Earth Information Day 2019

Observed changes and impacts and projected risks identified in the IPCC SRCCL and SROCC

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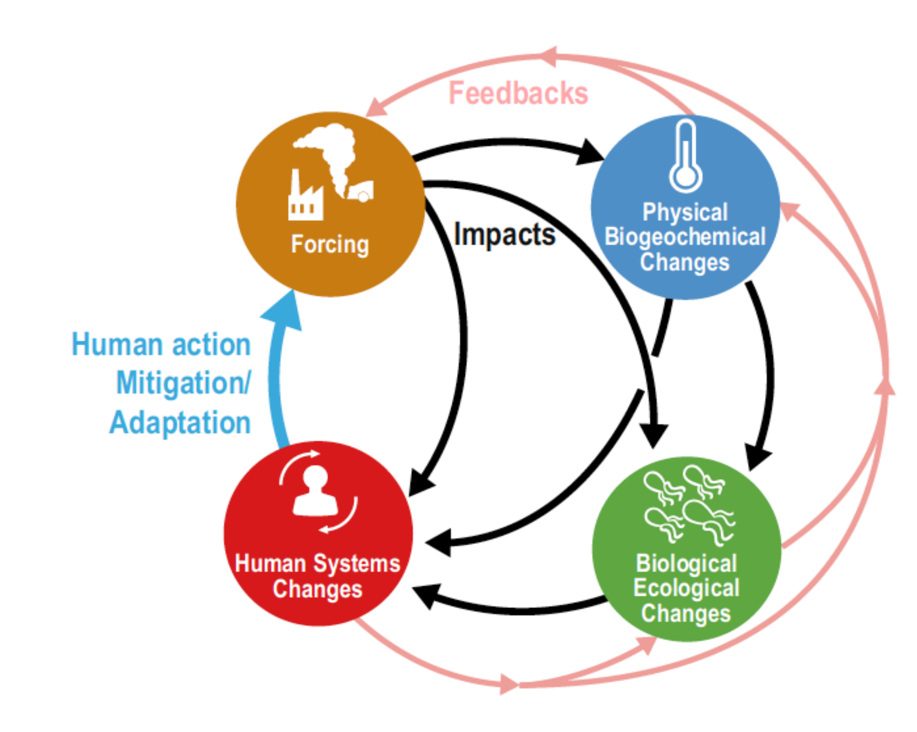
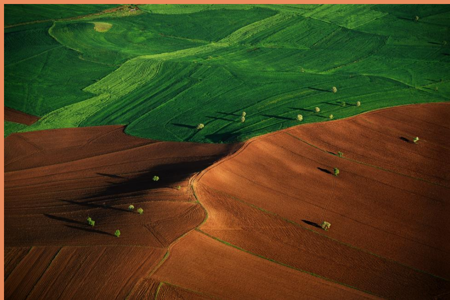
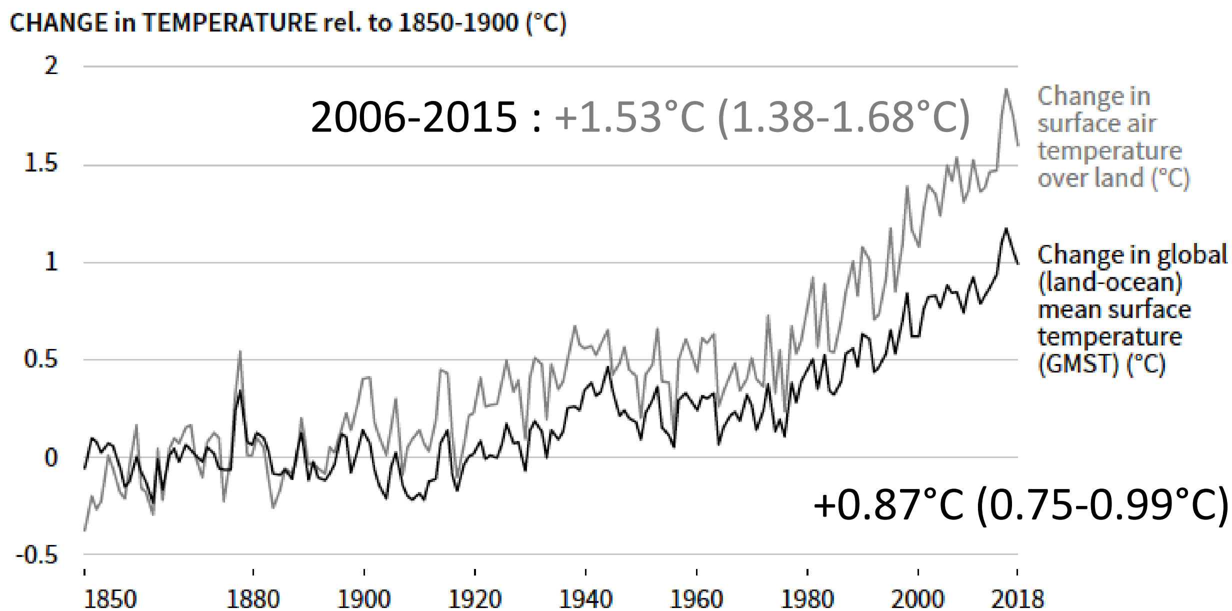
IPCC SROCC and SRCCL

- Integrated assessments of the state of knowledge
- 14 000 scientific publications
- 59 451 review comments





Land is under growing human pressure and climate change is adding to these pressures



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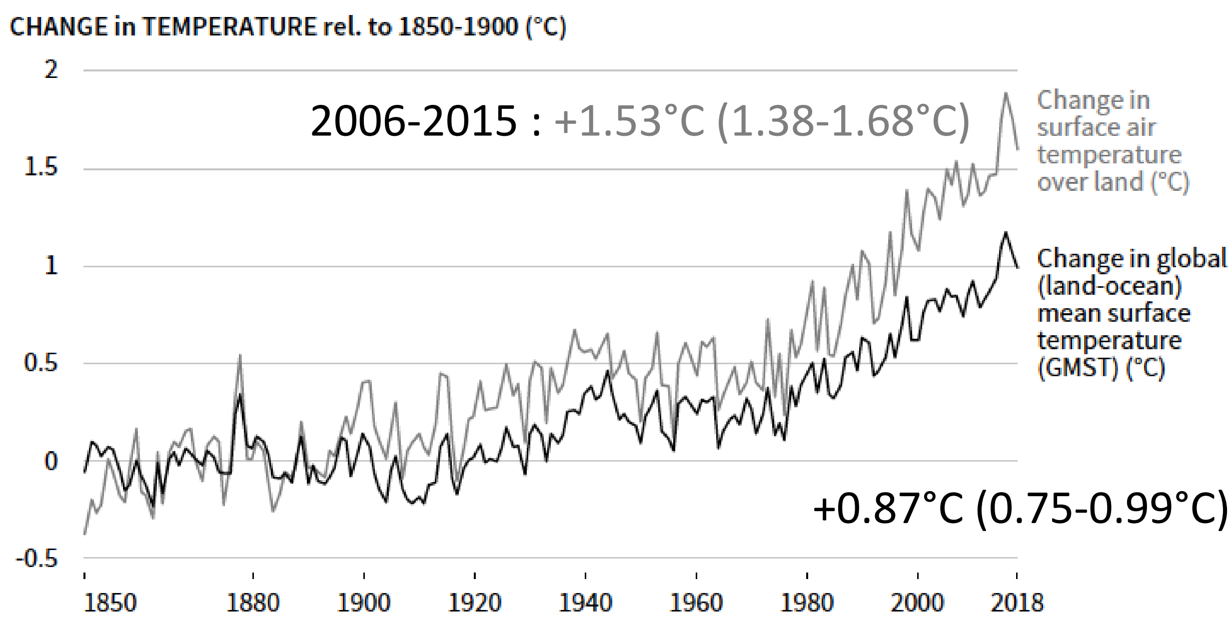
Land is under growing human pressure and climate change is adding to these pressures

- ↗ frequency, intensity and duration of heat waves
- ↗ intensity of heavy rainfall events
- ↗ frequency and intensity of drought (Mediterranean, West and NorthEast Asia, regions in South America and Africa)

Shifts of climate zones affecting many plant and animal species

Vegetation greening area > browning area

- ↗ land degradation (soil erosion, coastal erosion, permafrost thaw)
- ↗ area of drylands in drought +1% per year in average since 1961
- ↗ frequency and intensity of dust storms in many dryland areas



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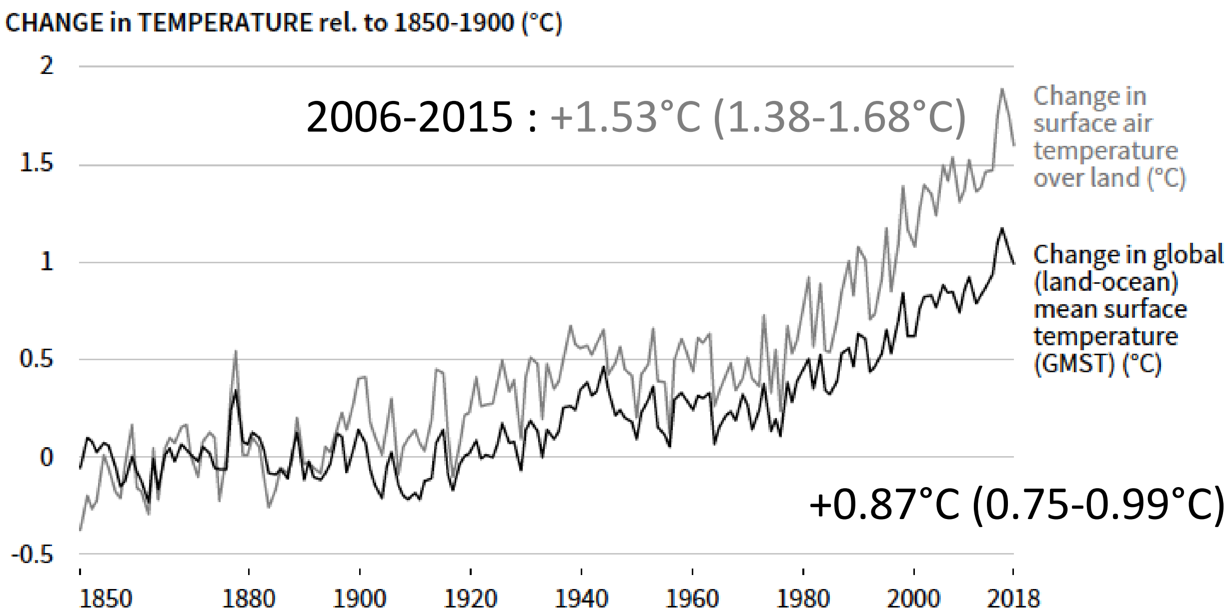

Climate change has already affected food security due to warming, changing precipitation patterns, and greater frequency of some extreme events

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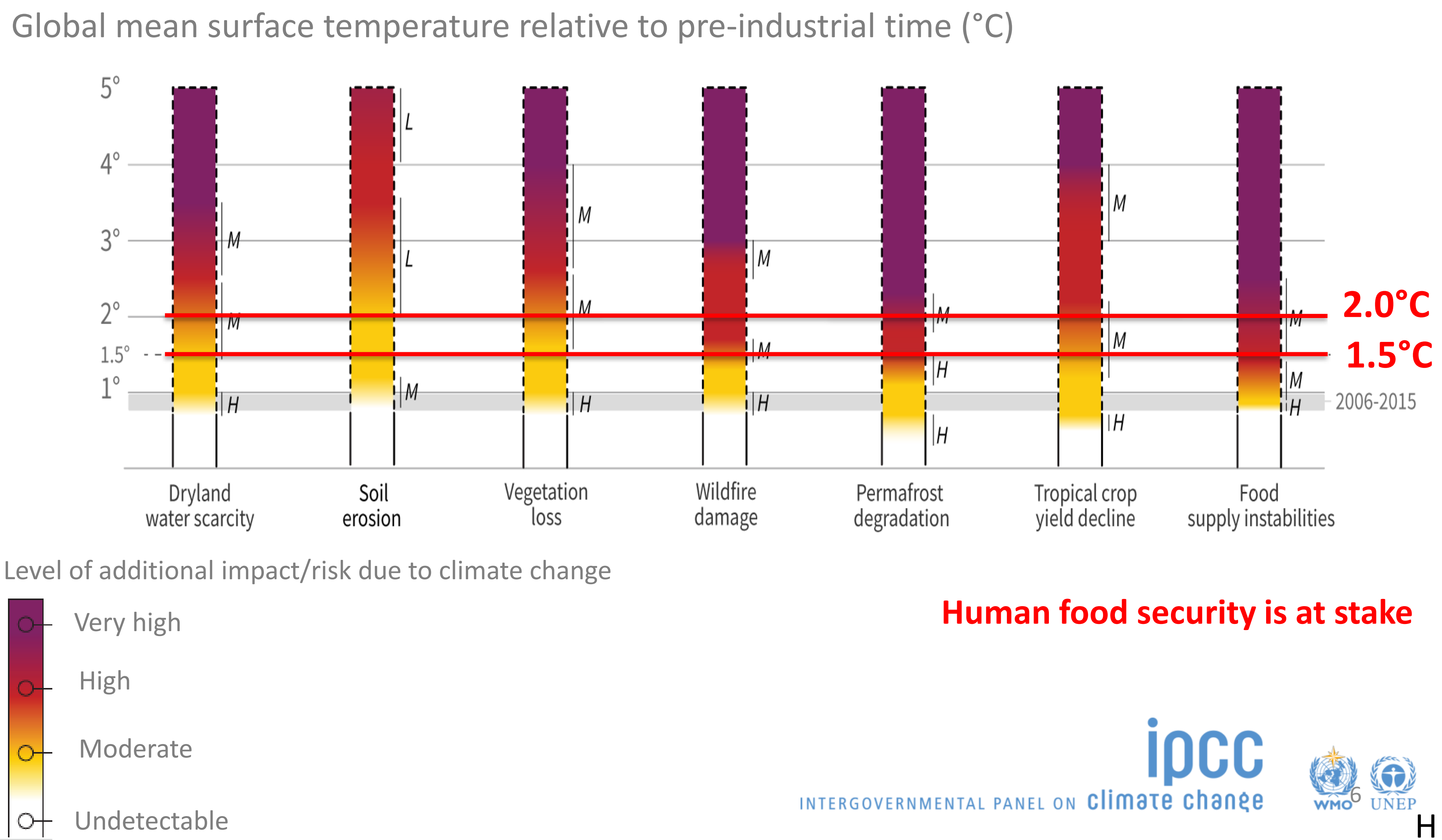
Risks to humans and ecosystems from changes in land-based processes as a result from climate change



Human food security is at stake

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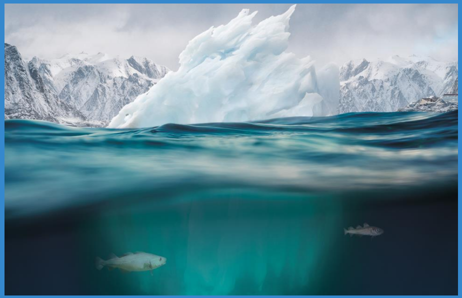
Photo: Yungdrung Tsewang



Global warming has led to widespread shrinking of the terrestrial cryosphere

2006-2015

Equivalent global sea level rise (in mm/yr)

Greenland :
0.77 ± 0.03

Antarctica :
0.45 ± 0.05

Glaciers worldwide :
0.61 ± 0.08

Global mean sea level rise
3.6 ± 0.5

- Ice sheets and glaciers worldwide have lost mass. Acceleration of ice slow is observed in the Admunsun Sea Embayment of West Antarctica and Wilkes Land, East Antarctica.
- Arctic June snow cover extent over land declined by 13.4 ± 5.4% per decade from 1967 to 2018 (2.5 million km^2)
- In high mountain areas, the depth, extent and duration of snow cover have declined over recent decades, especially at lower elevations
- Changes in snow and glaciers have changed the amount and seasonality of runoff and water resources in snow dominated and glacier-fed basins
- Permafrost temperatures increased by 0.29°C ±0.12°C from 2007 to 2016 averaged across polar and high-mountain regions, globally

Terrestrial cryosphere changes affect hazards, ecosystems and human activities

- Permafrost thaw and glacier retreat have decreased the stability of high-mountain slopes
- Cryospheric and associated hydrological changes have impacted plant and animal species and ecosystems
- The shrinking cryosphere in the Arctic and high-mountain regions had led to predominantly negative impacts on food security, water resources, water quality, livelihoods, health and well-being, infrastructure, transportation, tourism and recreation, as well as culture of human societies, particularly for indigenous peoples.
- Arctic residents have adjusted the timing of activities to respond to changes in seasonality and safety of land, ice, and snow travel conditions.

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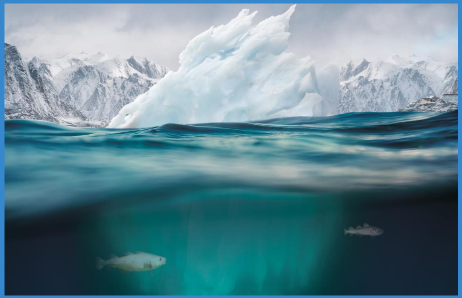
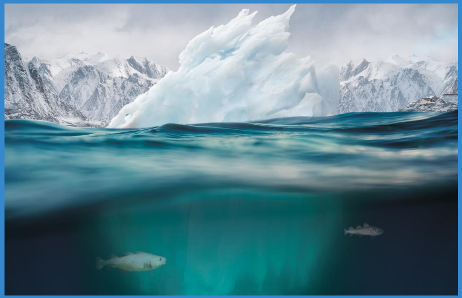


The global ocean has warmed unabated since 1970 and taken up more than 90% of the excess heat in the climate system

Increases in tropical cyclone winds and rainfall, and increase in extreme waves, combined with relative sea level rise, exacerbate extreme sea level events and coastal hazards

- Global mean sea level is rising, with acceleration in recent decades due to mass loss from the Greenland and Antarctic ice sheets, as well as continued glacier mass loss and ocean thermal expansion
- Marine heatwaves have doubled in frequency since 1982 and are increasing in intensity
- The ocean has taken up 20-30% of total anthropogenic CO_2 emissions since the 1980s. The decline in ocean pH has already emerged from background variability for > 95% of the ocean surface area.
- Surface ocean warming is enhancing density stratification and inhibiting mixing between surface and deep waters
- From 1970 to 2010, the open ocean has lost oxygen by 0.5-3.3% over the upper 1000 m.



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Global mean sea level rise (in mm/yr)

1901-1990
1.4 (0.8-2.0)

2006-2015
3.6 (3.1 -4.1)

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Photo: Mr. JK

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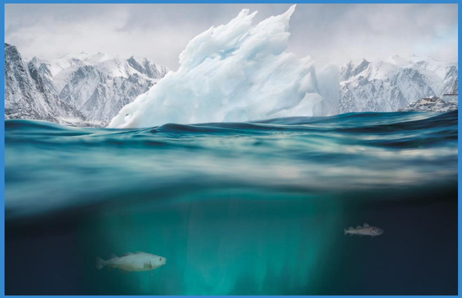


Many marine species have undergone shifts in geographical range and seasonal activities in response to climate change

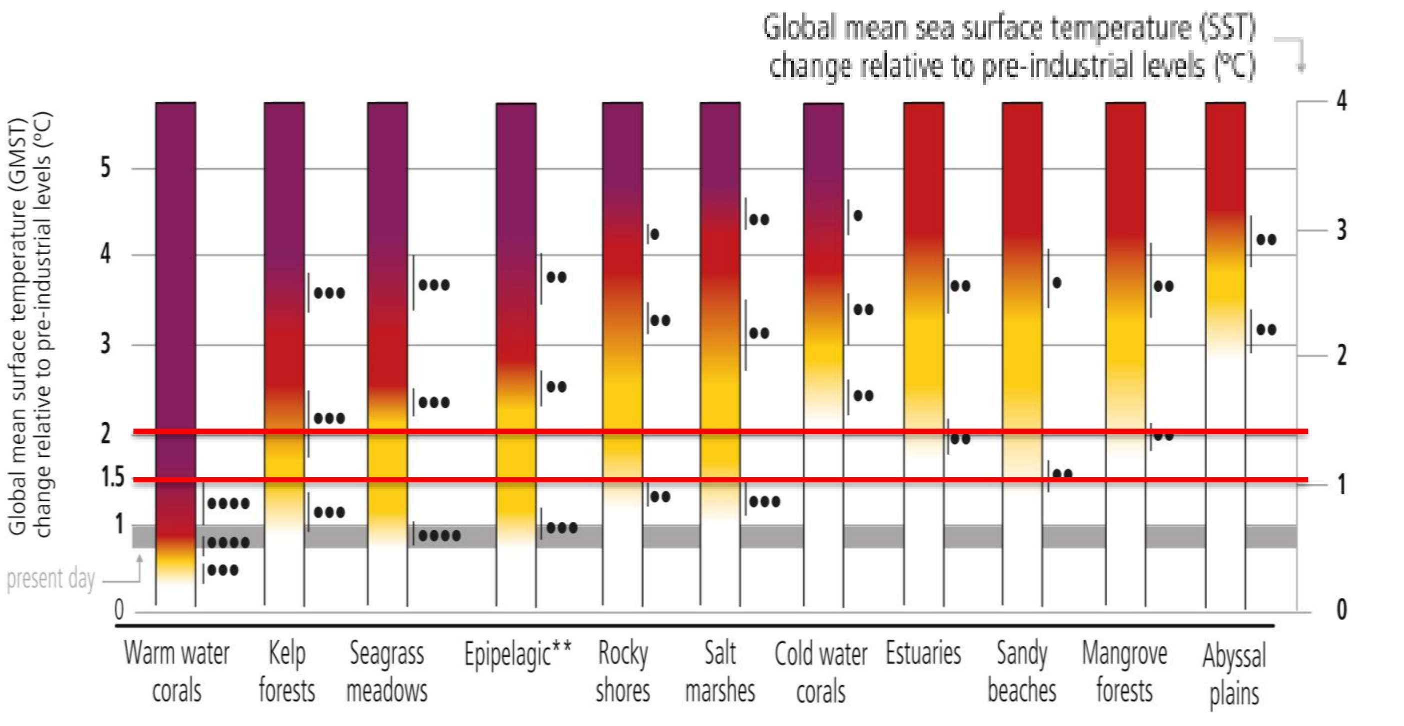
Poleward shifts since the 1950s :

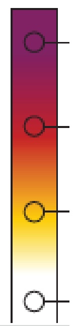
52 ± 33 km per decade (upper 200 m ecosystems)

29 ± 16 km per decade (seafloor ecosystems)

- Ocean acidification and oxygen loss are negatively impacting two of the four major upwelling systems
- Ocean warming has contributed to an overall decrease in maximum catch potential, compounding the impacts from overfishing for some fish stocks
- Coastal ecosystems are affected by ocean warming, including intensified marine heatwaves, acidification, loss of oxygen, salinity intrusion and sea level rise, in combination with adverse effects from human activities on ocean and land.
- Impacts are already observed on habitat area and biodiversity, as well as ecosystem functioning and services

Impacts and risks to ocean ecosystems from climate change





Ecosystems would benefit from ambitious mitigation

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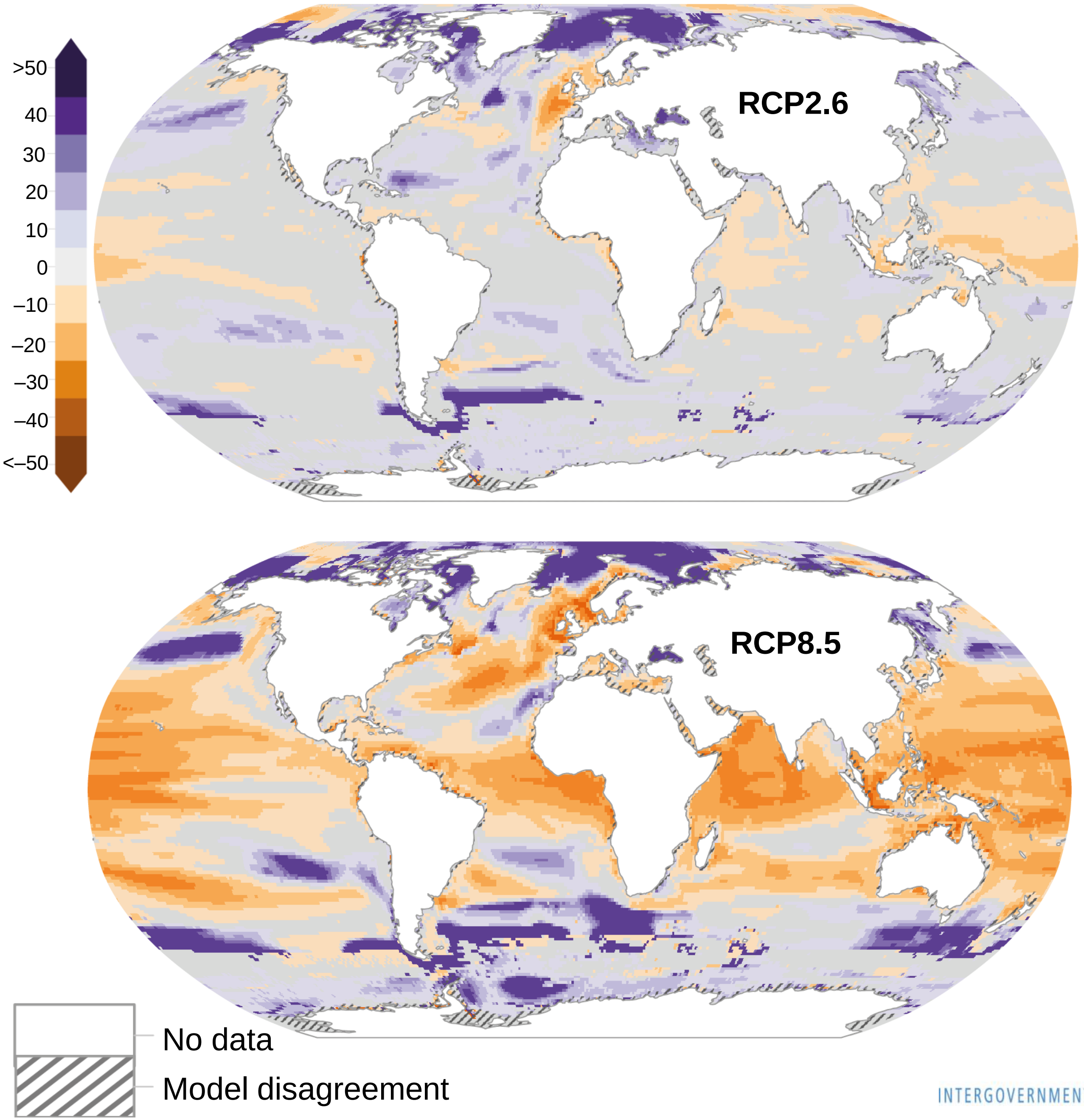
Future large scale shifts in animal biomass (including fish and invertebrates)

Percent change Average by 2081–2100, relative to 1986–2005



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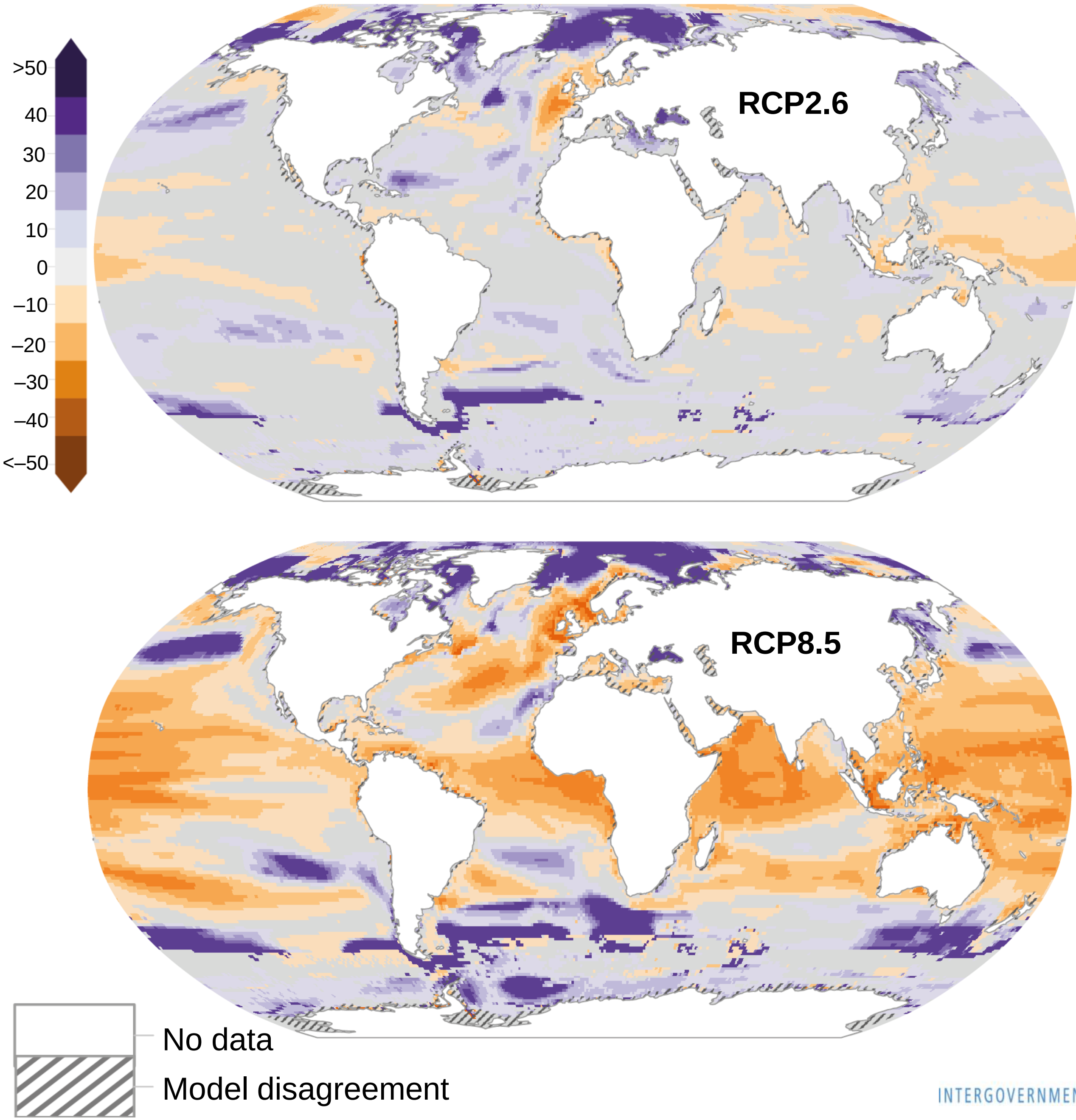

Future large scale shifts in animal biomass (including fish and invertebrates)

Conclusions (beyond SRs):

Marine (and terrestrial biodiversity tracking useful to verify modelled projections and improve forecasts of **biodiversity shifts and losses**

SR1.5, SRCCL, SROCC

Conclusions beyond SRs:

Continuous observations needed for sustainability: e.g. Essential Variables for Biology and Biodiversity, Human Food security

Monitoring successes in Ambitious mitigation, sustainable land and ocean management, supporting **biodiversity conservation** and **food security for human society….**

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High returns on investments related to sustained long-term monitoring, sharing of data, information and knowledge, and early warning systems :

- land use including land degradation and desertification
- context-specific ocean and cryosphere monitoring
- biodiversity monitoring
- improved context-specific forecasts (e.g. ENSO, marine heat waves, tropical cyclones)
- risk reduction, managing losses and adverse impacts
- new information and communication technologies