Climate Change Impacts: Global and National Scenario as per IPCC's. Sixth Assessment Report

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Deputy Managing Director
PKSF

IPCC

INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

WMO UNEP



- It is the **international body for assessing the science related to climate change.**
- It was **set up in 1988** by the World Meteorological Organization (WMO) and United Nations Environment Programme (UNEP) to provide policymakers with regular assessments of the scientific basis of climate change, its impacts and future risks, and options for adaptation and mitigation.

HISTORY | EVOLUTION OF THE IPCC

ipcc
INTERGOVERNMENTAL PANEL ON climate change
WMO UNEP

GROWING PUBLIC AWARENESS

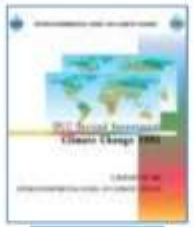
INCREASING STAKEHOLDER INVOLVEMENT

GROWTH IN SCIENTIFIC RESEARCH ON CLIMATE CHANGE



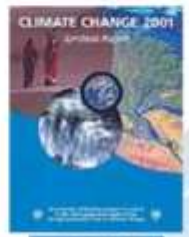
1988

IPCC
Jointly established by WMO and UNEP



1995

SAR
Kyoto Protocol



2001

TAR
Adaptation



2007

AR4
2°C limit



Nobel Peace Prize



2013-14

AR5
Paris Agreement



2018

AR6
SR1.5



2019

AR6
SROCC



AR6
SRCCL

Sixth Assessment Report



2021

AR6
WGI



2022

AR6
WGII



AR6
WGIII

Synthesis Report

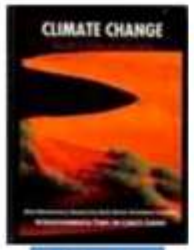
2023

AR6
SYR

UNFCCC
Global Stocktake

1990

FAR
UNFCCC



1980 — 1990 — 2000 — 2010 — 2020 — 2030

STRUCTURE

ipcc
INTERGOVERNMENTAL PANEL ON climate change

Intergovernmental Panel
195 member States appointing National Focal Points

POLICY

PLENARY

BUREAU

EXECUTIVE COMMITTEE

Policy and science work together to provide rigorous and balanced scientific information on climate change

WORKING GROUP I
The Physical Science Basis

WORKING GROUP II
Impacts, Adaptation & Vulnerability

WORKING GROUP III
Mitigation of Climate Change

TASK FORCE ON INVENTORIES
Task Force on National Greenhouse Gas Inventories

Hundreds of **scientists and experts from around the world** are involved in the preparation of IPCC reports

SCIENCE

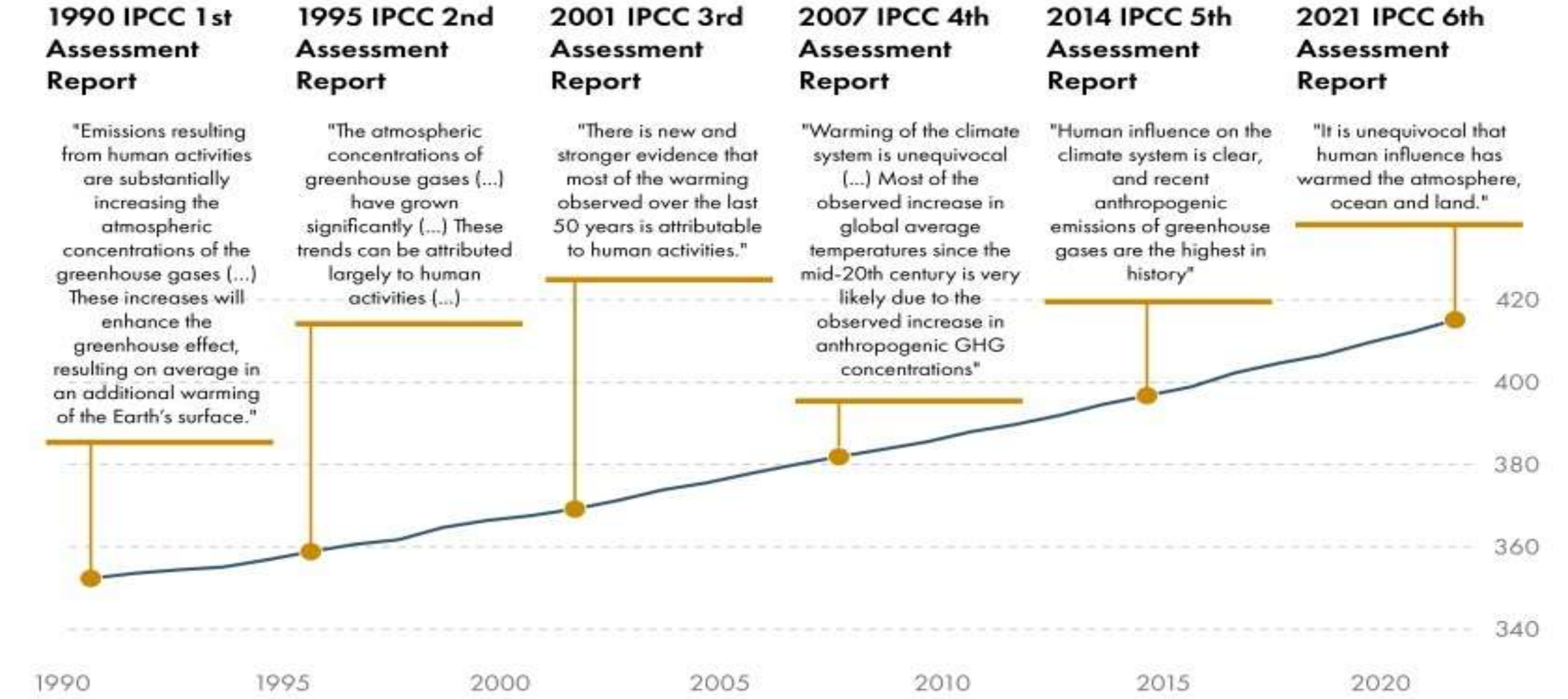
Authors & Scientists

Review Editors

Expert Reviewers

Key IPCC findings since 1990

Atmospheric CO2 concentration has continued to increase



IPCC REPORTS

ipcc
INTERGOVERNMENTAL PANEL ON climate change

5 Assessment Reports

1990, 1995, 2001, 2007, 2013-14

2021-2023: Sixth Assessment Report – *in progress*

14 Special Reports

1997, 1999, 2000, 2005, 2011, 2012, 2018, 2019

1992 Supplementary report
1994 Special report

9 Guidelines for national GHG inventories, good practice guidance

1995, 1996, 2000, 2003, 2006, 2013, 2019

Methodology report on short-lived climate forcers – *in progress*

6 Technical Papers

1996-2008



AUTHOR STATISTICS | COMPARING AR5 AND AR6

ipcc INTERGOVERNMENTAL PANEL ON climate change

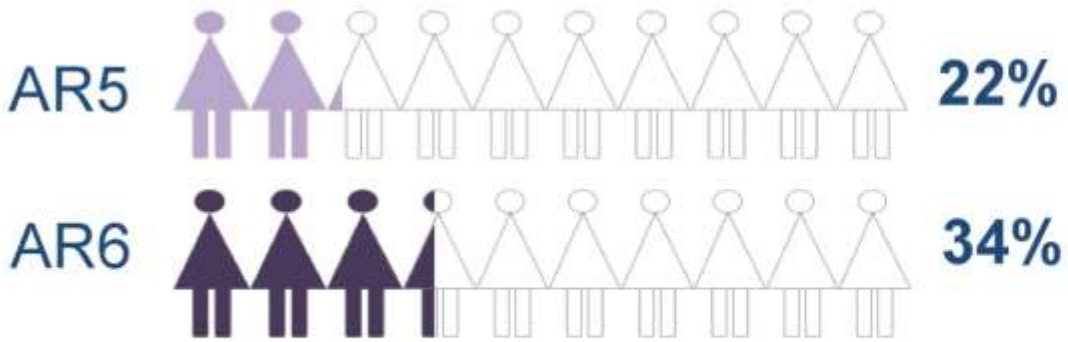
	AR5	AR6
REPORT CYCLE	**AR5** – 2013-2014 (WG I, II, III)	**AR6** – 2021-2022 (WG I, II, III, SYR)
TOTAL AUTHORS	1,013	783
AUTHORS FROM DEVELOPING COUNTRIES	33%	47%
AUTHORS FROM DEVELOPED COUNTRIES	67%	53%
PERCENT AUTHORS FEMALE	22%	34%
PERCENT AUTHORS MALE	78%	66%

From AR5 to AR6, IPCC saw…

…a 14% increase in developing country authors



…a 12% increase in female authors



STATISTICS | ADDITIONAL NUMBERS FROM AR6

ipcc
INTERGOVERNMENTAL PANEL ON climate change

over
66,000
publications assessed

783
total authors

41%
of authors
new to the IPCC

over
199,000
review comments received

GET INVOLVED

CONTRIBUTE TO EXISTING LITERATURE

IPCC assessments are as good as the literature available.

Look out for the various cut off dates for literature for the different reports.

AS AUTHORS OR REVIEW EDITORS

Bureau selects Authors and Review Editors from lists of nominations provided by governments and observer organizations.

Look out for the calls for nomination of authors and contact your IPCC Focal Point if you are interested in being nominated.

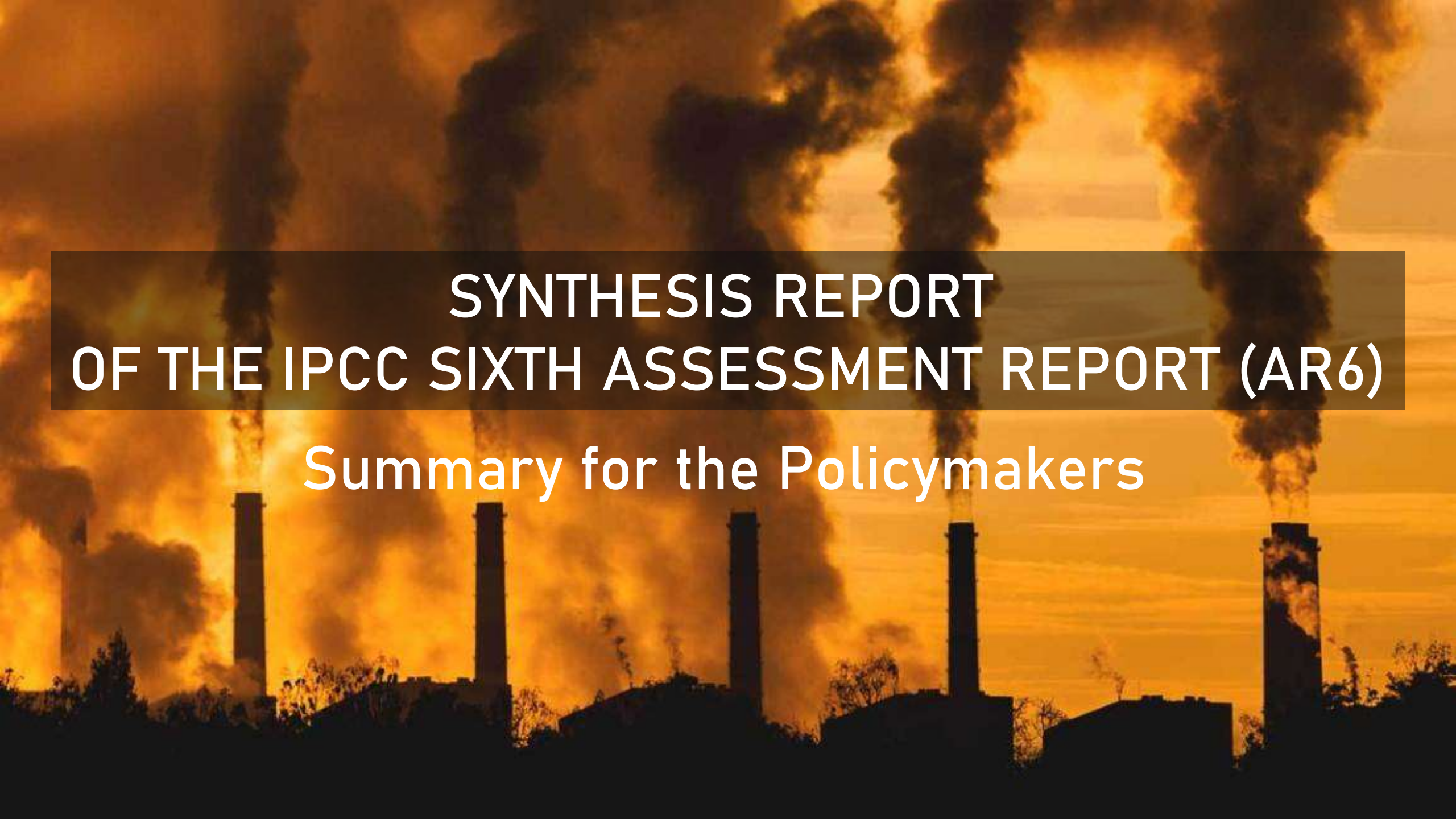
AS EXPERT REVIEWERS

Be involved in the two review stages:

Expert Review of the First Order Draft

&

Government and Expert Review of the Second Order Draft



SYNTHESIS REPORT OF THE IPCC SIXTH ASSESSMENT REPORT (AR6)

Summary for the Policymakers

Sixth Assessment Report

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A. Current Status and Trends

B. Future Climate Change, Risks, and Long-Term Responses

C. Responses in the Near Term

Sixth Assessment Synthesis Report

The three Working Group contributions to AR6 are:

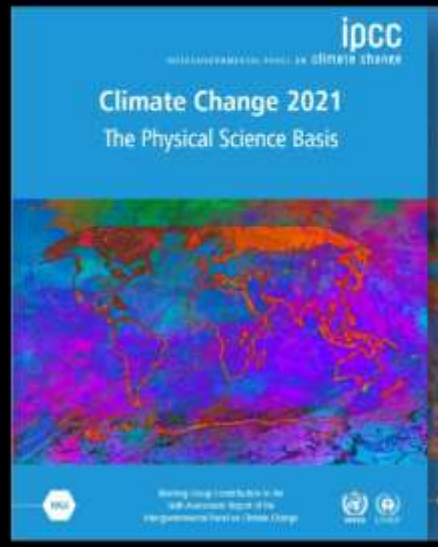
- AR6 Climate Change 2021: The Physical Science Basis;
- AR6 Climate Change 2022: Impacts, Adaptation and Vulnerability; and
- AR6 Climate Change 2022: Mitigation of Climate Change.

The three Special Reports are:

- Global Warming of 1.5°C (2018): an IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty (SR1.5);
- Climate Change and Land (2019): an IPCC Special Report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems (SRCCL); and
- The Ocean and Cryosphere in a Changing Climate (2019) (SROCC). The Special Reports cover scientific literature on ocean and cryosphere

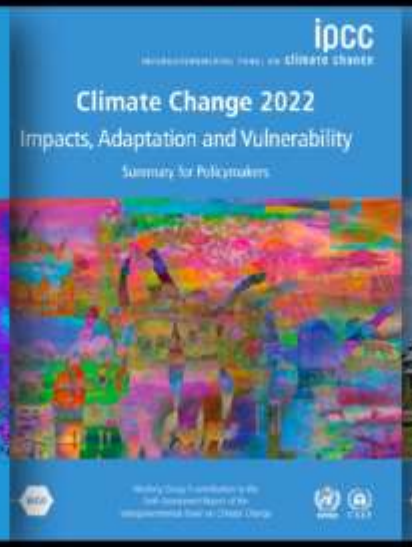
The State of Knowledge about Climate Change

WGI



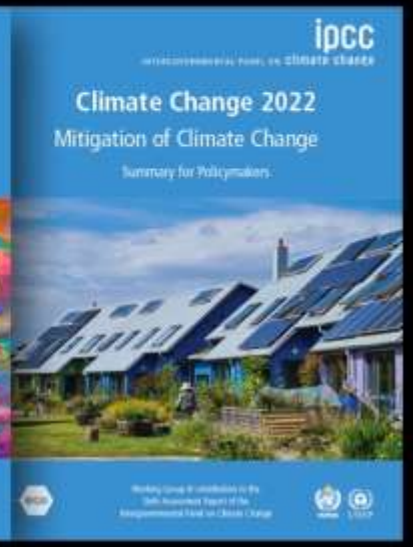
AR6 Climate Change 2021: The Physical Science Basis

WGII



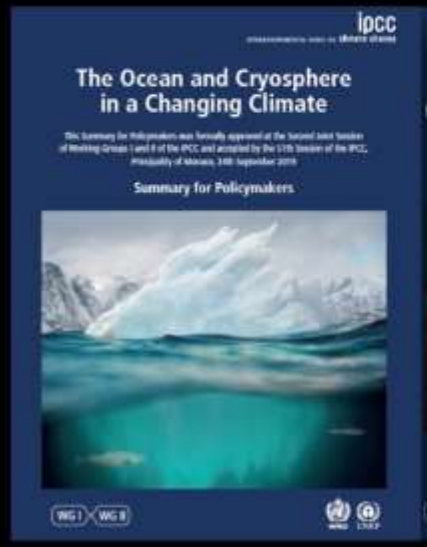
Climate Change 2022: Impacts, Adaptation and Vulnerability

WGIII



Climate Change 2022: Mitigation of Climate Change

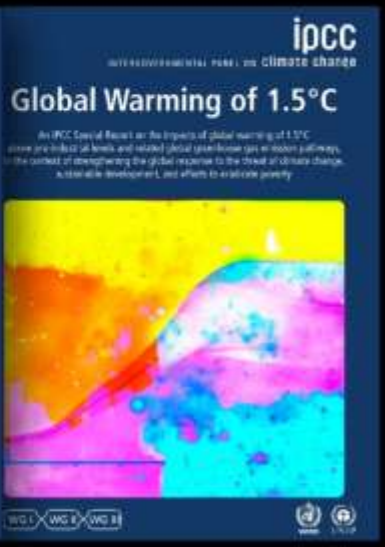
Special Report



Ocean and Cryosphere in a Changing Climate



Climate Change and Land



Global Warming of 1.5 °C

Sixth Assessment Report

Some terminology used in this report

The near term = period until 2040.
The long term = period beyond

The IPCC calibrated language uses five qualifiers to express a level of confidence:

- very low,
- low,
- medium,
- high and
- very high

The following terms are used to indicate the assessed likelihood of an outcome or a result:

- virtually certain 99–100%
- very likely 90–100%,
- likely 66–100%,
- more likely than not >50–100%,
- about as likely as not 33–66%,
- unlikely 0–33%,
- very unlikely 0–10%,
- exceptionally unlikely 0–1%.

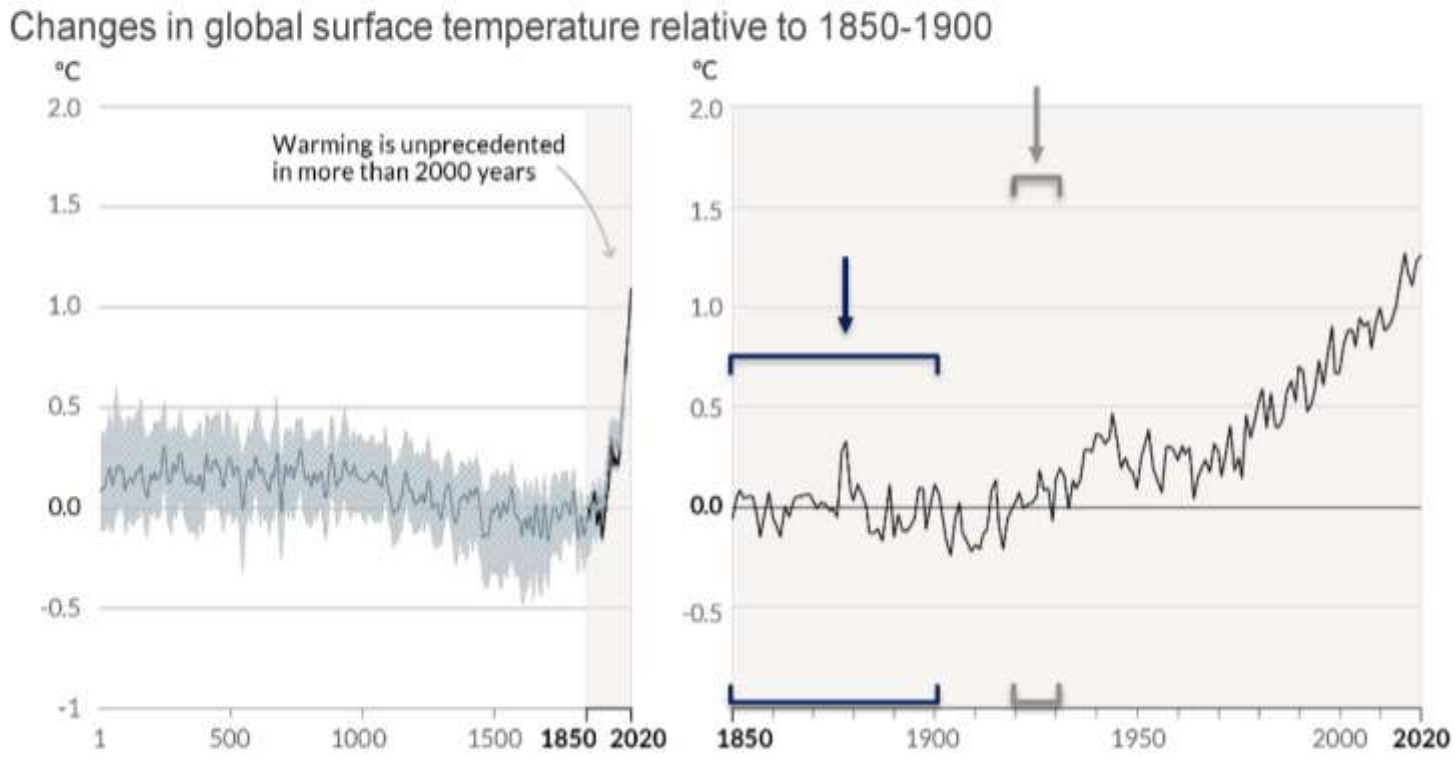
Sixth Assessment Report

A. Current Status and Trends

Observed Warming and its

Human activities, principally through emissions of greenhouse gases, have unequivocally caused global warming, with the global surface temperature reaching 1.1°C above 1850–1900 in 2011–2020. Global greenhouse gas emissions have continued to increase, with unequal historical and ongoing contributions arising from unsustainable energy use, land use and land-use change, lifestyles and patterns of consumption and production across regions, between and within countries, and among

Human influence has warmed the climate at a rate that is unprecedented in at least the last 2000 years



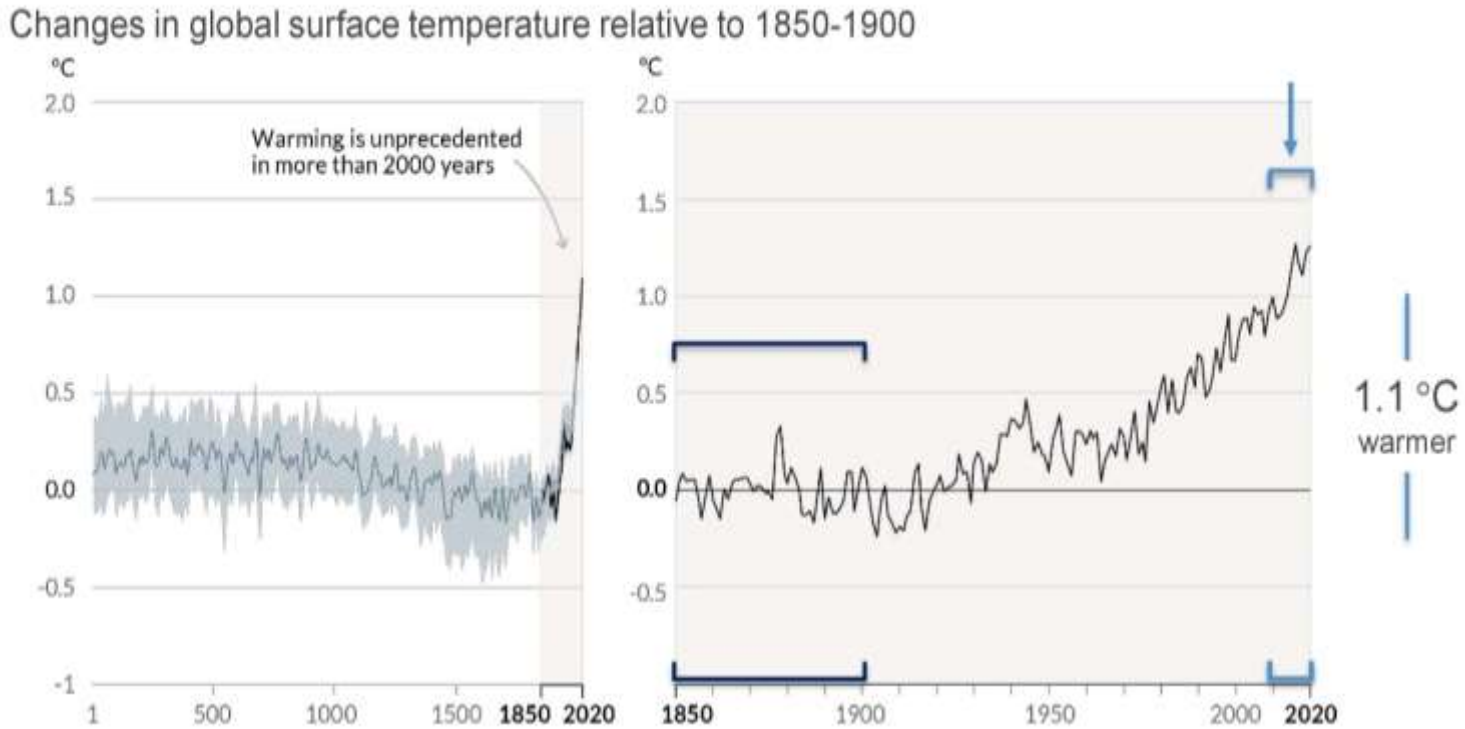
Sixth Assessment Report

A. Current Status and Trends

Observed Warming and its

The average surface temperature of the Earth will cross 1.5 °C over pre-industrial levels in the next 20 years (By 2040) and 2°C by the middle of the century without a sharp reduction of emissions. The last decade was hotter than any period of time in the past 1,25,000 years. Global surface temperature was 1.09°C higher in the decade between 2011-2020 than between 1850-1900.

Human influence has warmed the climate at a rate that is unprecedented in at least the last 2000 years

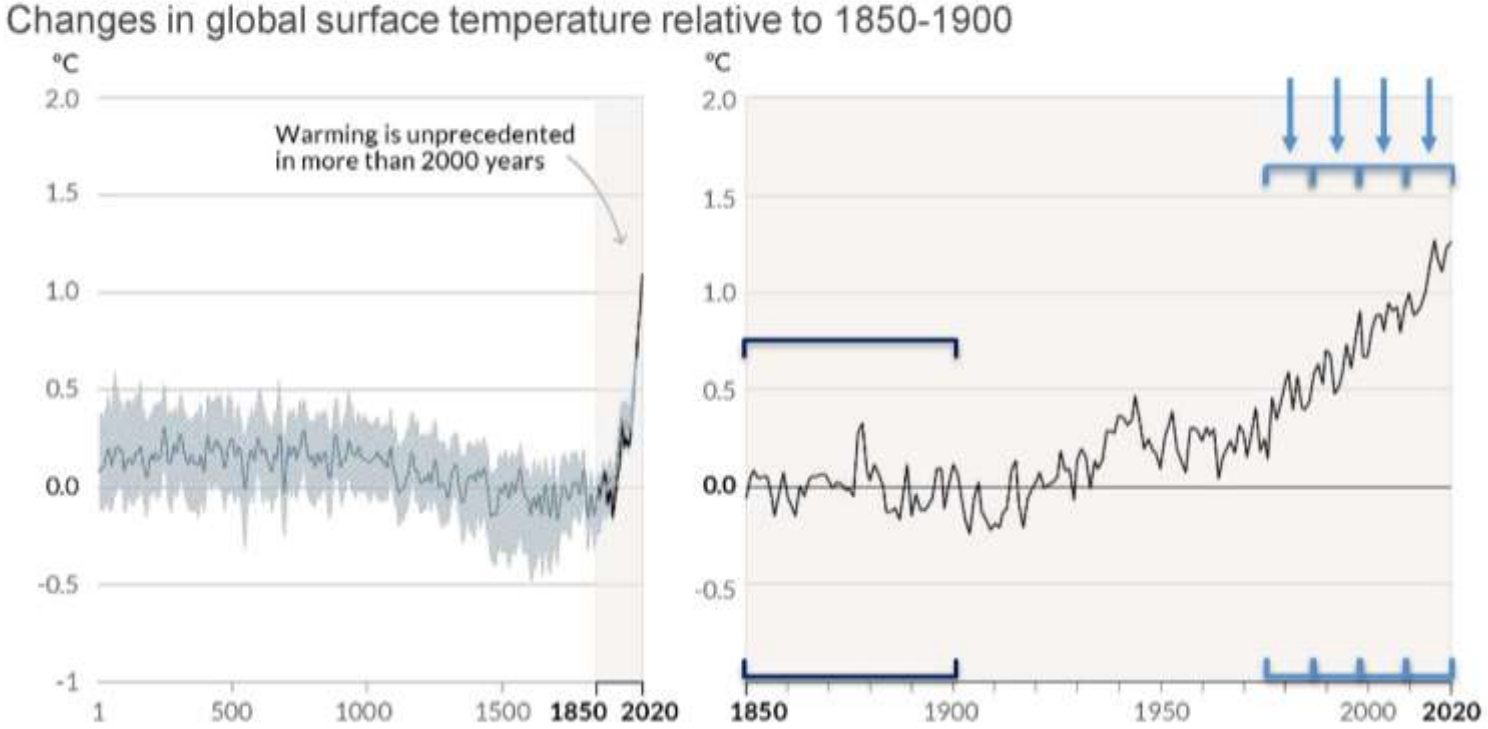


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Average Surface Temperature

This is the **first time** that the IPCC has said that the **1.5°C warming was inevitable even in the best-case scenario.**

Human influence has warmed the climate at a rate that is unprecedented in at least the last 2000 years



Observed Changes and Impacts

Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred. Human-caused climate change is already affecting many weather and climate extremes in every region across the globe.

A

This has led to widespread adverse impacts and related losses and damages to nature and people (*high confidence*).

B

Vulnerable communities who have historically contributed the least to current climate change are disproportionately affected (*high confidence*).

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Impact of Global Warming: Sea- Level Rise

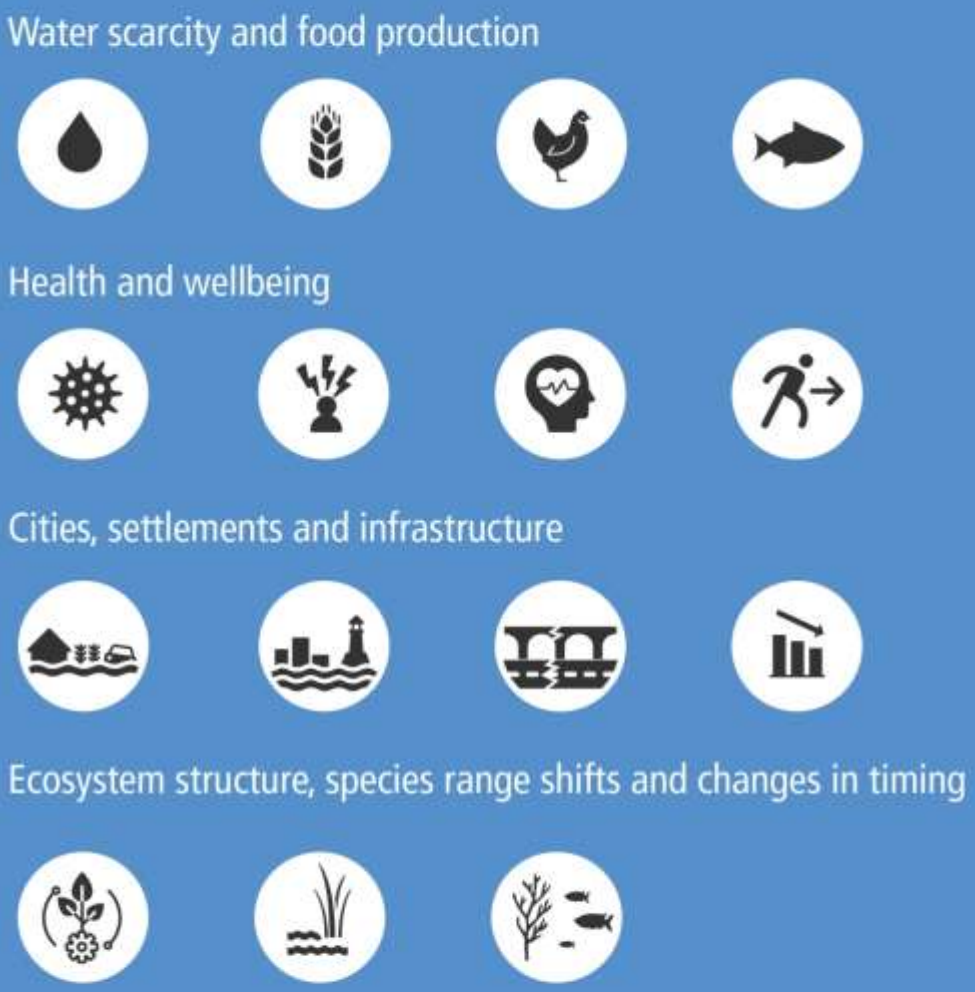


- Coastal areas will see continued sea-level rise throughout the 21st century, resulting in **coastal erosion and more frequent and severe flooding in low-lying areas.**
- About 50% of the sea level rise is **due to thermal expansion** (when water heats up, it expands, thus warmer oceans simply occupy more space).

Sea-level rise has **tripled compared with 1901-1971.** The Arctic Sea ice is the lowest it has been in 1,000 years.



Adverse impacts from human-caused change will intensify



ipcc

Current Progress in Adaptation and Gaps and Challenges



Adaptation planning and implementation have progressed across all sectors and regions, with documented benefits and varying effectiveness. Despite progress, adaptation gaps exist and will continue to grow at current rates of implementation. Hard and soft limits to adaptation have been reached in some ecosystems and regions. Maladaptation is happening in some sectors and regions. Current global financial flows for adaptation are insufficient for, and constrain the implementation of, adaptation options, especially in developing countries (*high confidence)*.

Current Mitigation Progress, Gaps, and Challenges



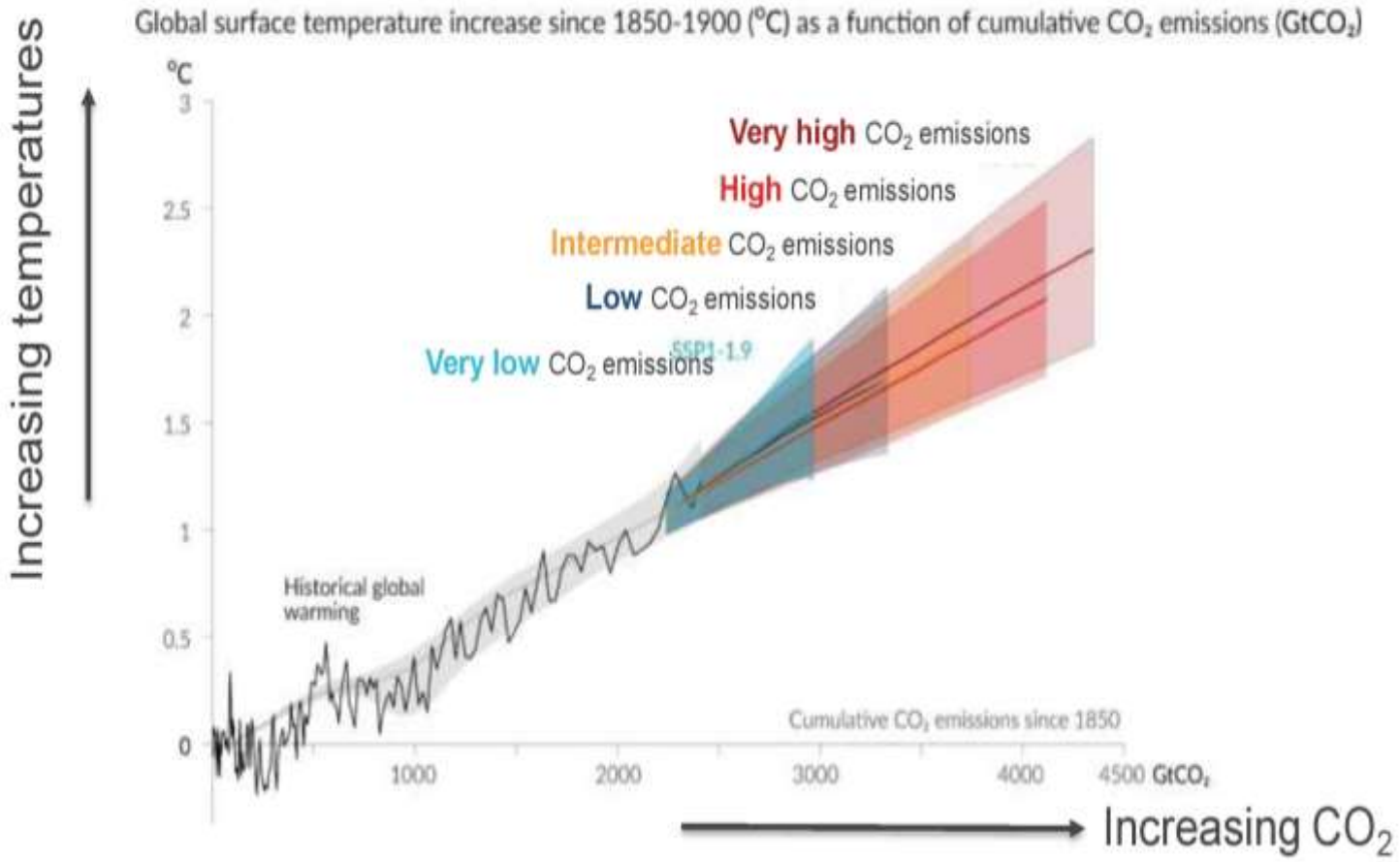
Policies and laws addressing mitigation have consistently expanded since AR5. Global GHG emissions in 2030 implied by nationally determined contributions (NDCs) announced by October 2021 make it *likely* that warming will exceed 1.5°C during the 21st century and make it harder to limit warming below 2°C. There are gaps between projected emissions from implemented policies and those from NDCs and finance flows fall short of the levels needed to meet climate goals across all sectors and regions. (*high confidence*).

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B. Future Climate Change, Risks, and Long-Term Responses

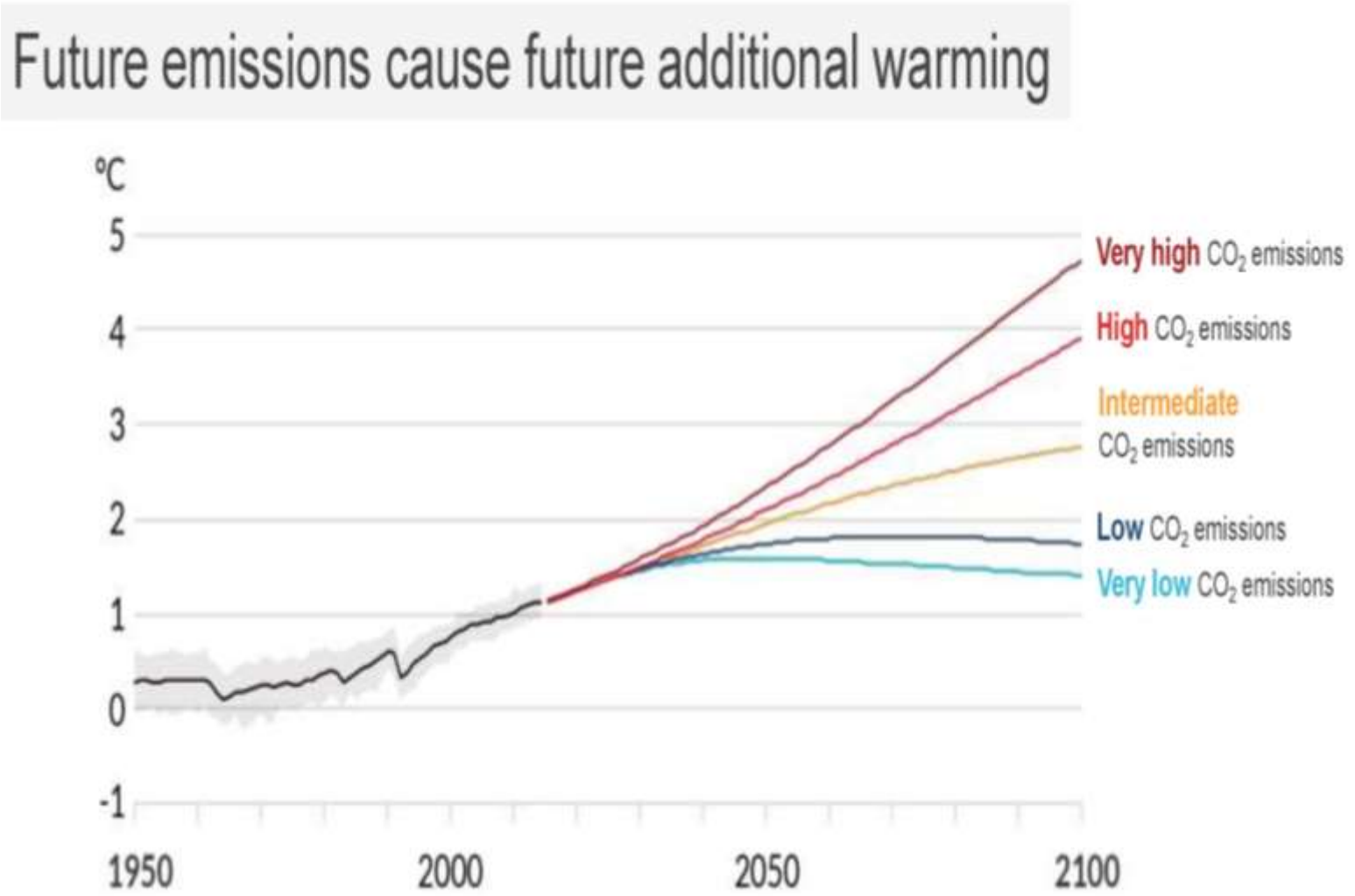
Continued greenhouse gas emissions will lead to increasing global warming, with the best estimate of reaching 1.5°C in the near term in considered scenarios and modeled pathways. Every increment of global warming will intensify multiple and concurrent hazards (*high confidence*). Deep, rapid, and sustained reductions in greenhouse gas emissions would lead to a discernible slowdown in global warming within around two decades, and also to discernible changes in atmospheric composition within a few years (*high confidence*).

Every tonne of CO_2 emissions adds to global warming



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Climate Change Impacts and Climate-Related Risks



For any given future warming level, many climate-related risks are higher than assessed in AR5, and projected long-term impacts are up to multiple times higher than currently observed (*high confidence*). Risks and projected adverse impacts and related losses and damages from climate change escalate with every increment of global warming (*very high confidence*). Climatic and non-climatic risks will increasingly interact, creating compound and cascading risks that are more complex and difficult to manage (*high confidence*).

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Likelihood and Risks of Unavoidable, Irreversible or Abrupt Changes

Some future changes are unavoidable and/or irreversible but can be limited by deep, rapid and sustained global greenhouse gas emissions reduction. The likelihood of abrupt and/or irreversible changes increases with higher global warming levels. Similarly, the probability of low-likelihood outcomes associated with potentially very large adverse impacts increases with higher global warming levels. (*high confidence*)



Extreme heat

More frequent

More intense



Heavy rainfall

More frequent

More intense



Drought

Increase in some regions



Fire weather

More frequent



Ocean

Warming

Acidifying

Losing oxygen

Sixth Assessment Report

Adaptation Options and Their Limits in a Warmer World



There are limits to adaptation

- Even effective adaptation cannot prevent all losses and damages
- Above 1.5°C some natural solutions may no longer work.
- Above 1.5°C, lack of fresh water could mean that people living on small islands and those dependent on glaciers and snowmelt can no longer adapt.
- By 2°C it will be challenging to farm multiple staple crops in many current growing areas.

Adaptation options that are feasible and effective today will become constrained and less effective with increasing global warming. With increasing global warming, losses and damages will increase and additional human and natural systems will reach adaptation limits. Maladaptation can be avoided by flexible, multi-sectoral, inclusive, long-term planning and implementation of adaptation actions, with co-benefits to many sectors and systems. (*high confidence*)

Carbon Budget and Net-Zero Emissions

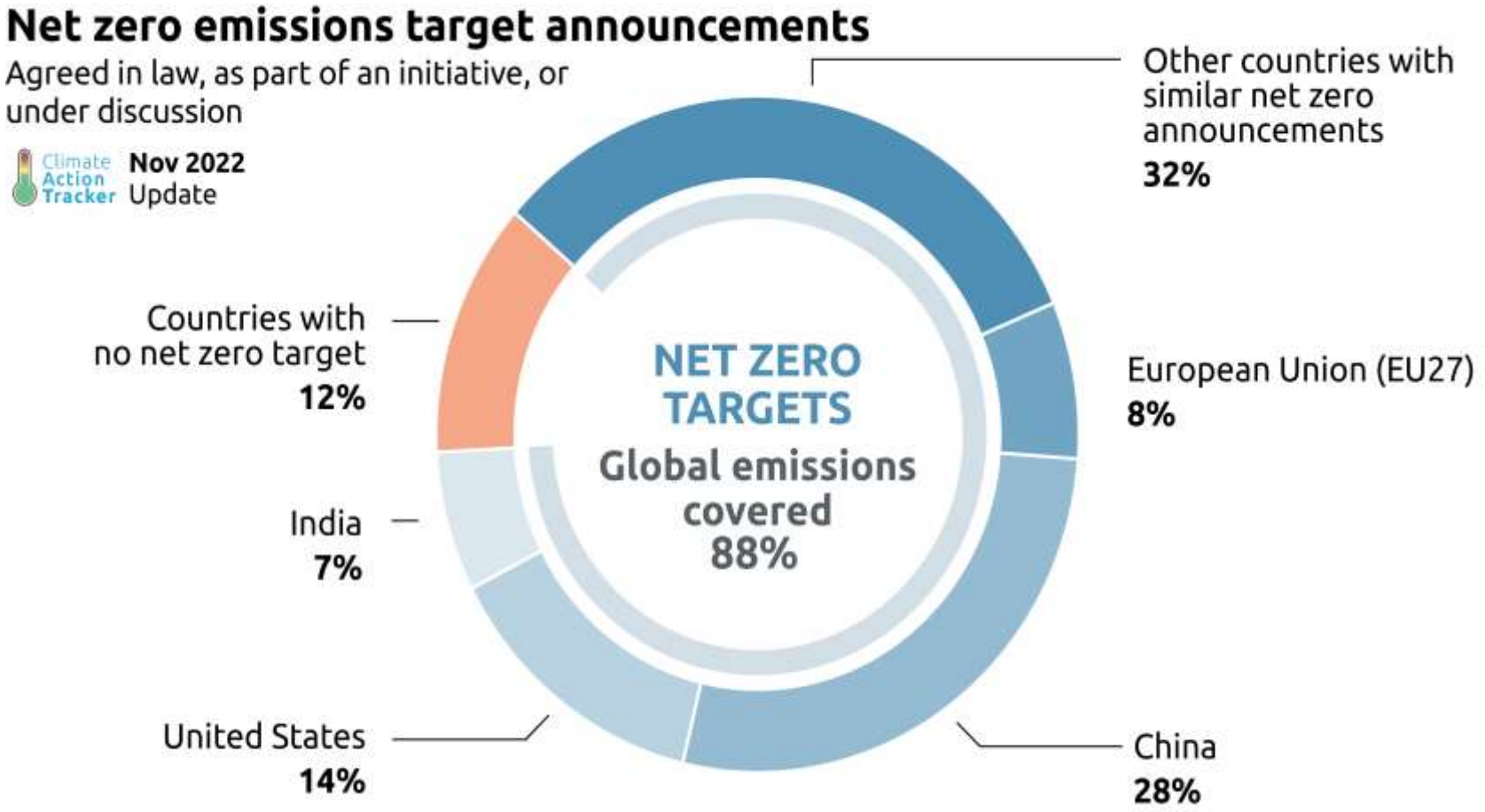
Limiting human-caused global warming requires net zero CO2 emissions. Cumulative carbon emissions until the time of reaching net-zero CO2 emissions and the level of greenhouse gas emission reductions this decade largely determine whether warming can be limited to 1.5°C or 2°C (*high confidence*).



Projected CO_2 emissions from existing fossil fuel infrastructure without additional abatement would exceed the remaining carbon budget for 1.5°C (50%) (*high confidence*).

The burning of fossil fuels like coal, oil, and gas for electricity, heat, and transportation is the primary source of human-generated emissions.

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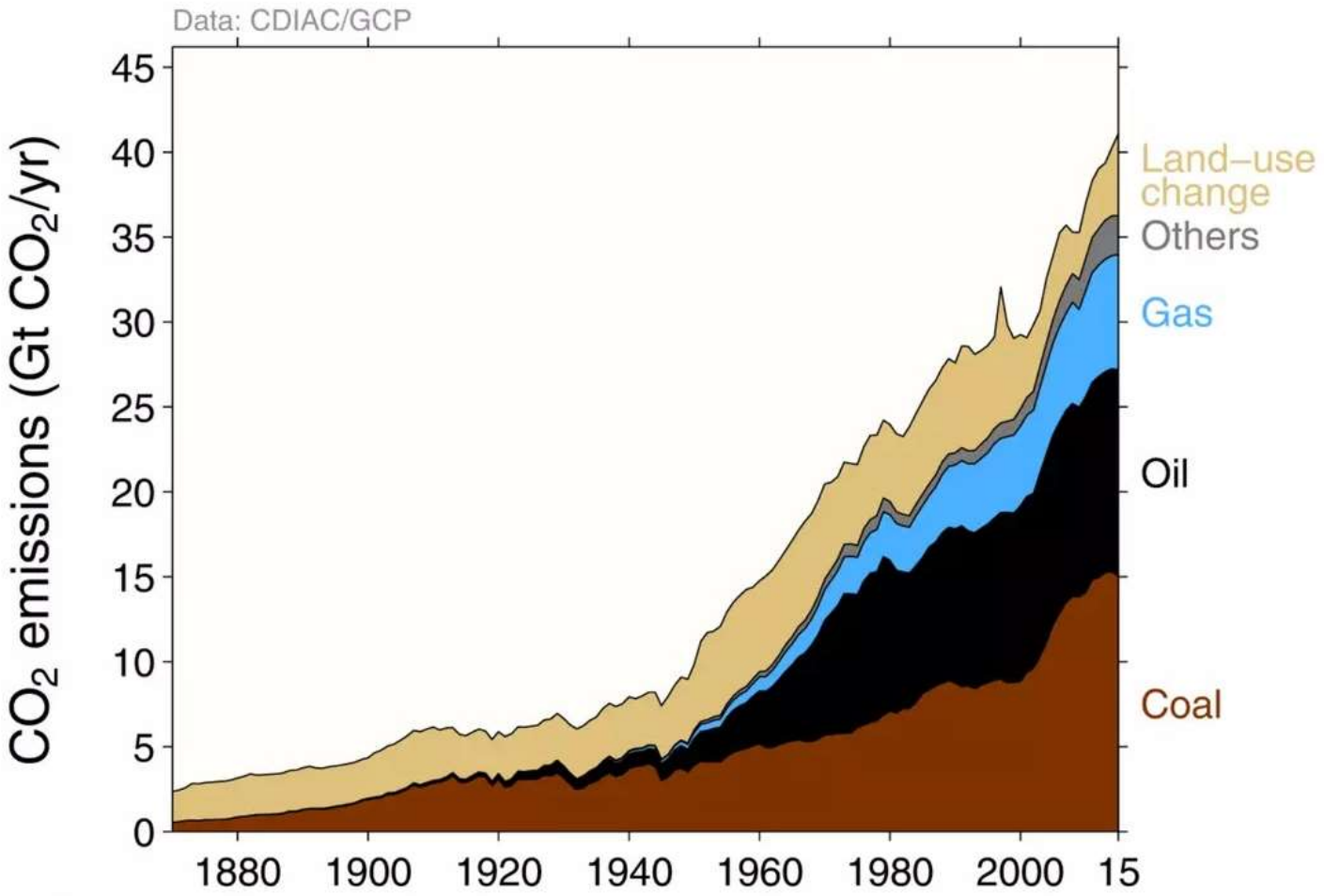


More than 100, have already announced their intentions to achieve net-zero emissions by 2050.

IPCC has informed that a global net-zero by 2050 was the minimum required to keep the temperature rise to 1.5°C.

Even **China, the world's biggest emitter, has a net-zero goal for 2060.**

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Mitigation Pathways

All global modelled pathways that limit warming to 1.5°C (>50%) with no or limited overshoot, and those that limit warming to 2°C (>67%), involve rapid and deep and, in most cases, immediate greenhouse gas emissions reductions in all sectors this decade. Global net zero CO_2 emissions are reached for these pathway categories, in the early 2050s and around the early 2070s, respectively. (*high confidence*)

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CO_2
concentration



Highest

in at least

2 million years

Sea level
rise



Fastest rates

in at least

3000 years

Arctic sea ice
area



Lowest level

in at least

1000 years

Glaciers
retreat

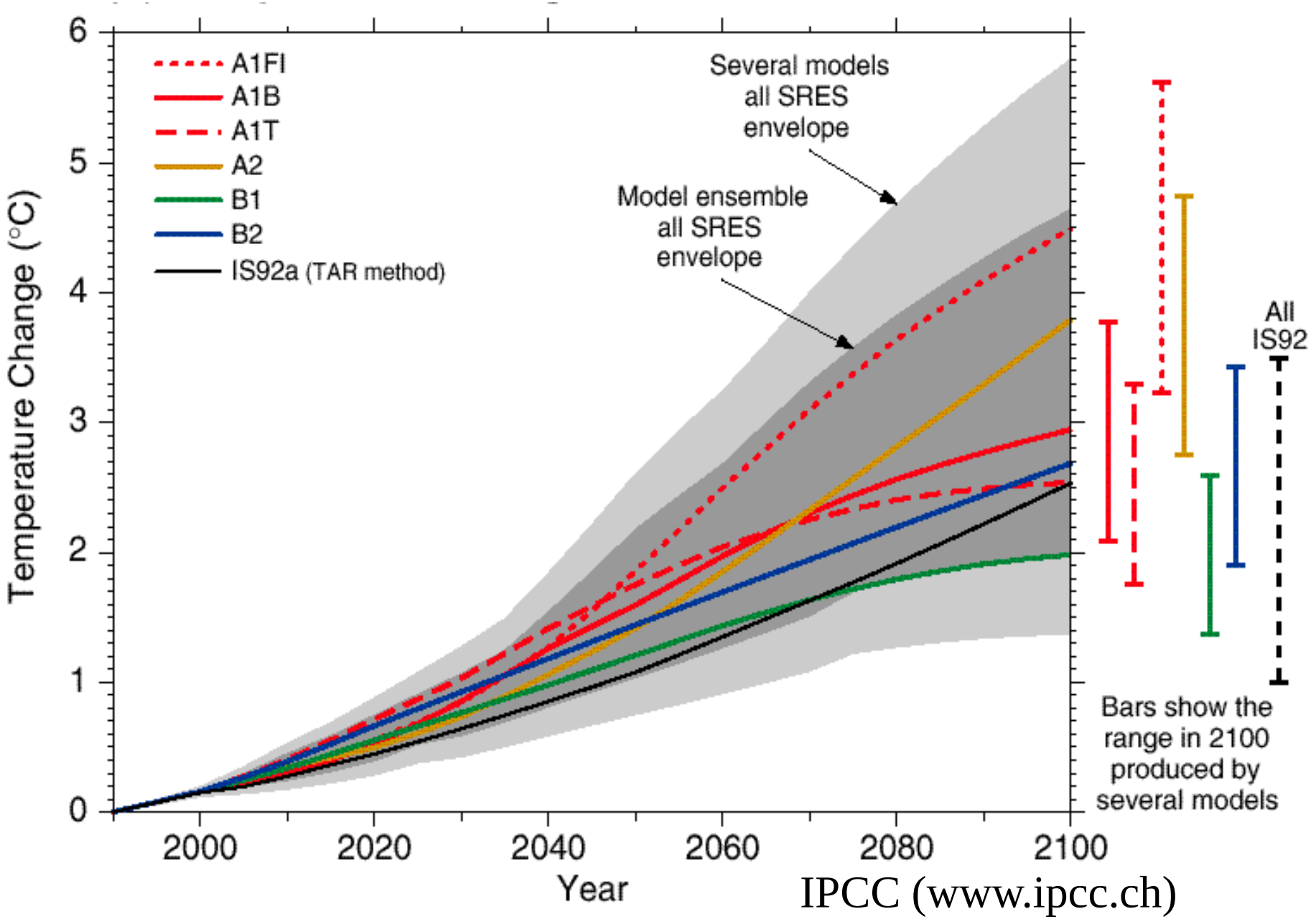


Unprecedented

in at least

2000 years

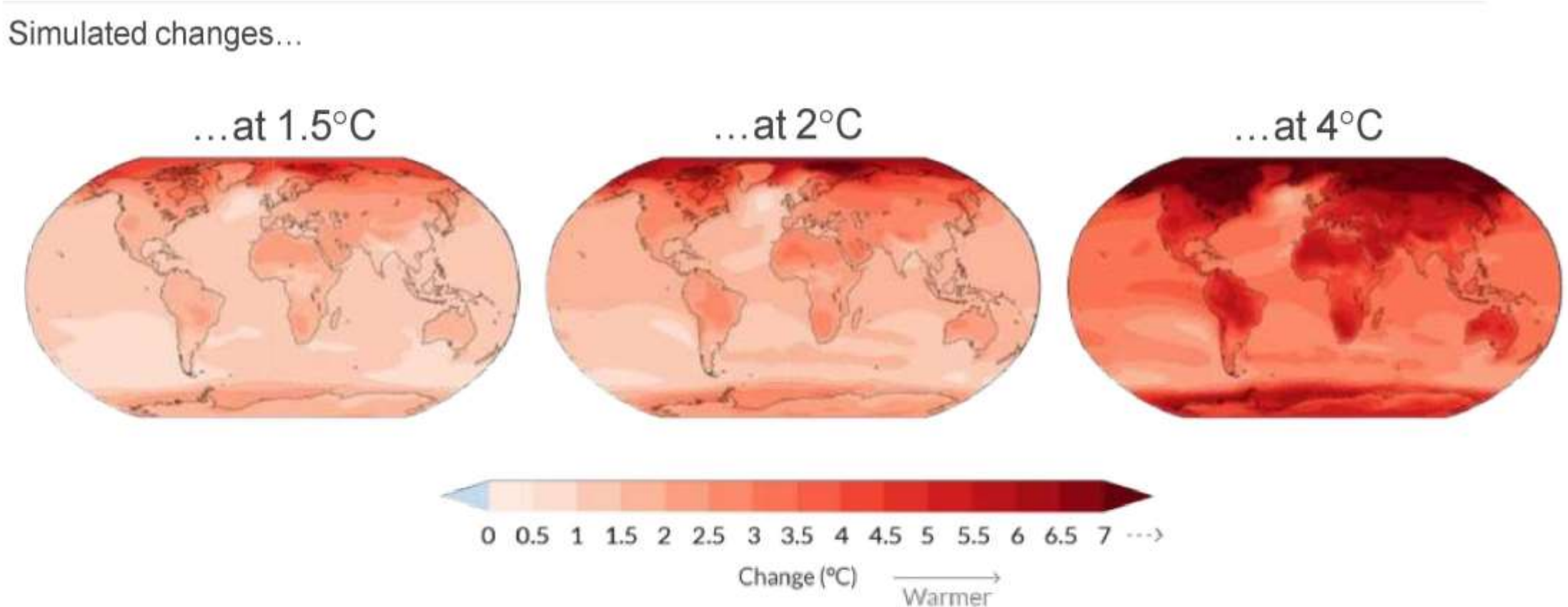
What will the future climate look like?



IPCC (www.ipcc.ch)

Overshoot: Exceeding a Warming Level and Returning

If warming exceeds a specified level such as 1.5°C, it could gradually be reduced again by achieving and sustaining net negative global CO_2 emissions. This would require additional deployment of carbon dioxide removal, compared to pathways without overshoot, leading to greater feasibility and sustainability concerns. Overshoot entails adverse impacts, some irreversible, and additional risks for human and natural systems, all growing with the magnitude and duration of overshoot. (*high confidence*)



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Precipitation & Drought



HAZARDS

- Water shortage
- Wind erosion
- Desertification
- Increased risk of wild fires

IMPACTS

- Less or no crops
- Animals may die
- Less water supply
- Incomes are lost
- Financial losses
- People become sick
- Migration

Every additional 0.5 °C of warming will increase hot extremes, extreme precipitation and drought. Additional warming will also weaken the Earth's carbon sinks present in plants, soils, and the ocean.

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Heat Extremes



HAZARDS

- Heat stroke
- Water shortage
- Increased malaria
- Dengue
- Sea level rise

IMPACTS

- People get sick or die
- Animals get sick
- Crops may die
- Water shortage
- Food shortage
- Damaged forests

Heat extremes have increased while cold extremes have decreased, and these trends will continue over the coming decades over Asia

Sixth Assessment Report

More intense rainfall & increased likelihood of floods



HAZARDS

- Flooding
- Flash floods
- Landslide
- Erosion

IMPACTS

- Vector-borne diseases (esp. malaria and dengue fever)
- Water-borne diseases (esp. diarrhoea)
- Extreme floods and population displacement

Equity and Inclusion

Justice is the concept of fairness.

Social justice relates to fairness within a society.

The idea of social justice is that people should have equal access to wealth, health, opportunities and privileges within a society. All humans should have the right to a certain standard of living, including a healthy diet, access to clean water, shelter, clothing, education and healthcare.

The impacts of climate change affect disadvantaged groups of people the most. The effect of climate change on these groups needs to be recognised and addressed.

Climate justice means looking at the climate crisis from the perspective of social justice. Solutions need to not only curb climate change; they need to protect and empower the most vulnerable groups of people too.

Some other outlines of the report

- Climate change is a threat to human well-being and planetary health (very high confidence). There is a rapidly closing window of opportunity to secure a liveable and sustainable future for all (very high confidence). Climate resilient development integrates adaptation and mitigation to advance sustainable development for all, and is enabled by increased international cooperation including improved access to adequate financial resources, particularly for vulnerable regions, sectors and groups, and inclusive governance and coordinated policies (high confidence). The choices and actions implemented in this decade will have impacts now and for thousands of years (high confidence).

Some other outlines of the report

- Deep, rapid and sustained mitigation and accelerated implementation of adaptation actions in this decade would reduce projected losses and damages for humans and ecosystems (very high confidence), and deliver many co-benefits, especially for air quality and health (high confidence). Delayed mitigation and adaptation action would lock-in high-emissions infrastructure, raise risks of stranded assets and cost-escalation, reduce feasibility, and increase losses and damages (high confidence). Near-term actions involve high up-front investments and potentially disruptive changes that can be lessened by a range of enabling policies (high confidence).

Some other outlines of the report

- Rapid and far-reaching transitions across all sectors and systems are necessary to achieve deep and sustained emissions reductions and secure a liveable and sustainable future for all. These system transitions involve a significant upscaling of a wide portfolio of mitigation and adaptation options. Feasible, effective, and low-cost options for mitigation and adaptation are already available, with differences across systems and regions. (high confidence)

Some other outlines of the report

- Accelerated and equitable action in mitigating and adapting to climate change impacts is critical to sustainable development. Mitigation and adaptation actions have more synergies than trade-offs with Sustainable Development Goals. Synergies and trade-offs depend on context and scale of implementation. (high confidence)

Some other outlines of the report

- Prioritising equity, climate justice, social justice, inclusion and just transition processes can enable adaptation and ambitious mitigation actions and climate resilient development. Adaptation outcomes are enhanced by increased support to regions and people with the highest vulnerability to climatic hazards. Integrating climate adaptation into social protection programs improves resilience. Many options are available for reducing emission-intensive consumption, including through behavioural and lifestyle changes, with co-benefits for societal well-being. (high confidence)

Some other outlines of the Report

- Effective climate action is enabled by political commitment, well-aligned multilevel governance, institutional frameworks, laws, policies and strategies and enhanced access to finance and technology. Clear goals, coordination across multiple policy domains, and inclusive governance processes facilitate effective climate action. Regulatory and economic instruments can support deep emissions reductions and climate resilience if scaled up and applied widely. Climate resilient development benefits from drawing on diverse knowledge. (high confidence)

Some other outlines of the report

- Finance, technology and international cooperation are critical enablers for accelerated climate action. If climate goals are to be achieved, both adaptation and mitigation financing would need to increase many-fold. There is sufficient global capital to close the global investment gaps but there are barriers to redirect capital to climate action. Enhancing technology innovation systems is key to accelerate the widespread adoption of technologies and practices. Enhancing international cooperation is possible through multiple channels. (high confidence)

Enablers for effective climate action

