Climate information relevant for Disaster Management and Insurance

This fact sheet presents Sixth Assessment Report Working Group (WGI) assessments for changes to climate factors connected to responses in Disaster Management and Insurance, highlighting climate information and data needs that inform sectoral assessments and further actions for adaptation and resilience planning.

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*This WGI fact sheet is focused on the assessment of climatic variables (temperature, precipitation, wind, etc.). A Summary for Actuaries is available here. "**Key risks across sectors and regions**" and "**Decision-making options for managing risk**" are assessed in the WGII Report Chapter 16 and Chapter 17.*

CHANGES IN EXTREMES AFFECT ALL REGIONS

- It is *very likely* that mean temperatures have increased in all land regions and will continue to increase at rates greater than the global average (*high confidence*).
- The frequency of heat and cold extremes have increased and decreased, respectively. Extreme heat would exceed critical thresholds for health more frequently by the mid 21st century with 2°C of global warming (*high confidence*).
- Relative sea level rise is *very likely* to *virtually certain* (depending on the region) to continue during the 21st century, contributing to increased coastal flooding in low-lying areas (*high confidence*) and coastal erosion along most sandy coasts (*high confidence*). Sea level will continue to rise beyond 2100 (*high confidence*).
- It is *virtually certain* that snow cover will experience a decline over most land regions during the 21st century, in terms of water equivalent, extent and annual duration.
- Every region of the world will experience concurrent changes in multiple climatic impact-drivers (CIDs) by mid-century (*high confidence*). {TS.4.3; TS4.3.1}

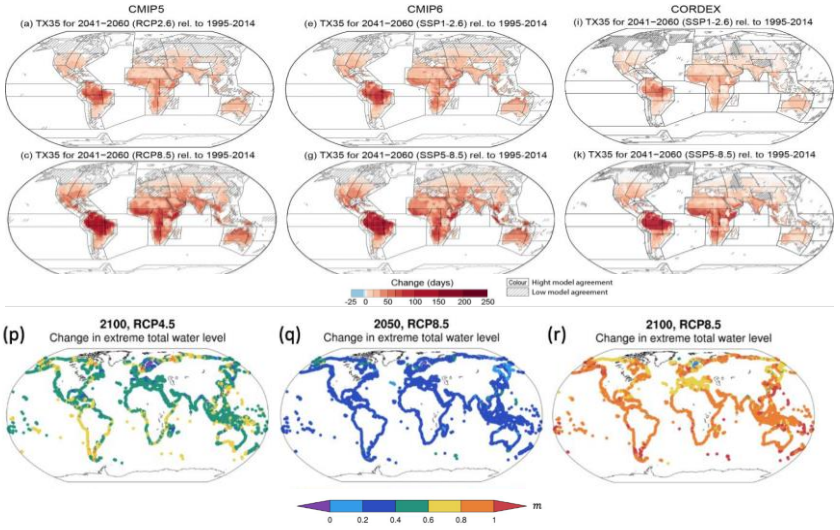


Figure 1: Projected change in the mean number of days per year with maximum temperature exceeding 35°C for CMIP5 (a,c), CMIP6 (e,g) and CORDEX (i,k). The map shows the median change in the number of days per year between the mid-century (2041–2060) and historical (1995–2014) periods for the CMIP5 and 6 CORDEX RCP8.5 and RCP2.6 and CMIP6 SSP5-8.5 and SSP1-2.6 scenarios ensembles. Stippling indicates areas where less than 80% of the models agree on the sign of change. CMIP5 and CORDEX shown in addition to CMIP6 to show how the previous climate model generation output differs compared to the latest generation. Panels p-r show change in extreme sea level (1:100 year return period total water 5 level from Vousdoukas et al. (2018)'s CMIP5 based dataset; meters). (p) RCP4.5 2100, (q) RCP8.5 2050 and (r) RCP8.5 2100, each relative to 1980–2014 {Interactive Atlas} {Figure TS.24, Figure 12.4}

HEAT AND COLD

- By the end of the 21st century, dangerous humid heat thresholds, such as the NOAA Heat Index (HI) of 41°C, will be exceeded much more frequently under the SSP5-8.5 scenario than under SSP1-2.6 and will affect many regions (*high confidence*). In many tropical regions, the number of days per year where a HI of 41°C is exceeded would increase by more than 100 days relative to the recent past under SSP5-8.5, while this increase will be limited to less than 50 days under SSP1-2.6 (*high confidence*) (Figure 1).
- The number of days per year where temperature exceeds 35°C would increase by more than 150 days in many tropical areas by end of century for SSP5-8.5 scenario, such as the Amazon basin and South East Asia under SSP5-8.5, while it is expected to increase by less than 60 days in these areas under SSP1-2.6 (except 19 for the Amazon Basin) (*high confidence*). {TS.4.3.1}

WET AND DRY

- At 1.5°C global warming, heavy precipitation and associated flooding are projected to intensify and be more frequent in most regions in Africa and Asia (*high confidence*), North America (*medium to high confidence*) and Europe (*medium confidence*). Also, more frequent and/or severe agricultural and ecological droughts are projected in a few regions in all inhabited continents except Asia compared to 1850–1900 (*medium confidence*); increases in meteorological droughts are also projected in a few regions (*medium confidence*).

- At 2°C of global warming, heavy precipitation and associated flooding events are projected to become more intense and frequent in the Pacific Islands and across many regions of North America and Europe (*medium* to *high confidence*). These changes are also seen in some regions in Australasia and Central and South America (*medium confidence*).
- Several regions in Africa, South America and Europe are projected to experience an increase in frequency and/or severity of agricultural and ecological droughts with *medium* to *high confidence*; increases are also projected in Australasia, Central and North America, and the Caribbean with *medium confidence*. A small number of regions in Africa, Australasia, Europe and North America are also projected to be affected by increases in hydrological droughts, and several regions are projected to be affected by increases or decreases in meteorological droughts, with more regions displaying an increase (*medium confidence*).

WIND

- The proportion of intense tropical cyclones (TC), average peak TC wind speeds, and peak wind speeds of the most intense TCs will increase on the global scale with increasing global warming (*high confidence*). Intensification of TCs and/or extratropical storms is projected in more regions from 2°C global warming and above (*medium confidence*). {TS.4.3.1; 11.7.1}

COASTAL

- By 2050, sea level is committed to rise by 15 to 30 cm above present-day level, almost independently of how quickly global greenhouse gas emissions are reduced. By 2050, extreme sea level events that occurred once per century in the recent past will occur globally 20 to 30 times more frequently. They would occur annually or more frequently at 19% to 31% of tide gauge locations. Beyond 2050, sea level will continue to rise, but with a rate and magnitude strongly dependent on choices regarding future greenhouse gas emissions. By 2100, they would occur at least 160 times more frequently (even if warming is limited to well below 2°C) and would occur at least annually at 60% of these locations (for warming less than 2°C) and up to 80% of these locations (for warming of 4°C). {Figure SPM.8}

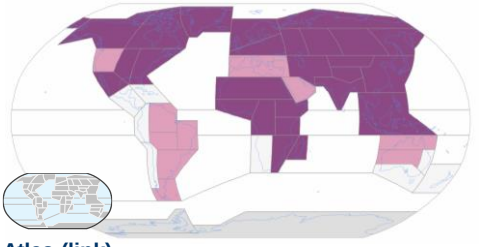
OTHER / COMPOUND

- With 2°C global warming, and as early as the mid-21st century, a wide range of CIDs, particularly related to the water cycle and storms, are expected to show simultaneous region-specific changes relative to recent past with *high* or *medium confidence*. In a number of regions (Southern Africa, the Mediterranean, North Central America, Western North America, the Amazon regions, South-Western South America, and Australia), increases in one or more of drought, aridity and fire weather (*high confidence*) will affect a wide range of sectors, including agriculture, forestry, health and ecosystems. In another group of regions (North-western, Central, and Eastern North America; Arctic regions; North-western South America; Northern and Central Western Europe; Siberia; Central, South and East Asia; Southern Australia and New Zealand), decreases in snow and ice or increases in pluvial/river flooding (*high confidence*) will affect sectors such as winter tourism, energy production, river transportation, and infrastructure {SPM C.2.4}

- Cities intensify human-induced warming locally, and further urbanization together with more frequent hot extremes will increase the severity of heatwaves (*very high confidence*). Urbanization also increases mean and heavy precipitation over and/or downwind of cities (*medium confidence*) and resulting runoff intensity (*high confidence*). In coastal cities, the combination of more frequent extreme sea level events (due to sea level rise and storm surge) and extreme rainfall/ riverflow events will make flooding more probable (*high confidence*). {SPM C.2.6}

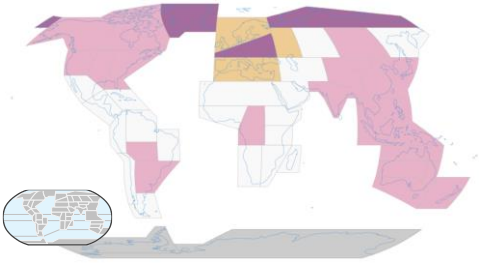
Projected changes at 2°C by 2050:

Heavy precipitation and pluvial flood

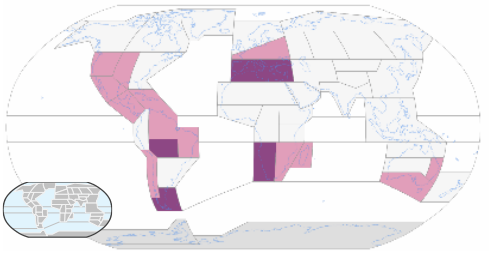


Atlas (link)

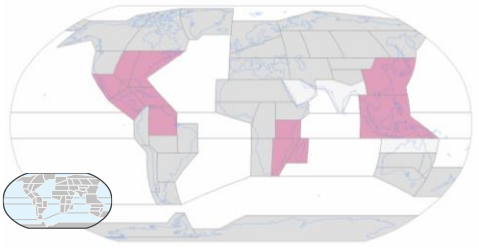
River flood



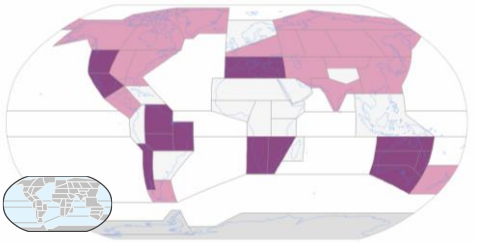
Agricultural and Ecological Drought



Tropical cyclone



Fire weather



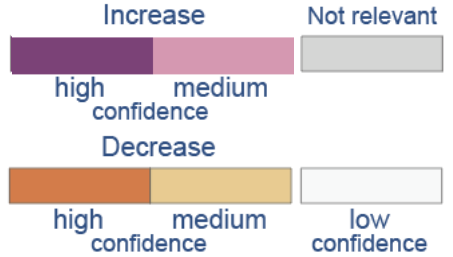


Figure 2. Projected changes for all AR6 regions a 2°C global warming by around 2050 for several CIDs that are relevant for disaster managment and insurance with attached level of confidence. Changes are projected to become more pronounced and widespread with every additional increment of global warming {SPM B.2.2, SPM C.2}.