

IPCC Fourth Assessment Report

Synthesis Report

Topic 3

Projected climate change and its impacts



WMO

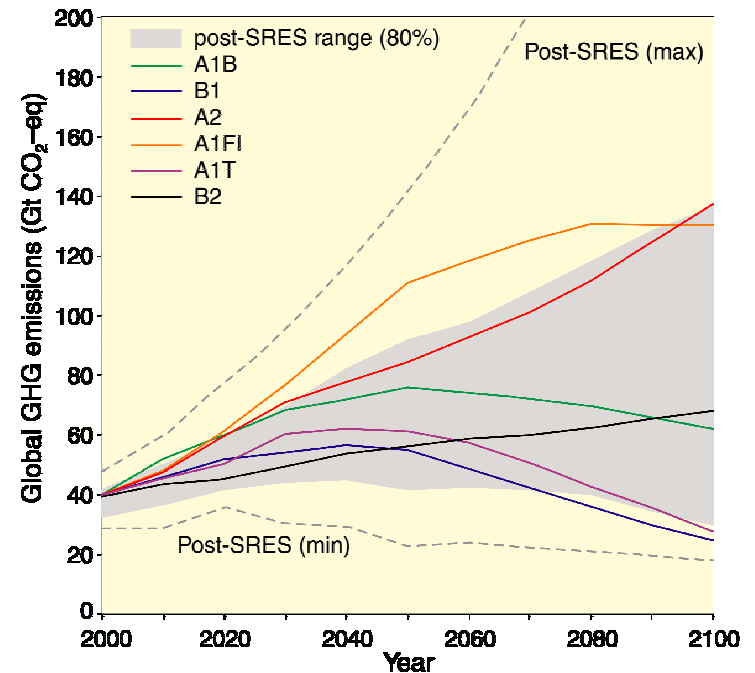
INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC)



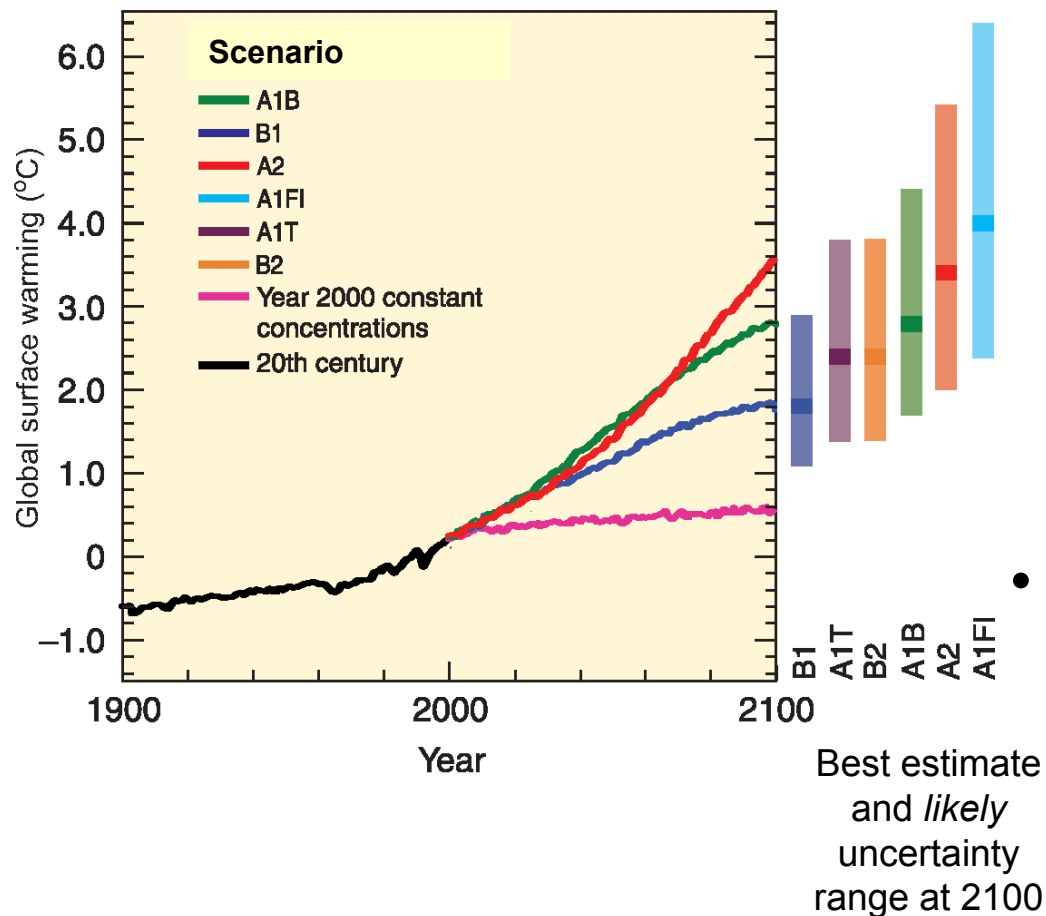
UNEP

Special Report on Emission Scenarios (SRES, 2000) and Post-SRES scenarios

- SRES emission scenarios used to make projections of 21st century changes.
- There is *high agreement* and *much evidence* that with current climate change mitigation policies and related sustainable development practices, global GHG emissions will continue to grow over the next few decades.

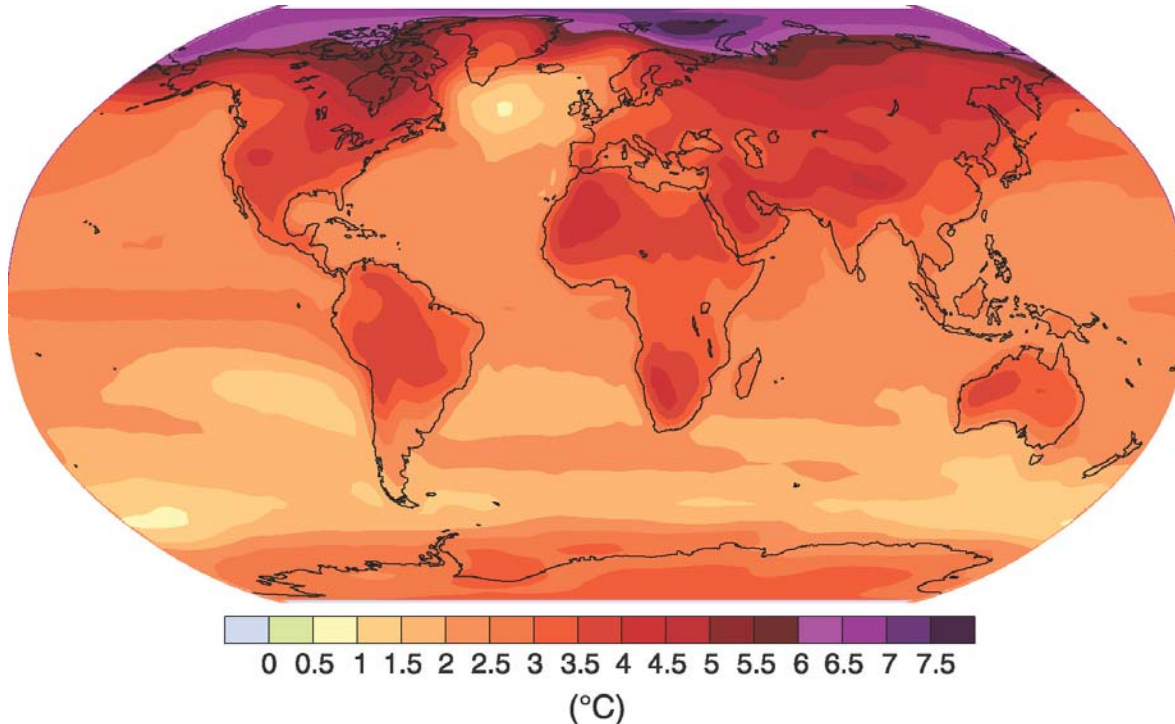


Projection of future changes in climate



- Range of projections is broadly consistent with the TAR.
 - High end of range is larger than in TAR.
 - Broader range of available models suggests stronger climate-carbon cycle feedbacks.
- Sea level rise projections for the 21st century are consistent with the TAR.
 - Uncertainty hinders making reliable estimates of the upper bound.

Warming greatest over land and at most high northern latitudes and least over Southern Ocean and parts of the North Atlantic Ocean



**Surface Warming
Pattern
A1B, 2090-2099
relative to 1980-1999**

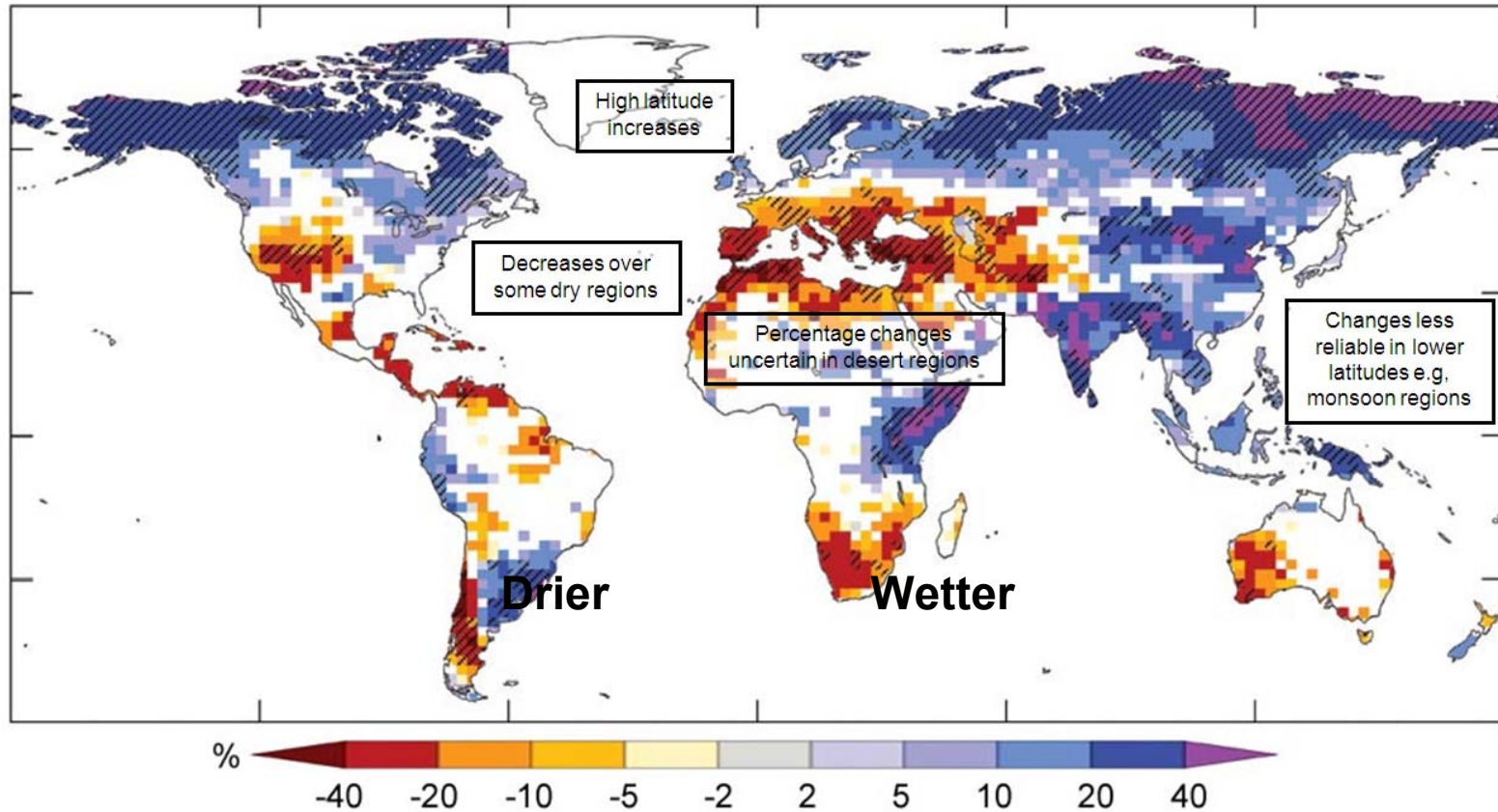
- Continuing recent observed trends in contraction of snow covered area, increases in thaw depth over most permafrost regions, and decrease in sea ice extent
- In some projections using SRES scenarios, Arctic late-summer sea ice disappears almost entirely by the latter part of the 21st century

Other examples of regional changes



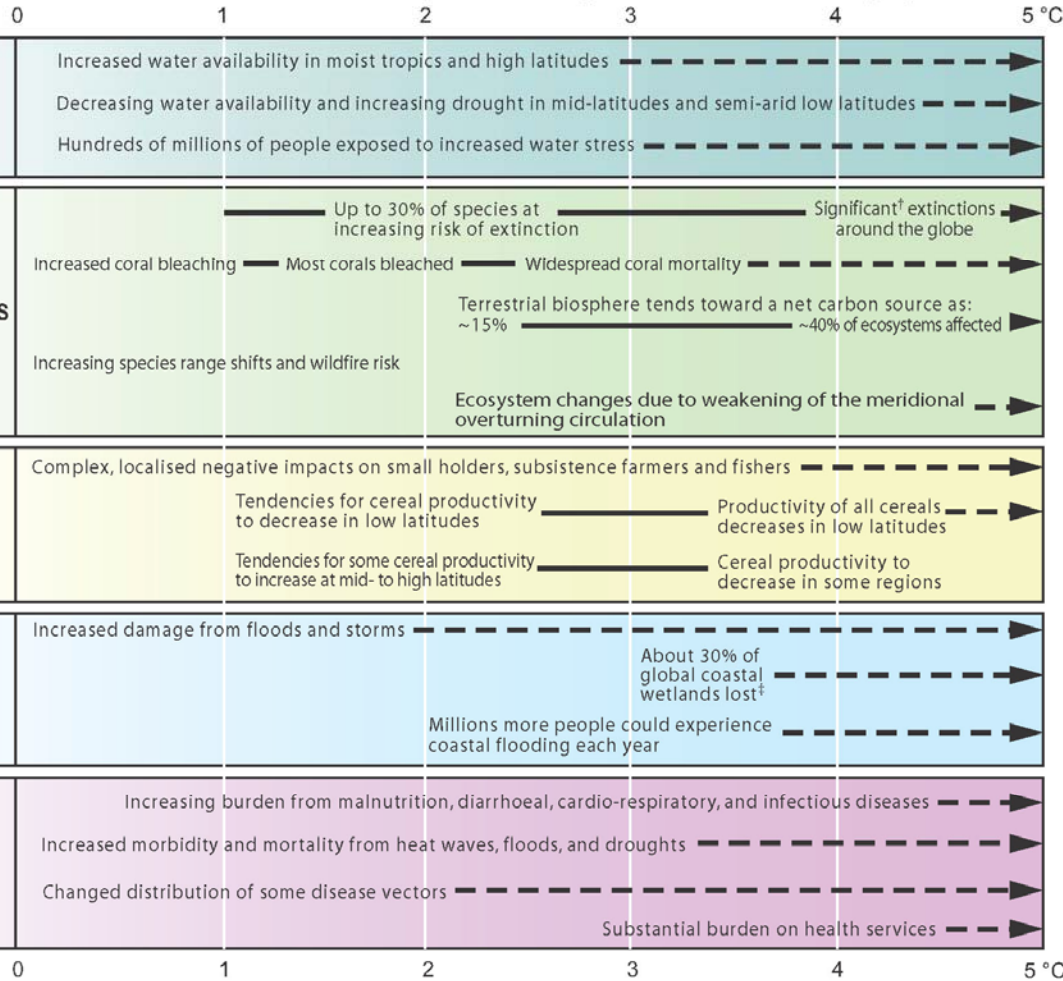
- *Very likely* increase in frequency of hot extremes, heat waves, and heavy precipitation
- *Likely* increase in tropical cyclone intensity; less confidence in global decrease of tropical cyclone numbers
- Poleward shift of extra-tropical storm tracks with consequent changes in wind, precipitation, and temperature patterns
- *Very likely* precipitation increases in high latitudes and *likely* decreases in most subtropical land regions, continuing observed recent trends

21st Century Water Availability (Runoff) Changes (Annually averaged)



- *Very likely* runoff will increase in high latitudes.
- *Likely* runoff will decrease over some subtropical and tropical regions.

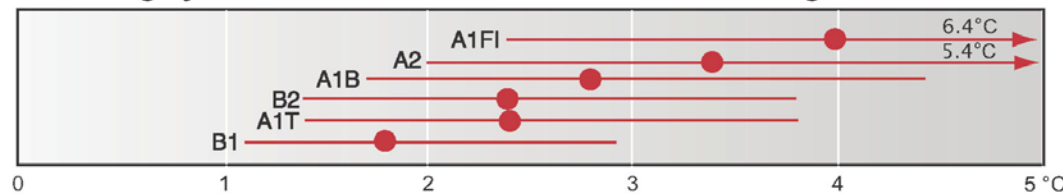
Global mean annual temperature change relative to 1980-1999 (°C)



[†]Significant is defined here as more than 40%. [‡]Based on average rate of sea level rise of 4.2 mm/year from 2000 to 2080.

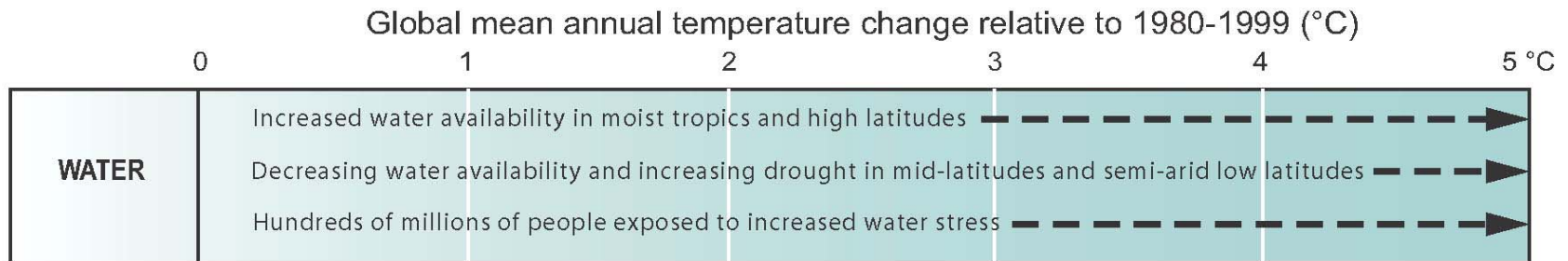
More systematic understanding of the timing and magnitude of impacts related to differing amounts and rates of climate change.

Warming by 2090-2099 relative to 1980-1999 for non-mitigation scenarios

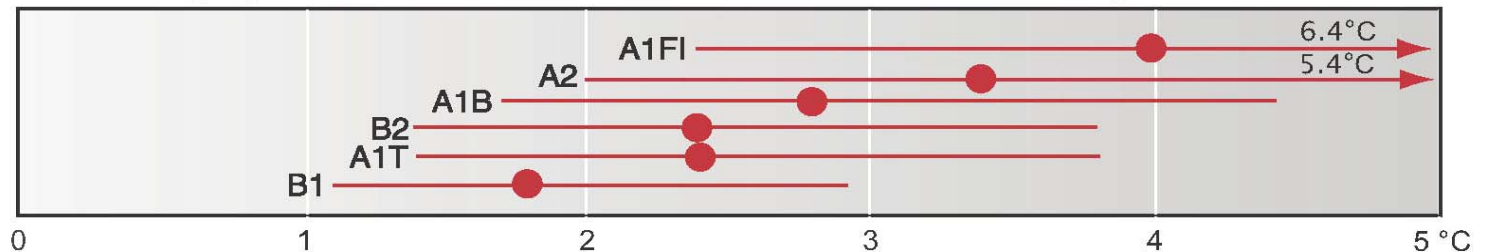


Water

There is high confidence that hundreds of millions of people will be exposed to increased water stress

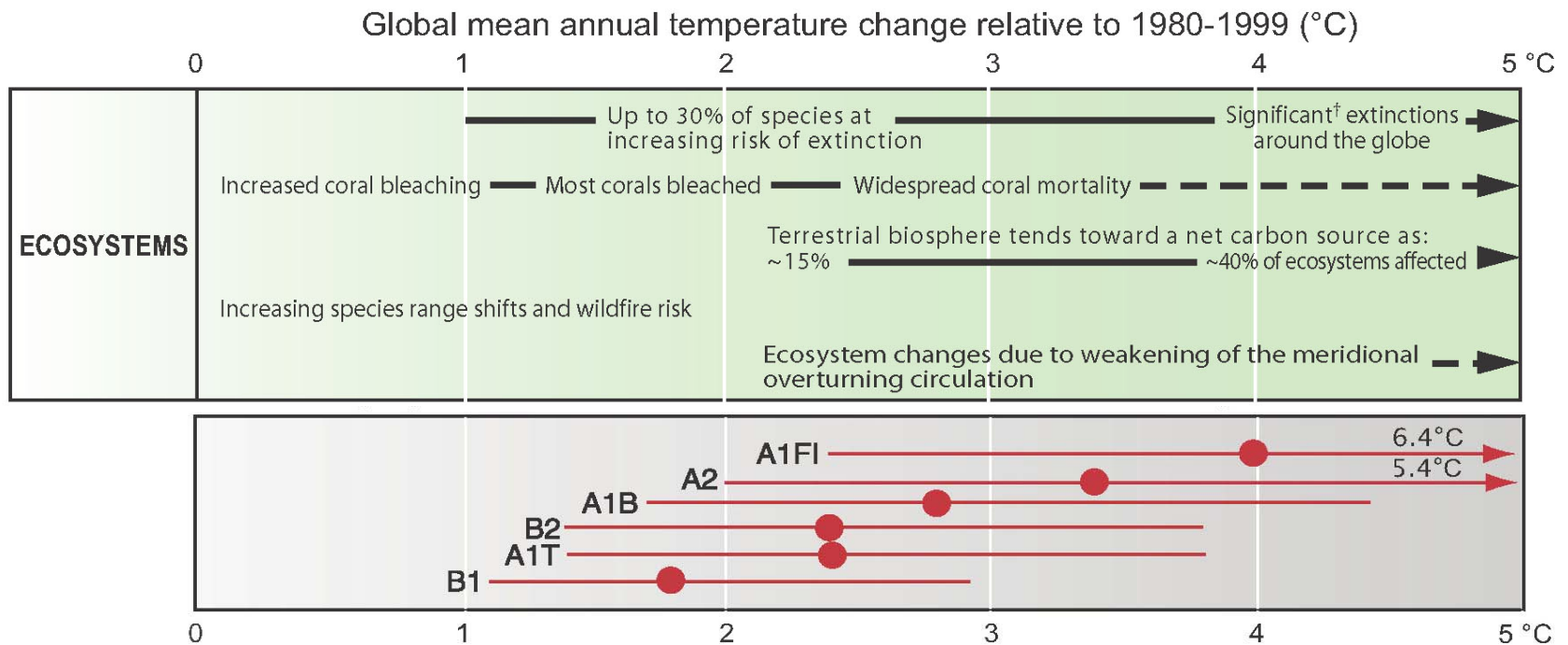


Warming by 2090-2099 relative to 1980-1999 for non-mitigation scenarios



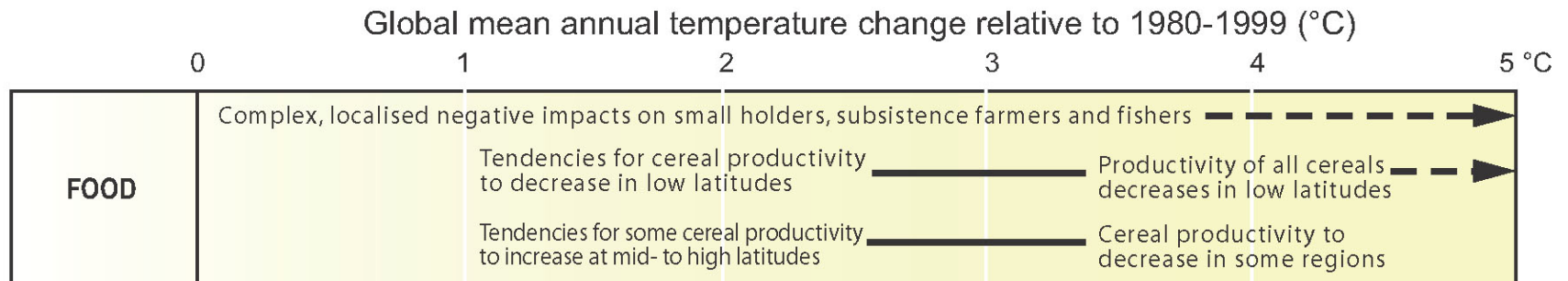
Ecosystems

There is high confidence that many species are at increasing risk of extinction with increasing temperature.

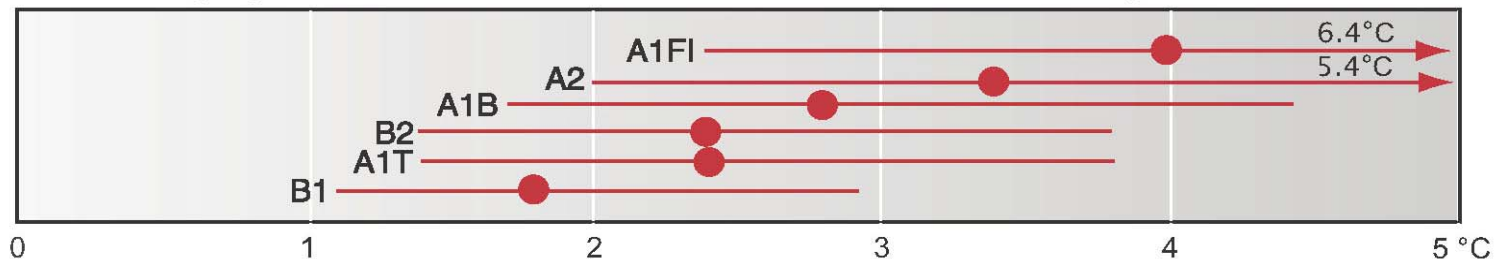


Food

Globally food production is projected to increase at local temperature increases of 1-3 °C; decreases projected above (medium confidence).



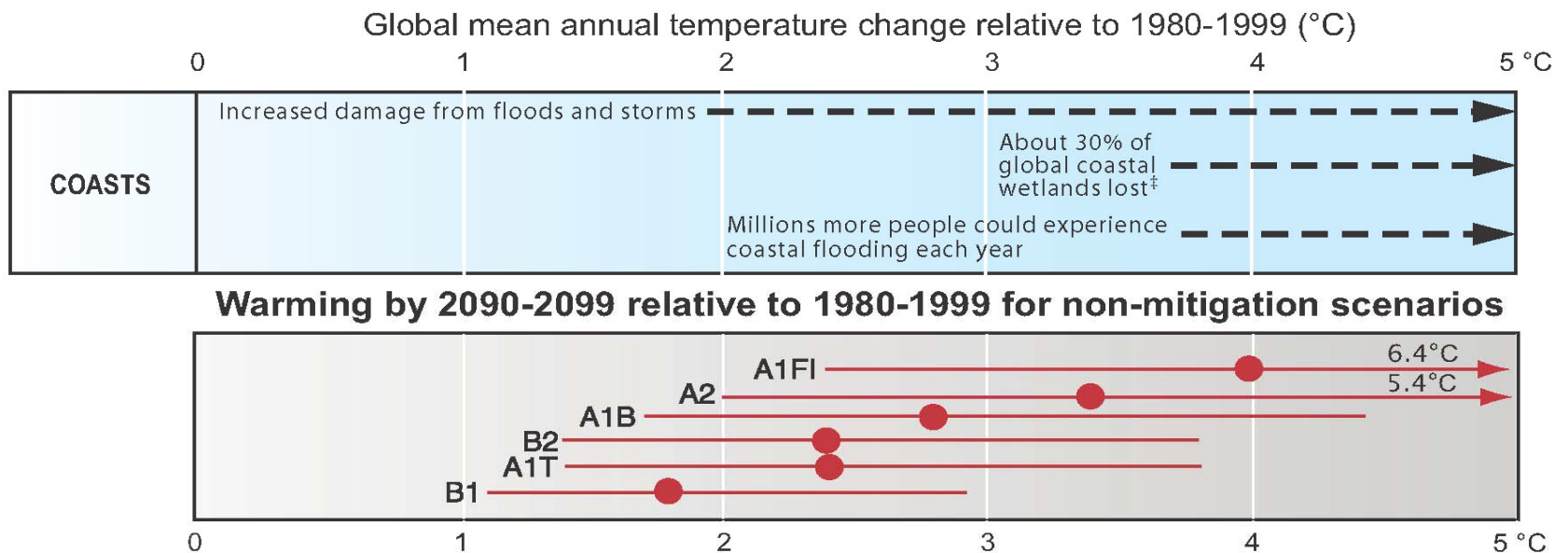
Warming by 2090-2099 relative to 1980-1999 for non-mitigation scenarios



Coasts

There is high confidence that millions of people could experience more coastal flooding if global temperature increases more than 2C in this century.

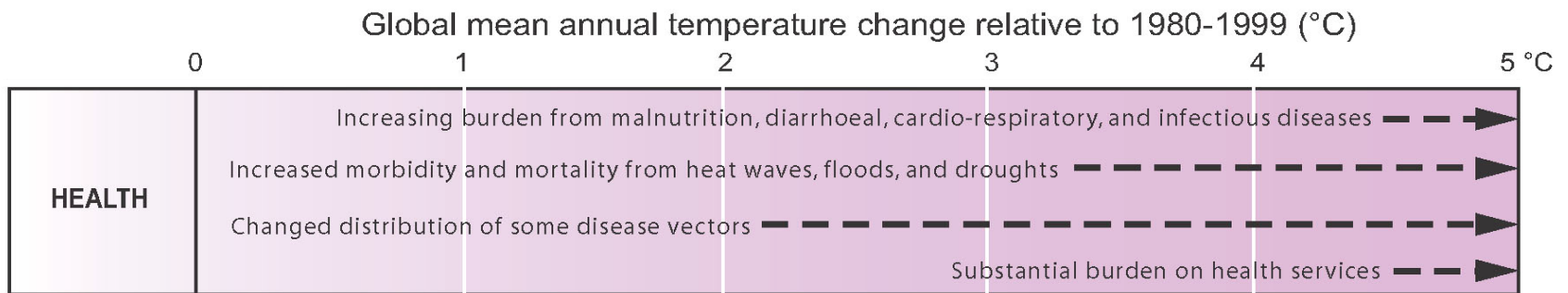
Sea level has very long times and will continue to rise for centuries after stabilization of GHG.



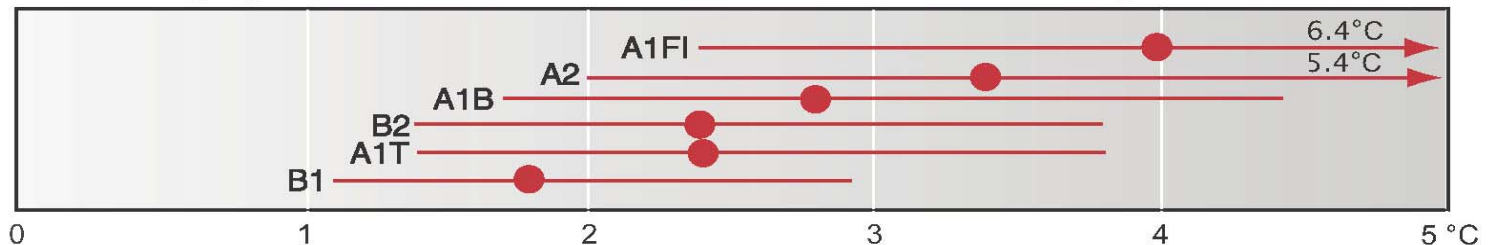
Health

The health status of millions of people is projected to be affected through, for example:


- Increases in malnutrition
- Increased deaths, diseases and injury due to extreme weather events
- Increased burden of diarrhoeal diseases
- Increased frequency of cardio-respiratory diseases due to changes in air quality
- Altered spatial distribution of some infectious diseases.



Warming by 2090-2099 relative to 1980-1999 for non-mitigation scenarios



Some regions are *likely* to be especially affected

- The **Arctic**, because of the impacts of high rates of projected warming on natural systems and human communities
 - **Africa**, because of low adaptive capacity and projected climate change impacts
 - **Small islands**, where there is high exposure of population and infrastructure to projected climate change impacts
 - **Asian and African megadeltas**, due to large populations and high exposure to sea level rise, storm surges and river flooding.
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Anthropogenic warming and sea level rise would continue for centuries, even if GHG concentrations were to be stabilized.

Anthropogenic warming could lead to some impacts that are abrupt or irreversible, depending upon the rate and magnitude of the climate change.



- Partial loss of ice sheets on polar land could imply meters of sea level rise, major changes in coastlines and inundation of low-lying areas, with greatest effects in river deltas and low-lying islands.
- Such changes are projected to occur over millennial time scales, but more rapid sea level rise on century time scales cannot be excluded.

Anthropogenic warming could lead to some impacts that are abrupt or irreversible



- There is *medium confidence* that approximately 20-30% of species assessed so far are *likely* to be at increased risk of extinction if increases in global average warming exceed 1.5-2.5°C (relative to 1980-1999).
- As global average temperature increase exceeds about 3.5°C, model projections suggest significant extinctions (40-70% of species assessed) around the globe.

Anthropogenic warming could lead to some impacts that are abrupt or irreversible

Ocean Circulation Conveyor Belt



The ocean plays a major role in the distribution of the planet's heat through deep sea circulation. This simplified illustration shows this "conveyor belt" circulation which is driven by differences in heat and salinity. Records of past climate suggest that there is some chance that this circulation could be altered by the changes projected in many climate models, with impacts to climate throughout lands bordering the North Atlantic.

- Based on current model simulations, the Meridional Overturning Circulation (MOC) of the Atlantic Ocean will *very likely* slow down during the 21st century; nevertheless temperatures over the Atlantic and Europe are projected to increase.
- The MOC is *very unlikely* to undergo a large abrupt transition during the 21st century.
- Longer-term MOC changes cannot be assessed with confidence.