
Climate Change 2023
Synthesis Report
Sixth Assessment Report
June 27, 2023
IPCC AR6 Synthesis Report
José Romero, Head SYR TSU
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The IPCC and the Synthesis Report

Intergovernmental Panel on Climate Change (IPCC) 1/2

- Established in 1988, 195 member governments.
- Objective: to provide scientific information for policy-making on climate change: drivers of climate change, its impacts and future risks, and adaptation and mitigation.
- Thousands of people from all over the world contribute to the work of the IPCC. For the assessment reports, experts volunteer their time as IPCC authors to assess the thousands of scientific papers published each year to provide a comprehensive summary of what is known about the drivers of climate change, its impacts and future risks, and how adaptation and mitigation can reduce those risks.

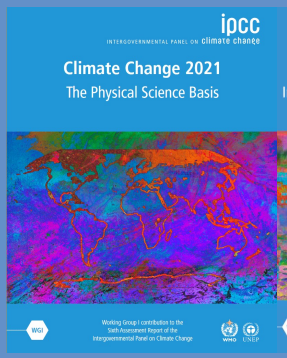
Intergovernmental Panel on Climate Change (IPCC) 2/2

- Through its assessments, the IPCC identifies the strength of scientific agreement in different areas and indicates where further research is needed. The IPCC does not conduct its own research.
- An open and transparent review by experts and governments around the world is an essential part of the IPCC process, to ensure an objective and complete assessment and to reflect a diverse range of views and expertise.

Synthesis Report (SYR) of Sixth Assessment Report 1/2

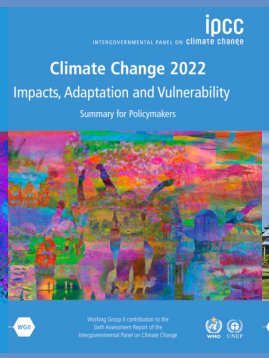
- Sixth Assessment Report (AR6) started in 2015.
- Professor Hoesung Lee, Chairman.
- The Synthesis Report (SYR) is the final report of the AR6.
- SYR integrates the content of the three reports produced by the Working Groups of the IPCC on the science; impacts and adaptation; and mitigation; and the three Special Reports (Global Warming of 1.5°C; Land; and Ocean and Cryosphere) during the AR6.
- The AR6 is the most comprehensive assessment of climate change undertaken thus far by the IPCC.

WGI



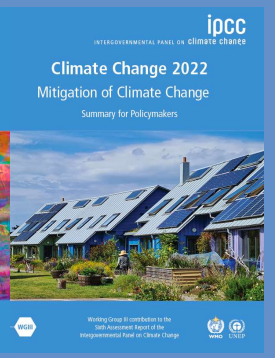
AR6 Climate Change 2021:
The Physical Science Basis

WGII



Climate Change 2022:
Impacts, Adaptation and Vulnerability

WGIII

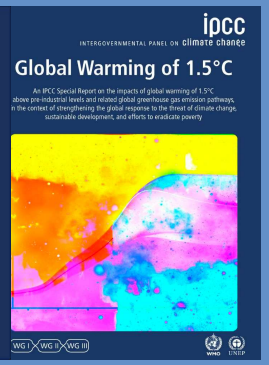


Climate Change 2022:
Mitigation of Climate Change

Special Report

Ocean and Cryosphere in a Changing Climate

Climate Change and Land



Global Warming of 1.5 ºC

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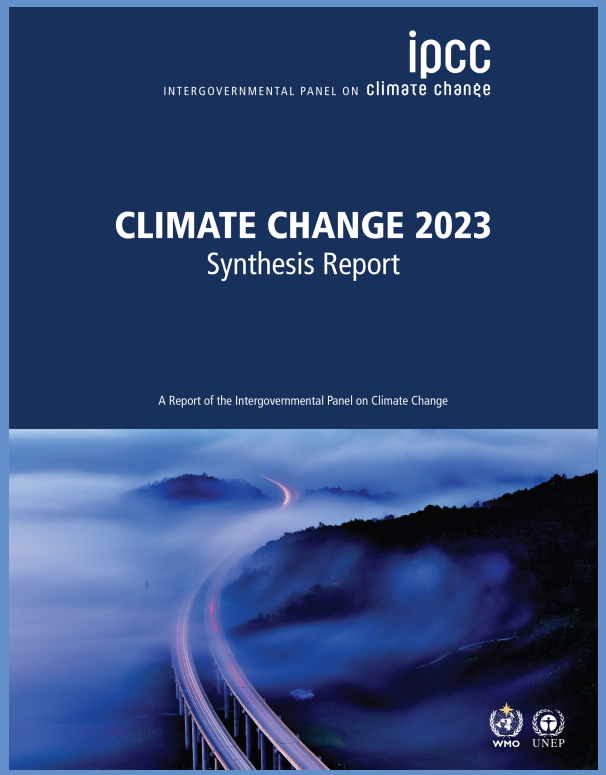
Synthesis Report (SYR) of Sixth Assessment Report 2/2

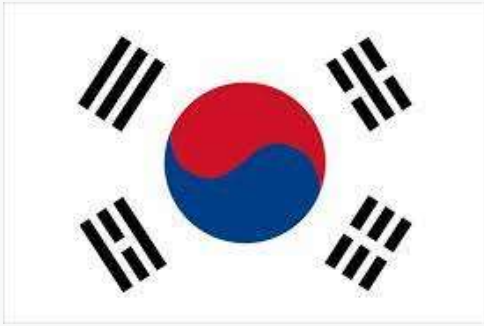
- The SYR comprises a Summary for Policymakers (SPM) and a longer report from which the SPM is derived, as well as annexes.
- The SPM follows a structure and sequence like that in the longer report.
- The longer report is structured around three topic headings as mandated by the Panel: A brief Introduction (Section1); Section 2: 'Current Status and Trends' ; Section 3: 'Long-Term Climate and Development Futures '; Section 4: 'Near-Term Responses in a Changing Climate'.




The Technical Support Unit
for the Synthesis Report

Technical Support Unit of the SYR (SYR TSU)

- The Technical Support Unit (TSU) of the SYR of the AR6 plans and manages the writing process of the SYR, including arranging author meetings, assisting the author team while drafting the SYR, ensuring quality control of the SYR and ensuring compliance with the IPCC Processes and Procedures and Panel decisions.
- The TSU SYR is established under the responsibility of the Chair of the IPCC.
- The SYR TSU is hosted by the Republic of Korea.



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Government of the Republic of Korea

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Findings of the Synthesis Report

A. Current Status and Trends

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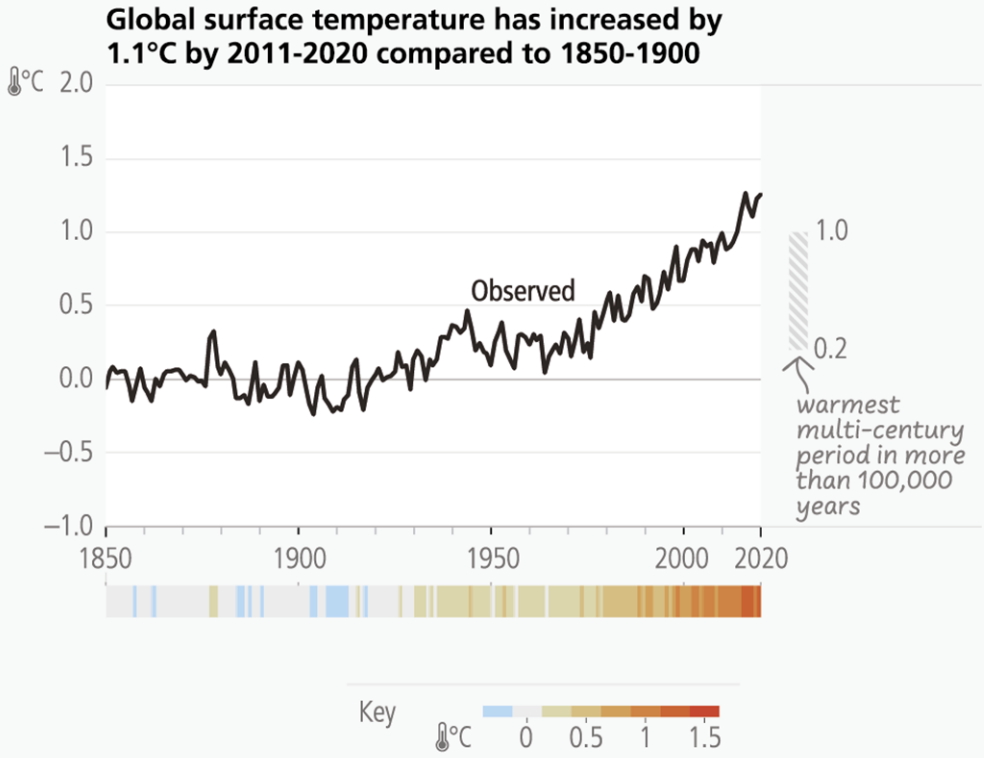
Observed Warming and its Causes

Global surface temperature was 1.1°C above 1850–1900 in 2011–2020.

This warming is unequivocally caused by GHG emissions due to human activities.

Historical and ongoing emissions differ across regions, between and within countries, and among individuals.

In 2019 about 80% of emissions came from energy, industry, transport and buildings. The rest came from agriculture, forestry and other land use.



Source: IPCC AR6 Figure 2.1 (c), 2023

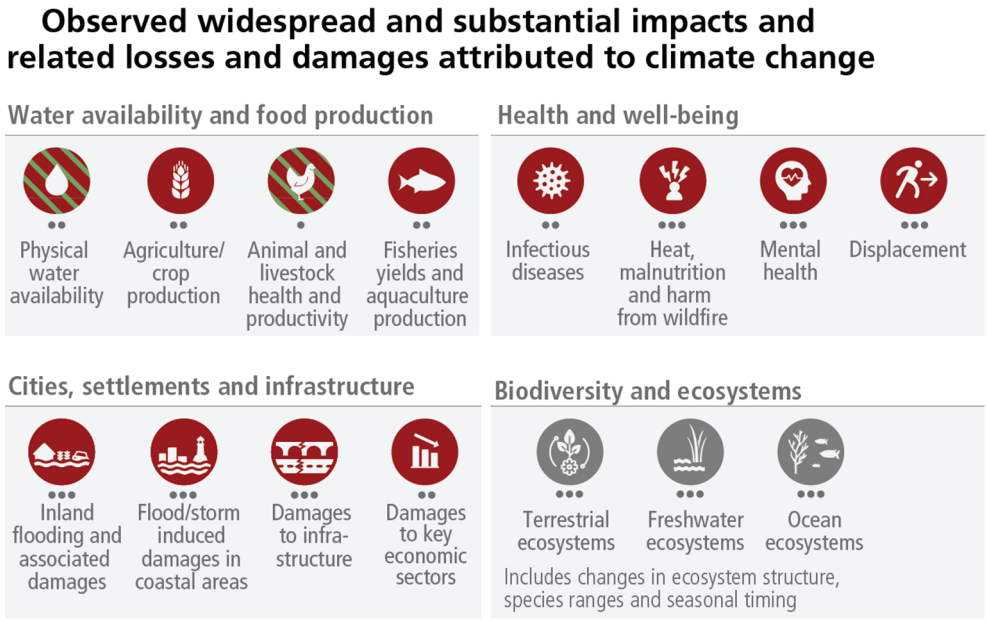
Observed Changes and Impacts

Climate change is already affecting every region, including observed changes in extremes, like heatwaves, that reduce food security and increase human morbidity and mortality.

The rate of sea level rise has increased over time reaching
3.7 mm/yr between 2006 and 2018.

Approximately 3.3 – 3.6 billion people live in contexts highly vulnerable to climate change.

Vulnerable communities who have historically contributed the least to current climate change are disproportionately affected.



Source: IPCC AR6 Figure SPM.1 (a), 2023

Adaptation Progress, Gaps and Challenges

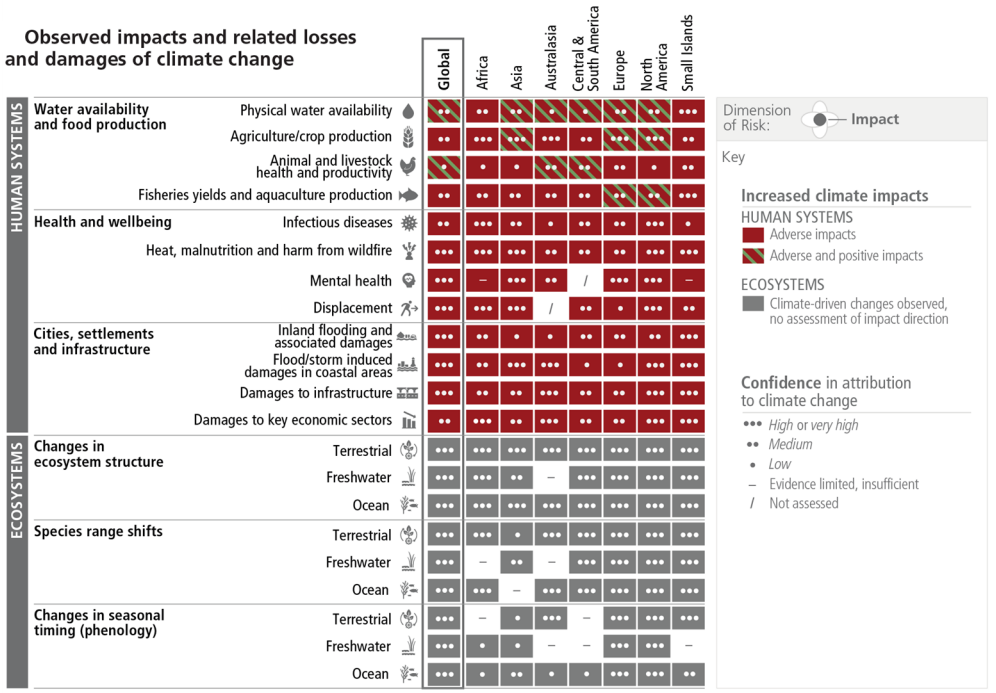
Most adaptation responses are fragmented, incremental, sector-specific and unequally distributed across regions.
Ecosystem-based adaptation approaches have contributed to reducing flood risks and urban heat.

Soft limits to adaptation are being experienced by small-scale farmers and households in low-lying coastal regions.

Some tropical, coastal, polar and mountain ecosystems have reached hard adaptation limits.

Despite progress, adaptation gaps remain and will grow at current rates of implementation.

Current global financial flows for adaptation are insufficient especially in developing countries.



Source: IPCC AR6 Figure 2.3 (c), 2023

Mitigation Progress, Gaps and Challenges

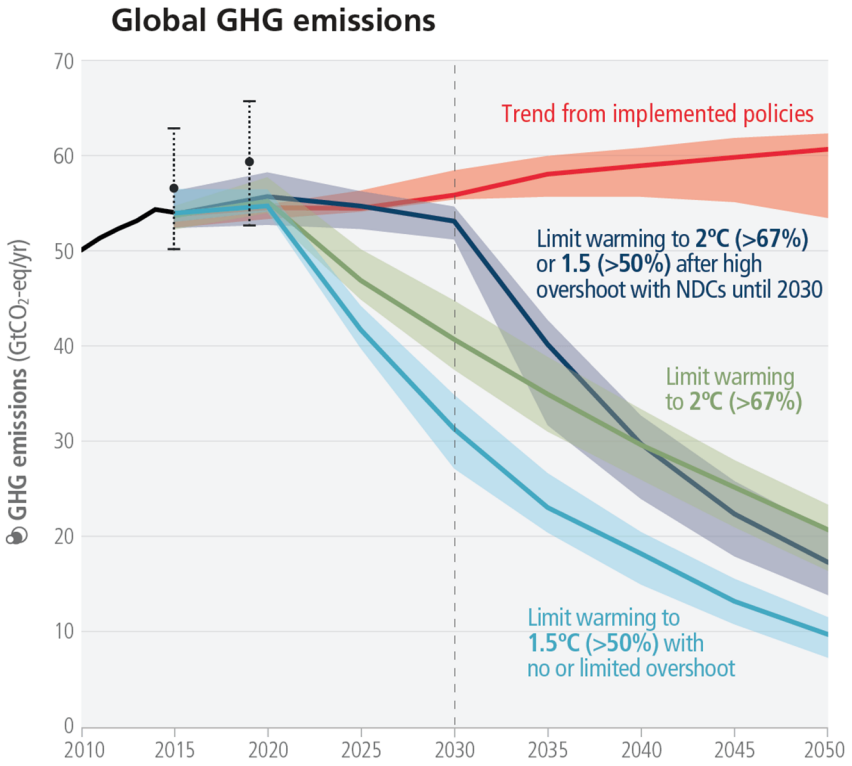
More countries have implemented mitigation policies avoiding emissions of at least 1.8GtCO_2e/yr but global emissions continue to rise.

At least 18 countries have sustained a decade of declining absolute emissions.

October 2021 NDCs not sufficient to achieve Paris Agreement temperature goal.

2020 policies not sufficient to achieve the NDCs.

Finance flows fall short of the levels needed and the USD 100 billion/yr goal.



Source: IPCC AR6 Figure 2.5 (a), 2023

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

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Future Climate Change

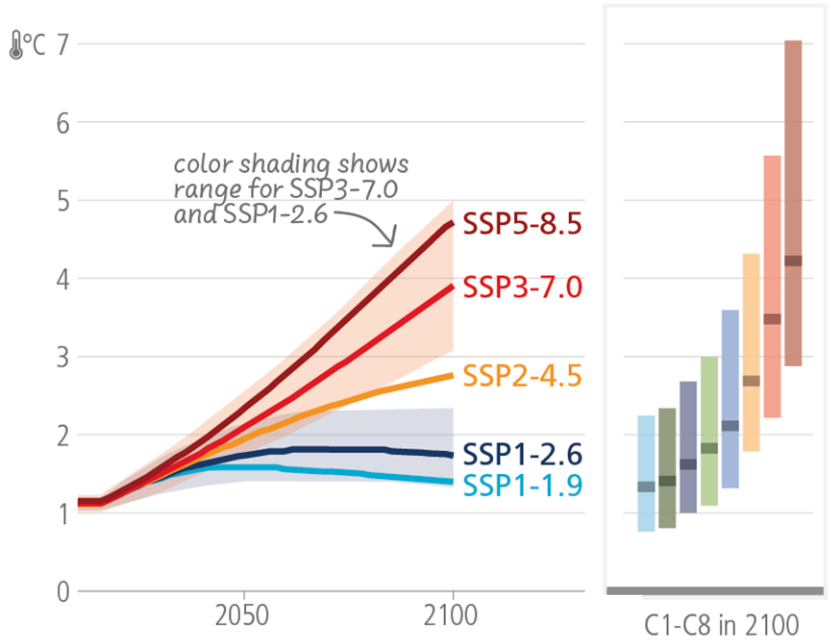
Nearly all scenarios and modelled pathways project continued growth in annual GHG emissions in the near term – 2021–2040 – leading to increasing global warming.

Warming is more likely than not to reach 1.5°C in the near term even under the very low GHG emissions scenario (SSP1–1.9).

Every increment of global warming will affect all major climate system components and intensify multiple and concurrent hazards.

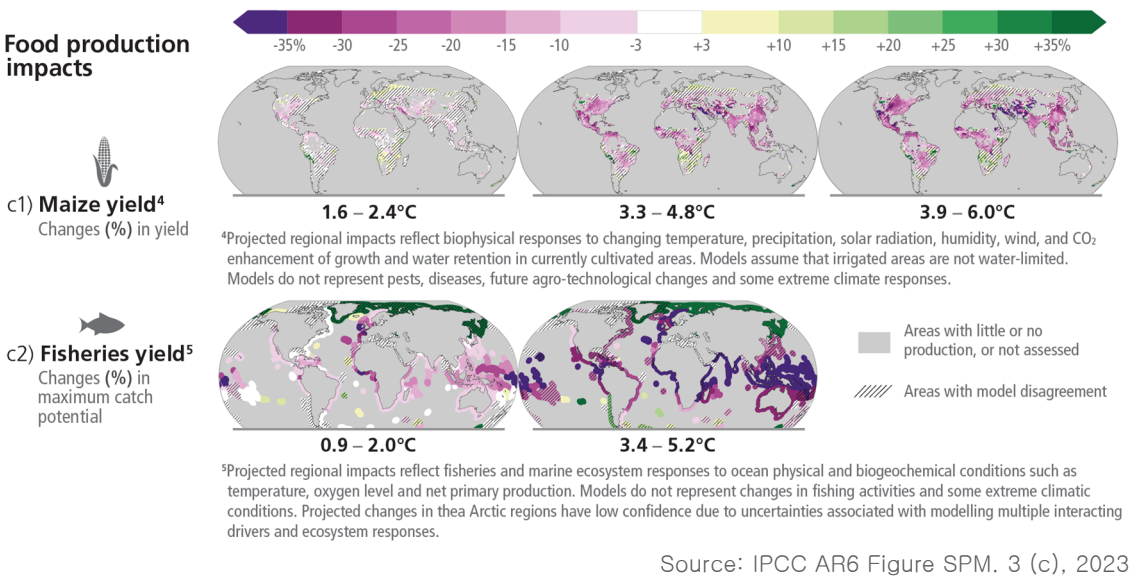
Deep, rapid, and sustained reductions in GHG emissions would lead to a discernible difference in global warming trends within two decades.

Temperature for SSP-based scenarios over the 21st century and C1-C8 at 2100



Source: IPCC AR6 Cross-Section Box.2 Figure 1 (a), 2023

Climate Change Impacts and Related Risks



Source: IPCC AR6 Figure SPM. 3 (c), 2023

Risks, projected adverse impacts and related losses and damages due to climate change escalate with further warming.

Land and ocean carbon sinks are projected to be less effective at slowing the accumulation of CO_2 in the atmosphere.

For a given warming level, many climate-related risks are higher than assessed in AR5 and long-term impacts are higher than currently observed.

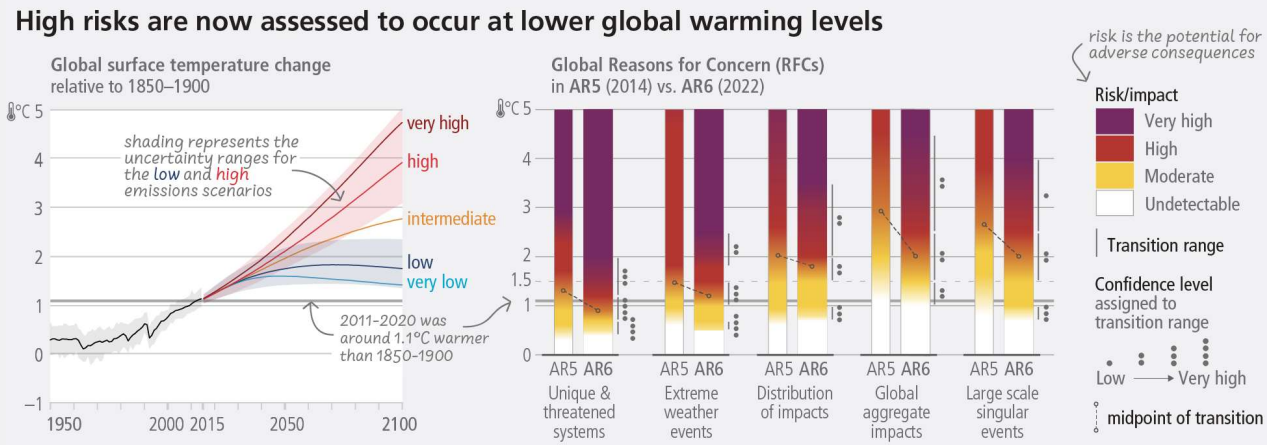
Climatic and non-climatic risks will increasingly interact, creating compound and cascading risks that are more complex and difficult to manage.

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 emissions reduction.

The likelihood of abrupt and/or irreversible changes such as species loss in forests, coral reefs and Arctic regions increases with additional warming.

Similarly, the probability of low-likelihood outcomes associated with potentially very large adverse impacts increases with additional warming.



Source: IPCC AR6 Figure SPM. 4 (a), 2023

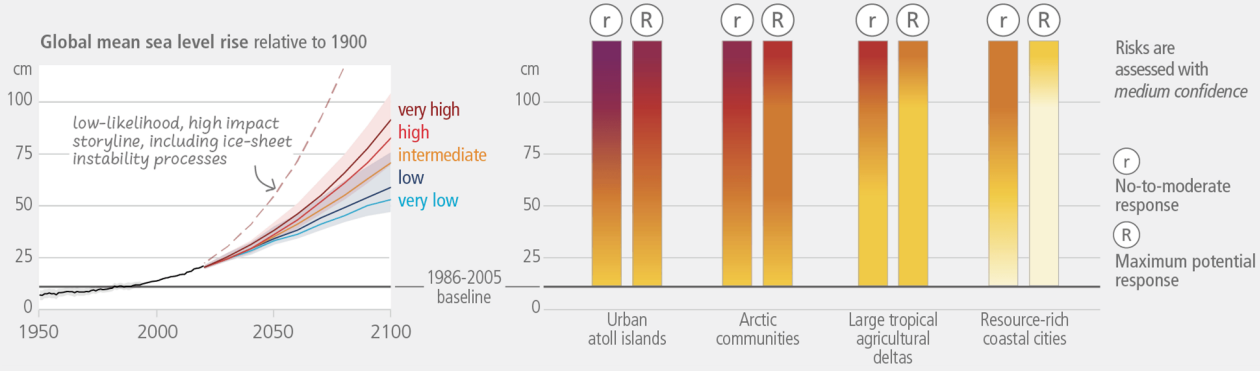
Adaptation Options and their Limits in a Warmer World

Adaptation options, including most water related options, will become constrained and less effective with further warming.

With more warming, losses and damages, concentrated among vulnerable populations, will increase and additional human and natural systems will reach adaptation limits.

Maladaptation can be avoided by careful long-term planning and implementation.

Risks to coastal geographies increase with sea level rise and depend on responses



Source: IPCC AR6 Figure SPM. 4 (c), 2023

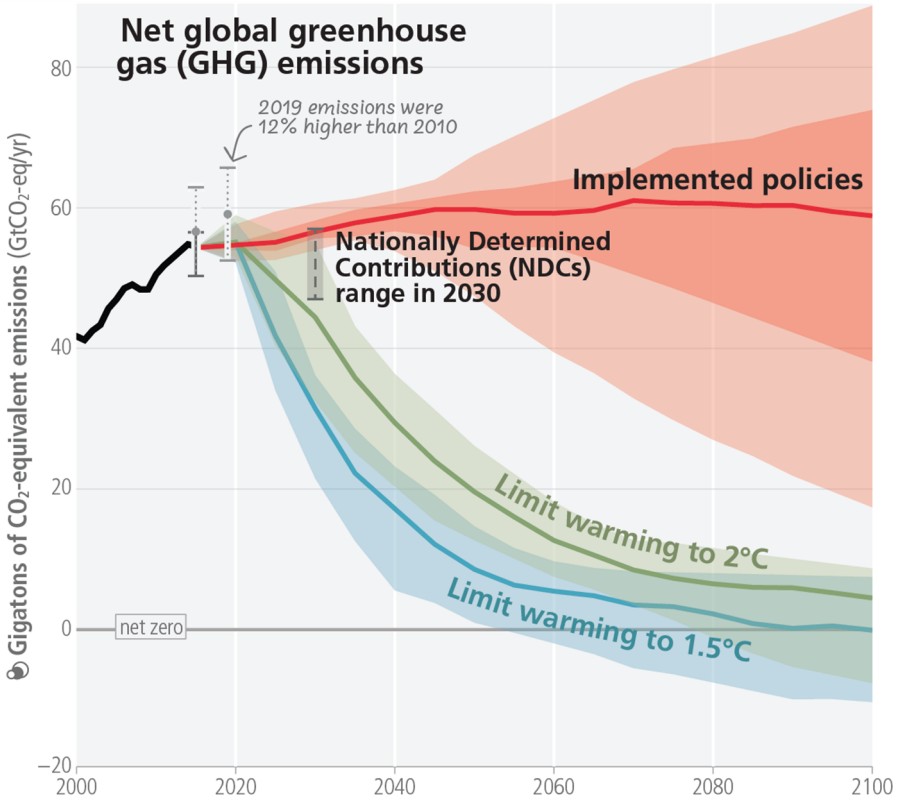
Carbon Budgets and Net Zero Emissions

Limiting human-caused global warming requires net zero CO_2 emissions.

Whether warming can be limited to 1.5°C or 2°C depends largely on cumulative carbon emissions until the time of reaching net-zero CO_2 and the level of GHG reductions this decade.

Post 2019 carbon budgets are 500 $GtCO_2$ for 1.5°C (50%) and 1150 Gt CO_2 for 2°C (67%).

Projected CO_2 emissions from existing fossil fuel infrastructure without additional abatement exceed the remaining carbon budget for 1.5°C.



Source: IPCC AR6 Figure SPM. 5 (a), 2023

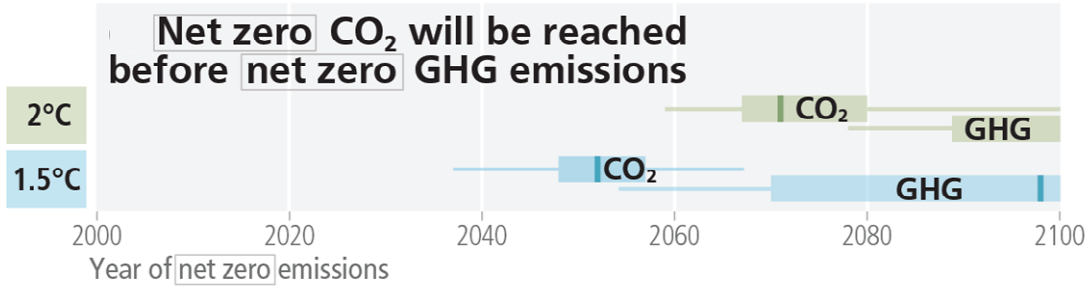
Mitigation Pathways

Modelled pathways consistent with the Paris Agreement goal to limit global warming fall into two categories:

- Those that limit warming to 1.5°C (>50%) with no or limited overshoot, and
- Those that limit warming to 2°C (>67%).

All global modelled pathways in these categories involve rapid, deep and usually immediate GHG emissions reductions in all sectors during this decade.

Global net zero CO_2 emissions are reached for these pathway categories, in the early 2050s and around the early 2070s, respectively.



Source: IPCC AR6 Figure SPM. 5 (d), 2023

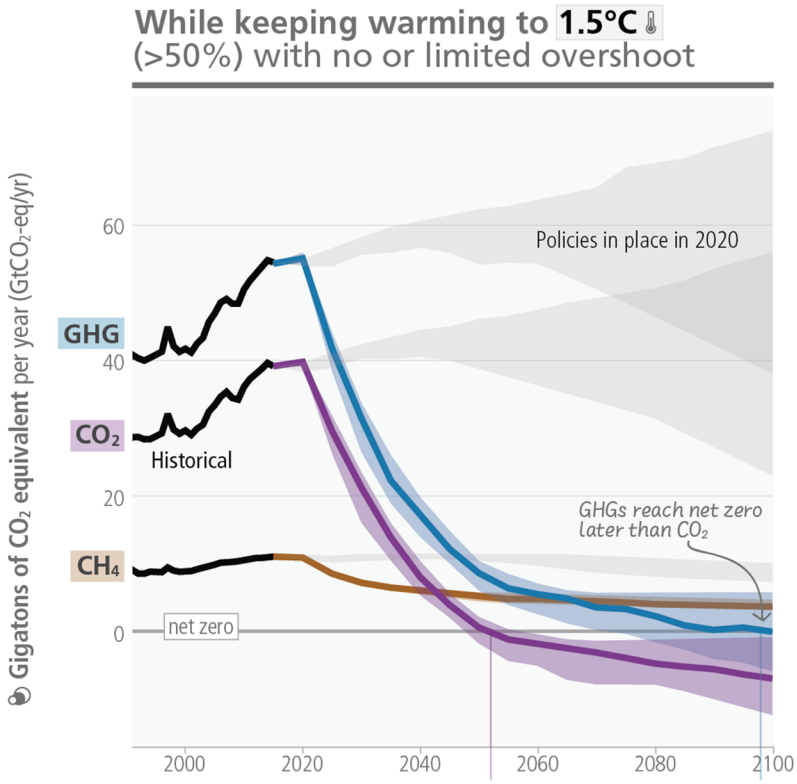
Overshoot:
Exceeding a Warming Level and Returning

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.

Net negative CO_2 emissions would require more carbon dioxide removal (CDR) deployment compared to pathways without overshoot.

Greater deployment of CDR raises feasibility and sustainability concerns.

Overshoot entails risks and adverse impacts, some irreversible, for human and natural systems, that grow with the magnitude and duration of overshoot.



Source: IPCC AR6 Figure 3.6 (a), 2023

C. Responses in the Near Term

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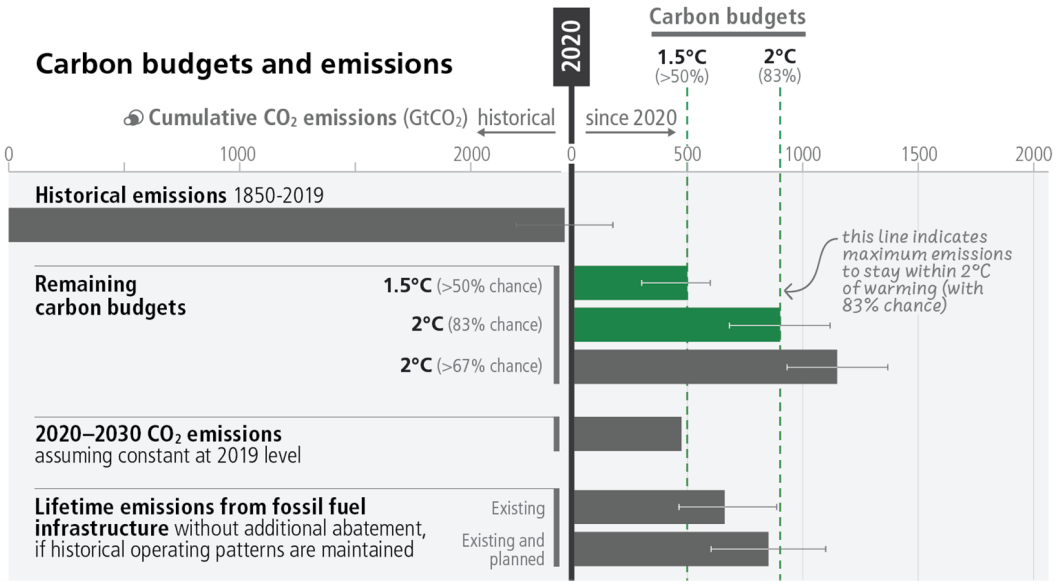
Urgency of Near-Term Integrated Climate Action



Source: IPCC AR6 Figure 3.5 (a), 2023

Climate change is a threat to human well-being and planetary health.

The window of opportunity to secure a liveable and sustainable future for all is closing rapidly.

The choices and actions implemented in this decade will have impacts now and for thousands of years.

Climate resilient development integrates adaptation and mitigation to advance sustainable development for all.

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Benefits of Near-Term Action

Ambitious action in this decade would yield numerous benefits.

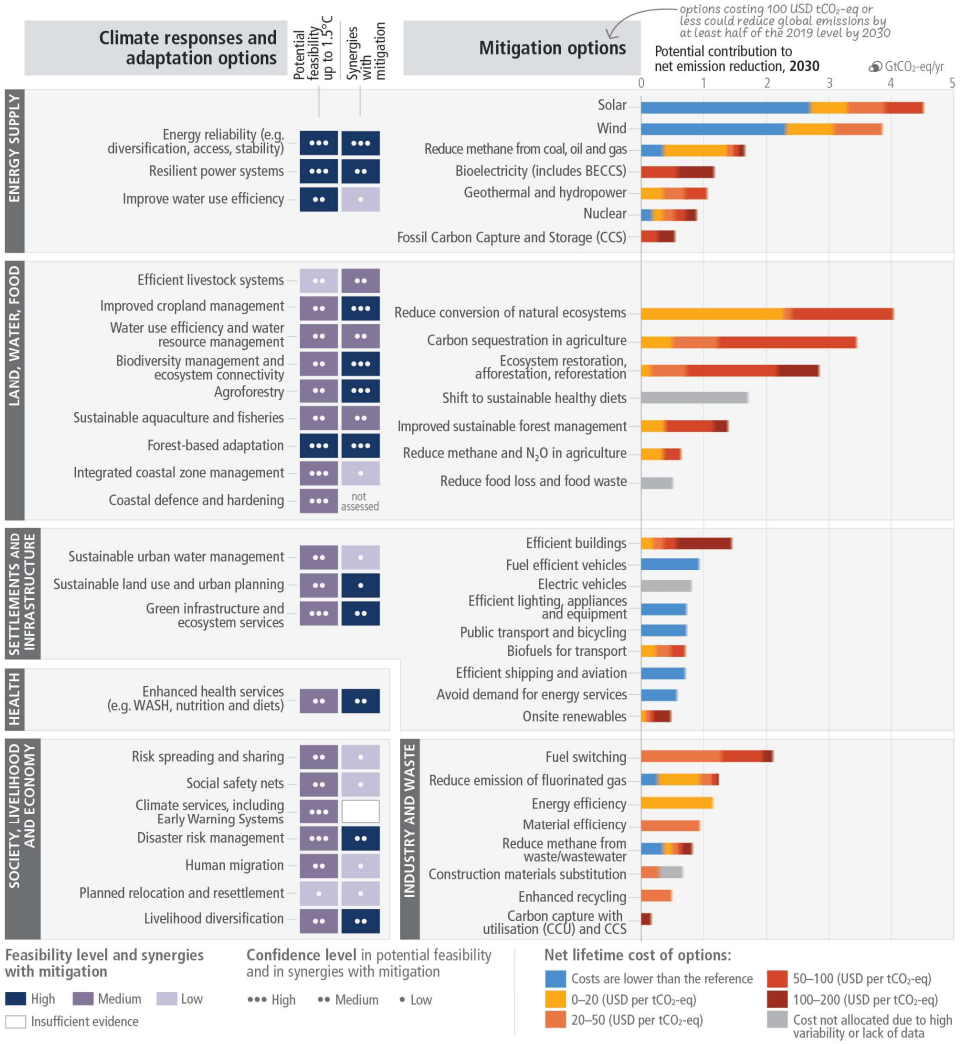
Ambitious near-term action would reduce projected losses and damages for humans and natural ecosystems and deliver many co-benefits.

Delayed action would reduce feasible adaptation options, increase losses and damages, and raise risks of stranded assets.

Near-term actions involve higher investments initially but yield savings in the longer term.

There are multiple opportunities for scaling up climate action

Feasibility of climate responses and adaptation, and potential of mitigation options in the near-term



Source: IPCC AR6 Figure SPM. 7 (a), 2023

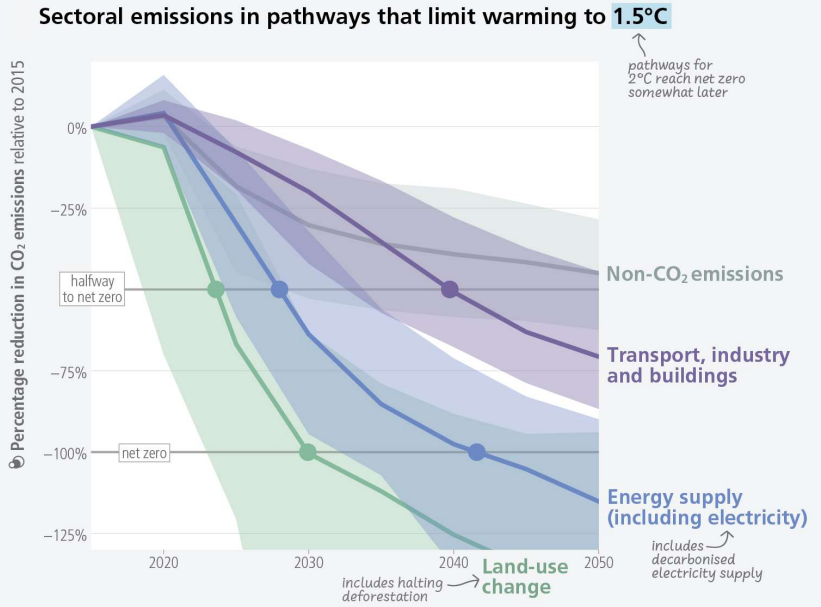
Mitigation and Adaptation Options across Systems

Rapid, ambitious and extensive transitions are needed in all sectors and systems to achieve net zero emissions.

Feasible, effective, and low-cost options for mitigation and adaptation are already available, with differences across systems and regions.

Options costing <USD100/tCO_2e could reduce 2019 global emissions by at least half by 2030.

The pace of the transitions will differ across sectors and regions.



Source: IPCC AR6 Figure 4.1 (a), 2023

Synergies and Trade-Offs with Sustainable Development

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.

Near-term adaptation and mitigation actions have more synergies than trade-offs with Sustainable Development Goals (SDGs)

Synergies and trade-offs depend on context and scale

Source: IPCC AR6 Figure 4.5, 2023

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Equity and Inclusion

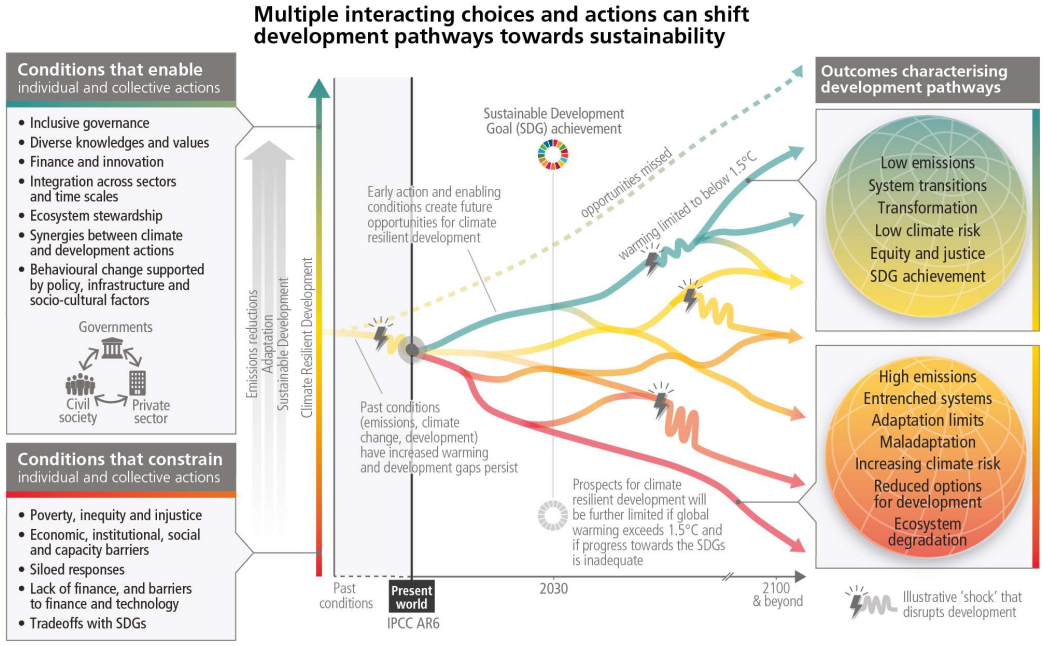
Prioritising equity, climate justice, social justice, inclusion and just transition processes can enable adaptation and ambitious mitigation actions.

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.

Options that reduce emission-intensive consumption can enhance societal well-being.

Extreme poverty can be eradicated without significant emissions growth.



Source: IPCC AR6 Figure SPM. 6, 2023

Governance and Policies

	Implied by policies implemented by the end of 2020 ($GtCO_2$-eq/yr)	Implied by Nationally Determined Contributions (NDCs) announced prior to COP26	
		Unconditional elements ($GtCO_2$-eq/yr)	Including conditional elements ($GtCO_2$-eq/yr)
Median projected global emissions (min–max)*	57 [52–60]	53 [50–57]	50 [47–55]
Implementation gap between implemented policies and NDCs (median)	–	4	7
Emissions gap between NDCs and pathways that limit warming to 2°C (>67%) with immediate action	–	10–16	6–14
Emissions gap between NDCs and pathways that limit warming to 1.5°C (>50%) with no or limited overshoot with immediate action	–	19–26	16–23

*Emissions projections for 2030 and gross differences in emissions are based on emissions of 52–56 $GtCO_2$-eq/yr in 2019 as assumed in underlying model studies. (*medium confidence*)

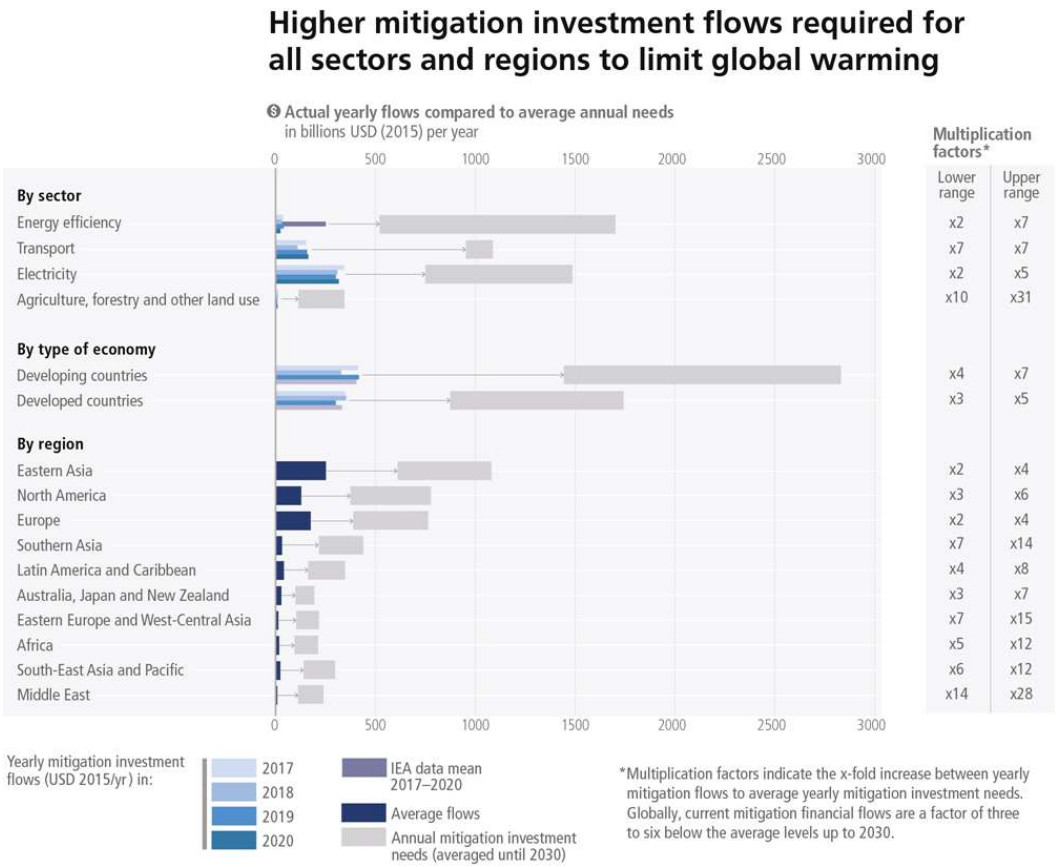
Source: IPCC AR6 Table 2.2, 2023

Effective national, sub-national and municipal government institutions are crucial for effective climate action.

Clear goals and inclusive governance processes facilitate effective climate action.

Vulnerabilities and climate risks can be reduced through carefully designed laws, policies and participatory processes.

Regulatory and economic instruments could achieve deep emissions reductions if applied widely and made more stringent.



Source: IPCC AR6 Figure 4.6, 2023

Finance, Technology and International Cooperation

Finance, technology and international cooperation are critical enablers for accelerated climate action.

To achieve climate goals both adaptation and mitigation finance need to increase many-fold.

Sufficient global capital exists but barriers inhibit deployment of capital to climate action.

Innovation and widespread adoption of climate-friendly technologies needs to be accelerated.

Enhancing international cooperation is possible through multiple channels.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