Key messages from the AR5 WGII with focus on Saudi Arabia and the region

---validating the Paris agreement---

Hans-O. Pörtner

Co-chair IPCC WGII: Impacts, adaptation and vulnerability

Paris Agreement: “aims to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty”... “**pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels**”… “**increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience**”.

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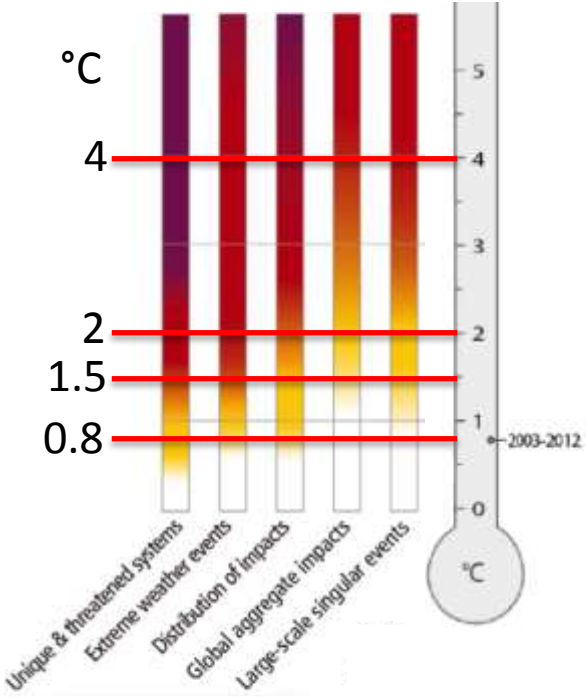
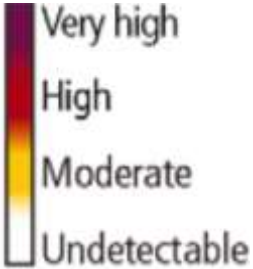
LTGG Risk assessment IPCC WGII: How to widely compare climate impacts?





Level of additional risk due to climate change

A **role for natural and human systems and their interdependencies** .....to guide and validate the setting of **long-term global goals** (LTGG, relative to preindustrial), considering levels of **risk**

LTGG

4°C
2°C
1.5°C
0.8°C

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

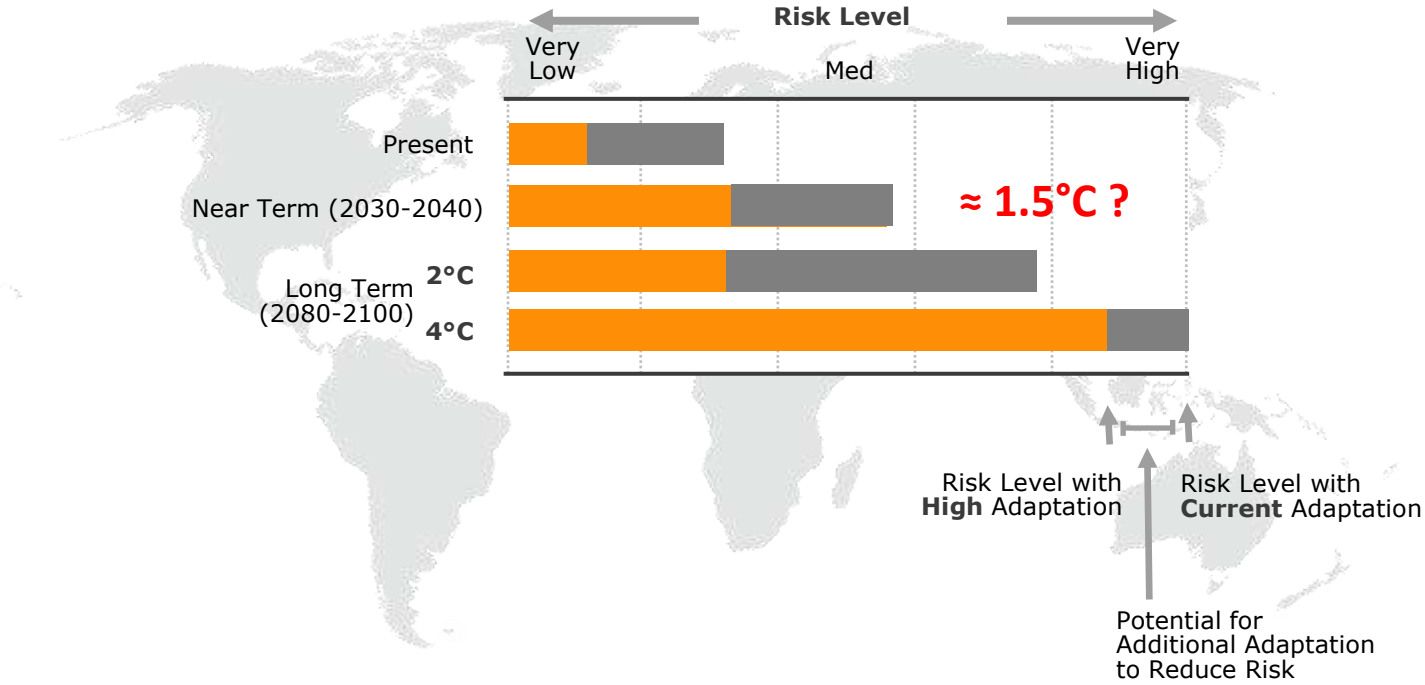
Climate change….causing risks

….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")

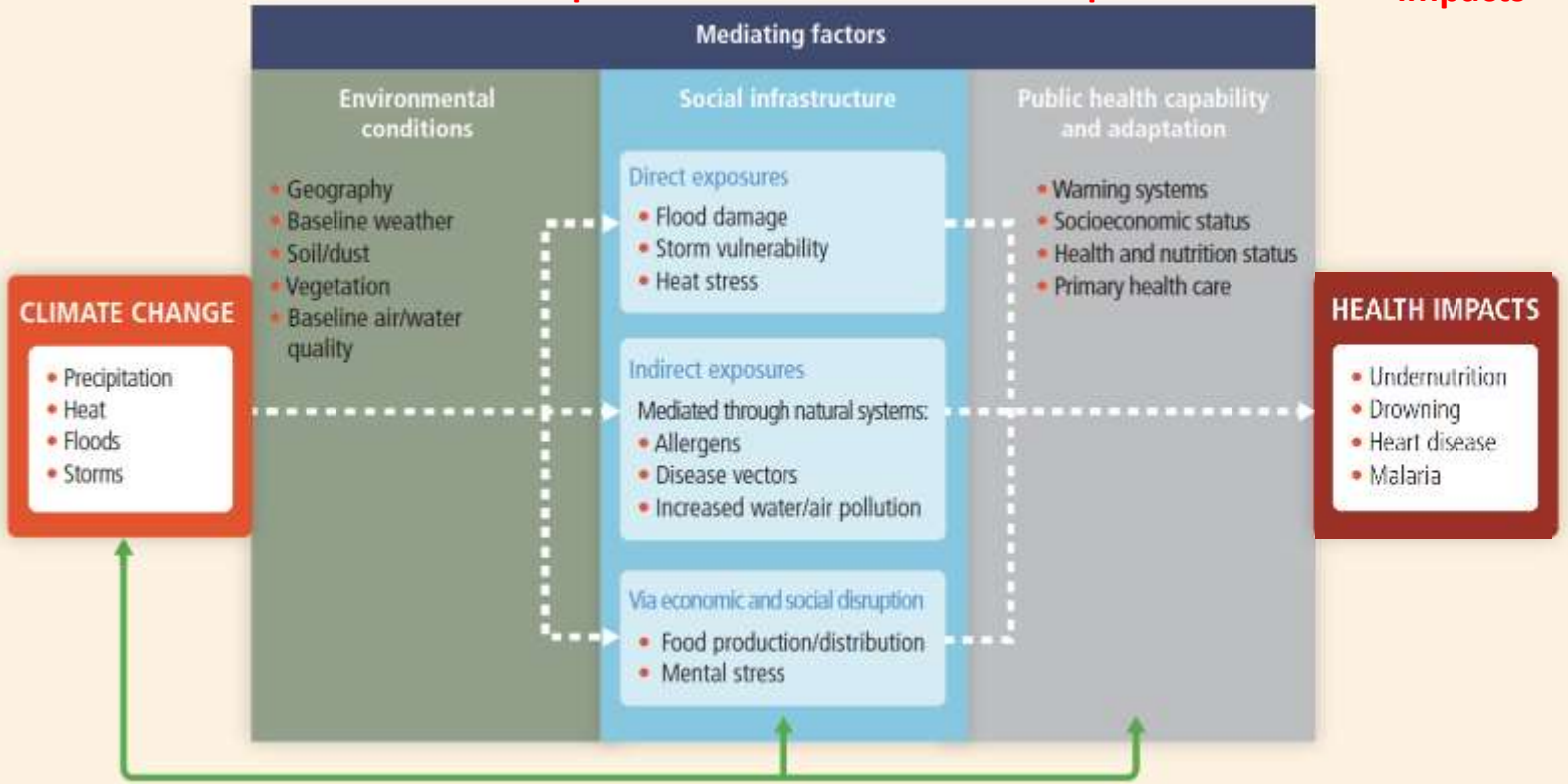


…. should be complemented by Potential for Mitigation to Reduce Risk

Climate-related health risks already exist

+0.8°C

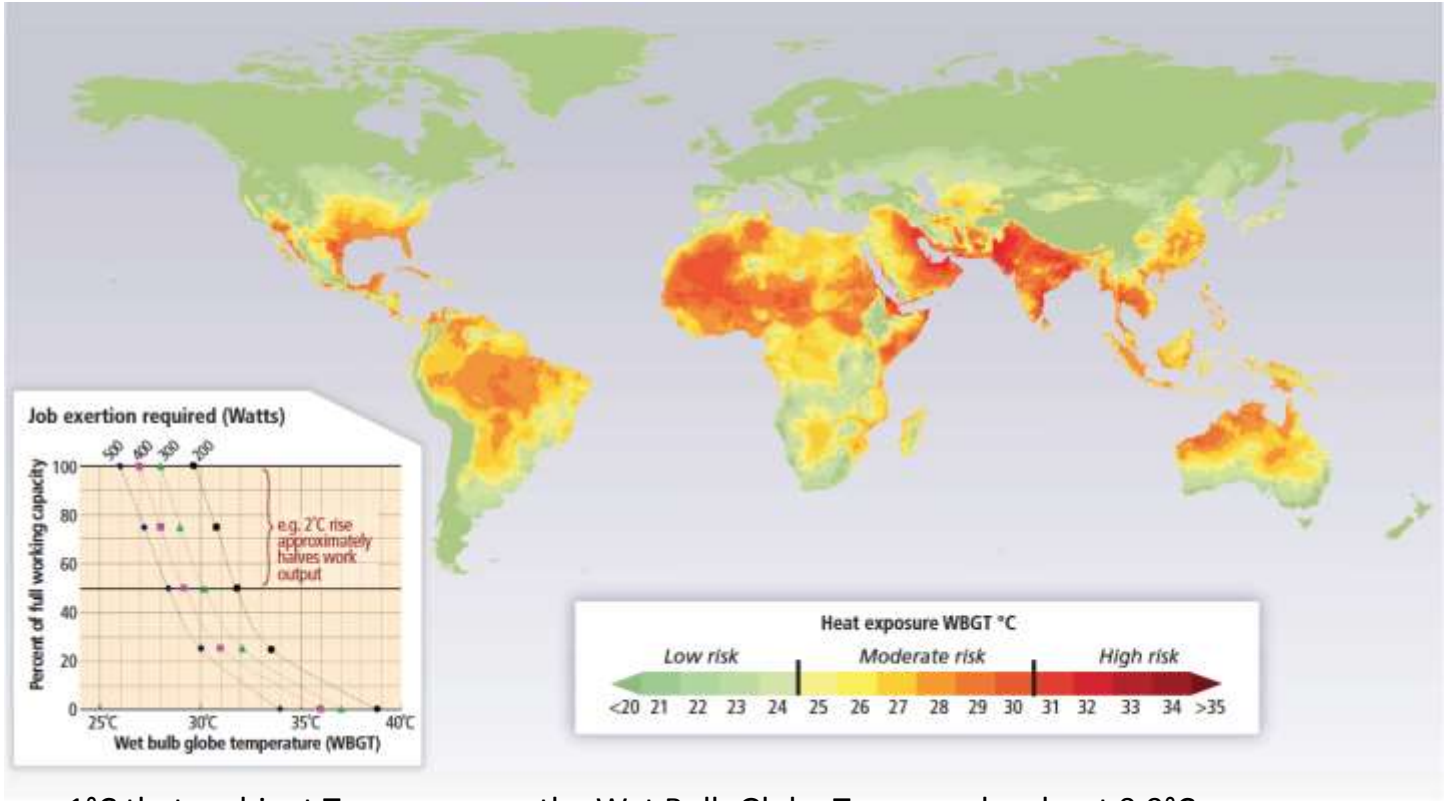
Climate and Environment | Exposure | Adaptation | Health impacts



IPCC AR5 WGII Fig. 11-1

Heat limits to outdoor work capacity exceeded during summer months (1980 -2009)
further expansion projected (low adaptation capacity in human physiology)

+0.8°C



For every 1°C that ambient Tmax goes up, the Wet Bulb Globe T goes up by about 0.9°C,
Fatigue reached at core body temperature close to 40°C

IPCC AR5 WGII Figure 11-5

Impacts of thermal extremes (heat waves)

+0.8°C

The health impacts of thermal extremes include significant adverse social impacts with reduced worker productivity

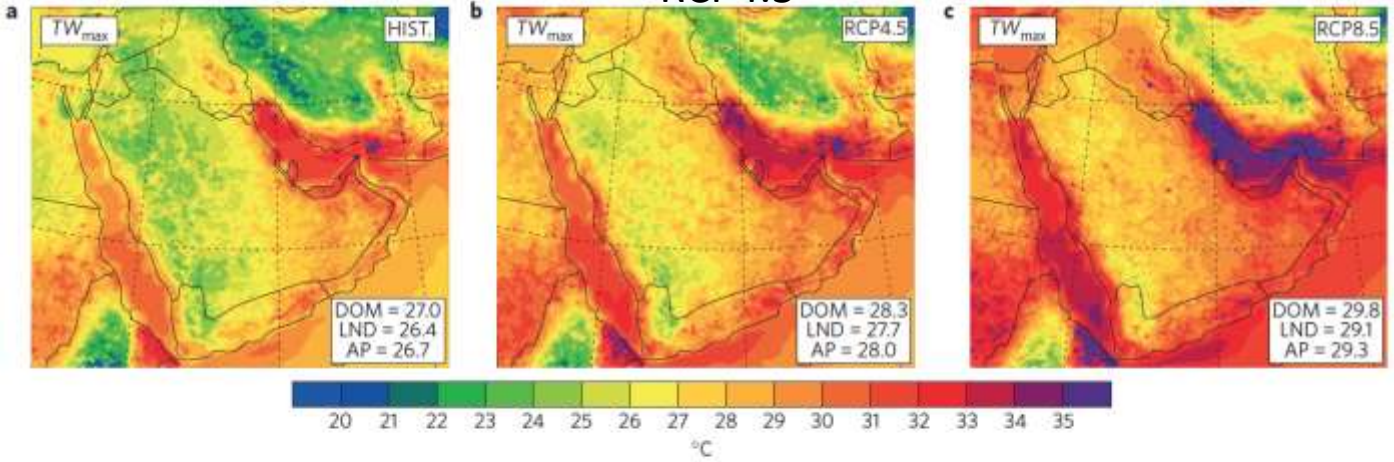
Photo: CBS News 2002

Photo: BBC News 2000

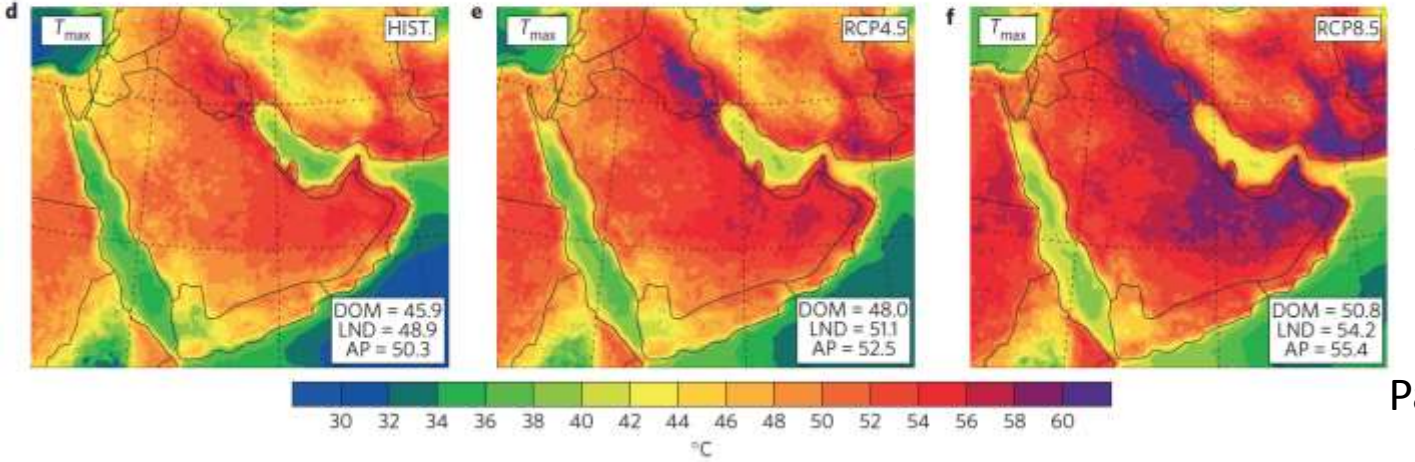
Historical

RCP4.5

RCP8.5



Wet bulb temperature (6 h average)



Air temperatures

Pal and Eltahir, NCC 2016

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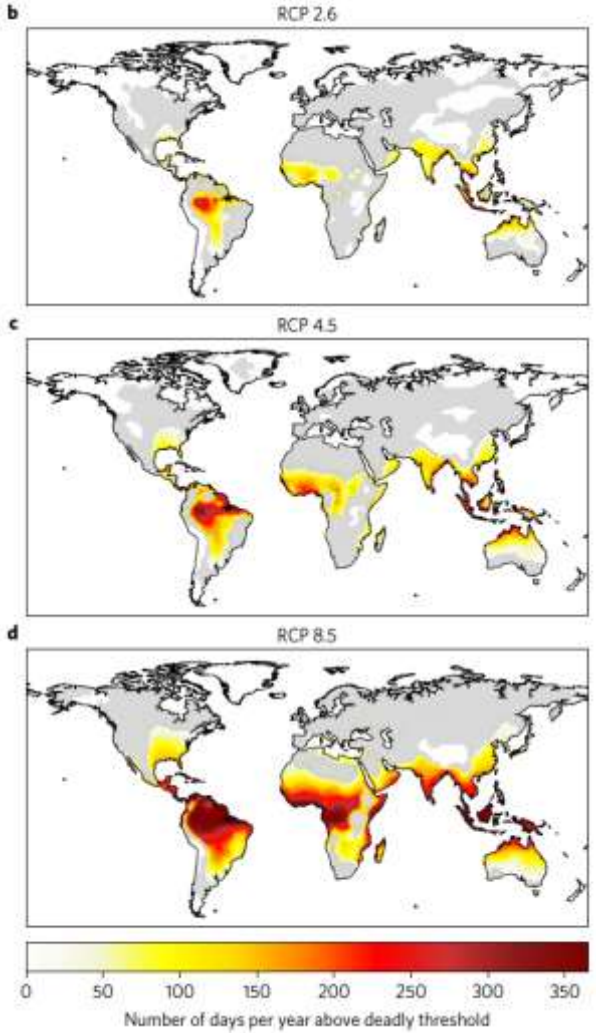
Temperature extremes and heat waves

Region/ region code	Trends in daytime temperature extremes (frequency of hot and cool days)		Trends in nighttime temperature extremes (frequency of warm and cold nights)		Trends in heat waves/warm spells		Trends in heavy precipitation (rain, snow)		Trends in dryness and drought	
	Observed	Projected	Observed	Projected	Observed	Projected	Observed	Projected	Observed	Projected
West Asia WAS, 19	*Very likely* increase in hot days (decrease in cool days *more likely than not*)[a]	*Likely* increase in hot days (decrease in cool days)[a]	*Likely* increase in warm nights (decrease in cold nights)[a]	*Likely* increase in warm nights (decrease in cold nights)[a]	Increase in warm spell duration[a]	*Likely* more frequent and/or longer heat waves and warm spells[a]	Decrease in heavy precipitation events[a]	Inconsistent signal of change[a]	Lack of studies, mixed results[a]	Inconsistent signal of change[a]

In Jeddah and nearby Mecca, for example, annual TW_{max} is projected to reach values as high as 33° C and 32° C, respectively, with annual T_{max} approaching and exceeding 55° C, ... challenging the Muslim rituals of Hajj when during summers, as Muslim pilgrims (2 million) pray outdoors from dawn to dusk near Mecca.

AR5WGII Ch. 21 Pal and Eltahir, NCC 2016



Depending on the degree of climate change conditions in some parts of the planet may become intolerable outside for humans and other mammals (e.g. livestock)

exposure aggravated
by an ageing population (higher vulnerability) and increasing urbanization (heat-island effects).

Mora et al., NCC 2017

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>1.5°C

...warming, droughts

Food security constrained on land ….Crops

>1.5°C: high risk of more severe impacts after 2050

Key risk	Adaptation issues & prospects
Reductions in mean crop yields because of climate change and increases in yield variability. (*high confidence*) [7.2, 7.3, 7.4, 7.5, Box 7-1]	With or without adaptation, negative impacts on average yields become *likely* from the 2030s with median yield impacts of 0 to –2% per decade projected for the rest of the century, and after 2050 the risk of more severe impacts increases.

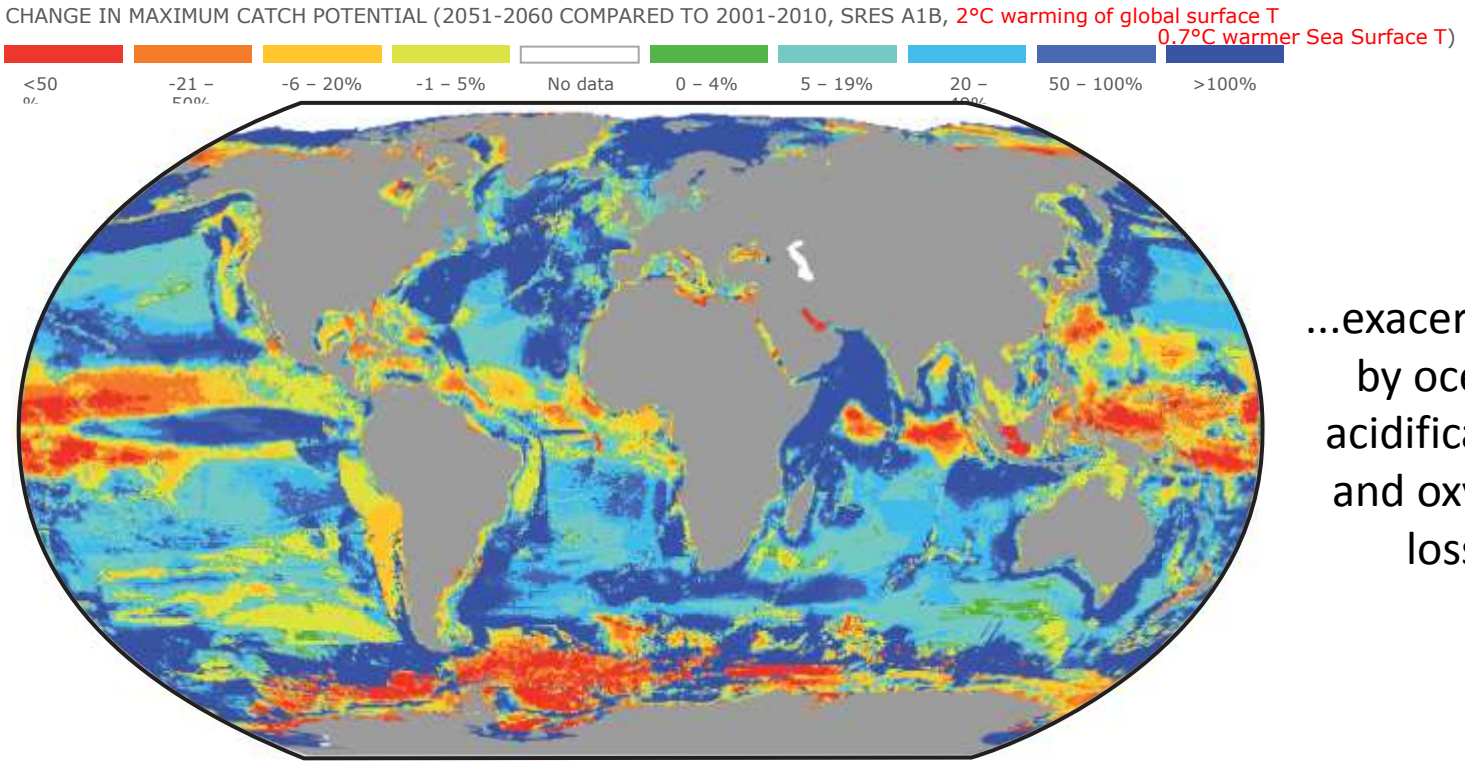
...includes effects of redistributed precipitation, heat and drought events

WGII, Table TS.4, SYR Table 2.3

... ocean warming

+2°C

2051-60: shifted productivity, fish and invertebrate catch potential



...exacerbated by ocean acidification and oxygen loss

HIGH RISK FOR FISHERIES AT LOW LATITUDES:
small human adaptation capacity over time

WGII, 6-14, SPM.6, SYR 2.6

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Adaptation options in arid areas

Enhance water management across sectors

- Reduce unsustainable groundwater exploitation (e.g. fossil aquifers)
- Reduce water intensive crops
- Enhance irrigation efficiency
- Enhance Rainwater harvesting
- Enhance Solar driven desalination systems
- Ensure access to safe drinking water and adequate sanitation

- Establish water efficient growing of crops and vegetables
- Restore ecosystems and their services (mangroves, blue carbon)

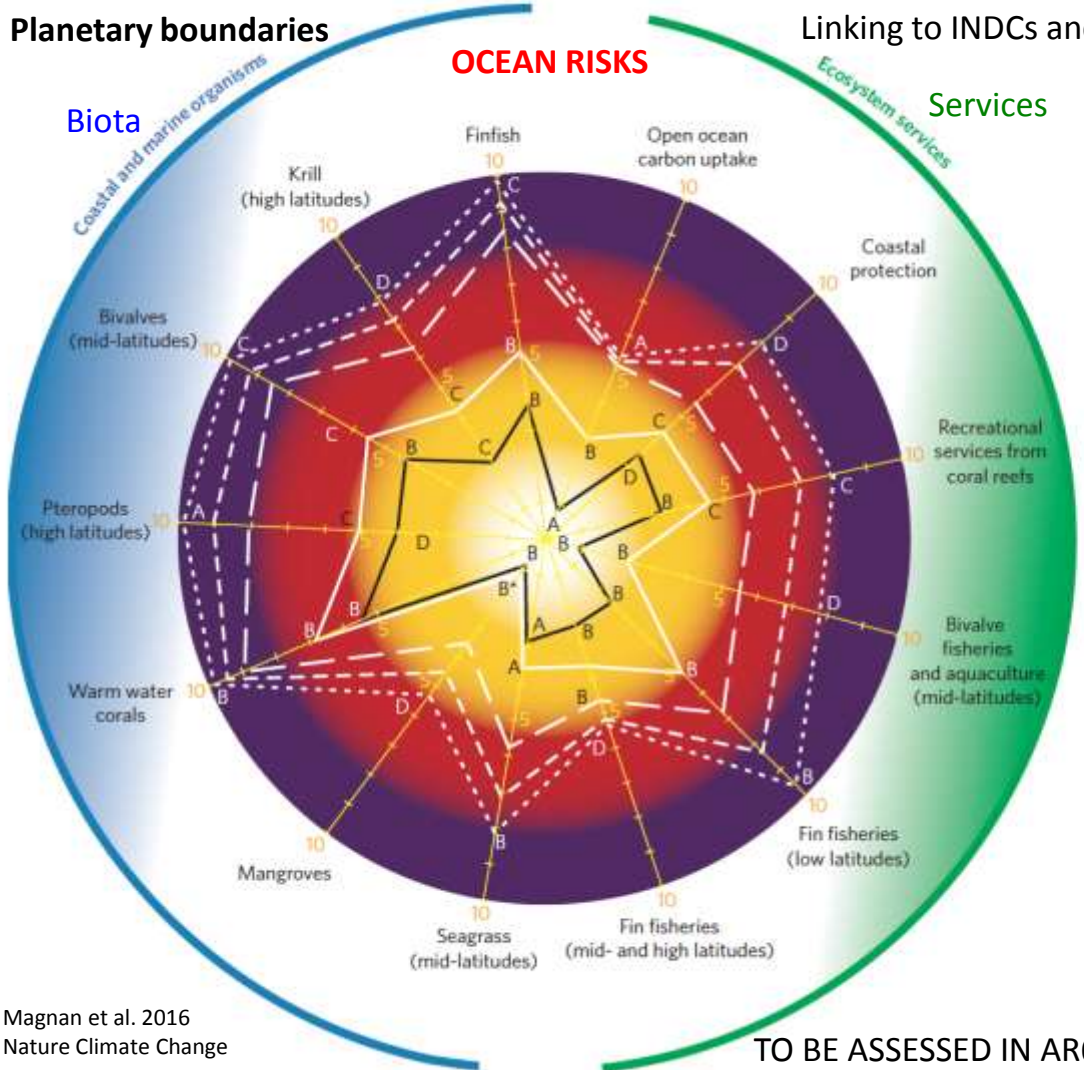
- **Reduce likelihood of heatwaves and heat induced human/mammal failures and mortalities**

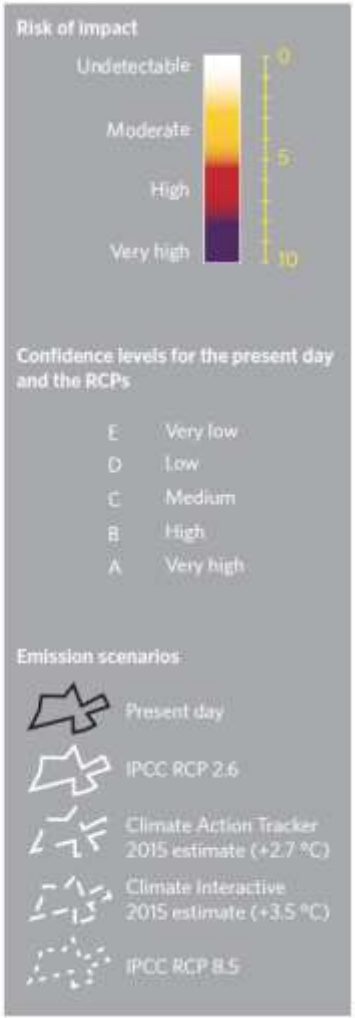
- Reduce degree of climate change by keeping to the Paris agreement
- Enhance cooperative and multidisciplinary international efforts

(after DeNicola et al 2015, Albany and Jeddah) TO BE ASSESSED IN AR6

Planetary boundaries

Linking to INDCs and Global Stocktake





Adaptation capacity of ecosystems is very limited....

....suggesting a precautionary approach in line with the Paris agreement.

°C
0.8
1.5
2.7
3.5
>4

Magnan et al. 2016
Nature Climate Change

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THANK YOU FOR YOUR ATTENTION!

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