

Synthesis of the state of knowledge on climate change

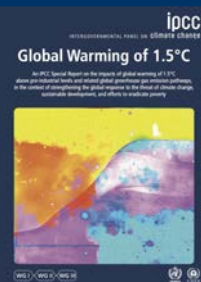
Climate risks and how to deal with them

Hans-O. Pörtner
Co-Chair IPCC Working Group II



The State of Knowledge about Climate Change

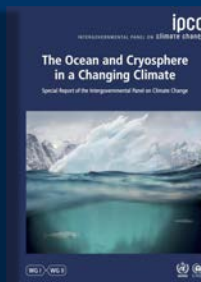
Special Reports



Global Warming of 1.5°C, 2018

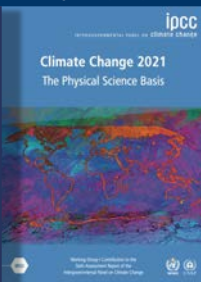


Climate Change and Land, 2019

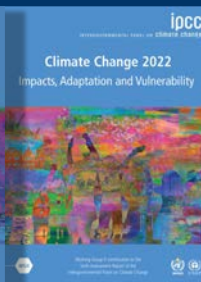


The Ocean and Cryosphere in a Changing Climate, 2019

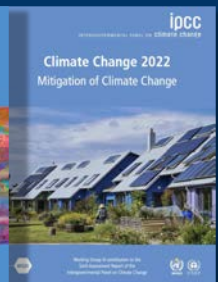
Working Group Reports



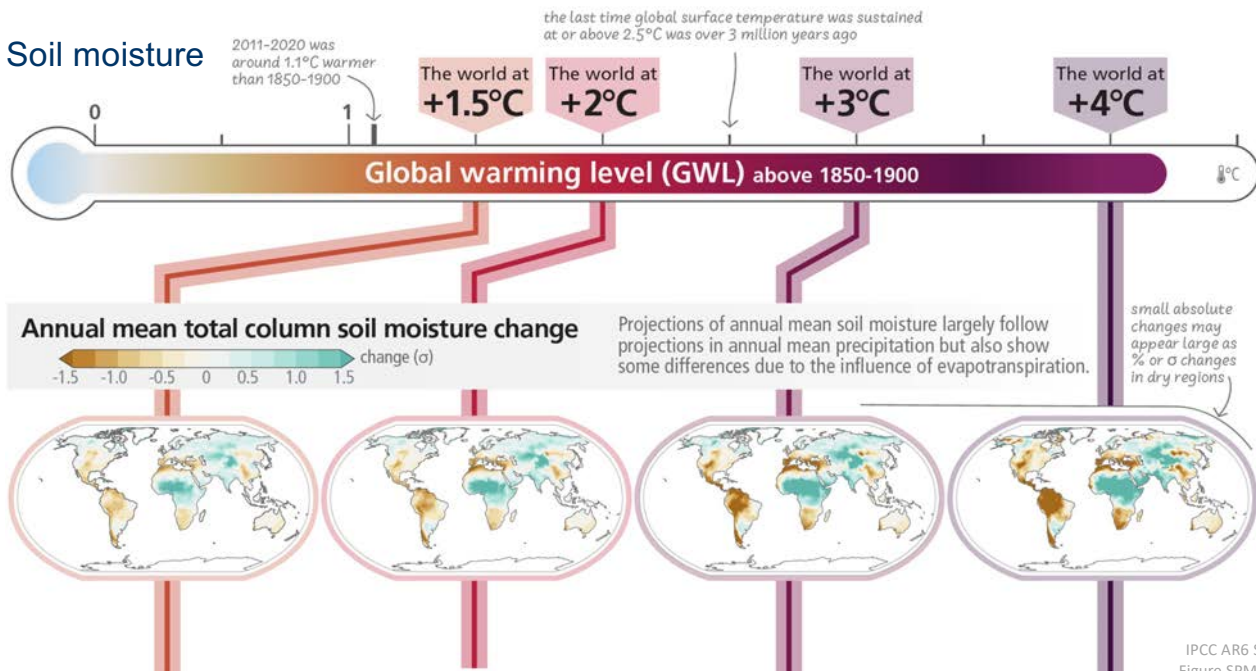
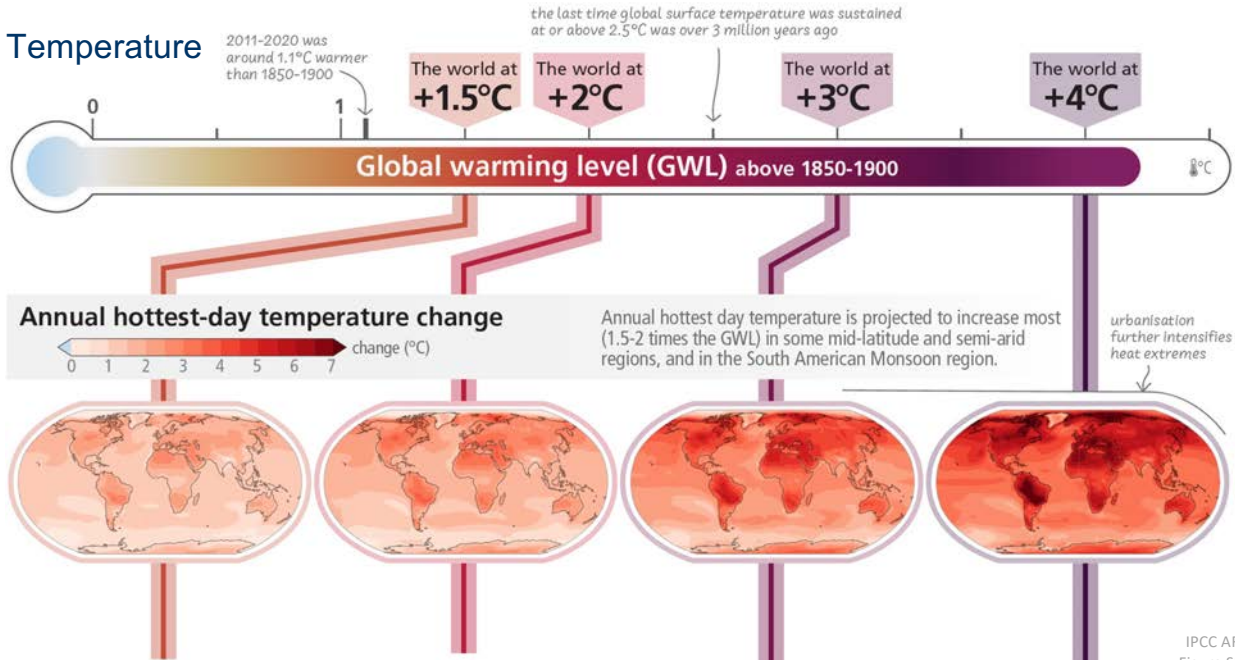
WGI: The Physical Science Basis, 2021



WGII: Impacts, Adaptation and Vulnerability, 2022



WGIII: Mitigation of Climate Change, 2022



Impacts are driven by changes in multiple climate conditions, which are increasingly attributed to human influence.

Attribution of observed physical climate changes to human influence:

Medium confidence

Increase in agricultural & ecological drought	Increase in fire weather	Increase in compound flooding

Likely

Increase in heavy precipitation

Very likely

Glacier retreat	Global sea level rise

Virtually certain

Upper ocean acidification	Increase in hot extremes

IPCC AR6 SYR Figure SPM.1b

Observed widespread and substantial impacts and related losses and damages attributed to climate change

Water availability and food production

Physical water availability	Agriculture/crop production	Animal and livestock health and productivity	Fisheries yields and aquaculture production

Health and well-being

Infectious diseases	Heat, malnutrition and harm from wildfire	Mental health	Displacement

Cities, settlements and infrastructure

Inland flooding and associated damages	Flood/storm induced damages in coastal areas	Damages to infrastructure	Damages to key economic sectors

Biodiversity and ecosystems

Terrestrial ecosystems	Freshwater ecosystems	Ocean ecosystems
Includes changes in ecosystem structure, species ranges and seasonal timing		

Key

Observed increase in climate impacts to human systems and ecosystems assessed at **global level**

- Adverse impacts
- Adverse and positive impacts
- Climate-driven changes observed, no global assessment of impact direction

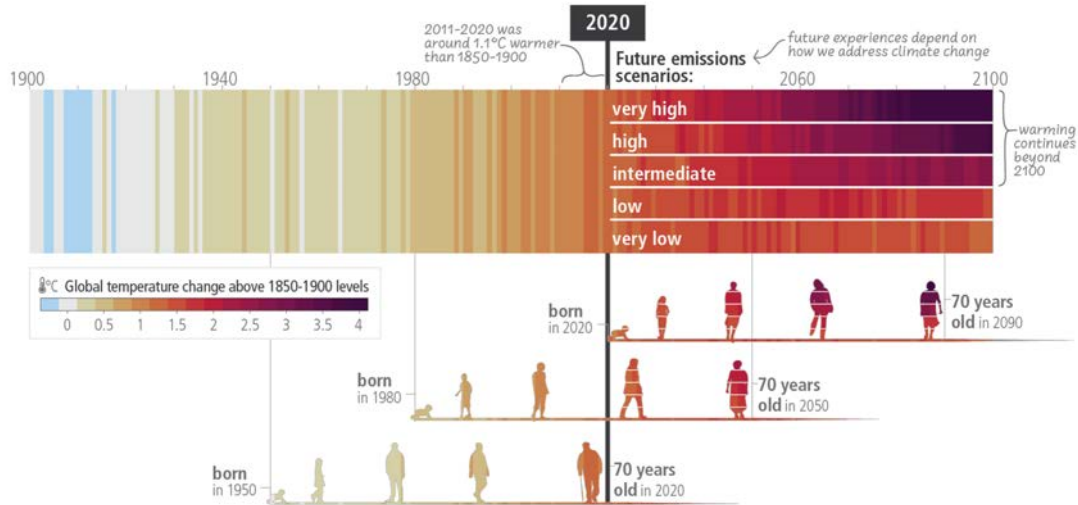
Confidence in attribution to climate change

- High or very high confidence
- Medium confidence
- Low confidence

Conclusion: No sector and system remains untouched

IPCC AR6 SYR Figure SPM.1a

The extent to which future generations will experience a hotter and different world depends on choices now and in the near term.

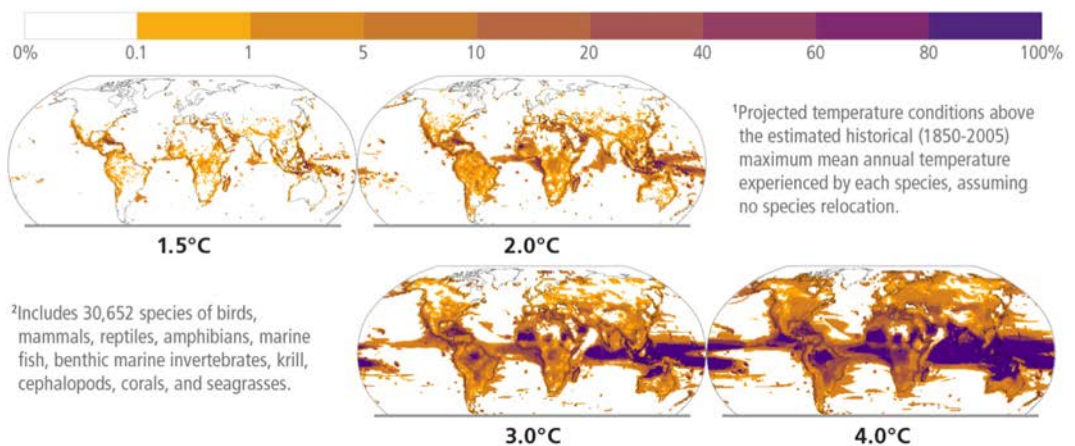


Conclusion: What we do now, defines the future of humankind and planet

IPCC AR6 SYR Figure SPM.1c

Regional species losses – resulting from evolutionary adaptation limits

Risk of species losses
Percentage of animal species and seagrasses exposed to potentially dangerous temperature conditions^{1,2}



²Includes 30,652 species of birds, mammals, reptiles, amphibians, marine fish, benthic marine invertebrates, krill, cephalopods, corals, and seagrasses.

Conclusion: Loss of habitat – Animal life retreats from the tropics.

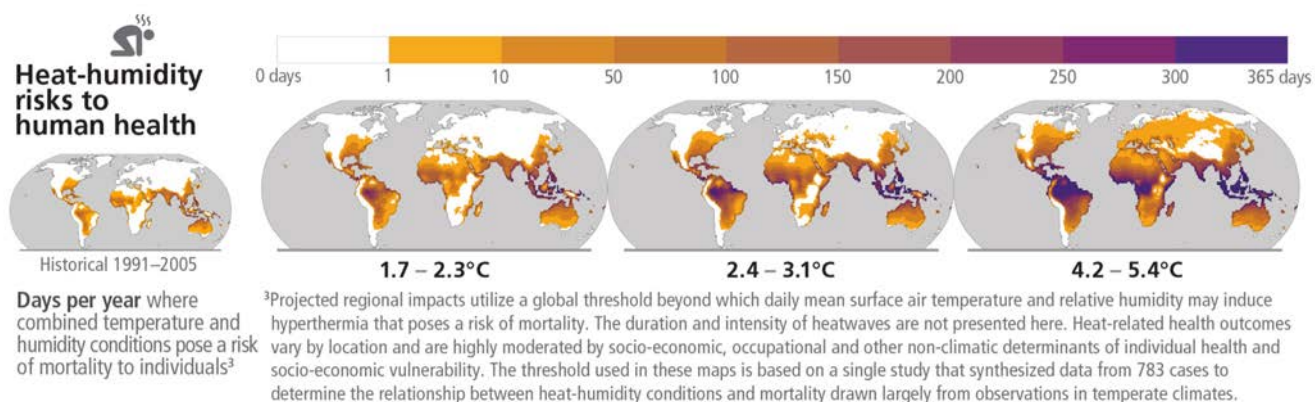
IPCC AR6 SYR Figure SPM.3a

3.3 – 3.6 billion people live in hotspots of high vulnerability to climate change...large parts of Africa, South Asia, Central and South America, small islands and the Arctic.



Denis Onyodi / KRCS CC BY-NC 2.0

Heat-humidity risks to human health*



Conclusion: Human habitat is lost from lower latitudes.

* Without “technical” adaptation measures

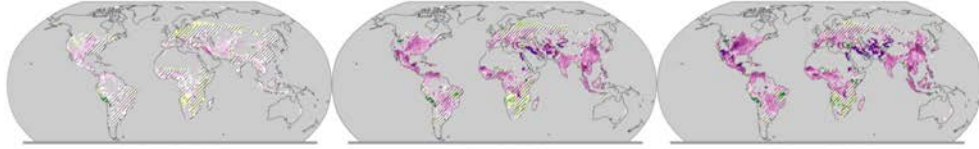
Food production impacts

(without additional adaptation)

Food production impacts

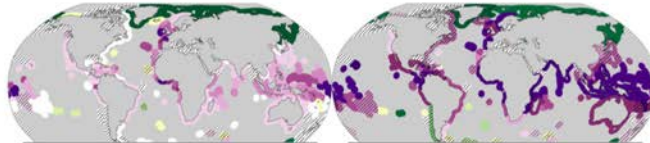


c1) **Maize yield⁴**
Changes (%) in yield



⁴Projected regional impacts reflect biophysical responses to changing temperature, precipitation, solar radiation, humidity, wind, and CO₂ enhancement of growth and water retention in currently cultivated areas. Models assume that irrigated areas are not water-limited. Models do not represent pests, diseases, future agro-technological changes and some extreme climate responses.

c2) **Fisheries yield⁵**
Changes (%) in maximum catch potential



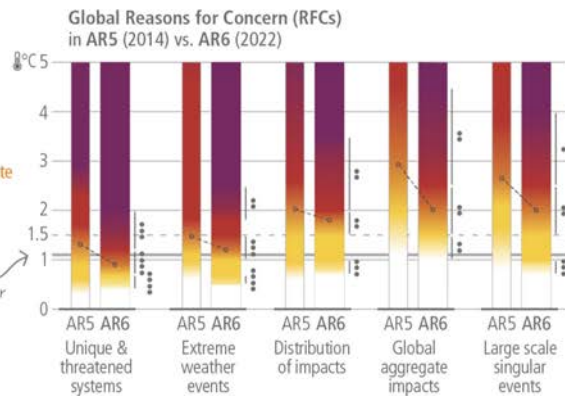
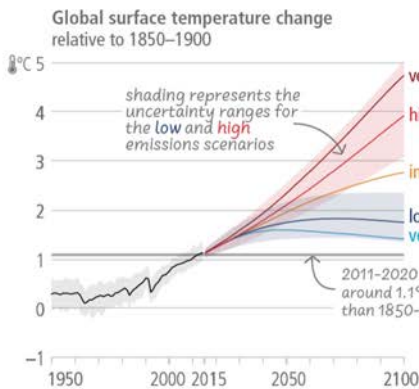
Areas with little or no production, or not assessed
Areas with model disagreement

⁵Projected regional impacts reflect fisheries and marine ecosystem responses to ocean physical and biogeochemical conditions such as temperature, oxygen level and net primary production. Models do not represent changes in fishing activities and some extreme climatic conditions. Projected changes in the Arctic regions have low confidence due to uncertainties associated with modelling multiple interacting drivers and ecosystem responses.

IPCC AR6 SYR Figure SPM.3c

Risks are occurring sooner than assessed earlier.

High risks are now assessed to occur at lower global warming levels



risk is the potential for adverse consequences

Risk/impact
Very high
High
Moderate
Undetectable

Transition range

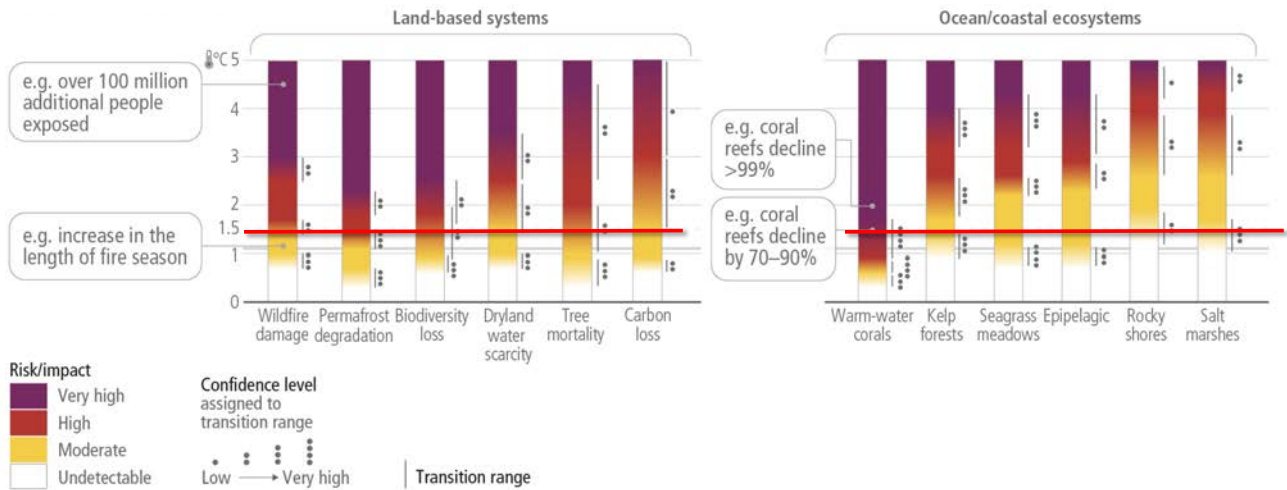
Confidence level assigned to transition range

Low → Very high
midpoint of transition

Conclusion: Limit warming close to 1.5°C

IPCC AR6 SYR Figure SPM.4a

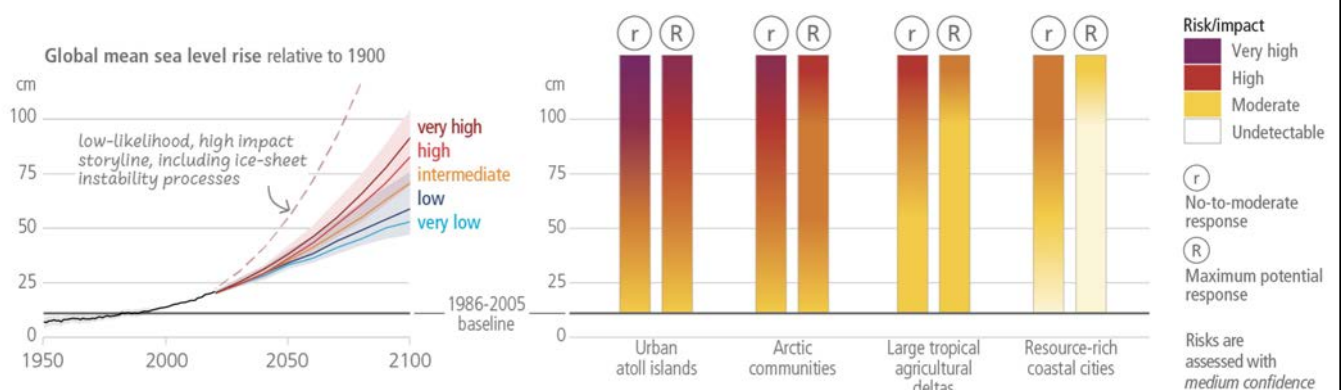
Humans and nature are exposed to diverse risks.



Conclusion: Limit warming close to 1.5°C

IPCC AR6 SYR Figure SPM.4b

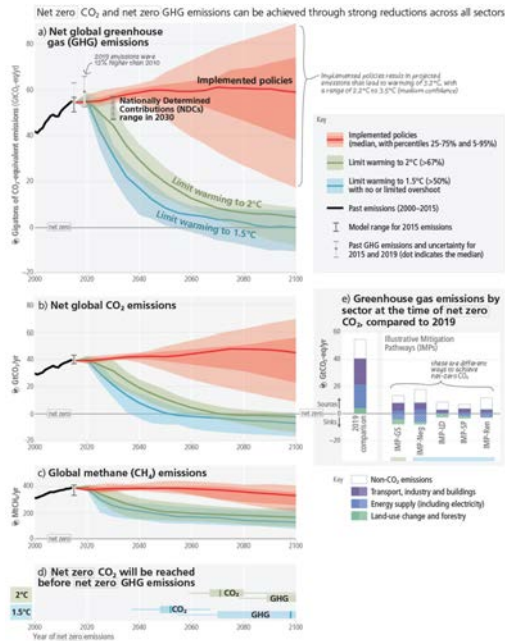
Risks caused by sea level rise



Risks for coastal regions increase with sea level and depend on responses taken.

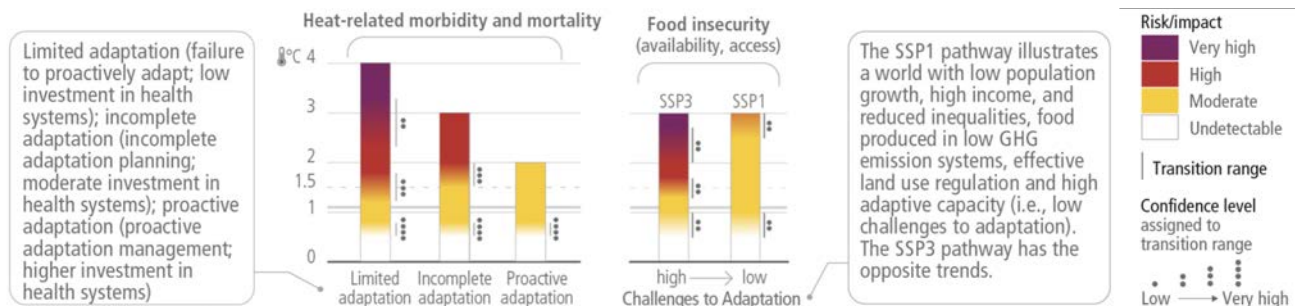
Conclusion: Limit warming close to 1.5°C

IPCC AR6 SYR Figure SPM.4c

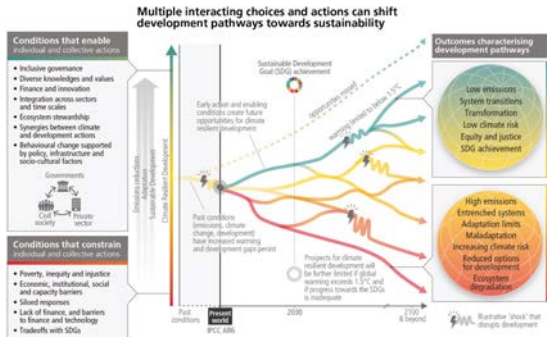


Limiting warming to 1.5°C and 2°C involves rapid, deep and in most cases immediate greenhouse gas emission reductions ...Talk WGIII Jim Skea

Our adaptation measures and socioeconomic development define climate risks



Conclusion: Limit warming close to 1.5°C in order to maintain adaptation capacity

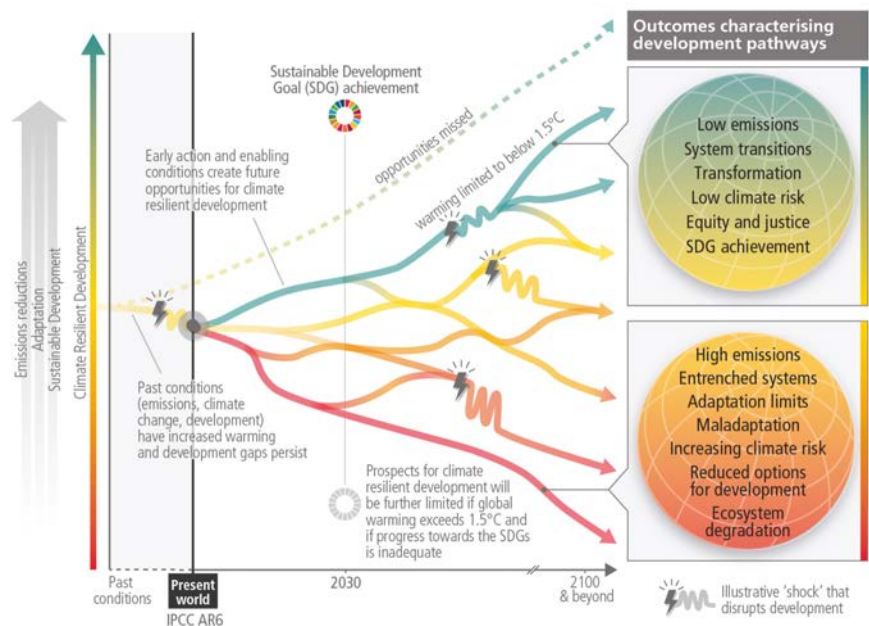


There is a rapidly narrowing window of opportunity to enable higher climate resilient development

Our future is decided now!

All aspects of life would change when avoiding greenhouse gas emissions and minimizing climate risks.

Each decision counts!



Conclusion:
Limit warming close to 1.5°C in order to maintain adaptation capacity

Conditions that enable individual and collective actions

- Inclusive governance
- Diverse knowledges and values
- Finance and innovation
- Integration across sectors and time scales
- Ecosystem stewardship
- Synergies between climate and development actions
- Behavioural change supported by policy, infrastructure and socio-cultural factors



IPCC AR6 SYR Figure SPM.2c

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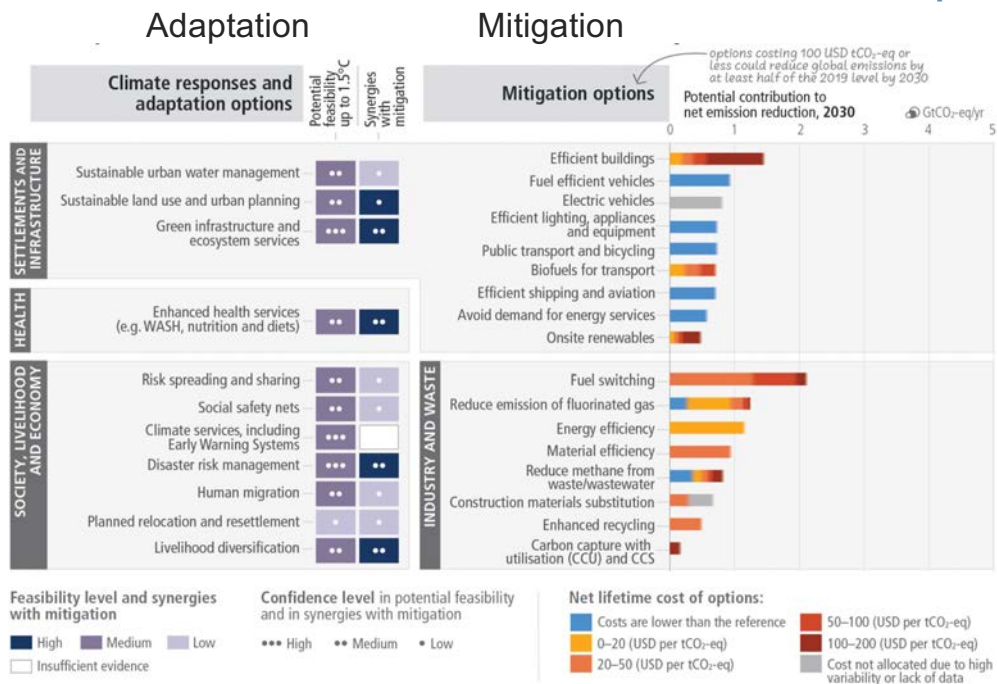
Conditions that constrain individual and collective actions

- Poverty, inequity and injustice
- Economic, institutional, social and capacity barriers
- Siloed responses
- Lack of finance, and barriers to finance and technology
- Tradeoffs with SDGs

IPCC AR6 SYR Figure SPM.2c

Feasibility of diverse solution options:

Adaptation often has synergies with mitigation.

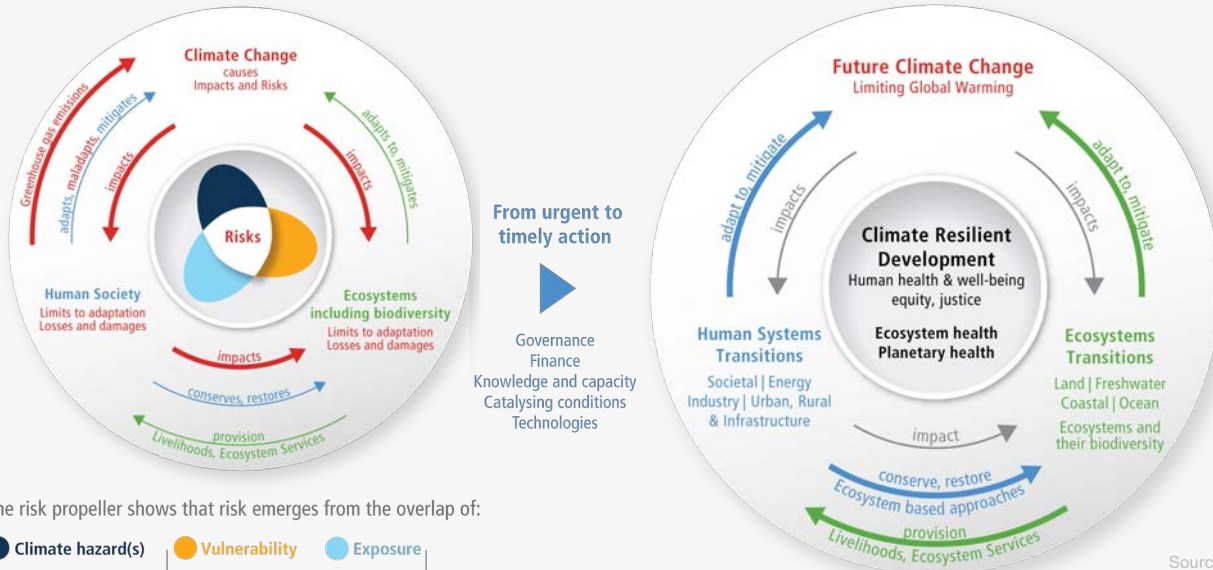


IPCC AR6 SYR Figure SPM.2c

„... the WGII view of the world“

From current imbalance ...

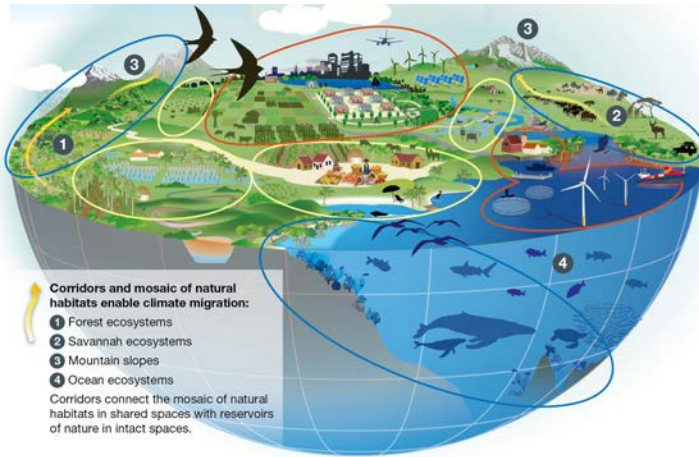
...towards a sustainable future?



The risk propeller shows that risk emerges from the overlap of:



Integrate protection and adaptation responses of ecosystems and their contribution to mitigate for climate resilient development

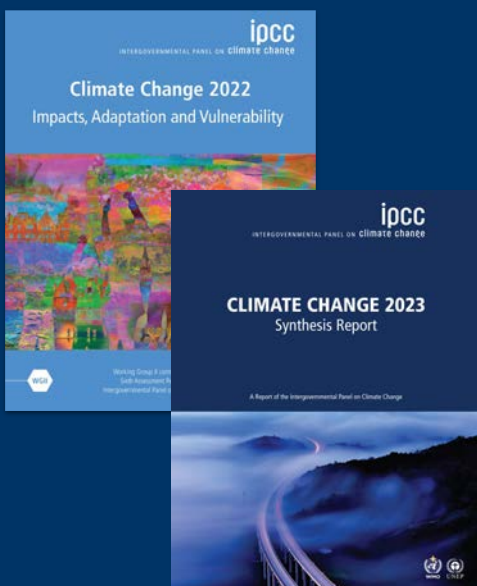


IPBES-IPCC: Co-Sponsored Workshop on Biodiversity and Climate Change

Quantify effective and ecosystem-specific needs

Establish Mosaic- Land-, Ocean- and Freshwater-‘scapes’

Effective and socially just protection measures to restore 30-20% of Land-, Freshwater and Ocean ecosystems can help Planetary Health including resilient ecosystem services (Nature’s contributions to people)



The science is clear.

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

IPCC AR6 reports offer solutions. However, it is getting late.