

Regional and sectoral information - Outreach lab

- « **WGI regional and sectoral fact sheets** » by Nada Caud (20 mn)
 - « **WGIII sectoral fact sheets** » by Sigourney Luz (20 mn)
 - « **WGII regional and crosscutting fact sheets** » by Komila Nabiyeva (20 mn)
 - « **WGI Summary for actuaries and Summary for all** » by Sarah Connors (20 mn)
- Discussion and wrap up (10)

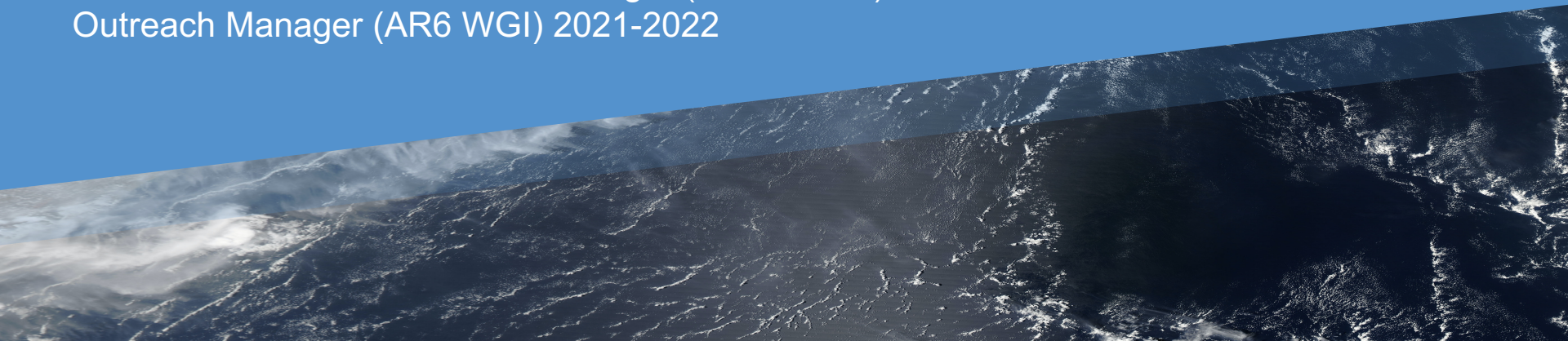
SIXTH ASSESSMENT REPORT

Working Group I – The Physical Science Basis

June 7th, 2023 - Trieste

« WGI Regional and sectoral fact sheets »

Nada Caud, Communications Manager (LSCE-IPSL)
Outreach Manager (AR6 WGI) 2021-2022



WGI regional and sectoral fact sheets

- Which audience?
- Which content?
- Which process?

Targeted audience

High level policymakers/stakeholders

They need very brief and robust notes

They may have no scientific background

Practitioners/engineers in companies/climate services

They need more technical information

They need to access to the physical climate data (to run their own impact models...)

Scientists

They need to access to the scientific literature

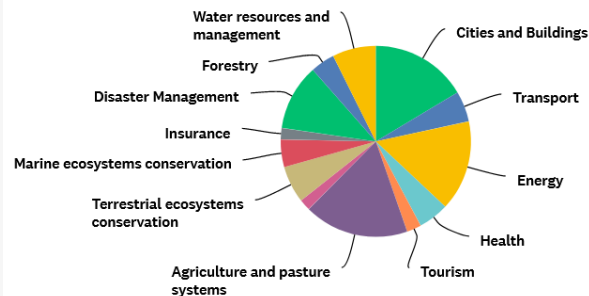
They need to access to the data

Results of the survey

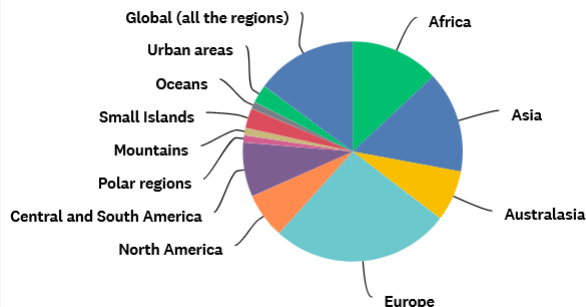
Some numbers:

391 participants (22%-Governments, 9%-other public sector, 21%-private sector, 8%-consultancy, 9% NGOs, 40%-research...)

186 provided their emails to be contacted for further consultation

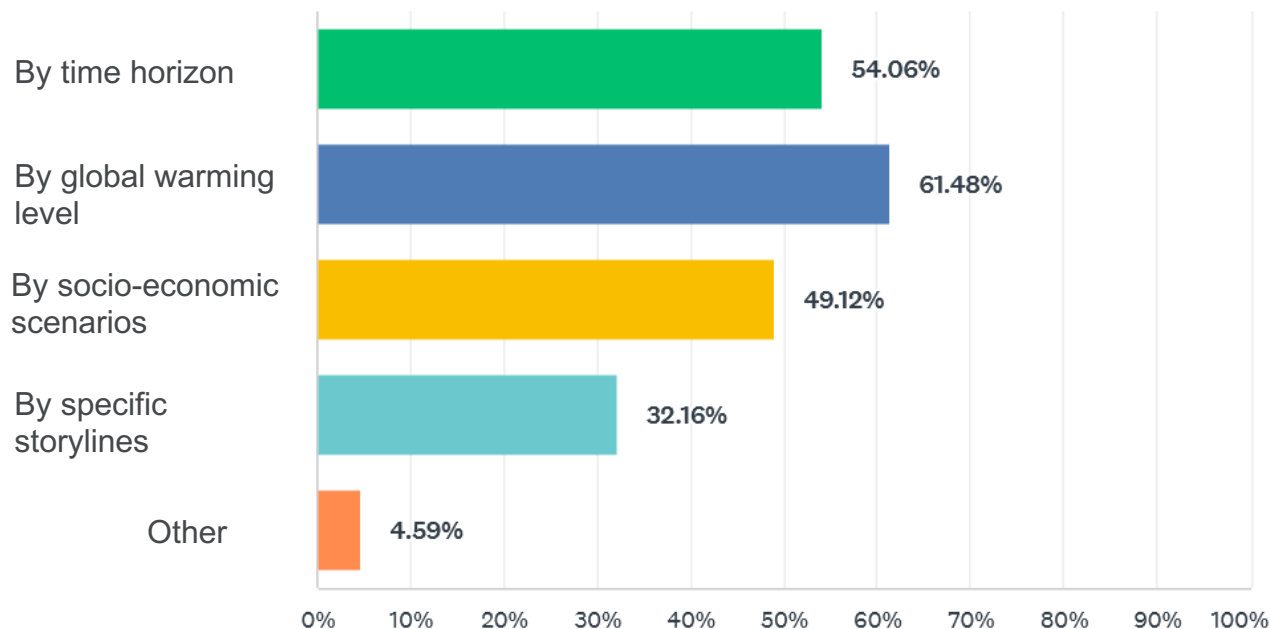


- Climate information (quantitative/qualitative/both)
- Climate data they use
- List of CIDs relevant for their sectors
- Worst case scenario
- Preferred time/spatial scale
- GWLs/SSPs/Time horizons/storylines
- Climate statistics (means, extremes, both...)
- Do they need uncertainty?
- Preferred presentation for the fact sheets (bullet points, paragraphs, tables, maps, ...)



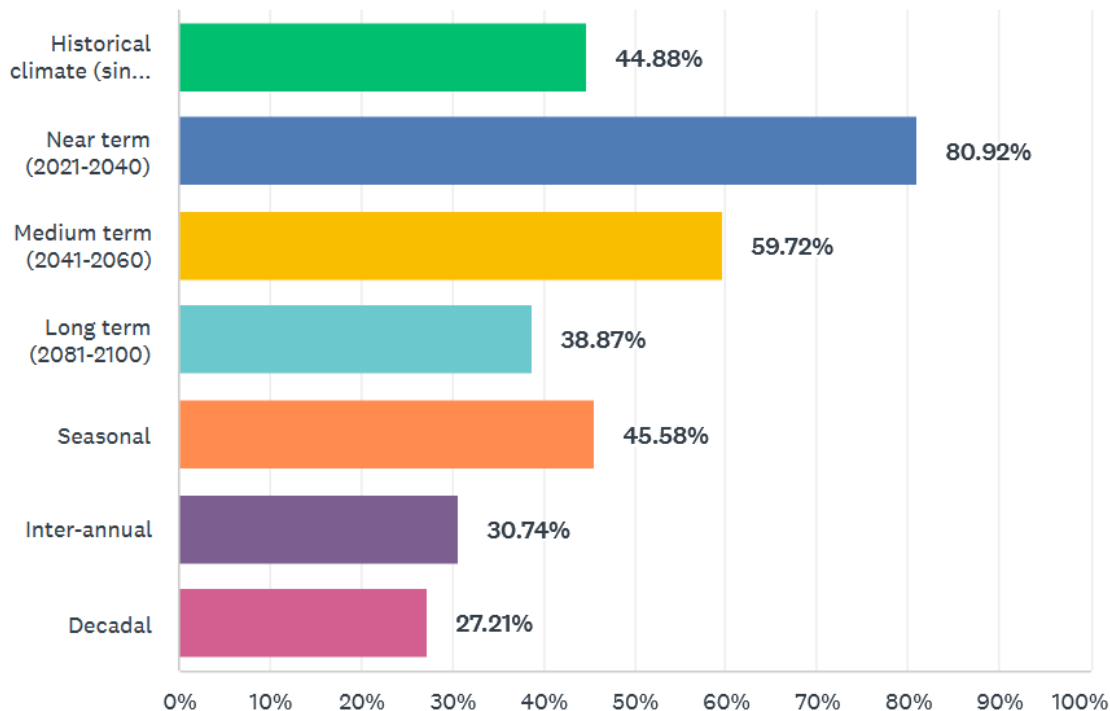
For future climate changes, which of the following is a preferred way of presenting information for your sector?

Answered: 283 Skipped: 108 (multiple answers allowed)



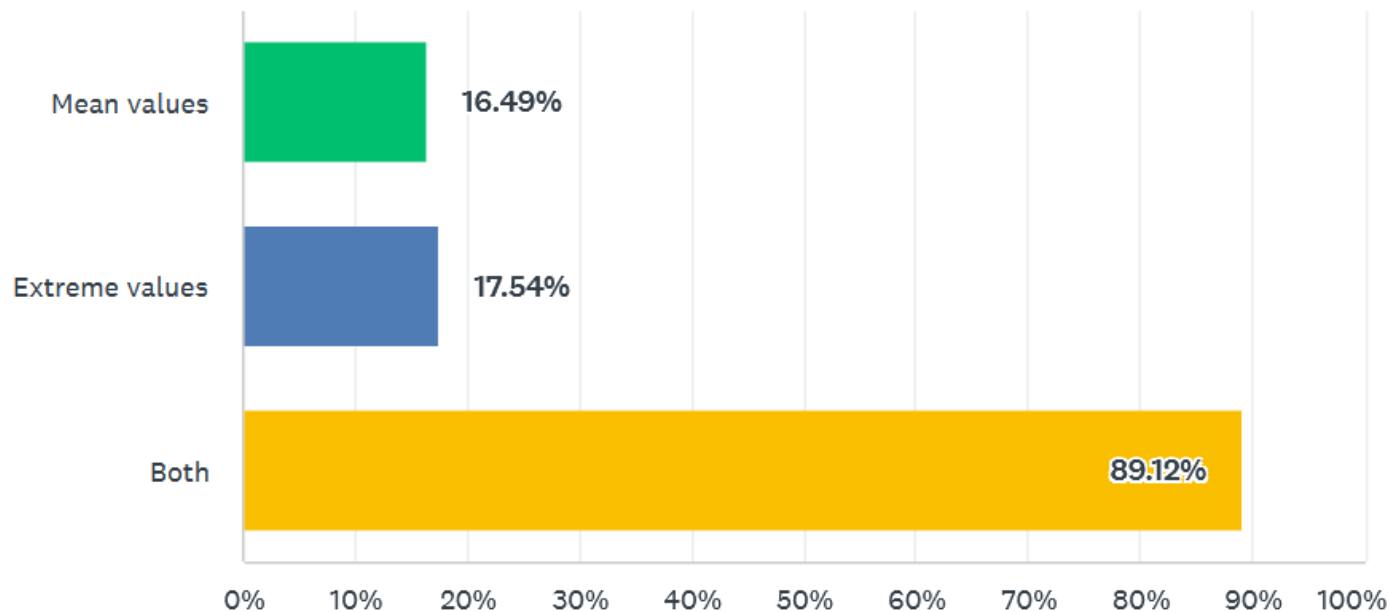
Which is your time scale of interest?

Answered: 283 Skipped: 108 (multiple answers allowed)



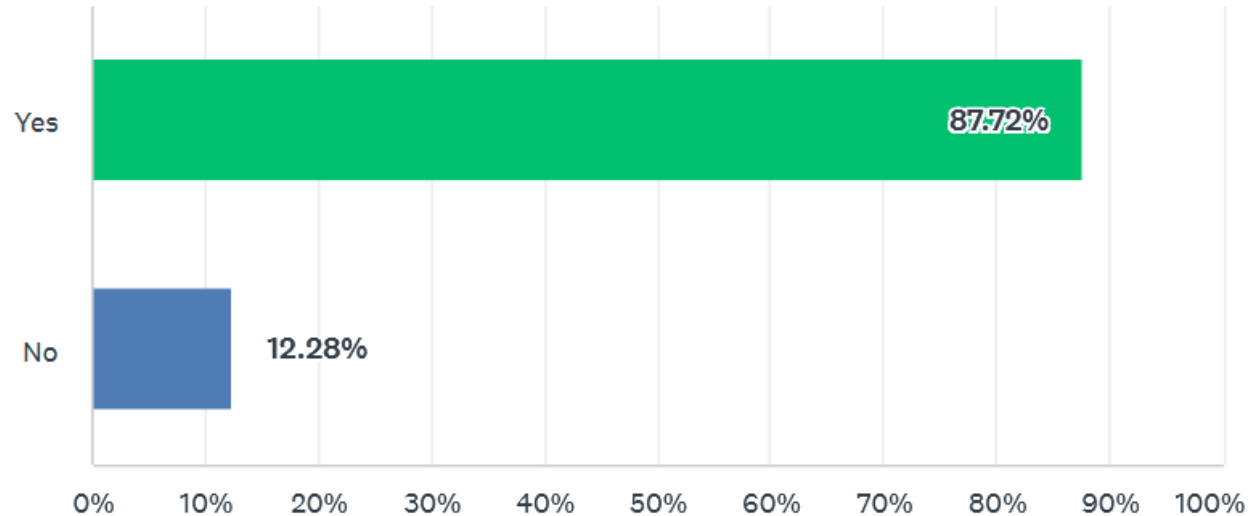
Which climate statistics are you interested in?

Answered: 285 Skipped: 106 (multiple answers allowed)



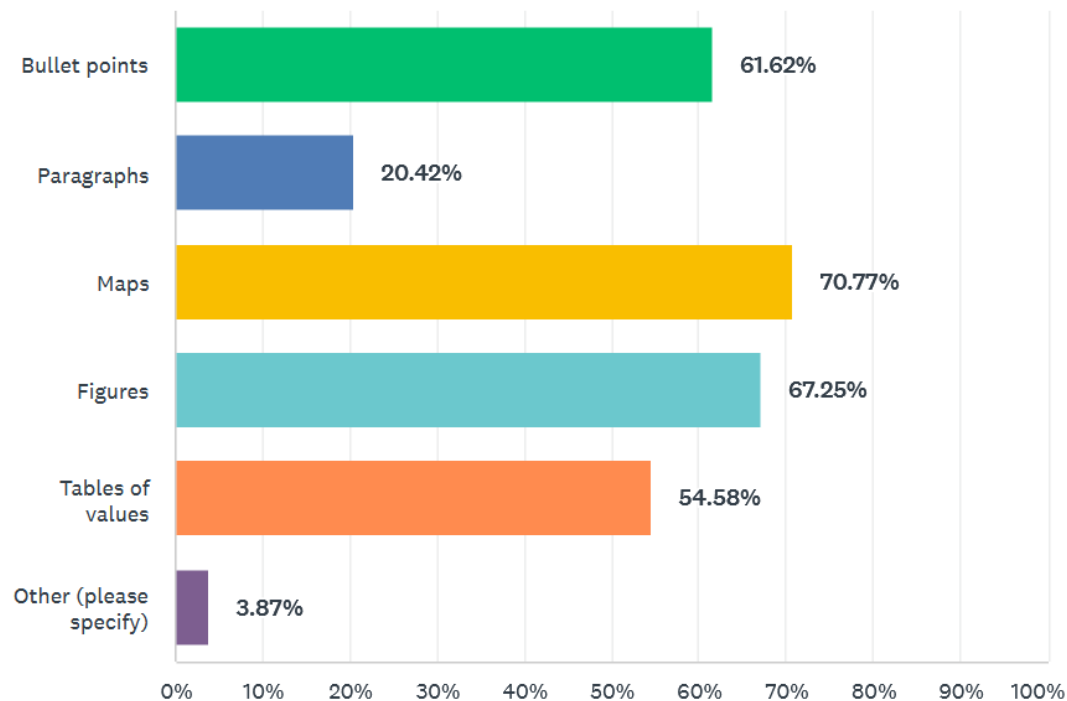
Do you need the information about uncertainty?

Answered: 285 Skipped: 107



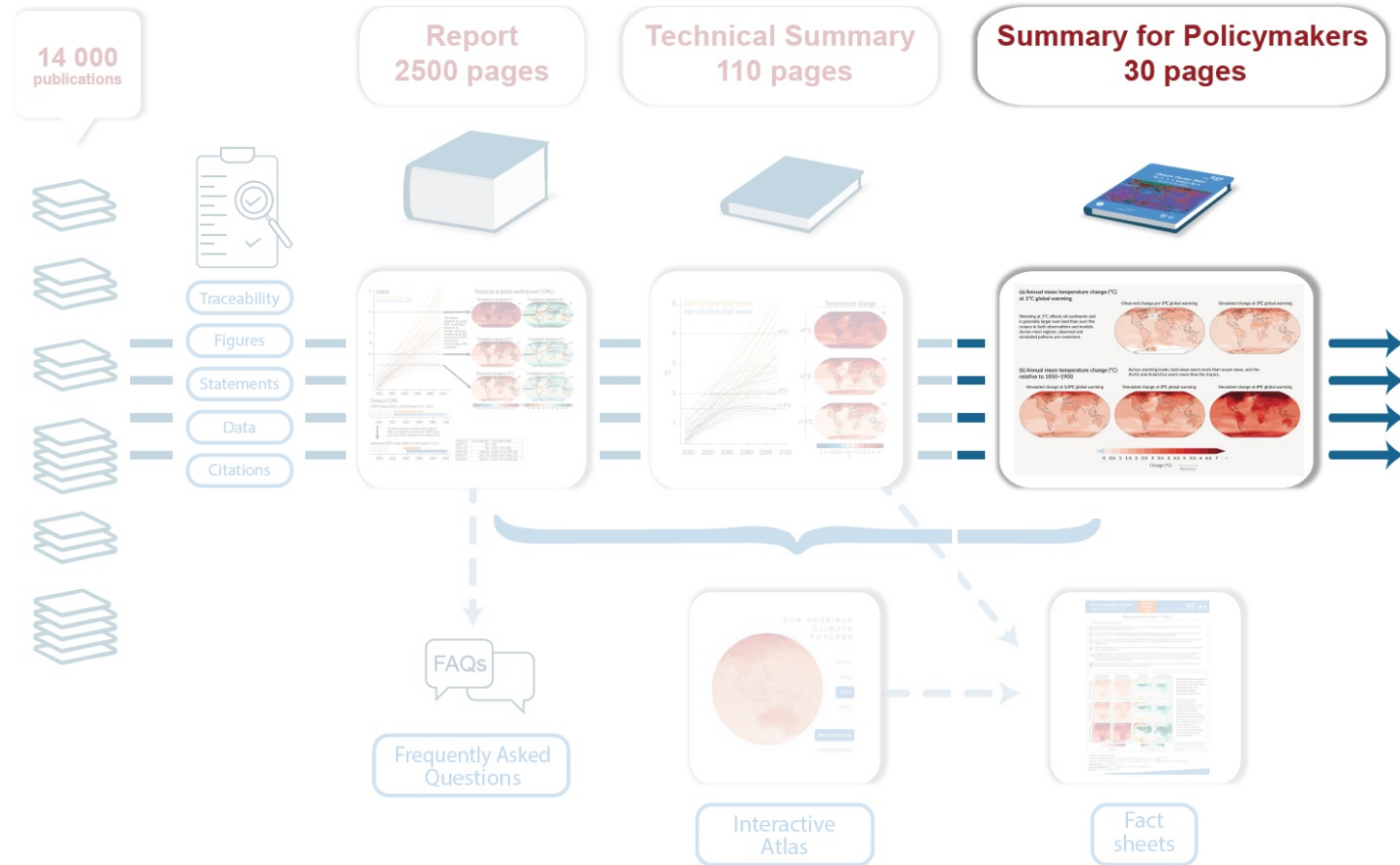
Preferred presentation format in a two pages fact sheets?

Answered: 284 Skipped: 108 (multiple answers allowed)



WGI regional and sectoral fact sheets

- Which audience?
- Which content?
- Which process?



Most of the users focus mainly on the Summary for Policymakers

but

there is more detailed climate information that is relevant for their region or sector in the Report.

Table TS.5 | Summary of confidence for climatic impact-driver changes in each AR6 WGI reference region (illustrated in Figure TS.25) across multiple lines of evidence for observed, attributed and projected directional changes. The colours represent their projected aggregate characteristic changes for the mid-21st century, considering scenarios RCP4.5, SSP2-4.5, SRES A1B, or above (RCP6.0, RCP8.5, SSP3-7.0, SSP5-8.5, SRES A2), which approximately encompasses global warming levels of 2.0°C to 2.4°C. Arrows indicate *medium to high confidence* trends derived from observations, and asterisks indicate *medium and high confidence* in attribution of observed changes. (North Africa is not an AR6 WGI reference region, but assessment here is based upon the African portion of the Mediterranean reference region). [Tables 12.3–12.11 and Tables 11.4–11.21]

	Climatic Impact-driver																													
	Heat and Cold		Wet and Dry					Wind		Snow and Ice					Coastal and Oceanic			Other												
	Mean air temperature	Extreme heat	Cold spell	Frost	Mean precipitation	River flood	Heavy precipitation and pluvial flood	Landslide	Aridity	Hydrological drought	Agricultural and ecological drought	Fire weather	Mean wind speed	Severe wind storm	Tropical cyclone	Sand and dust storm	Snow, glacier and ice sheet	Permafrost	Lake, river and sea ice	Heavy snowfall and ice storm	Hail	Snow avalanche	Relative sea level	Coastal flood	Coastal erosion	Marine heatwave	Ocean and lake acidity	Air pollution weather	Atmospheric CO ₂ at surface	Radiation at surface
Africa																														
North Africa	↗	↗	↗	***				↘	↘	↘				3									↗	↗	4	↗	↗		↗	
Sahara	↗	↗	↗	**																			↗	↗	4	↗	↗		↗	
Western Africa	↗	↗	**	**	1	↗		↗	1	↗	1												↗	↗	4	↗	↗		↗	
Central Africa	↗				↗	1,2				↗													↗	↗	4	↗	↗		↗	
North Eastern Africa	↗	↗	**	**	↗			1	1	1						↗							↗	↗	4	↗	↗		↗	
South Eastern Africa	↗	↗	**					1	1	1				3		↗							↗	↗	4	↗	↗		↗	
West Southern Africa	↗	↗	***	↗	↗	↗	↗			↗													↗	↗	4	↗	↗		↗	
East Southern Africa	↗	↗	***	↗	↗	↗	↗			↗				3									↗	↗	4.5	↗	↗		↗	
Madagascar	↗	↗	↗											3									↗	↗	4.5	↗	↗		↗	

Note: There are several region-specific qualifiers/exceptions attached to some of the directions of change/confidence levels indicated above. [12.4]

Key for observational trend evidence ↗ Past upward trend (medium or higher confidence) ↘ Past downward trend (medium or higher confidence)

Key for attribution evidence *** High confidence (or more) ** Medium confidence

Key for level of confidence in future changes High confidence of increase (or more) Medium confidence of increase (or more) Low confidence in direction of change Medium confidence of decrease High confidence of decrease Not broadly relevant

IPCC WGI Technical Summary Table TS.5

Table 12.2 | Relevance of key climatic impact-drivers (and their respective changes in intensity, frequency, duration, timing and spatial extent) for major categories of sectoral assets, as assessed with at least medium confidence in Section 12.3 across many studies and applications. ‘High relevance’ indicates climatic impact-drivers that are most prominent and widely studied for their direct connection to assets, while lower relevance indicates weaker linkages and less commonly-studied driving behaviours. Specific levels of risk and opportunity depend on the changing character of regional hazards, vulnerability and exposure as assessed in WGII.

Sector	Asset	Climatic Impact-driver																																
		Heat and Cold		Wet and Dry				Wind		Snow and Ice			Coastal	Open Ocean			Other																	
		Mean air temperature	Extreme heat	Cold spell	Frost	Mean precipitation	River flood	Heavy precipitation and pluvial flood	Landslide	Aridity	Hydrological drought	Agricultural and ecological drought	Fire weather	Mean wind speed	Severe wind storm	Tropical cyclone	Sand and dust storm	Snow, glacier and ice sheet	Permafrost	Lake, river and sea ice	Heavy snowfall and ice storm	Hail	Snow avalanche	Relative sea level	Coastal flood	Coastal erosion	Mean ocean temperature	Marine heatwave	Ocean acidity	Ocean salinity	Dissolved oxygen	Air pollution weather	Atmospheric CO ₂ at surface	Radiation at surface
Terrestrial and Freshwater Ecosystems (WGII Chapter 2)	Tropical forests	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	
	Temperate and boreal forests	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	
	Lakes, rivers and wetlands	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	
	Grasslands and savanna	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High
	Deserts	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High
	Mountains	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High
Ocean and Coastal Ecosystems (WGII Chapter 3)	Polar	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	
	Coastal land and intertidal zones	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	
	Coastal seas	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	
	Shelf seas and upwelling zones	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High
	Polar seas	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High
Water (WGII Chapter 4)	Open ocean and deep sea	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	
	Cryosphere reservoir	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	
	Aquifers and groundwater	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High
	Streamflow and surface water	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High
Water quality	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	

None/low confidence | Low/moderate | High

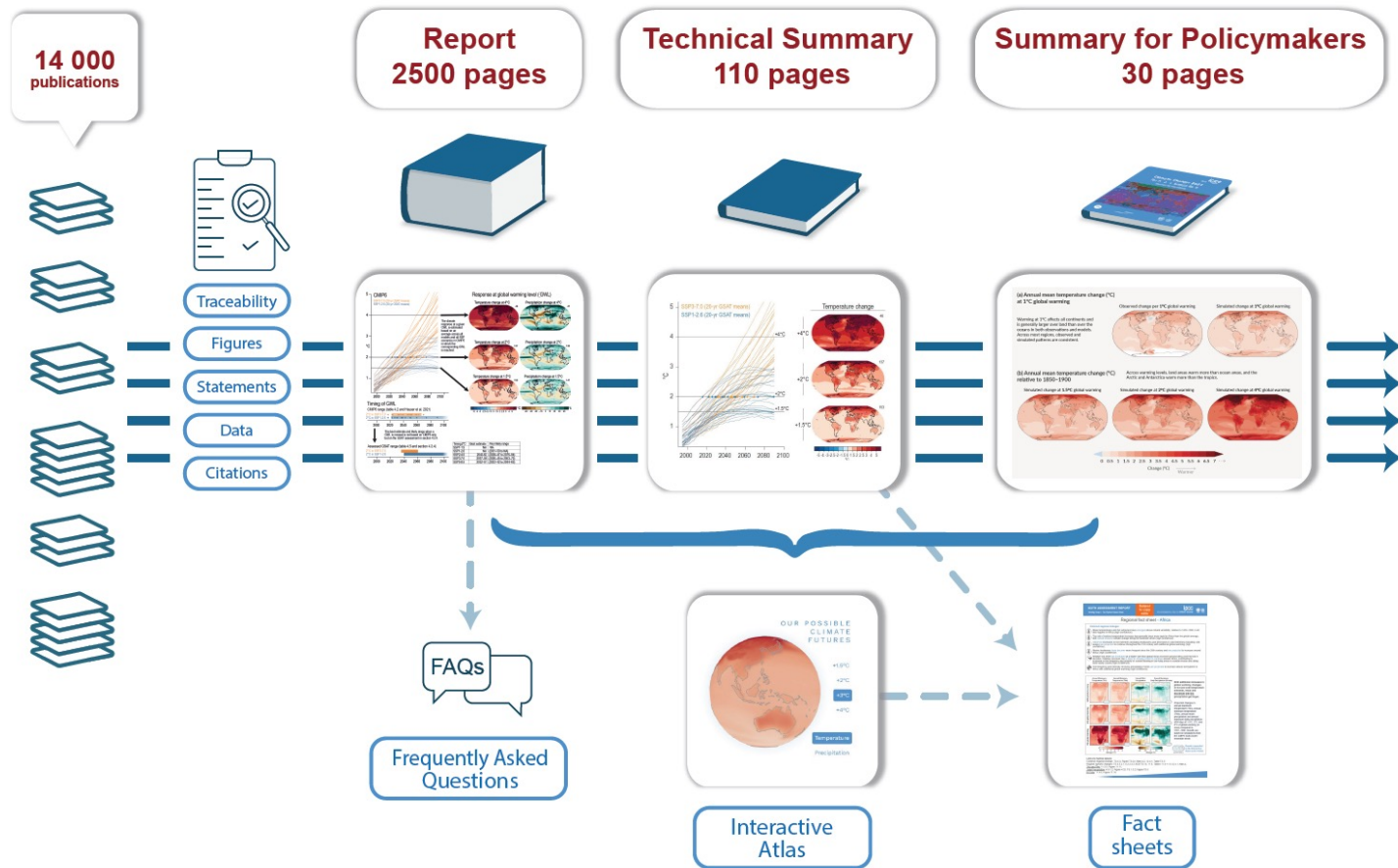
Impacts and risk relevance

IPCC WGI
Chapter 12
Table 12.2

The **challenge** is to guide the users to the relevant sections for their needs in the:

- Interactive Atlas
- Technical Summary
- Full Report

In only two pages



WGI regional and sectoral fact sheets

- Which audience?
- Which content?
- Which process?

Co-construction process

Working closely with WGI authors/TSU/Bureau

- Accuracy and robustness
- Traceability to the Report

Surveys and meetings with the stakeholders/practitioners

- The usefulness and relevance
- The clarity

Interaction with WGII/WGIII Working Groups

- Consistency

Making editorial choices

- An harmonized structure across the full set
- With some flexibility to respect the specificities of each fact sheet

Regional fact sheets

Regional Fact Sheets

Regional fact sheets are an outreach product that is fully traceable to the Chapters, the Technical Summary and the Interactive Atlas. They constitute an entry point for regionalized information in the AR6 Working Group I report. (11 fact sheets)

[Download Regional Fact Sheets](#)

Introduction	DOWNLOAD
Africa	DOWNLOAD
Asia	DOWNLOAD
Australasia	DOWNLOAD
Central and South America	DOWNLOAD
Europe	DOWNLOAD
Mountains	DOWNLOAD
North and Central America	DOWNLOAD
Ocean	DOWNLOAD
Polar regions	DOWNLOAD
Small Islands	DOWNLOAD
Urban areas	DOWNLOAD
Contributors	DOWNLOAD

The content is fully traceable to the Report

The maps are linked to the Interactive Atlas

- 11 regional fact sheets (2 pages)
- 70 contributors
- Compared to survey (WGI, WGII, WGIII, Delegates/Focal Points)

SIXTH ASSESSMENT REPORT
Working Group I – The Physical Science Basis

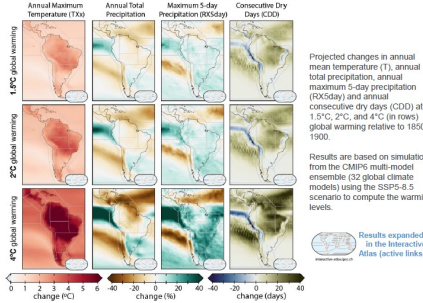
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INTERGOVERNMENTAL PANEL ON climate change

Regional fact sheet – Central and South America

Common regional changes

- Mean temperatures have very likely increased in all sub-regions and will continue to increase at rates greater than the global average (high confidence).
- Mean precipitation is projected to change, with increases in North-West South America (NWS) and South-East South America (SES) (high confidence) and decreases in North-East South America (NES) and South-West South America (SWS) (medium confidence). This is consistent among model projections by mid- and end of the 21st century for RCP4.5 and RCP8.5 scenarios.
- Compared to global mean sea level, over the last three decades, relative sea level has increased at a higher rate than global mean level in the South Atlantic and the subtropical North Atlantic, and at a lower rate in the East Pacific.
- Relative sea level rise is extremely likely to continue in the oceans around Central and South America, contributing to increased coastal flooding in low-lying areas (high confidence) and shoreline retreat along most sandy coasts (high confidence).
- Marine heatwaves are also projected to increase around the region over the 21st century (high confidence).



Projected changes in annual mean temperature (T_m), annual total precipitation, annual maximum 5-day precipitation (R5day) and annual consecutive dry days (CDD) at 1.5°C, 2°C, and 4°C (in rows) global warming relative to 1850–1900.

Results are based on simulations from the CMIP5 multi-model ensemble (32 global climate models) using the SSP5-8.5 scenario to compute the warming levels.

Results expanded in the Interactive Atlas (active links)

Links for further information:
TS Chapters: TS.4.3.1, TS.4.3.2, Box TS.6, Box TS.13, Figure TS.21a, Figure TS.24. Chapters: 8.3, 8.4, 8.6, 10.4, 11.3, 11.4, 11.9, Table 11.3, Table 11.14, Table 11.15, 12.4, Atlas 7, Atlas 7.2

SIXTH ASSESSMENT REPORT
Working Group I – The Physical Science Basis

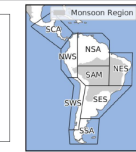
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INTERGOVERNMENTAL PANEL ON climate change

Regional fact sheet – South America

Common regional changes

- Southern Central America (SCA)
 - Aridity, and agricultural and ecological drought are increasing (medium confidence). Fire weather is projected to increase (medium confidence).
- Northern South America (NSA)
 - The intensity and frequency of extreme precipitation and pluvial floods are projected to increase (medium confidence) for 2°C of global warming level and above.
 - There is high confidence in a dominant increase in the number of dry days and drought frequency.
- Northeastern South America (NES)
 - The intensity and frequency of extreme precipitation and pluvial floods are projected to increase (medium confidence) for 2°C of global warming level and above.
 - There is high confidence in a dominant increase in drought duration.
- Northwest South America (NWS)
 - Increases in snow and ice, and increases in pluvial/lake flooding are projected with high confidence.
 - Glacier volume loss and permafrost thawing will likely continue in the Andes Cordillera under all greenhouse emissions scenarios in this report, causing important reductions in river flow and potentially high-magnitude glacial lake outburst floods.
- Southwest South America (SWS)
 - The total land area subject to increasing drought frequency and severity will expand (high confidence). Projections of the weather indices indicate an increased risk in the region (high confidence).
 - Increases in one or more aspects between drought, aridity, and fire weather (high confidence) will potentially impact a wide range of sectors (including agriculture, forestry, health, and ecosystems), which will be assessed in the IPCC Working Group II report.
 - Glacier volume loss and permafrost thawing will likely continue in the Andes Cordillera under all greenhouse gas emissions scenarios in this report, causing important reductions in river flow and potentially high-magnitude glacial lake outburst floods.
- Southeastern South America (SES)
 - Increases in mean and extreme precipitation are observed since the 1960s (high confidence). Drivers of this change include internal variability as well as external forcing, like increases in greenhouse gases and aerosols and ozone depletion.
 - The intensity and frequency of extreme precipitation and pluvial floods are projected to increase (medium confidence) for 2°C of global warming level and above.
- Southern South America (SSA)
 - The intensity and frequency of extreme precipitation and pluvial floods is projected to increase (medium confidence) for 2°C of global warming level and above.
- South American Monsoon (SAM)
 - There is low confidence in projected precipitation changes, but high confidence that the South American monsoon will be delayed during the 21st century.
 - There are projections of increased agricultural and ecological drought for the mid-21st century, for 2°C of global warming level and above (high confidence).
 - Increases in one or more aspects between drought, aridity, and fire weather (high confidence) will affect a wide range of sectors, including agriculture, forestry, health, and ecosystems.
 - The intensity and frequency of extreme precipitation and pluvial floods is projected to increase (medium confidence) for a 2°C of global warming level and above.
 - Over the Amazon, the number of days per year with maximum temperatures exceeding 35°C would increase by more than 150 days by the end of the 21st century in the SSP5-8.5 scenario, while it is expected to increase by less than 50 days under the SSP1-2.6 scenario (high confidence).



WGI fact sheets for the sectors

Introduction to Fact Sheets	DOWNLOAD
Agricultural and Pasture Systems	DOWNLOAD
Cities, Buildings and Transport	DOWNLOAD
Disaster Management and Insurance	DOWNLOAD
Energy sector	DOWNLOAD
Forestry	DOWNLOAD
Health	DOWNLOAD
Marine Ecosystems, Fisheries and Aquaculture	DOWNLOAD
Terrestrial and Freshwater Ecosystems	DOWNLOAD
Tourism	DOWNLOAD
Water resources management	DOWNLOAD
List of contributors	DOWNLOAD

- 10 sectors (2 pages)
- ~60 contributors
- Surveys and meetings with the stakeholders, WGI, WGII, WGIII Working Groups, IPCC Focal Points...

SIXTH ASSESSMENT REPORT
Working Group I – The Physical Science Basis

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INTERGOVERNMENTAL PANEL ON climate change

Climate information relevant for Agricultural and Pasture Systems

Agricultural and pasture systems encompass the food, fibre and animal products cultivated on farms and grasslands, which respond strongly to climate conditions around the world. This fact sheet presents Sixth Assessment Report Working Group I (AR6 WGI) assessments for changes to climate factors connected to responses in agricultural and pasture systems, highlighting climate information and data needs that inform sectoral assessments and further actions for adaptation, mitigation and resilience planning.

Impacts, adaptation and vulnerability in agricultural and pasture systems are predominantly assessed in AR6 WGII Chapter 6. Mitigation options are assessed in AR6 WGIII Chapter 7.

HEAT AND COOL

- Agricultural and pasture systems are often selected to match expected seasonal temperatures. Relevant climate information includes, for example, the number of growing degree days and the length of the frost-free season. (T2.3.1) Projections indicate increasing mean temperatures and reductions in frost days. (TS4.3)
- Extreme temperature thresholds can disrupt plant growth or damage crops, while conditions with high temperature and humidity can lead to heat stress for animals and agricultural workers (T2.3.1). The intensity and frequency of extreme heat has increased and will continue through the 21st century (high confidence), exceeding critical thresholds more frequently by the mid of the century with 2°C of global warming (high confidence). (TS4.3) (Figure 1a,b, Figure 2)

WET AND DRY

- Agricultural systems depend on seasonal rainfall and may suffer from water stress during periods of drought affecting available soil and surface water. (T2.3.2)
- Projections indicate future shifts in seasonal rainfall and an expansion of arid conditions and fire weather in many parts of the world (medium confidence) (Figure 2) (TS4.3, Box TS 13)
- Human-induced climate change has contributed to increases in arid and agricultural droughts in some regions due to increased land evapotranspiration (medium confidence), with drought increasing in more regions under higher global warming levels (medium confidence). (TS4.3) (Figure 1c, Figure 2, Figure 3).
- River floods (medium confidence) and heavy precipitation extremes (high confidence) are projected to increase in many regions, which can threaten livestock and croplands exposed in flood plains. (TS4.3)

Figure 1: Projections of climate indices relevant for agriculture and pastures. Projections indicate an increase in days per year with (a) extreme temperature and (b) dangerous heat index (Figures 12.4) under a low emissions end-of-the-21st-century scenario, and regional shifts in (c) soil moisture change 2°C global warming. (Figure SPM.5)

SIXTH ASSESSMENT REPORT
Working Group I – The Physical Science Basis

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INTERGOVERNMENTAL PANEL ON climate change

Figure 2: Combination of selected CIDs that are relevant for agricultural and pasture systems, along with their observed, attributed and projected changes for all AR6 regions (represented as hexagons in stylized world map). Changes in CIDs are projected to become more pronounced and widespread with every additional increment of global warming. (SPM.B.2.2, SPM.C.2, Interactive Atlas)

Figure 3: Agricultural drought has already increased in frequency and intensity, with larger changes with each increment of global warming. (Figure SPM.6)

AGRICULTURAL DROUGHT

Relative sea level rise is very likely to virtually certain (depending on the region) to continue along the 21st century in regions with low-lying agricultural areas, increasing coastal flooding and the potential for salinity intrusion (high confidence). (TS4.3.1)

SNOW AND ICE

- The duration of seasonal snowpack, which can be important for determining the length of the viable growing season some crops, is virtually certain to decrease in the Northern Hemisphere, with earlier spring meltwater also altering irrigation water supply seasonality. (TS2.6, TS4.3)

WIND

- Mid-latitude and tropical region agriculture systems are projected to face more intense severe storms and a higher proportion of intense tropical cyclones with higher rainfall rates (medium confidence). (TS4.3, 12.3)

COASTAL AND OCEANIC

ADDITIONAL RELEVANT CLIMATE CHANGES

- Increases in atmospheric carbon dioxide concentrations are associated with higher photosynthetic rates and improved water retention as well as reduced nutritional quality of crops (high confidence). (T2.3.7, TS4.3)
- Many CIDs that are important to agriculture and livestock systems have only low confidence projections of regional changes. These include hail, dust and sand storms, ice storms and air pollution weather. (SPM.C)
- Major volcanic eruptions also have the potential to drive future food system hazards (SPM.C.1.4).

Future global warming levels

1850-1900	Present 1.5°C	1.5°C	2°C	4°C
Once	Now rarely occurs 1.7 times (0.7 - 4.0)	Will rarely occur 2.2 times (0.9 - 5.0)	Will likely occur 2.4 times (0.9 - 6.6)	Will likely occur 4.1 times (0.7 - 7.0)
Frequency increase	+0.3 sd	+0.5 sd	+0.6 sd	+1.0 sd

THANK YOU

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