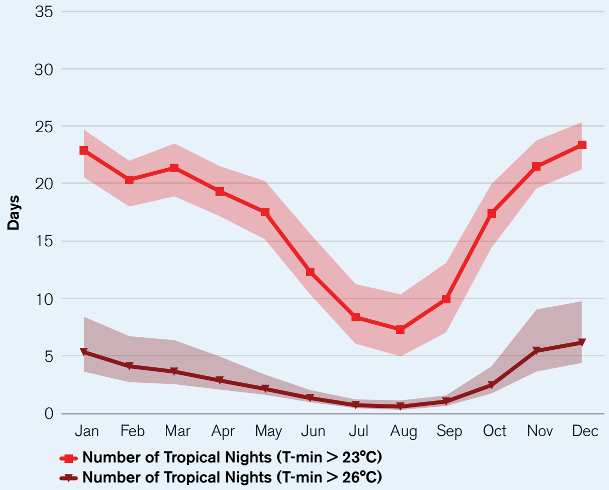
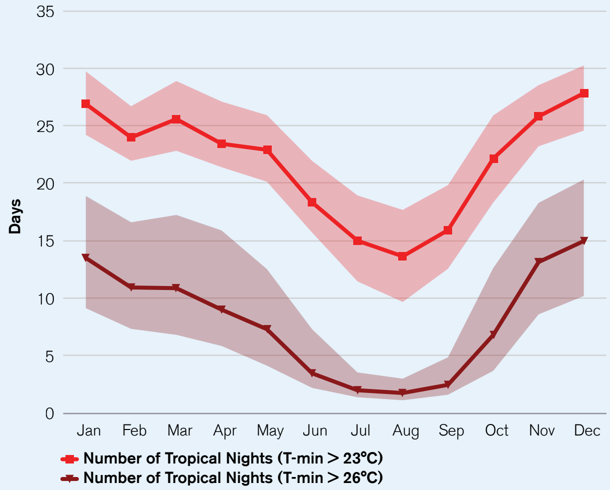


FIGURE 9B. Projected Monthly Number of Tropical Nights at Different Temperature Thresholds by 2080–2099 Under SSP3-7.0



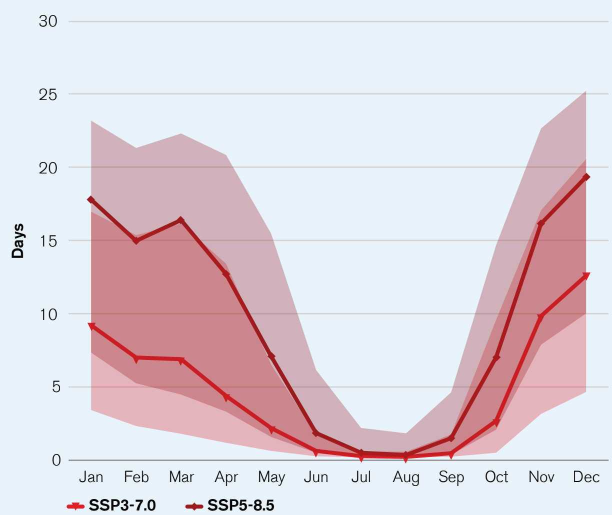
The yearly number of tropical nights (Tmin > 26°C) is projected to increase at an average rate of 4.98 more nights per decade between 2000 and 2050 under the SSP3-7.0 scenario. However, the northern coastal region of Dili is expected to experience a higher rate, with an increase of 8.13 tropical nights per decade. Even more significant increases are projected for the eastern municipalities of Viqueque and Lautem, with rates of 9.96 and 12.71 additional tropical nights per decade, respectively, from 2000 to 2050 (**Table A2**).

Next, we examine the percentage of the population at high health risk due to hot nights. For the calculation of population exposure, high-risk areas are locations where the 50-year return level[14] of the annual number of days with night temperatures exceeding 26°C is greater than 30[15]. At the national level, population exposure to dangerous levels of tropical nights (Tmin > 26°C) is projected to rise dramatically from 2% during the historical period (1975–2025) to 50% by 2075 (**Table A3**). By the end of the 21st century (2050–2099, with 2075 as the central year), over 80% of the population in Oecussi (81.77%), Dili (99.86%), and the eastern municipalities of Baucau (91.15%) and Lautem (100%) are expected to be exposed to hot nights, significantly increasing the risks to both health and agriculture.

Humid Heat

The Heat Index is a measure of perceived temperature that combines both air temperature and humidity in the shade[16]. When both are high, the Heat Index rises, significantly increasing the risk to human health. In such conditions, the body's ability to cool itself through sweating is impaired, which can lead to heat-related illnesses or even fatalities. The number of days with a Heat Index of 35°C or higher is expected to become significantly more relevant by the end of the 21st century, particularly during the rainy months (November to March). While the period from 2040–2059 is projected to have only a small number of days with a Heat Index above 35°C (3 days), from 2051 to 2100, this number is expected to increase by 11.11 days per decade. By 2081–2100, the total number of such days could reach 54 per year (**Table A2**), with the highest occurrences in December—up to 12 days with a Heat Index above 35°C, and 19 days under the SSP5-8.5 scenario (**Fig. 10**).

FIGURE 10. Projected Monthly Climatology of Number of Days with Heat Index > 35°C by 2080–2099 Under SSP3-7.0 and SSP5-8.5



[14] A 50-year return level refers to an event that is expected to occur, on average, once every 50 years.

[15] Population dataset: Gridded Population of the World, Version 4: GPWv4; Revision 11, Dec 2018. For each pixel (at approximately 25 km resolution), the return level for a given return period is calculated by fitting a Generalized Extreme Value (GEV) distribution. A pixel is classified as "too risky" (1) if the return level exceeds the specified threshold, and "not too risky" (0) otherwise. The reported population exposure represents the percentage of the total population in each region that is exposed to risk (1).

[16] Heat Index as defined by US-National Weather Service - Steadman R.G., 1979: The assessment of sultriness, Part I: A temperature-humidity index based on human physiology and clothing science. J. Appl. Meteorol., 18, 861–873, doi: http://dx.doi.org/10.1175/1520-0450

As a result, the risk associated with the increased Heat Index is projected to reach moderate levels by mid-century and become extreme by the end of the century during the hottest months. This risk is especially pronounced in Dili and Lautem, where the number of days with a Heat Index above 35°C is projected to increase to 111 and 131 days per year, respectively, by the end of the 21st century under SSP3-7.0. In comparison, the number of such days is expected to be 19 and 8 per year in the mid-century period (2040–2059), and zero during the historical period.

Next, we examine the percentage of the population at high health risk due to increased humid heat. High-risk areas are locations where the 50-year return level of the annual number of days with heat index exceeding 35°C is greater than 20—a threshold considered particularly dangerous for health. Historically (2000), no population was exposed to a high heat index. By 2035 (2010 to 2059), this exposure is projected to achieve a maximum of 13.7% in Dili. In the latter half of the 21st century (2075), the proportion of the population exposed to extreme humid heat is projected to rise significantly, with nearly 100% of the population in Dili and the eastern municipalities of Baucau, Viqueque, and Lautem being affected, and more than 70% of the population in Oecussi, Covalima, and Manatuto exposed between 2050 and 2099 (with 2075 as the central year) (**Table A3**). Additionally, Timor-Leste's population is expected to face dangerous wet-bulb temperatures—another measure of extreme heat and humid conditions, which are particularly hazardous for outdoor workers[17]. By the second half of the century (2075), around 35% of the population will be exposed to these dangerous wet-bulb temperatures, with more than 90% of the population in Baucau (91.15%) and Lautem (100%) at risk.High-risk areas are locations where the 50-year return level of the annual number of days with wet bulb temperatures exceeding 27°C is greater than 15.

Drought

Drought conditions can severely disrupt the growth cycle of crops, leading to crop collapse and reduced yields, especially in places with poor irrigation systems. Given the expectation of minimal changes in precipitation, the yearly maximum number of consecutive dry days, which historically fluctuates between 20 and 80 days per year (ERA5 data), has remained stable and is not projected to change in the future (CMIP6 models)[18].

Approximately 23% of Timor-Leste's population will continue to be exposed to droughts at similar levels throughout the 21st century. High-risk areas are locations where the 50-year return level of consecutive dry days in a year exceeds 90. Oecussi is fully exposed to droughts, with over 99% of the population affected. Dili follows with 88% exposure, while Manatuto is at 63%, and Covalima and Bobonaro have exposures of 33% and 31%, respectively. The remaining municipalities are minimally impacted.

Extreme Precipitation

Given the expectation of minimal changes in precipitation, the yearly maximum number of wet days[19], which historically fluctuates between 30 and 80 days per year (ERA5 data), has remained stable and is not projected to change in the future (CMIP6 data).

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17 Wet Bulb Temperature formulation by Stull (2011) - Stull R., 2011: Wet-bulb temperature from relative humidity and air temperature. J. Appl. Meteorol. Climatol., 50(11), 2267–2269, doi: 10.1175/JAMC-D-11-0143-1

18 This statistic measures the maximum length of a dry spell, computed sequentially for the entire time series, then taking the maximum value during each year in the data period (a dry day is defined as any day in which the daily accumulated precipitation < 1 mm).

19 This statistic measures the maximum length of a wet spell, computed sequentially for the entire time series, then taking the maximum value during each year in the data period (a wet day is defined as any day in which the daily accumulated precipitation ≥ 1 mm).

However, intense precipitation events are expected to become more frequent, with their return periods decreasing. In a warmer world, the potential of air to carry moisture goes up, and thus the potential for heavier precipitation goes up. Intense precipitation events, characterized by the largest single-day event during the historical period, will likely recur more frequently (e.g. the return period will decrease, **Table 1**), which can negatively affect the flooding risk, and be dangerous for infrastructure, human safety, or agriculture. In Timor-Leste, flash floods and landslides will become more frequent due to intense rain events especially when combined with anomalously dry conditions. Extreme precipitation events with return periods of 100 years are projected to occur 45% more frequently by mid-century (2035–2064) under the SSP3-7.0 scenario, compared to historical data from 1985–2014. This means that what was historically a 100-year event will occur approximately every 70 years in the future. Similarly, 50-year return events are projected to increase by nearly 40%, 25-year events by 30%, and 10-year events by 25% by mid-century. However, there is significant uncertainty in these projections (**Table 1**). By the end of the 21st century, 100-year rare events are projected to occur 3.28 times more frequently, happening every 31 years instead of every 100 years. Similarly, 20-year, 25-year, and 50-year events are expected to occur at least twice as often—2.00, 2.13, and 2.62 times more frequently, respectively. In Timor-Leste, a historical 100-year precipitation event corresponds to 158.5 mm of rain falling in a single day—an amount that, historically, has been observed over an average of 16 days during the rainiest month of January.

TABLE 1. Future (2035–2064) and (2070–2099) Return Period (years) for Extreme Precipitation Events that Correspond to the Return Levels for the Largest Single-Day Event during the Historical Period (1985–2014) for SSP3-7.0. Change in Future Exceedance Probability Expressed as Change Factor for Extreme Precipitation Events that Correspond to the Return Levels for the Largest Single-Day Event During the Historical Period (1985–2014) for Future (2035–2064) and (2070–2099) SSP3-7.0.

Time Period	Historical Return Period (1985–2014, center 2000)					
1985–2014 center 2000	5-yr	10-yr	20-yr	25-yr	50-yr	100-yr
	Future Return Period (years) - Median (10th, 90th)					
2035–2064 center 2050	4.22 (2.91–6.09)	8.12 (5.00–12.81)	15.40 (8.61–26.92)	18.96 (10.17–34.17)	36.64 (16.27–71.68)	69.57 (26.64–151.07)
2070–2099 center 2085	3.44 (2.33–4.95)	5.85 (3.37–9.56)	10.08 (5.00–18.55)	11.87 (5.79–23.00)	19.42 (8.11–44.93)	31.52 (10.45–88.01)
	Change in Future Annual Exceedance Probability (change factor) - Median (10th, 90th)					
2035–2064 center 2050	1.19 (0.79–1.67)	1.24 (0.73–1.91)	1.31 (0.66–2.19)	1.33 (0.63–2.34)	1.38 (0.56–2.79)	1.45 (0.50–3.09)
2070–2099 center 2085	1.46 (0.98–2.12)	1.71 (1.00–2.65)	2.00 (1.02–3.66)	2.13 (1.02–4.07)	2.62 (1.03–5.60)	3.28 (1.05–8.75)

Fractional change above 1 indicates increased probability and decreased return period. For example, a fractional change of 1.45 indicates a 45% increase in the probability of suffering 100-year extreme precipitation events in the future, or 1.45 more likely.

As a result, almost the entire population (>99%) is and will continue to be exposed to dangerous levels of extreme rainfall throughout the 21st century without significant changes. High-risk areas are locations where the 25-year return level of the largest 5-day precipitation exceeds 130 mm. The only municipality with less than 95% exposure is Dili, at 85% of the population exposed throughout the century.

Sea Surface Temperatures

The Southeast Asia region, with Timor-Leste located on its southern edge, has historically experienced an average sea surface temperature ranging from 27.7°C to 29.7°C between 1995 and 2014 (CMIP6 models[20]). With climate change, the region is already experiencing more frequent marine heatwaves. Under the SSP3-7.0 scenario, sea surface temperatures are projected to increase by 0.5°C (with a range of 0.3°C at the 10th percentile to 0.7°C at the 90th percentile) in the near term (2021–2040), 1.0°C (0.8°C to 1.3°C) by mid-century (2041–2060), and 2.2°C (1.7°C to 2.8°C) by the end of the century (2081–2100), relative to recent historical averages (1995–2014), which are already higher than sea temperatures during pre-industrial conditions. This temperature increase is expected to be similar throughout the year.

In the northern Australia region, just south of Timor-Leste, sea surface temperatures typically fluctuate between 25.3°C and 29.5°C. Under the same SSP3-7.0 scenario, sea surface temperatures in this region are projected to rise at similar rates as those in Southeast Asia.

Due to the inertia of the oceans, these temperature increases are unlikely to reverse anytime soon. A rise of more than 1°C is expected to have catastrophic consequences for fisheries, biodiversity, and coral reefs, which are especially vulnerable to even small increases in sea temperature.

Sea Level Rise

According to altimetry (satellite) data, sea level rose 15 centimeters total from 1993 to present in Timor-Leste[21]. Under the SSP3-7.0 scenario, sea level is expected to rise 18 centimeters from 2020 to 2050, with a likely range from 14 to 23 centimeters, and 67 centimeters from 2020 to 2100, with a likely range from 48 to 93 centimeters. This means that sea level rise is projected to increase by 0.23 meters by 2050 and 0.72 meters by 2100 under the SSP3-7.0 scenario, relative to 2005[22] (**Fig. 11)**.

Over the next two decades, sea level rise is expected to occur at a similar rate regardless of emissions, scenarios, or warming levels. However, beyond this period, high-emission scenarios project significantly greater increases in sea level. Despite uncertainties, it is certain that sea levels will continue to rise across all scenarios for centuries, underscoring the need for long-term planning. Sea level rise could reach 0.3 m above historical conditions starting around 2050 in all scenarios, and 0.5m during the second half of the 21st century with respect to 1995–2014 baseline[23]. "Under the SSP3-7.0 scenario, there is a 92% chance of exceeding half meter of global sea level rise 9% chance of exceeding 1 meter of global sea level rise by 2100"[24].

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[20] IPCC AR6 WGI Interactive Atlas https://interactive-atlas.ipcc.ch/.
[21] NASA https://earth.gov/sealevel/sea-level-explorer/
[22] NASA https://earth.gov/sealevel/sea-level-explorer/
[23] NASA Sea Level Projection tool at 9°S, 127°E https://sealevel.nasa.gov/ipcc-ar6-sea-level-projection-tool?lat=-9&lon=%20127&data_layer=scenario
[24] NASA https://earth.gov/sealevel

FIGURE 11. Projected Total Sea Level Change Under Different SSP Scenarios Relative to the Historical Baseline (1994–2014). The Shaded Ranges Show Uncertainties at 17th–83rd Percentile Ranges. Data Reflects the Grid at 9°S, 127°E (along Timor-Leste's Southeast coast). Data from NASA Sea Level Tool.[25]

Concerning inundation, "on average across the coastlines of Timor-Leste there were 76 days in total exceeding the minor high-water level between 1980 and 1990, and 293 between 2005 and 2015"[26]. The minor high-water level is defined as 40 cm above the average high tide (mean higher high-water, MHHW) and serves as an indicator of potential flooding impacts.

Extreme sea level surge events are projected to become significantly more frequent across much of the tropics. In Timor-Leste, a sea level event with a 100-year return period, currently reaching 1.9 meters, is expected to occur as often as once every 50 years by 2050 under the RCP4.5 scenario, with approximately 2°C of warming[27]. Tebaldi et al. (2021)[28] project that 100-year sea level events will become annual occurrences with just 1.5°C of global warming (in Timor-Leste).

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[25] NASA https://earth.gov/sealevel/sea-level-explorer/
What are low confidence scenarios? https://earth.gov/sealevel/about-sea-level-change/future-sea-level/the-basics/#otp_what_are_low_confidence_projections_vs._medium_con

[26] NASA https://earth.gov/sealevel

[27] Vousdoukas, M.I., Mentaschi, L., Voukouvalas, E. et al. Global probabilistic projections of extreme sea levels show intensification of coastal flood hazard. Nat Commun 9, 2360 (2018). https://doi.org/10.1038/s41467-018-04692-w

[28] Tebaldi, C., Ranasinghe, R., Vousdoukas, M. et al. Extreme sea levels at different global warming levels. Nat. Clim. Chang. 11, 746–751 (2021). https://doi.org/10.1038/s41558-021-01127-1

Cyclones

Although Timor-Leste is mostly located outside the primary cyclone zone, it is still impacted by tropical cyclones originating more south (**Fig. 12**). These storms can cause coastal damage, infrastructure destruction, biodiversity loss, and the displacement of communities. Additionally, flooding and landslides may become more frequent due to storms and coastal storm surge.

Data overview: The occurrence of tropical cyclones in any specific location remains a rare event, making historical records too limited to reliably estimate recurrence intervals for these storms. This historical uncertainty can be partially addressed using models that simulate large ensembles of tropical cyclones. One such tool is the Columbia HAZard Model (CHAZ[29]), which generates an extensive synthetic catalog of potential cyclone tracks by simulating tropical cyclones across the oceans and their impacts upon landfall. This approach provides a more comprehensive perspective compared to observational data alone. The findings presented here rely exclusively on the CHAZ model, utilizing the column relative humidity (CRH) configuration to represent moisture. These simulations are informed by 12 different Global Circulation Models from the CMIP6 ensemble and project tropical cyclone activity during the historical period (1951–2014) and into the future under the SSP2-4.5 scenario, focusing on the period 2035–2064 (centered around 2050). We apply a footprint to the CHAZ tracks to capture the full extent of the cyclones. This is especially important for small islands to ensure that the cyclone's impact is not underestimated. The footprint is based on modeled horizontal wind profiles and latitude, using a dual-exponential decay function derived from 380 observed storms, as detailed by Willoughby et al. (2006)[30].

Tropical Cyclones are classified using the Saffir-Simpson Hurricane Scale, which is based on maximum sustained wind speeds (see **Fig. 12**). Historically, the frequency of tropical cyclones (maximum wind speeds above 34 knots) in the entire East Timorian Exclusive Economic Zone EEZ is 1.46 cyclones per year, corresponding to a return period of 0.68 years. Of these, 0.57 cyclones per year make landfall, equivalent to a return period of about 1.75 years. More than half of the tropical cyclones that intersect with the EEZ are tropical storms (64.5%), 18% are Category 1 cyclones, and only 1.2% reach Category 5 intensity. At landfall, the proportion of lower-intensity cyclones increases, with tropical storms accounting for 72%, while the proportion of high-intensity cyclones, such as Category 5, decreases to 0.6% (**Fig. 13** and **Table 2**).

In this region, the CHAZ model does not project any significant changes in the frequency of tropical cyclones in the future (**Table 2**).

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29 Lee, C.-Y., Tippett, M. K., Sobel, A. H., & Camargo, S. J. (2018). An environmentally forced tropical cyclone hazard model. *Journal of Advances in Modeling Earth Systems*, 10, 223–241. https://doi.org/10.1002/2017MS001186

30 Willoughby, H. E., R. W. R. Darling, and M. E. Rahn, 2006: Parametric Representation of the Primary Hurricane Vortex. Part II: A New Family of Sectionally Continuous Profiles. *Mon. Wea. Rev.*, **134**, 1102–1120, https://doi.org/10.1175/MWR3106.1.

FIGURE 12. Observed Historical Cyclones from IBTrACS[31]. All Recorded Cyclones have been Classified According to the Saffir-Simpson Scale using the Variable "USA_wind", which Records Sustained Maximum Winds Every 3 Hours (see label in knots). The IBTrACS Historical Data Covers Cyclones Recorded from 1840 to 2023, with the Caveat that Records Prior to 1980 may be Incomplete. Note that Most Cyclones Occur South of East-Timor.

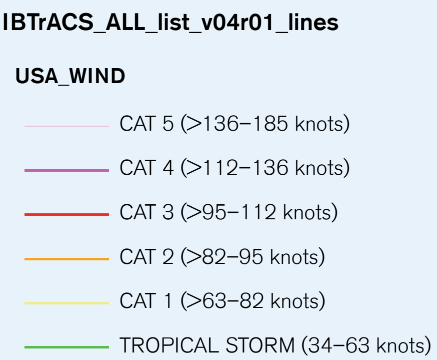
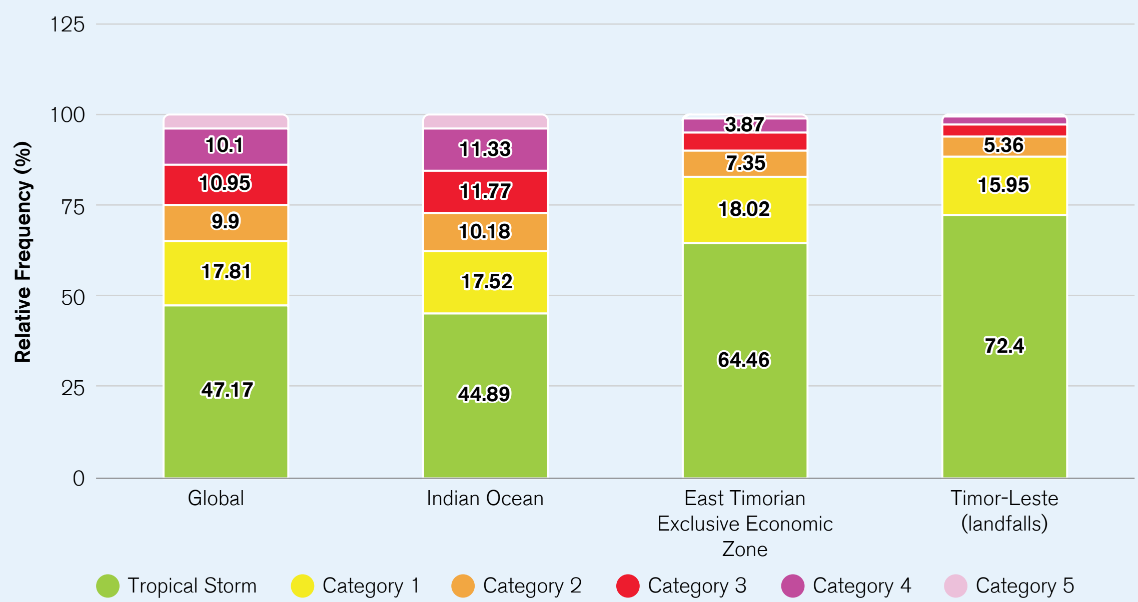


FIGURE 13. Simulated Percentage of Cyclone Types for Global Oceans, Indian Ocean, East Timorian Exclusive Economic Zone, Timor-Leste (landfalls), CHAZ, Historical Simulation (1951–2014)



[31] International Best Track Archive for Climate Stewardship (IBTrACS) https://www.ncei.noaa.gov/products/international-best-track-archive

TABLE 2. Median Value (with 10th and 90th percentiles) of Counts of Cyclones per Year for Historical (1951–2014) and Projected Future Period (2035–2064, Central Year 2050) Along with the Fractional Changes for the Full EEZ Area and for Landfall (<1 means a decrease in the frequency of storms, >1 Means an Increase in the Frequency of Storms). Note That the Reported Median of Fractional Change is Not Necessarily the Future Median Divided by the Historical Median Value. Values are Rounded to One Thousandths.

	East Timorian Exclusive Economic Zone			Timor-Leste (landfalls)		
	Historical Cyclone Count per Year	SSP2-4.5 Cyclone Count per Year	SSP2-4.5 Fractional Change	Historical Cyclone Count per Year	SSP2-4.5 Cyclone Count per Year	SSP2-4.5 Fractional Change
Cat 5	0.017 (0.013, 0.025)	0.021 (0.013, 0.022)	0.890 (0.700, 1.640)	0.003 (0.002, 0.004)	0.003 (0.002, 0.004)	0.930 (0.570, 1.270)
Cat 4	0.057 (0.045, 0.069)	0.063 (0.039, 0.068)	0.990 (0.740, 1.380)	0.013 (0.008, 0.014)	0.012 (0.009, 0.014)	0.970 (0.660, 1.260)
Cat 3	0.075 (0.066, 0.090)	0.088 (0.053, 0.092)	1.100 (0.660, 1.350)	0.020 (0.014, 0.022)	0.019 (0.014, 0.022)	0.950 (0.710, 1.330)
Cat 2	0.108 (0.091, 0.115)	0.108 (0.076, 0.136)	1.080 (0.830, 1.300)	0.031 (0.025, 0.035)	0.029 (0.021, 0.037)	0.900 (0.690, 1.260)
Cat 1	0.264 (0.220, 0.277)	0.267 (0.191, 0.312)	1.040 (0.790, 1.190)	0.091 (0.078, 0.097)	0.089 (0.071, 0.106)	0.990 (0.770, 1.200)
Tropical Storm	0.944 (0.889, 0.988)	0.984 (0.801, 1.096)	1.020 (0.930, 1.130)	0.415 (0.353, 0.418)	0.426 (0.330, 0.482)	1.060 (0.820, 1.310)
Total	1.464 (1.323, 1.563)	1.531 (1.173, 1.727)	1.060 (0.870, 1.150)	0.573 (0.480, 0.591)	0.577 (0.446, 0.666)	1.040 (0.810, 1.290)

Natural Hazards

Climate change is now recognized to have a significant impact on disaster management efforts and poses a significant threat to the efforts to meet the growing needs of the most vulnerable populations. EM-DAT[32] (1980–2020) shows flood as the most relevant natural hazard (50% of events), followed by drought and epidemic (17% each), and storm and earthquake (8% each). Think Hazard[33] identifies urban floods, coastal floods, earthquakes, landslides, cyclones, and wildfires as the highest natural risks, followed by river floods, tsunamis, and extreme heat, categorized as medium risk—most of which are closely linked to the climate crisis.

Blue Economy Impacts

The main critical marine ecosystems in Timor-Leste are coral reefs, seagrass beds and mangrove forests. These provide multiple benefits to biodiversity, fisheries, blue carbon, and resilience to coastal floods.

[32] The International Disaster Database https://www.emdat.be/
[33] Think Hazard, GFDRR, https://thinkhazard.org/en/report/242-timor-leste

The IPCC AR6 WGII Chapter 15 on Small Islands[34] states that coral reefs are most at risk. "Scientific evidence has confirmed that globally and in small islands tropical corals are presently at high risk (high confidence). Severe coral bleaching, together with declines in coral abundance, has been observed in many small islands, especially those in the Pacific and Indian oceans (high confidence)."

By the period 2090–2099 and under the high-emissions scenario RCP8.5 (+4.4°C), marine animal biomass along Timor-Leste's coast is expected to decline up to 36% (Tittensor et al., 2021[35]), relative to levels observed during 1990–1999.

The historical maximum sustainable yield from 2012 to 2021 is 24 metric tons for Timor-Leste's entire Exclusive Economic Zone. By 2100, under the RCP8.5 scenario (with a projected warming of +4.5°C), the maximum sustainable yield is expected to decrease substantially by 90% compared to historical levels (Free et al., 2020[36]).

Temperate tuna species such as albacore, Atlantic bluefin, and southern bluefin are anticipated to decline in tropical regions (where Timor-Leste is part of) and migrate poleward. Conversely, skipjack and yellowfin tunas are expected to increase in abundance within tropical areas (Erauskin-Extramiana et al., 2019)[37].

Trisos et al. (2020)[38] project that as climate change advances, the risks to biodiversity will intensify, potentially leading to a catastrophic loss of global biodiversity. Using temperature and precipitation projections from 1850 to 2100, they assess the exposure of over 30,000 marine and terrestrial species to hazardous climate conditions. The study predicts that climate change will abruptly disrupt ecological assemblages, as most species within any given assemblage will simultaneously face conditions beyond their niche limits. Under a high-emissions scenario (RCP 8.5), these abrupt exposure events are expected to begin before 2030, with tropical oceans, including Timor-Leste, being particularly affected.

Tropical small islands have particularly rich ecosystems. Protecting biodiversity is essential for adapting to climate change, among other reasons (e.g. Sala et al., 2021[39] or Zhao et al., 2020[40]).

Note that this summary provides a broad overview of external sources and is not an exhaustive list.

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34 Chapter 15 - Small Islands, IPCCWG2, https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_Chapter15.pdf

35 Tittensor, D.P., Novaglio, C., Harrison, C.S. et al. Next-generation ensemble projections reveal higher climate risks for marine ecosystems. Nat. Clim. Chang. 11, 973–981 (2021). https://doi.org/10.1038/s41558-021-01173-9

36 Free CM, Mangin T, Molinos JG, Ojea E, Burden M, Costello C, et al. (2020). Realistic fisheries management reforms could mitigate the impacts of climate change in most countries. PLoS ONE 15(3): e0224347. https://doi.org/10.1371/journal.pone.0224347

37 Erauskin-Extramiana M, Arrizabalaga H, Hobday AJ, et al. Large-scale distribution of tuna species in a warming ocean. Glob Change Biol. 2019; 25: 2043–2060. https://doi.org/10.1111/gcb.14630

38 Trisos, C.H., Merow, C. & Pigot, A.L. The projected timing of abrupt ecological disruption from climate change. Nature 580, 496–501 (2020). https://doi.org/10.1038/s41586-020-2189-9

39 Sala, E., Mayorga, J., Bradley, D. *et al.* Protecting the global ocean for biodiversity, food and climate. Nature 592, 397–402 (2021). https://doi.org/10.1038/s41586-021-03371-z

40 Zhao et al. (2020). Where Marine Protected Areas would best represent 30% of ocean biodiversity, Biological Conservation, Volume 244, 108536, https://doi.org/10.1016/j.biocon.2020.108536

ANNEX – TABLES: HISTORICAL AND PROJECTED CHANGES ACROSS REGIONS

Historical Climate Across Regions

Table A1 shows the variations in historical temperature and precipitation across Timor-Leste's municipalities.

TABLE A1. Historical a) Air Surface Temperature Averages (1991–2020) and b) Trends per Decade (1971–2020) for Temperatures (in deg C), c) Historical Precipitation and Interannual Variability (1991–2020) (in mm), All Columns Colored According to Intensity. The Decadal Trend in Precipitation is Negligible (around 1% maximum) and Not Significant (not shown). ERA5 Dataset.

	Historical Air Surface Temperature Averages (1991–2020) (degrees C)			Trend per Decade (1971–2020) (degrees C/ decade)		Historical Precipitation Yearly Averages (1991–2020) (mm)	
Regions	**Temp**	**Min Temp (night temp)**	**Max Temp (day temp)**	**Temp**	**Temp (Dec–Feb)**	**Total PR (mm)**	**Interannual Variability (mm)**
Timor-Leste	24.59	21.89	27.87	0.14	0.24	1628.3	147.18
Oecussi	25.39	22.81	28.51	0.12	0.21	1375.03	110.81
Bobonaro (northwest)	23.96	20.99	27.48	0.13	0.24	1632.8	131.55
Covalima (southwest)	24.68	21.72	28.36	0.15	0.26	1402.3	147.26
Liquica (northwest)	24.64	22.28	27.27	0.14	0.22	1569.38	117.07
Ermera (centerwest)	23.02	19.8	26.89	0.15	0.25	1831.18	150.49
Ainaro (centersouthwest)	23.41	20.42	27.08	0.15	0.27	1693.29	177.88
Dili (north)	26.06	24.15	28.17	0.14	0.2	1266.53	106.84
Aileu (north interior)	22.81	19.33	27.05	0.15	0.26	1783.57	148.86
Manufahi (south)	24.06	21.47	27.16	0.14	0.27	1650.85	186.74
Manatuto (center)	24.54	21.43	28.23	0.14	0.25	1544.96	141.03
Baucau (northeast)	25.1	22.52	28.36	0.14	0.23	1864.41	165.7
Viqueque (southeast)	25.19	22.83	28.04	0.13	0.23	1508.6	153.42
Lautem (east)	25.67	23.52	28.32	0.14	0.22	1794.58	180.76

Projected Climate Across Regions

Table A2 shows the variations in CMIP6 historical and projected temperature and precipitation related variables across Timor-Leste's municipalities.

TABLE A2. CMIP6 Simulated Historical Averages (1994–2015), Mid-Century SSP3-7.0 Projections (2041–2060), and Decadal Trends (2000–2050) for a) Average Surface Air Temperature, b) Number of Tropical Nights per Year with Tmin > 26°C, c) Number of Hot Days per Year with Tmax > 30°C, and d) Number of Days with Heat Index > 35°C (for 2041–2060 and 2081–2100, as values are projected to be zero before this period). The Trend in Days with Heat Index > 35°C is Calculated for the Second Part of the 21st Century (2050–2100). The Trend for Average Surface Air Temperature is Uniform Across Municipalities, 0.25 deg/decade (not shown).

Regions	Average Surface Air Temperature (degrees C)		Number of Tropical Nights per Year with Tmin > 26°C (days)			Number of Hot Days per Year with Tmax > 30°C (days)			Number of Days with Heat Index > 35°C		
	1994–2015	2041–2060	1994–2015	2041–2060	Trend 2000–2050	1994–2015	2041–2060	Trend 2000–2050	2041–2060	2081–2100	Trend 2050–2100
Timor-Leste	24.86	26.03	10.35	35.64	4.98	25.67	85.81	11.45	2.98	54.16	11.11
Oecussi	25.65	26.84	3.57	39.15	5.83	25.17	142.8	22.17	0.64	42.14	7.4
Bobonaro (northwest)	24.21	25.41	13.47	25.03	2.48	7.21	53.53	9.45	2.01	25.67	4.42
Covalima (southwest)	25.01	26.21	2.46	25.76	4.6	44.67	126.29	16.53	2.79	43.47	8.44
Liquica (northwest)	24.74	25.92	29.82	53.05	5.04	0.91	26.38	3.74	2.87	40.4	7.63
Ermera (centerwest)	23.31	24.5	0	0	0	1	24.38	3.91	0	0.02	0
Ainaro (centersouthwest)	23.71	24.9	6.55	25.72	3.93	1.41	40.86	6.48	2.66	26.93	5.77
Dili (north)	26.14	27.29	102.32	139.12	8.13	4.76	72.38	11.19	19.32	111.23	17.71
Aileu (north interior)	23.16	24.35	0	0.54	0.08	1.84	40.43	6.47	0	2.69	0.2
Manufahi (south)	24.28	25.47	6.99	19.8	2.56	1.74	43.14	6.76	2.42	29.22	5.47
Manatuto (center)	24.83	26	0.03	9.02	1.37	48.04	110.57	12.26	0.65	37.25	6.96
Baucau (northeast)	25.45	26.59	0.28	14.9	2.71	50.49	110.34	11.99	0.57	61.54	12.32
Viqueque (southeast)	25.41	26.57	11.38	62.28	9.96	31.86	96.77	12.7	4.09	87.66	19.27
Lautem (east)	25.92	27.03	22.05	83.73	12.71	38.33	118	15.49	7.86	130.93	29.61

Population Exposure Across Regions

Table A3 shows the variations in CMIP6 historical and projected population exposure to temperature related variables across Timor-Leste's municipalities. As a tropical rainy country, all municipalities and most population are subject to extreme precipitation, now and in the future.

TABLE A3. For Each Admin1 District, Percent of the Population at High Health Risk for Three Periods: Retrospective (1975–2024, centered on 2000), Future (2010–2059, centered on 2035), and Distant Future (2050–2099, centered on 2075), Under SSP3-7.0. High-Risk Areas are defined as locations where the 50-year return level indicates that, on average once every 50 years, a year occurs with: a) more than 30 nights with minimum temperatures exceeding 26°C; b) more than 20 days with heat index values above 35°C (retrospective period not shown, as values are zero throughout); c) more than 15 days with wet bulb temperatures exceeding 27°C; d) more than 90 consecutive dry days (CDD), equivalent to three months of drought. 'cdd' Exposure Does Not Change Much Through the 21st Century so We Only Show the Historical Value for Reference.

	Tropical Nights (Tmin > 26C)			Heat Index > 35C		Wet Bulb Temp > 27C	Maximum Number of Consecutive Dry Days
Regions	**tr26 - 2000**	**tr26 - 2035**	**tr26 - 2075**	**hi35 - 2035**	**hi35 - 2075**	**wb27 - 2075**	**cdd - 2000**
Timor-Leste	2.12	12.86	52.41	2.08	55.7	35.45	22.88
Oecussi	0.52	52.71	81.77	0	81.77	0.44	99.17
Bobonaro (northwest)	0.89	0.92	39.77	0.92	39.77	0.94	30.68
Covalima (southwest)	0.27	10.31	72.56	0.33	72.56	13.72	33.3
Liquica (northwest)	1.91	1.35	5.46	1.35	5.46	1.1	1.28
Ermera (centerwest)	0	0	0	0	0	0	0
Ainaro (centersouthwest)	0.86	8.16	8.8	0.96	8.8	8.8	0
Dili (north)	14.82	13.7	99.86	13.7	99.86	13.05	88.37
Aileu (north interior)	0	0	13.95	0	13.95	0	14.83
Manufahi (south)	1.31	1.33	24.58	1.33	24.58	24.58	0
Manatuto (center)	0	0.09	73.15	0	74.15	59.38	62.79
Baucau (northeast)	0	19.11	91.15	0	100	91.15	0
Viqueque (southeast)	0	63.11	64.76	0	93.86	64.76	0
Lautem (east)	13.31	19.89	100	12.27	100	100	0.62

CLIMATE RISK COUNTRY PROFILE

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