

Environmental and Energy Study Institute

Briefing Series: What Congress Needs to Know About COP27

Climate Change 2022: Impacts, Adaptation and Vulnerability

Dr. Debora Ley

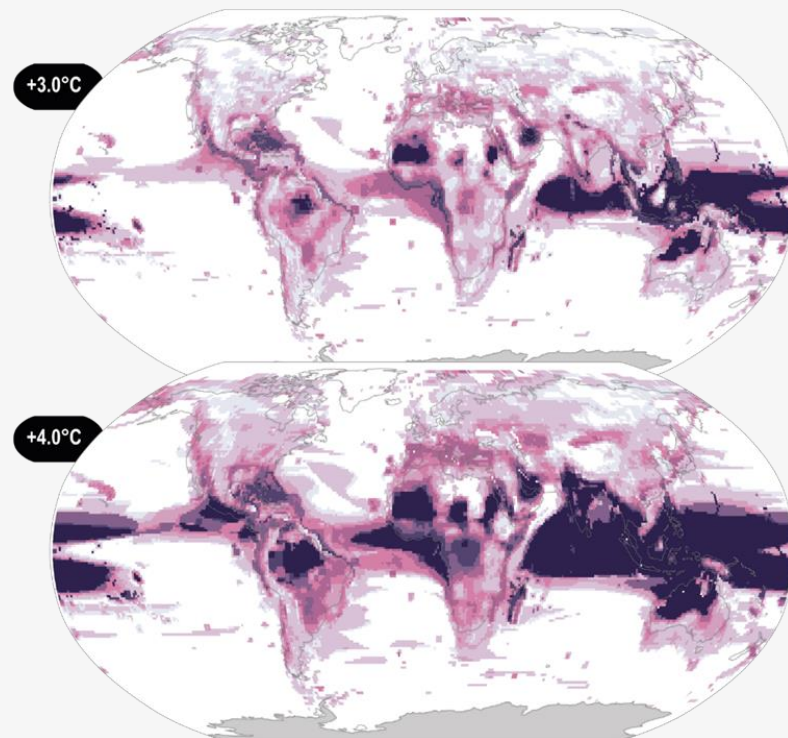
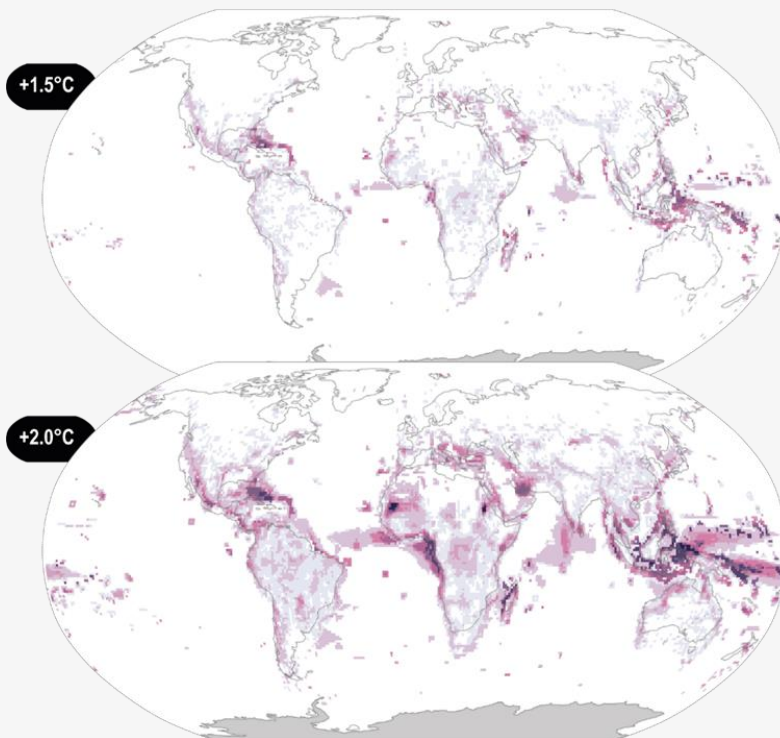
October 12th, 2022



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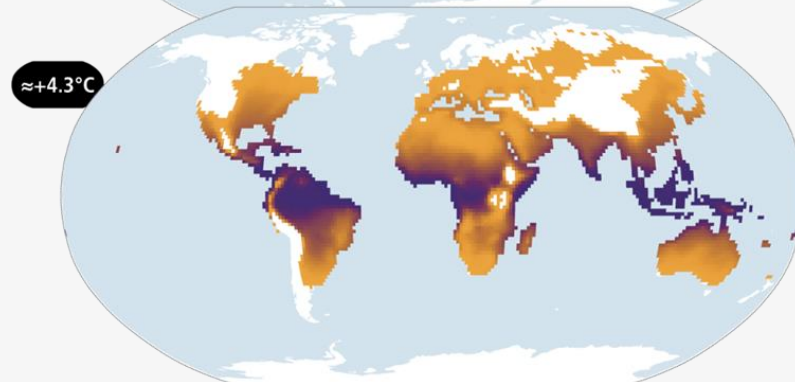
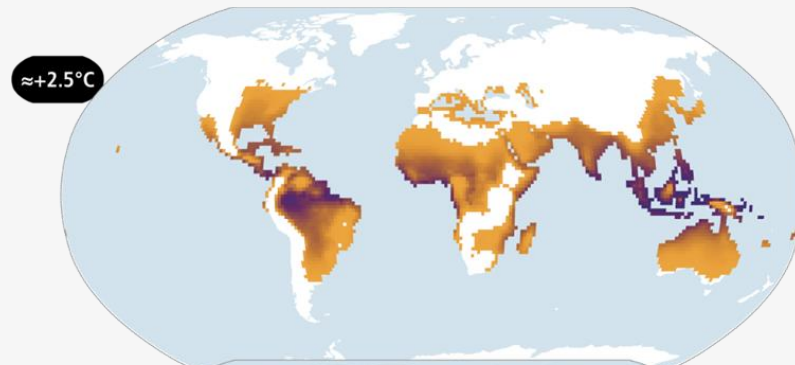
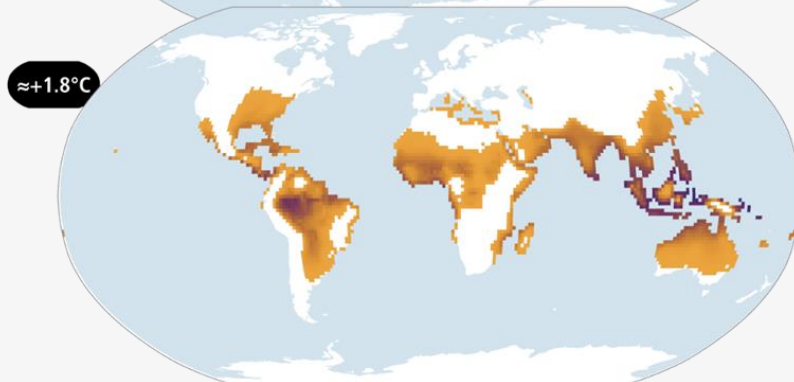
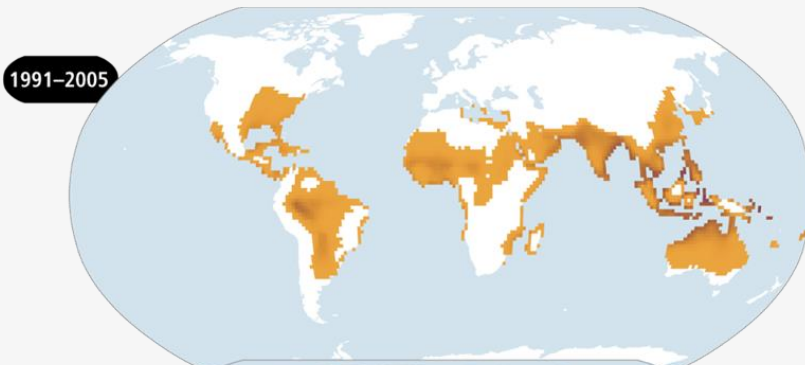
Species exposed to potentially dangerous climate conditions

Percentage of biodiversity exposed



Global distribution of population exposed to hyperthermia from extreme heat and humidity - Projections for year 2100

Days per year when air temperature and humidity conditions turn deadly and pose a risk of death



Future global climate risks



Heat stress

Exposure to heat waves will continue to increase with additional warming.



Water scarcity

At 2°C, regions relying on snowmelt could experience 20% decline in water availability for agriculture after 2050.



Food security

Climate change will increasingly undermine food security.



Flood risk

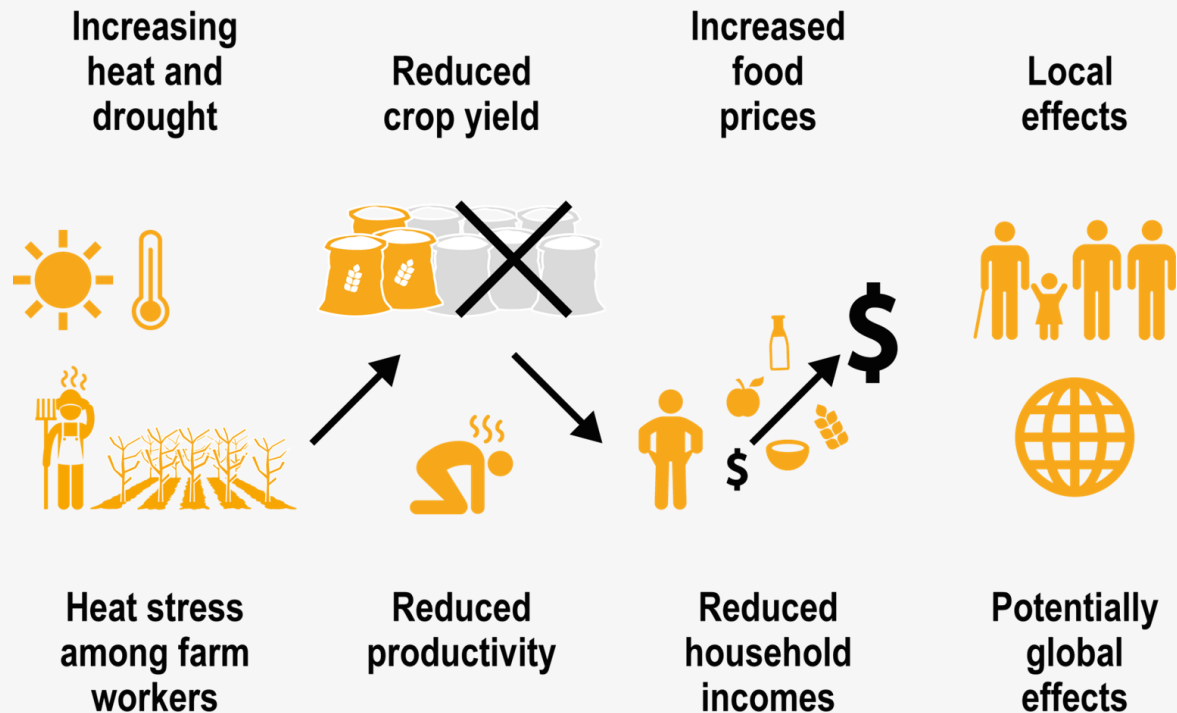
About a billion people in low-lying cities by the sea and on Small Islands at risk from sea level rise by mid-century.

Simultaneous extreme events compound risks

Multiple extreme events that compound the risks are more difficult to manage

... e.g. reductions in crop yields, made worse by heat stress among farm workers

...



Between 3.3 y 3.6 billion people live in places that are highly vulnerable to climate change



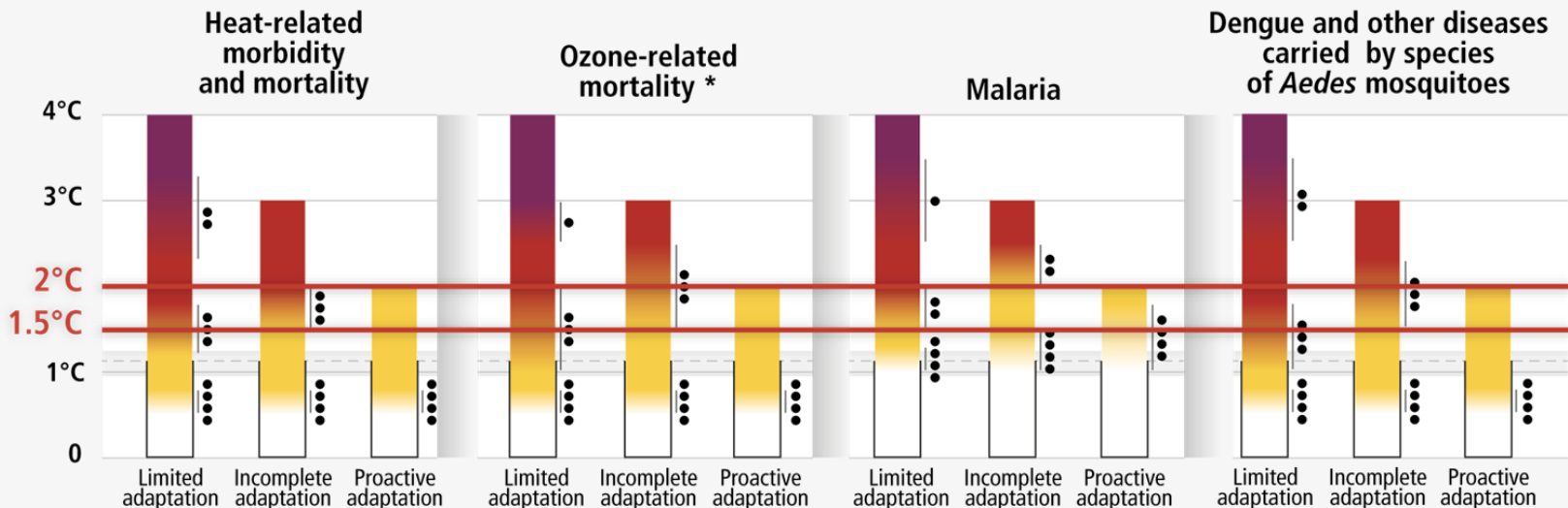


These places face simultaneous challenges

- Limited access to basic services and infrastructure
- Climate sensitive income sources
- High levels of poverty and unequal income distribution
- Problems with governance
- Lack of financing sources
- Low levels of trust



Risk development and reduction under 3 adaptation scenarios: human health



Scenario narratives

- Limited adaptation:** Failure to proactively adapt; low investment in health systems
- Incomplete adaptation:** Incomplete adaptation planning; moderate investment in health systems
- Proactive adaptation:** Proactive adaptive management; higher investment in health systems

* Mortality projections include demographic trends but do not include future efforts to improve air quality that reduce ozone concentrations.



Adaptation saves lives, reduces risks
and has multiple benefits.



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.

Maladaptation

- Adaptation that has unintended consequences and exacerbates vulnerability, including shifting risk burdens now and over time, due to short-term actions, lack of attention to the most vulnerable, and lack of planning, amongst others.



The most disadvantaged groups are most affected by maladaptation.

Five System Transitions in Adaptation



**Land, ocean,
coastal and
freshwater
ecosystems**

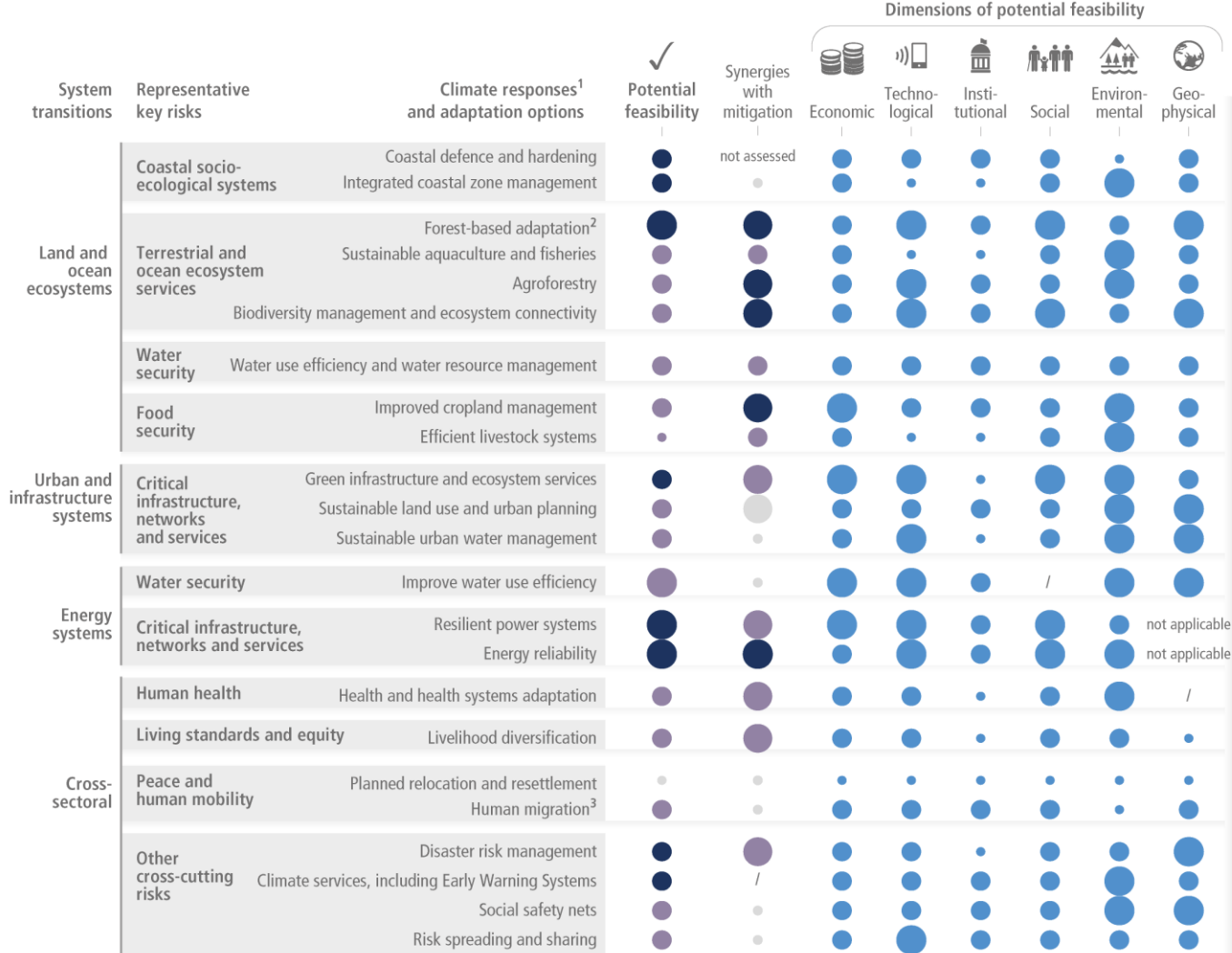
**Urban, rural
and
infrastructure**

Energy

Industry

Society

- Make possible the adaptation required for human health and well being; economic and social resilience; ecosystem health and planetary health
- Are important for achieving the low global warming levels that would avoid many limits to adaptation



Feasibility level and synergies with mitigation

- High
- Medium
- Low
- / Insufficient evidence

■ Dimensions of potential feasibility

Confidence level in potential feasibility and in synergies with mitigation

- High
- Medium
- Low

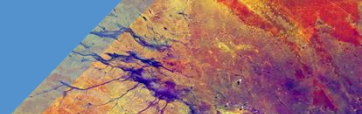
Footnotes:

¹ The term response is used here instead of adaptation because some responses, such as retreat, may or may not be considered to be adaptation.

² Including sustainable forest management, forest conservation and restoration, reforestation and afforestation.

³ Migration, when voluntary, safe and orderly, allows reduction of risks to climatic and non-climatic stressors.

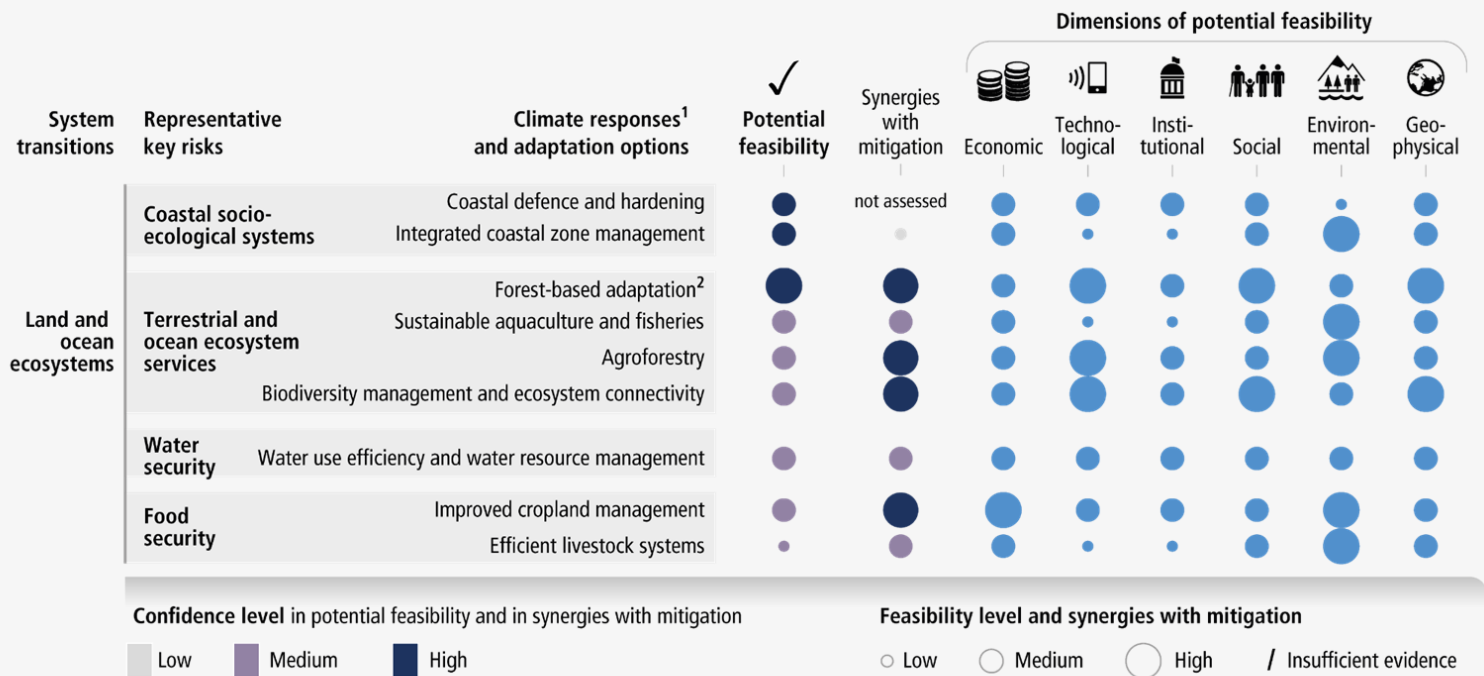




Indicators for adaptation

Dimensions	Adaptation indicators
Economic	Micro-economic viability Macro-economic viability Socio-economic vulnerability reduction potential Employment & productivity enhancement potential
Technological	Technical resource availability Risks mitigation potential
Institutional	Political acceptability Legal & regulatory feasibility Institutional capacity & administrative feasibility Transparency & accountability potential
Socio-cultural	Social co-benefits (health, education) Socio-cultural acceptability Social & regional inclusiveness Intergenerational equity Gender equity
Environmental/ ecological	Ecological capacity Adaptive capacity/ resilience building potential
Geophysical	Physical feasibility Land use change enhancement potential Hazard risk reduction potential

The Feasibility of Adaptation measures



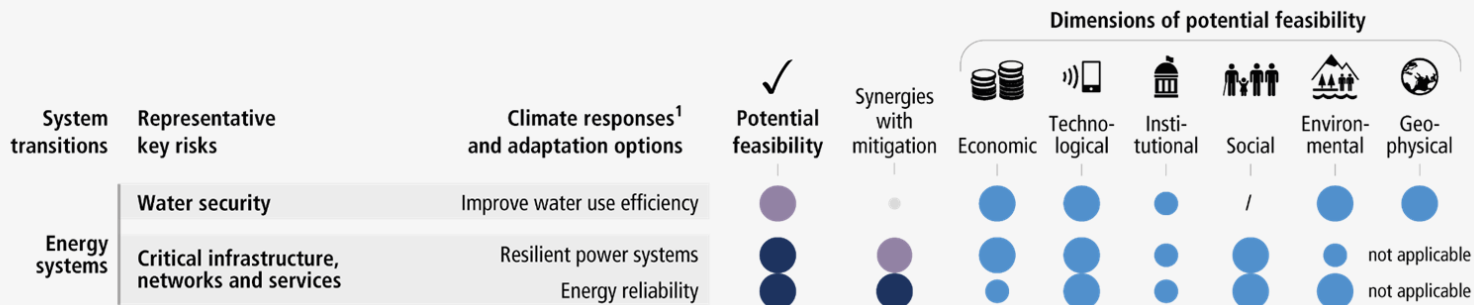
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The Feasibility of Adaptation measures



Confidence level in potential feasibility and in synergies with mitigation

Low Medium High

Feasibility level and synergies with mitigation

Low Medium High / Insufficient evidence

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Land and ocean ecosystems

Urban and infrastructure systems

Examples of climate responses and adaptation options

Forest-based adaptation*

Sustainable aquaculture and fisheries

Agroforestry

Biodiversity management and ecosystem connectivity

Green infrastructure and ecosystem services

Sustainable land use and urban planning

Sustainable urban water management

Potential feasibility:

high

medium

medium

medium

medium

medium

medium

Synergies with mitigation:

high

medium

high

high

high

high

low

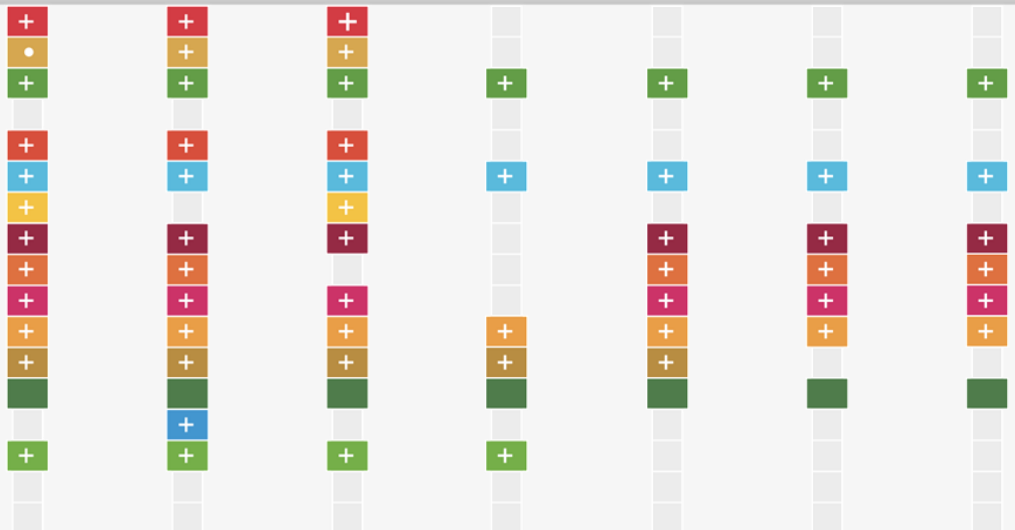
* Including sustainable forest management, forest conservation and restoration, reforestation and afforestation

● *High confidence*
 ● *Medium confidence*
 ● *Low confidence*

Relation with Sustainable Development Goals



SDGs are integrated and indivisible, and efforts to achieve any goal in isolation may trigger synergies or trade-offs with other SDGs



- 1: No Poverty
- 2: Zero Hunger
- 3: Good Health and Well-being
- 4: Quality Education
- 5: Gender Equality
- 6: Clean Water and Sanitation
- 7: Affordable and Clean Energy
- 8: Decent Work and Economic Growth
- 9: Industry, Innovation and Infrastructure
- 10: Reducing Inequality
- 11: Sustainable Cities and Communities
- 12: Responsible Consumption and Production
- 13: Climate Action
- 14: Life Below Water
- 15: Life On Land
- 16: Peace, Justice, and Strong Institutions
- 17: Partnerships for the Goals



Accelerating adaptation

- Political commitment and follow-through across all levels of government
- Institutional framework: clear goals, priorities that define responsibilities
- Enhancing knowledge of impacts and risks improves responses
- Monitoring and evaluation of adaptation measures are essential to track progress
- Inclusive governance that prioritises equity and justice – direct participation

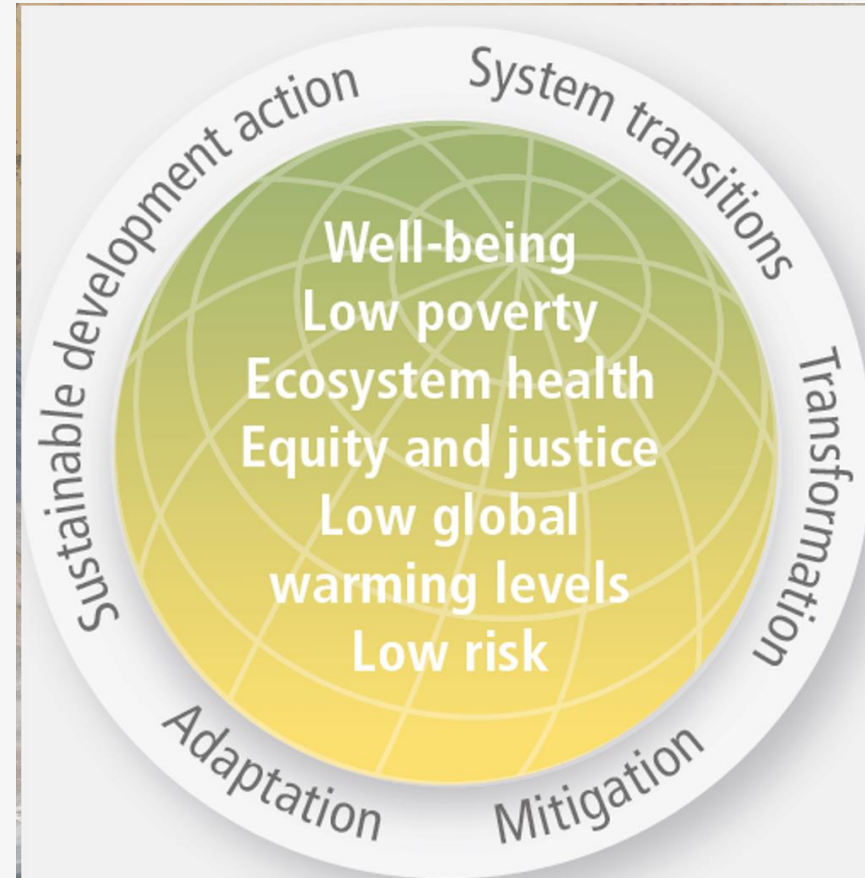
Climate resilient development

Adaptation: Reduced climate risks

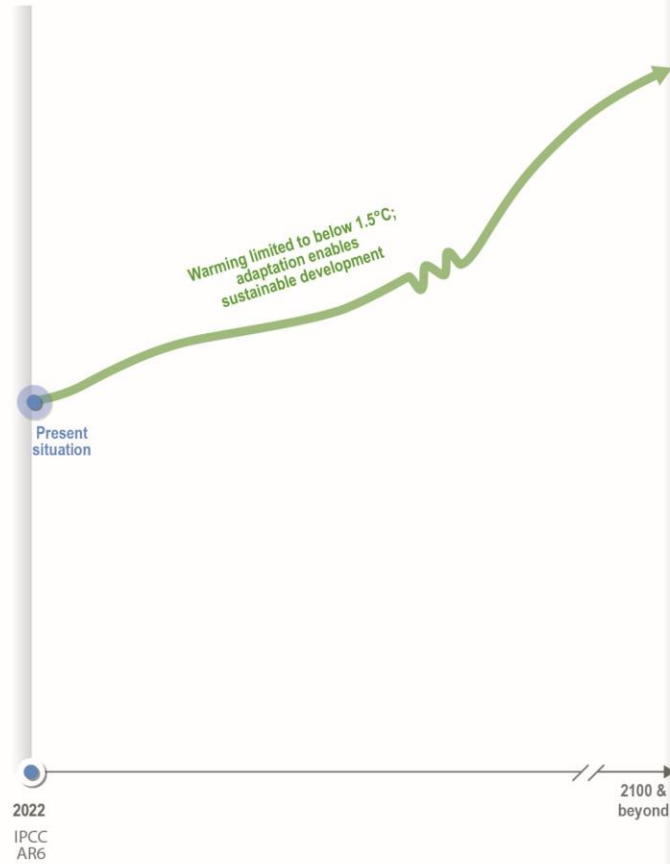
Mitigation: Reduced greenhouse gas emissions

Interdependence with ecosystems:
Enhanced biodiversity and Sustainable Development Goals

Shifting to a societal development that limits global warming and climate risk, and that advances sustainable development, is urgent



(b) Illustrative development pathways



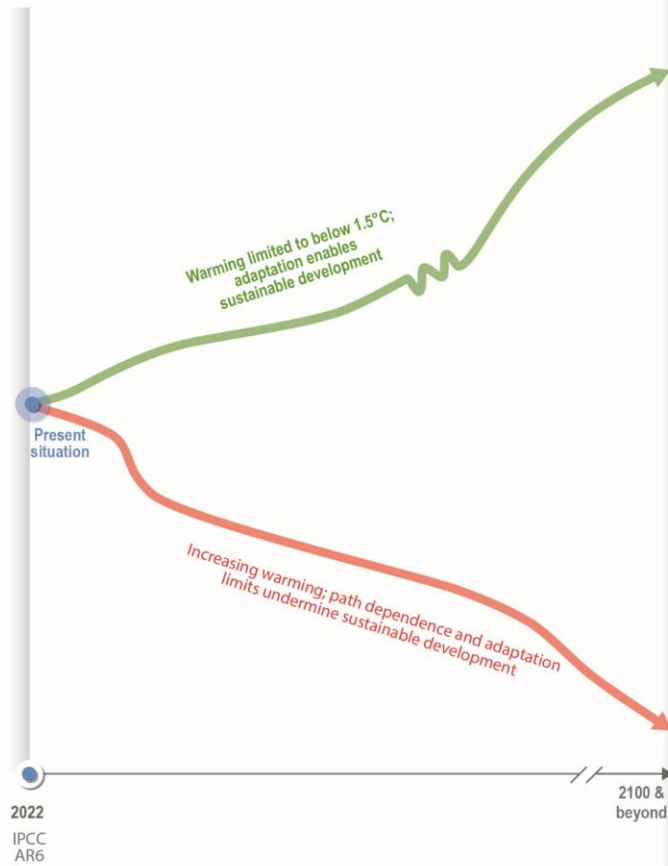
(c) Actions and outcomes characterizing development pathways



Climate resilient development:

- Adaptation supporting sustainable development
- Increasingly irreversible changes as we approach and exceed 1.5 degrees warming
- Limits to adaptation increase with warming

(b) Illustrative development pathways



(c) Actions and outcomes characterizing development pathways

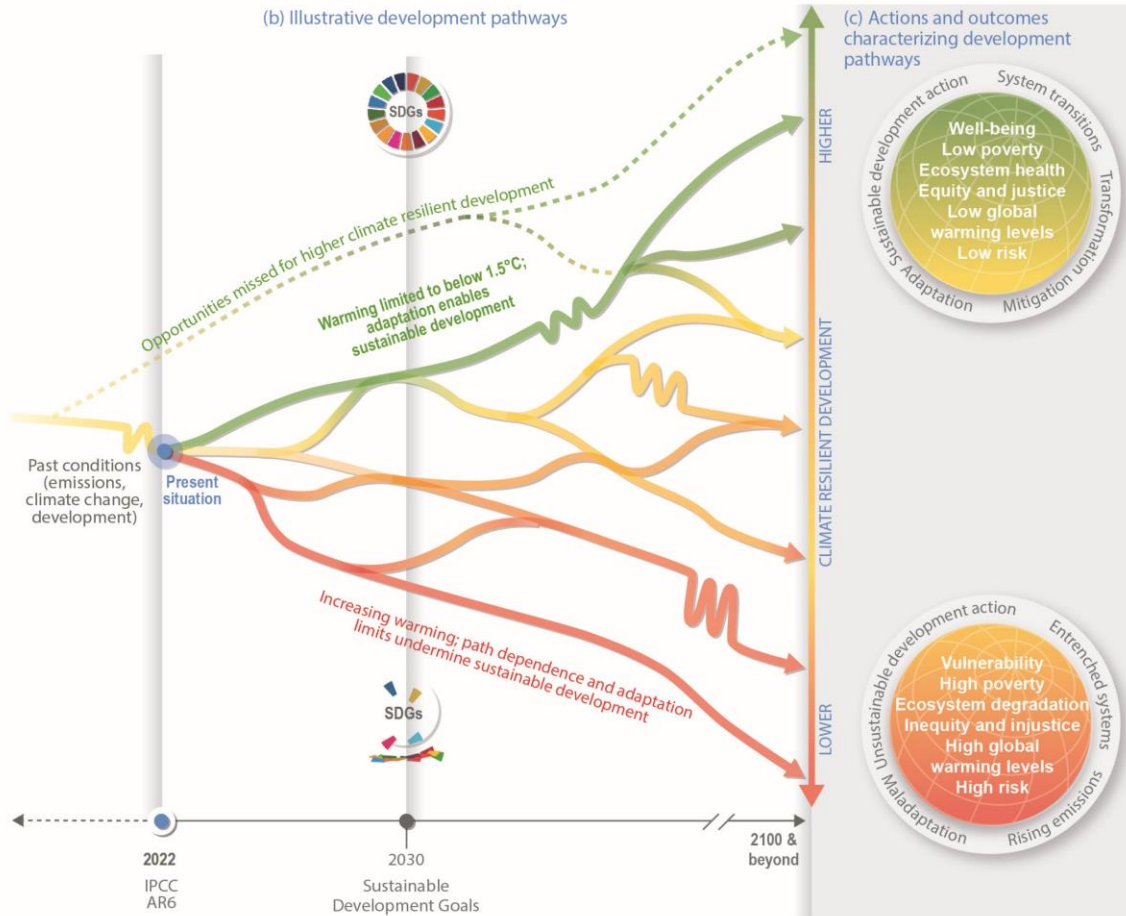


Climate resilient development:

- Adaptation supporting sustainable development
- Increasingly irreversible changes as we approach and exceed 1.5 degrees warming
- Limits to adaptation increase with warming

Current development trajectories

- Adaptation gaps are increasing
- Inequities exacerbate vulnerability
- We are on course to 3.2 degrees warming by 2100
- Path dependence



Climate resilient development:

- Adaptation supporting sustainable development
- Increasingly irreversible changes as we approach and exceed 1.5 degrees warming
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Current development trajectories

- Adaptation gaps are increasing
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- We are on course to 3.2 degrees warming by 2100
- Path dependence

The prospects to shift to pathways towards sustainable futures depend on action this decade

Development pathways result from continuous societal choices

Societal choices are the result of multiple decisions made by multiple actors in diverse arenas of engagement



- Multiple government, private sector and civil society actors interact in different arenas of engagement, including **economic + financial**

Arenas of engagement:



Economic + financial



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Societal choices are the result of multiple decisions made by multiple actors in diverse arenas of engagement



- Multiple government, private sector and civil society actors interact in different arenas of engagement, including economic + financial, **knowledge + technology**



Arenas of engagement:

Knowledge + technology
Economic + financial



Societal choices are the result of multiple decisions made by multiple actors in diverse arenas of engagement



- Multiple government, private sector and civil society actors interact in different arenas of engagement, including economic + financial, knowledge + technology, **ecological**

Arenas of engagement:



Ecological
Knowledge + technology
Economic + financial



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- Multiple government, private sector and civil society actors interact in different arenas of engagement, including economic + financial, knowledge + technology, ecological, **political**

Arenas of engagement:



- Political
- Ecological
- Knowledge + technology
- Economic + financial



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Societal choices are the result of multiple decisions made by multiple actors in diverse arenas of engagement



Arenas of engagement:

Socio-cultural
Political
Ecological
Knowledge + technology
Economic + financial

- Multiple government, private sector and civil society actors interact in different arenas of engagement, including economic + financial , knowledge + technology, ecological, political, **socio-cultural**



Photo: Marianne Mosberg



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Societal choices are the result of multiple decisions made by multiple actors in diverse arenas of engagement



- Multiple government, private sector and civil society actors interact in different arenas of engagement, including economic + financial, knowledge + technology, ecological, political, socio-cultural and **community** arenas.

Arenas of engagement:

Community
Socio-cultural
Political
Ecological
Knowledge + technology
Economic + financial



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Dimensions that enable actions towards higher climate resilient development



Arenas of engagement:

- Community
- Socio-cultural
- Political
- Ecological
- Knowledge + technology
- Economic + financial



Dimensions that result in actions towards lower climate resilient development

Key dimensions enable climate resilient development

- Dimensions that enable societal choices towards *higher* climate resilient development include knowledge diversity, ecosystem stewardship, equity and justice and inclusion.
- Dimensions that result in societal choices towards *lower* climate resilient development have been identified as **singular knowledge, ecosystem degradation, exclusion, and inequity and injustice**

(a) Societal choices about adaptation, mitigation and sustainable development made in arenas of engagement

Dimensions that enable actions towards higher climate resilient development

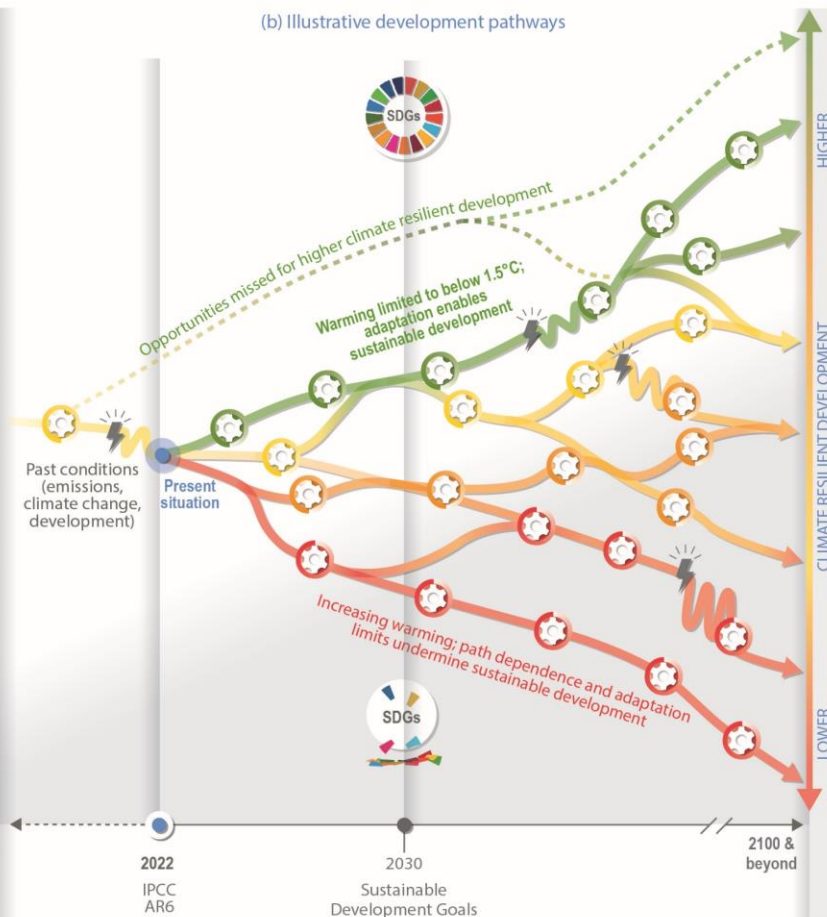


Arenas of engagement:
 Community
 Socio-cultural
 Political
 Ecological
 Knowledge + technology
 Economic + financial



Dimensions that result in actions towards lower climate resilient development

(b) Illustrative development pathways



(c) Actions and outcomes characterizing development pathways



Illustrative climatic or non-climatic shock, e.g. COVID-19, drought or floods, that disrupts the development pathway

Narrowing window of opportunity for higher CRD

Key message I

- Since AR5, climate risks are appearing faster and will get more severe sooner.
- Impacts cascade through natural and human systems, often compounding with the impacts from other human activities.



Key message II

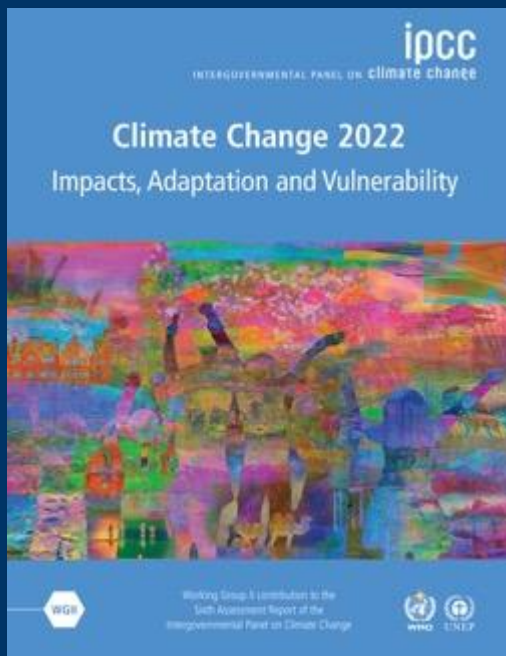
- For many locations on Earth, the capacity for adaptation is already significantly limited.
- The maintenance and recovery of natural and human systems will depend on the achievement of mitigation targets.



Key message III

- The magnitude of observed impacts and projected climate risks indicate the scale of decision-making, funding and investment needed over the next decade if climate resilient development is to be achieved.
- Available evidence on projected climate risks indicates that opportunities for adaptation to many climate risks will likely become constrained and have reduced effectiveness should 1.5°C global warming be exceeded...





“ The scientific evidence is unequivocal: climate change is a threat to human well-being and the health of the planet.

Any further delay in concerted global action will miss the brief, rapidly closing window to secure a liveable and sustainable future for all.

This report offers solutions to the world.



THANK YOU FOR YOUR ATTENTION!

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