

Ocean changes, marine ecosystems and dependent communities

UNFCCC Art. 2:

.....prevent dangerous anthropogenic interference....

.....allow **ecosystems to adapt** naturally...

.....ensure **that food production** is not threatened...

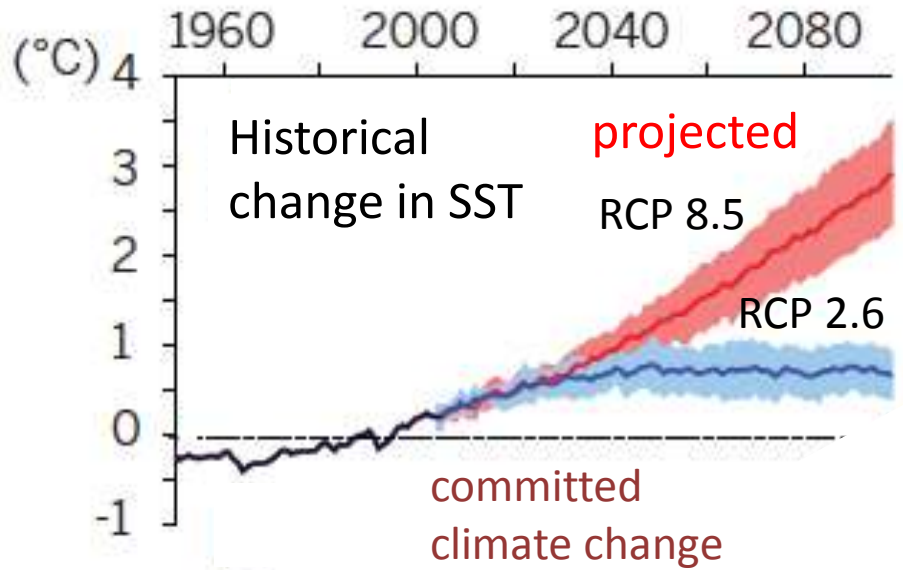
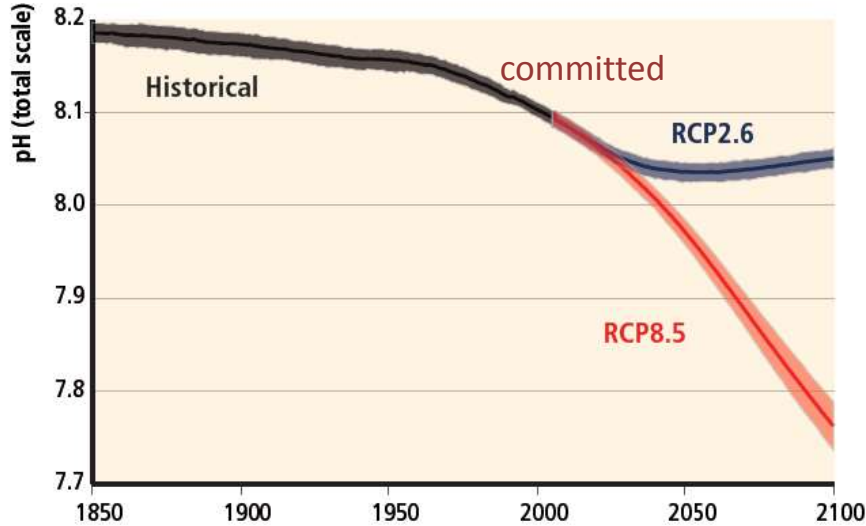
.....enable **economic development to proceed** in a sustainable manner

Hans-O. Pörtner: Co-Chair WGII AR6
AR5: CLA WGII CH. 6, Ocean Systems,
Ocean products in TS and SPM, CC-Boxes, SYR, SED

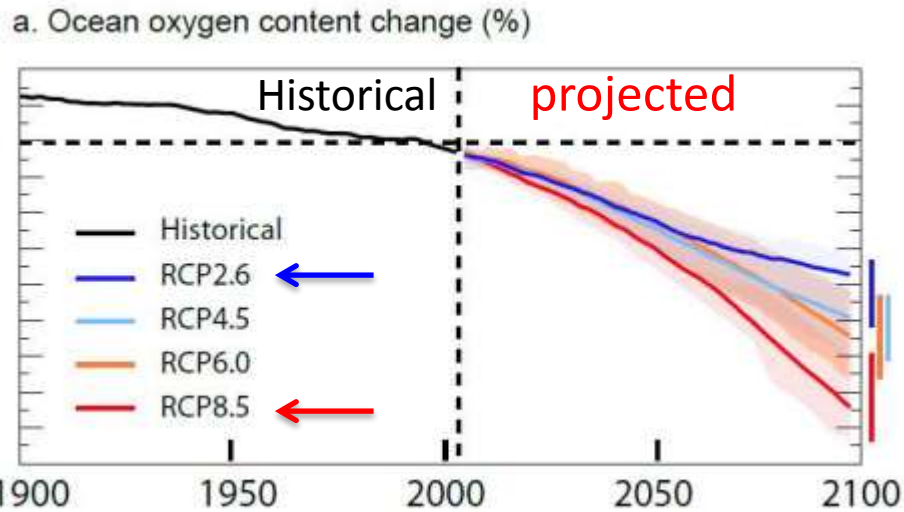
According to emission scenarios oceans are: **... warming**

...acidifying

Historical → Projections



... losing oxygen



CMIP5 model runs



WGI Figure 6.30



Gattuso et al., 2015

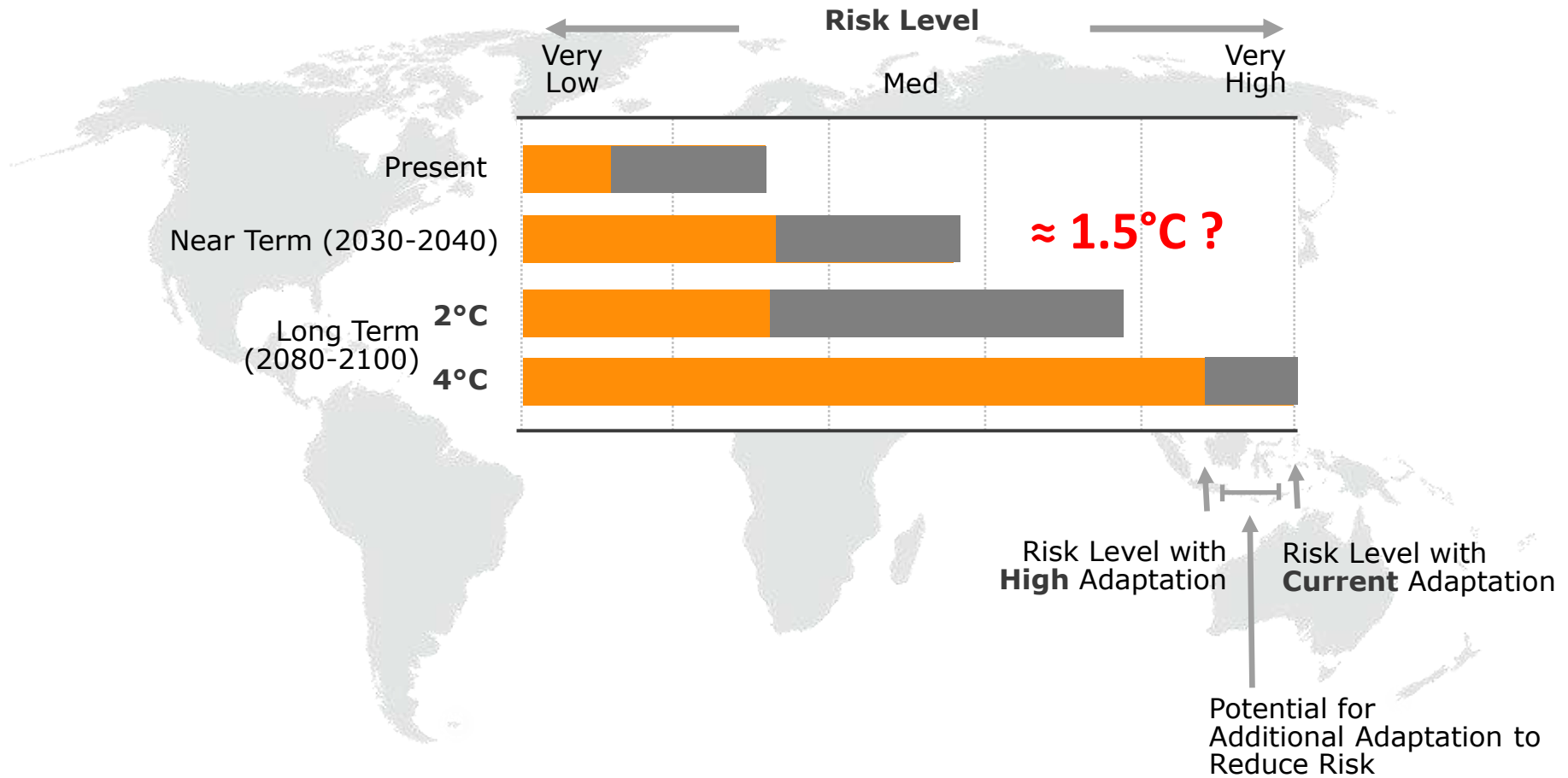
Climate change....causing risks

...which were assessed in AR5, with open questions for AR6:

1.5°C not fully covered and compared

(key risks are those relevant to article 2, UNFCCC:

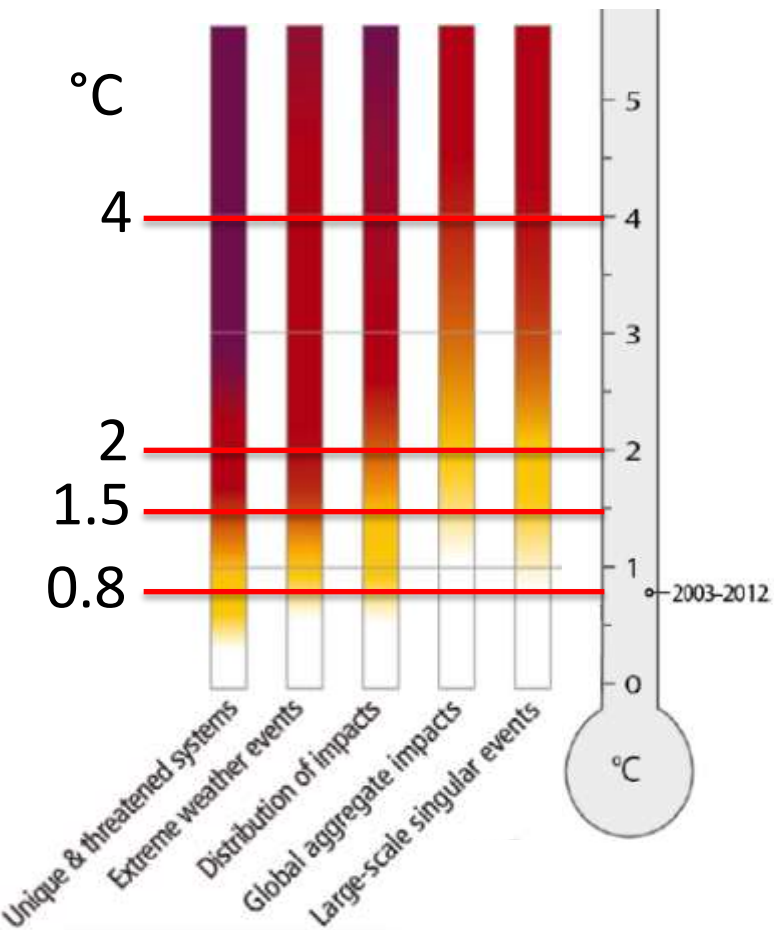
“avoid dangerous anthropogenic interference with the climate system”)



.... complemented by Potential for Mitigation to Reduce Risk

LTGG

How to widely compare climate impacts?



Risk assessment IPCC WGII:

A role for natural marine systems to guide the setting of **long-term global goals** (LTGG, relative to preindustrial), considering levels of **risk for vulnerable systems**

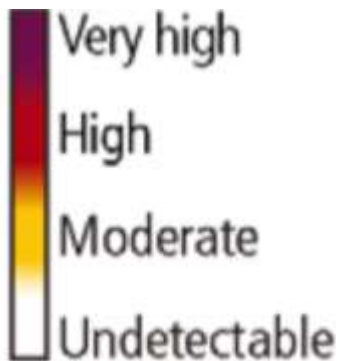
LTGG

4°C

2°C

1.5°C

0.8°C



Level of additional risk due to climate change

...comparing LTGGs, identifying... **Key risks of impacts** Risks to be avoided

IPCC WGII

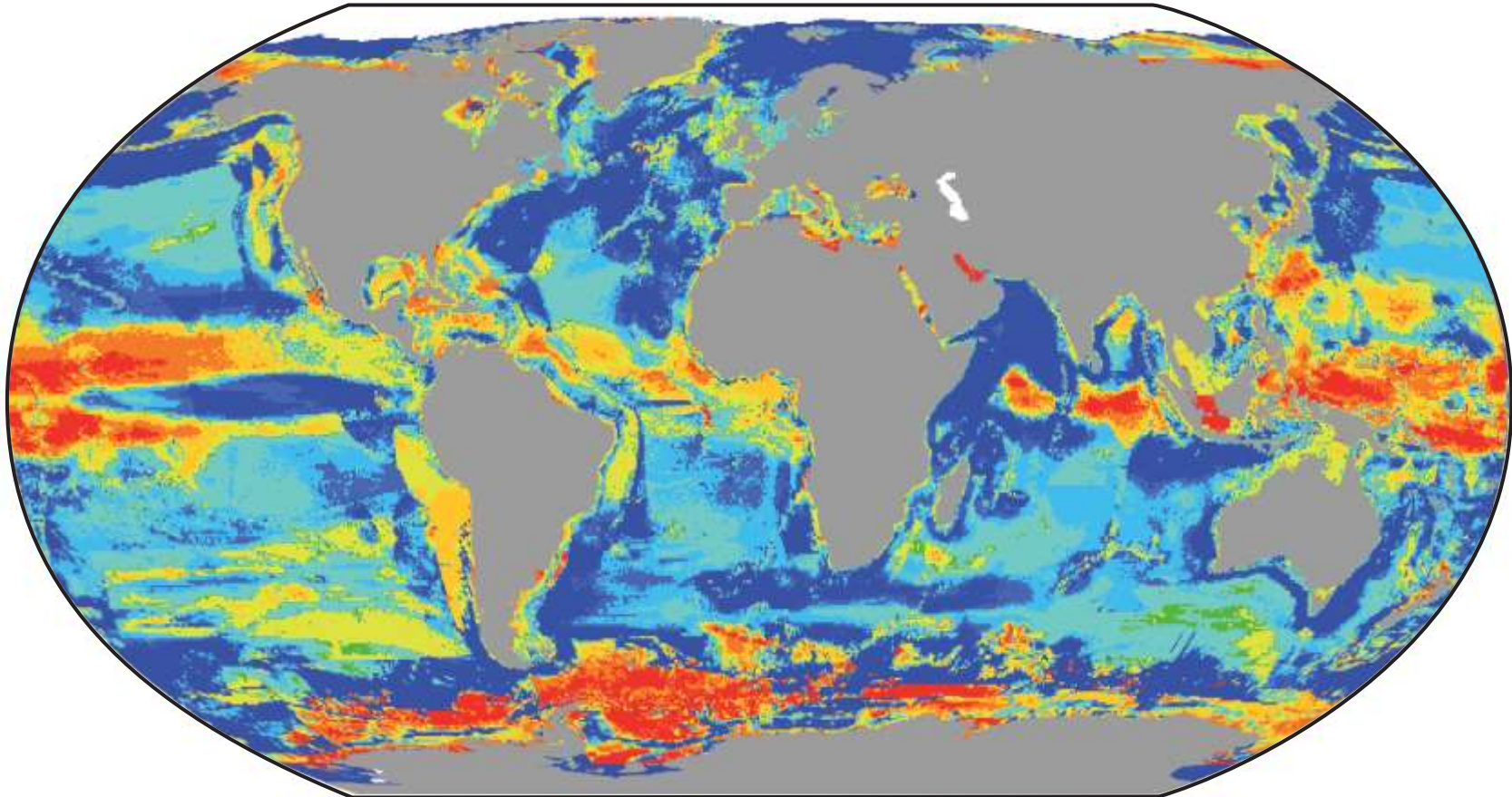
Unabated Ocean Warming by 2050

Projections

2°C

2051-60: fish and invertebrate biomass and diversity displaced and reduced at low latitudes

CHANGE IN MAXIMUM CATCH POTENTIAL (2051-2060 COMPARED TO 2001-2010, SRES A1B, 2°C warming of global surface T
0.7°C warmer Sea Surface T)



Key risk

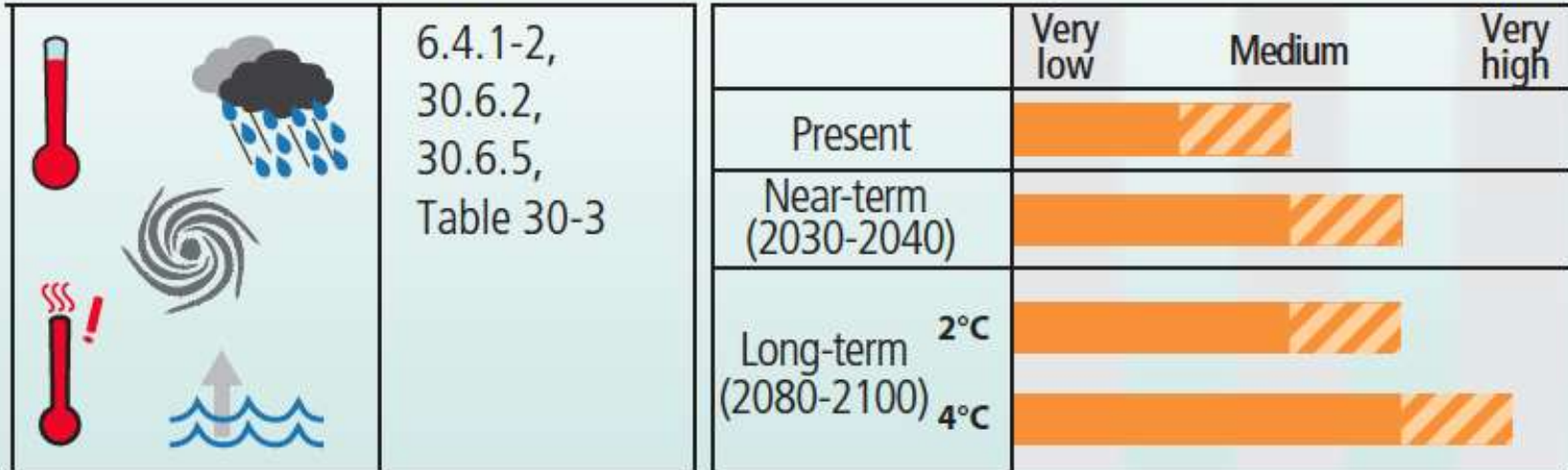
Adaptation issues and prospects

Risks to fisheries

Temperature driven stock displacement

Reduced livelihoods and increased poverty
(*medium confidence*)

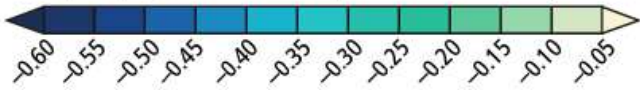
Human adaptation options involve the **large scale relocation of industrial fishing activities** following the regional decreases (low latitude) versus increases (high latitude) in catch potential and shifts in biodiversity. **Artisanal local fisheries are extremely limited in their adaptation options** by available financial resources and technical capacities, except for their potential shift to other target species.



Unabated Ocean acidification affecting mollusk and crustacean fisheries, and coastal protection by coral reefs

>>2 °C

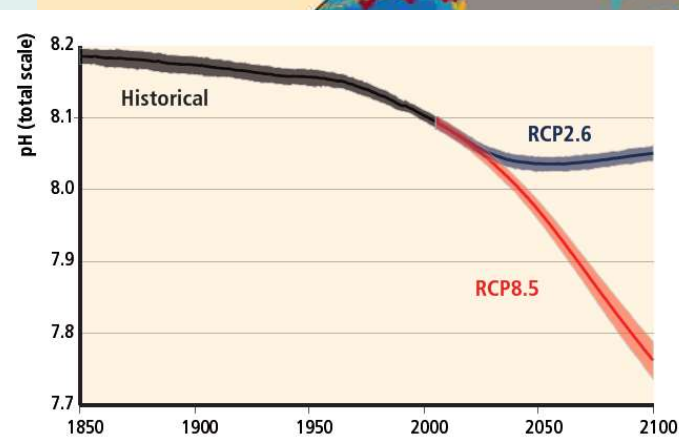
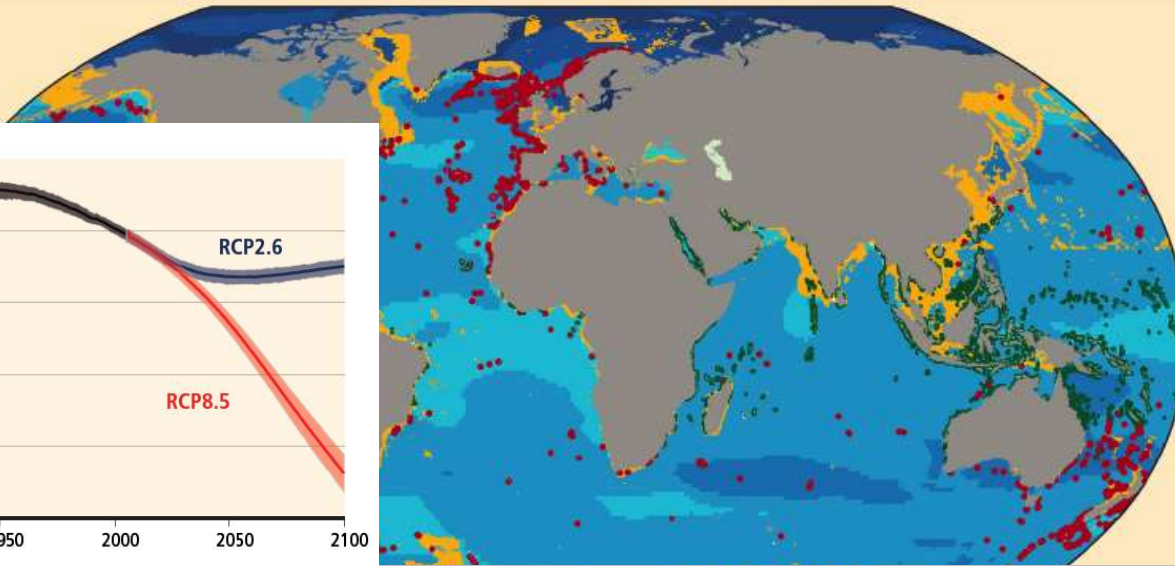
Change in pH (2081-2100 compared to 1986-2005, RCP8.5)



Mollusk and crustacean fisheries
(present-day annual catch rate ≥ 0.005 tonnes km⁻²)

Cold-water corals

Warm-water corals


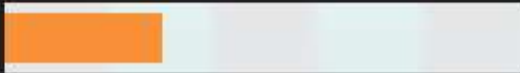





.....risks enhanced by warming extremes

Key risk	Adaptation issues and prospects
Risks to fisheries	

Ocean acidification affecting fisheries and ecosystem engineers (corals)

<p>Ocean acidification: Reduced growth and survival of commercially valuable shellfish and other calcifiers, e.g., reef building corals, calcareous red algae (<i>high confidence</i>)</p>	<p>Evidence for differential resistance and evolutionary adaptation of some species exists but is likely to be limited at higher CO₂ concentrations and temperatures reached; adaptation options include the shift to exploiting more resilient species or the protection of habitats with low natural CO₂ levels, as well as the reduction of other stresses mainly pollution and limiting pressures from tourism and fishing.</p>
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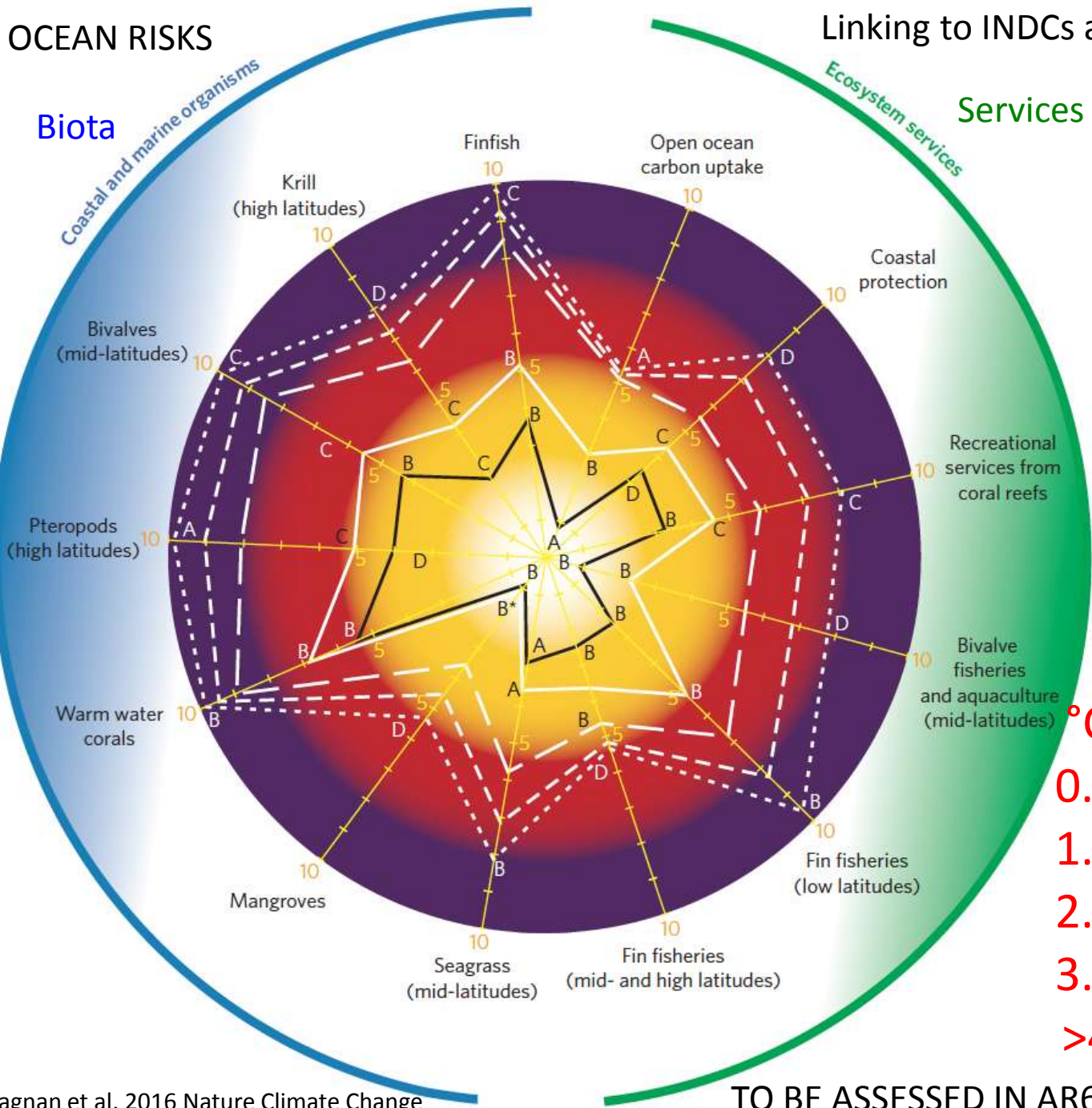
	<p>5.3.3.5, 6.1.1, 6.3.2, 6.4.1.1, 30.3.2.2, Box CC-OA</p>		Very low	Medium	Very high
		Present			
		Near-term (2030-2040)			
		Long-term (2080-2100)	2°C		
		4°C			

OCEAN RISKS

Linking to INDCs and Global Stocktake

Biota

Services



Risk of impact

Undetectable 0
 Moderate 5
 High
 Very high 10

Confidence levels for the present day and the RCPs

E Very low
 D Low
 C Medium
 B High
 A Very high

Emission scenarios

Present day
 IPCC RCP 2.6
 Climate Action Tracker 2015 estimate (+2.7 °C)
 Climate Interactive 2015 estimate (+3.5 °C)
 IPCC RCP 8.5

0.8
 1.5
 2.7
 3.5
 >4

Future Risks



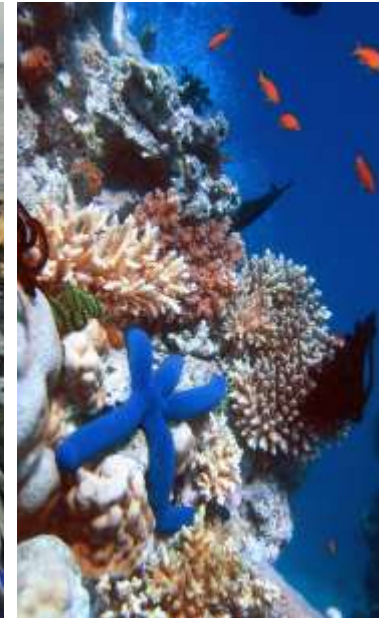
Climate change will **amplify existing risks** and create **new risks** for natural and human systems.

Risks are **unevenly distributed** and are generally **greater for disadvantaged people and communities** in countries at all levels of development.

Increasing magnitudes of warming increase the likelihood of severe, pervasive, and irreversible impacts for people, species and ecosystems.

REGIONAL ADAPTATION IS ALREADY OCCURRING

- **Ocean acidification:** Defending oyster cultures at the US Westcoast against inflow of acidified water.
- **Marine Protected Areas:** Enhancing the resilience of coral reefs and their fish stocks against warming and acidification.
- **Restoration** of Mangrove Forests



...but adaptation capacity is highest under moderate climate change

THANK YOU FOR YOUR ATTENTION!

For more information:

Website: <http://ipcc.ch/>

IPCC Secretariat: ipcc-sec@wmo.int

IPCC Press Office: ipcc-media@wmo.int

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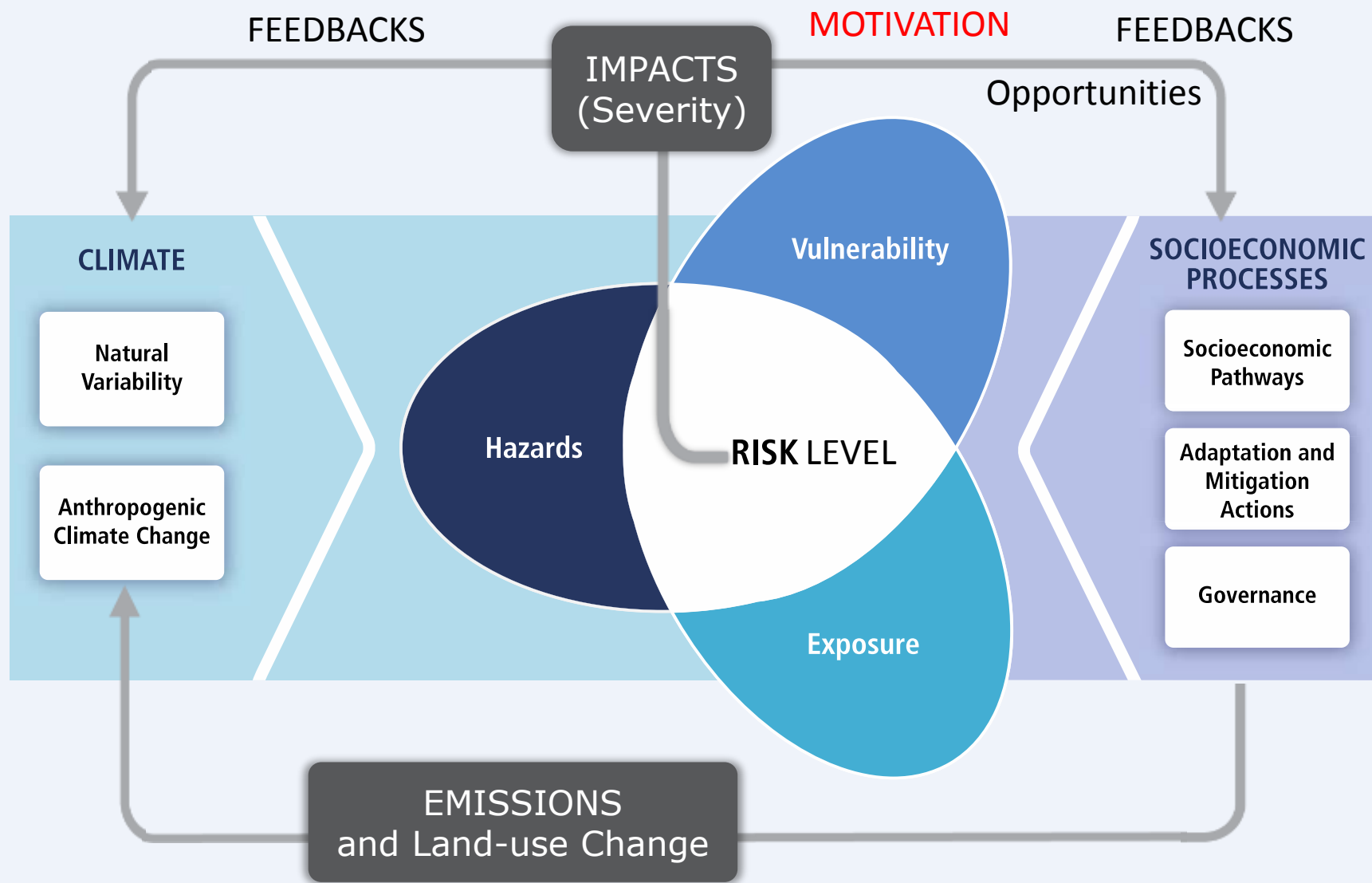
<https://vimeo.com/ipcc>

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INTERGOVERNMENTAL PANEL ON climate change



How to widely compare climate impacts (risks)?



.... the risk concept of IPCC WGII, liaising to WGI and WGIII approaches
.... linking to Article 2, UNFCCC