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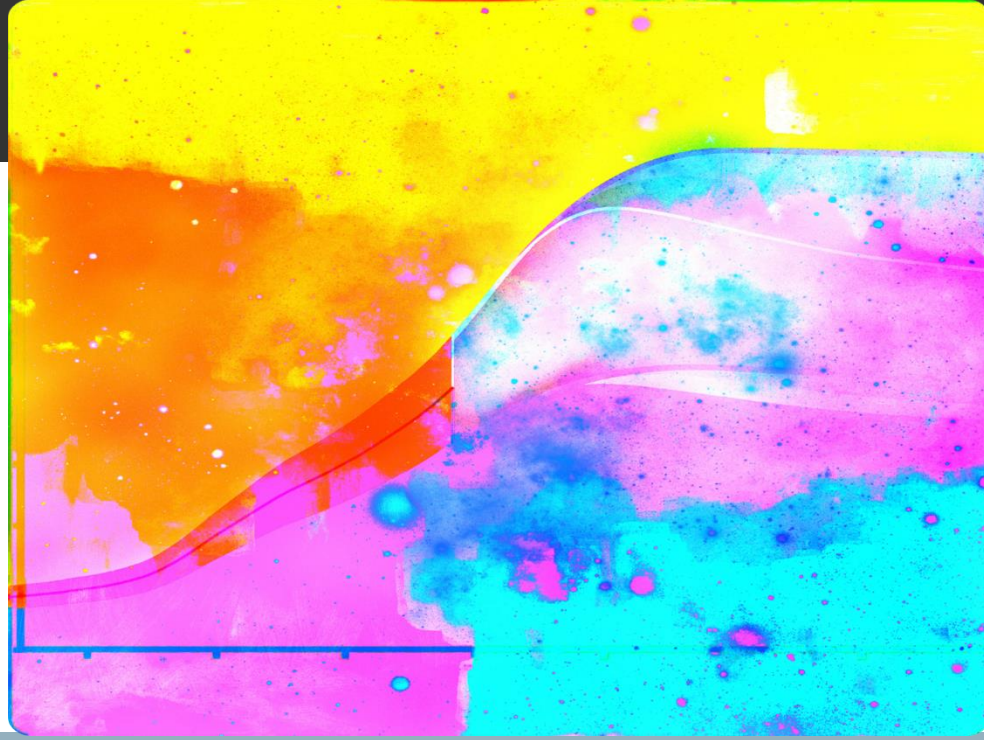
The IPCC Special Report on 1.5°C: implications for Southeast Asia



Professor Mark Howden

ANU Climate Change Institute

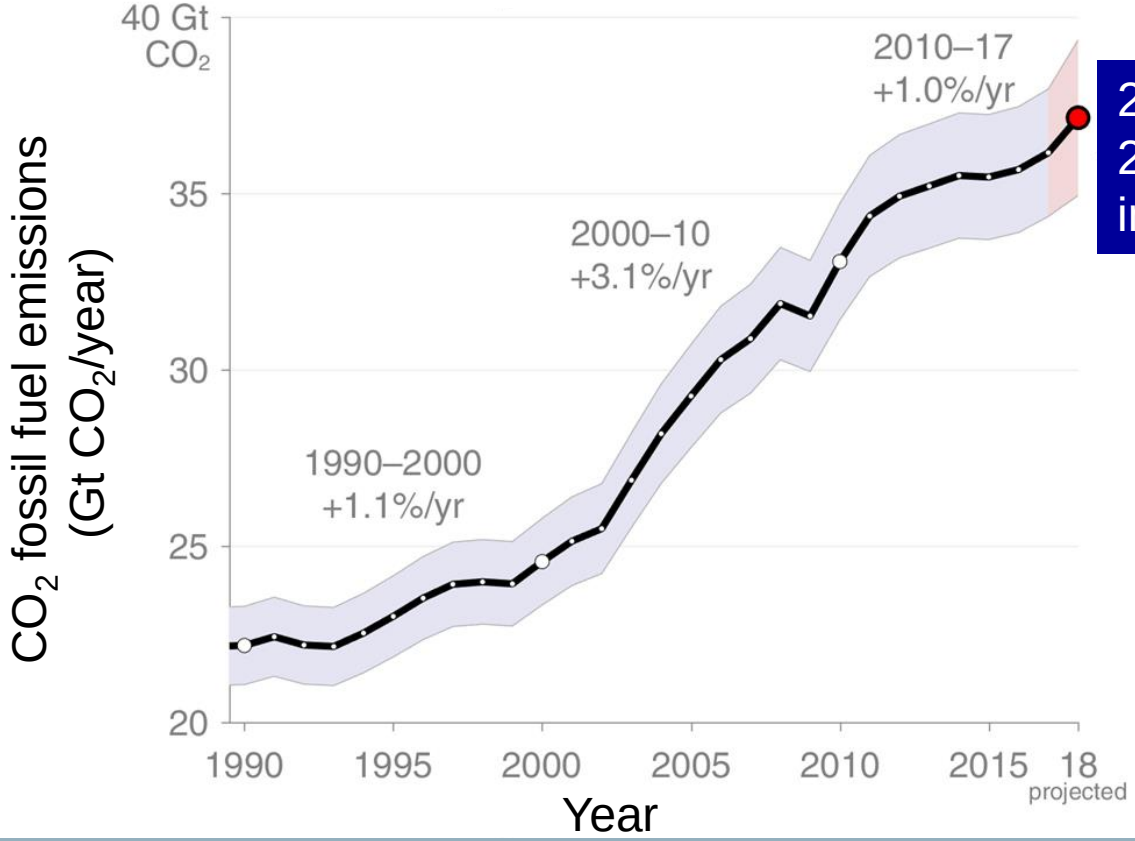
Vice Chair, IPCC Working Group II

@ProfMarkHowden

The IPCC Special Report

- *An IPCC special report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty*
- Global scale, policy-informing
- 91 Authors, 133 Contributing Authors, 17 Review Editors
- 6 000 studies
- 42 001 comments

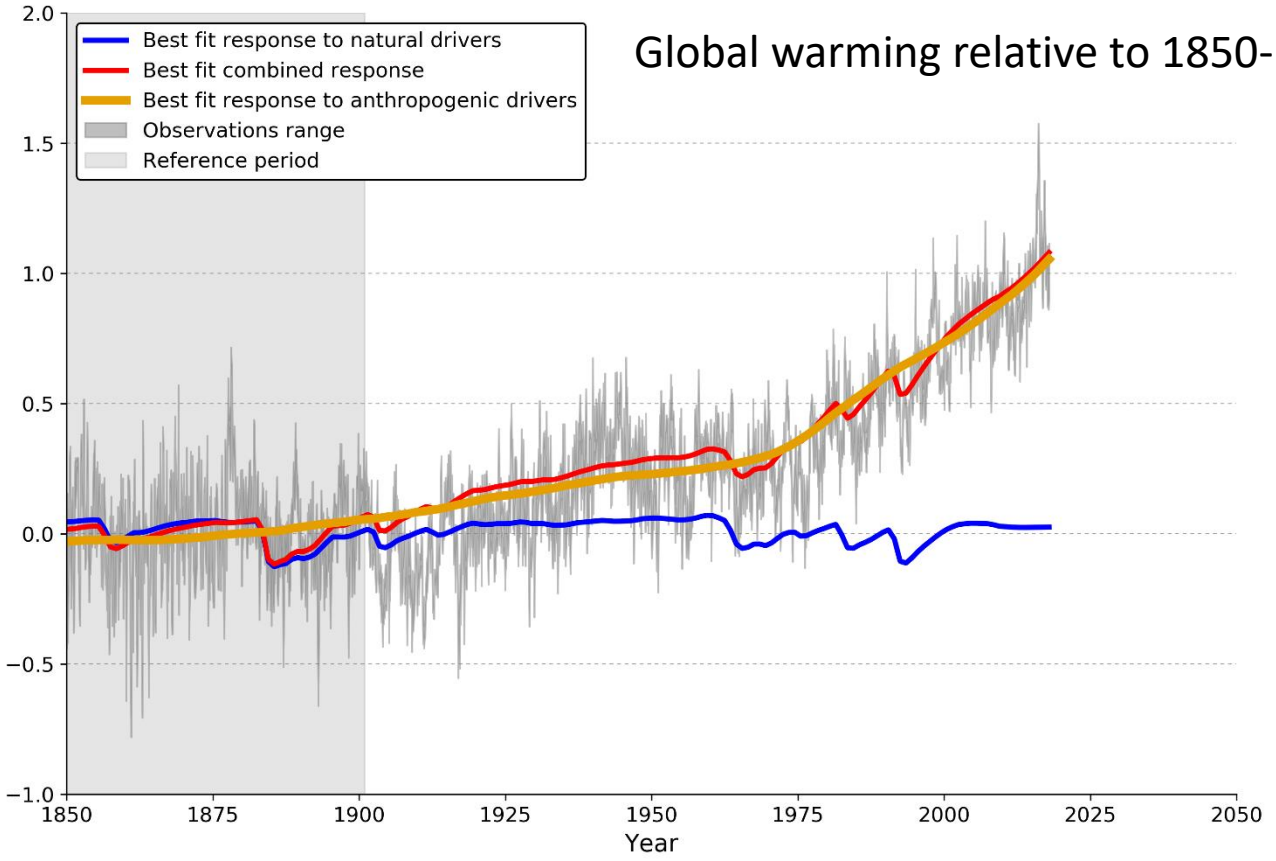
CO_2 emission rising again: record levels



2018
2.7%
increase

Global Carbon Project 2018, IPCC 2018

Global warming: human and natural

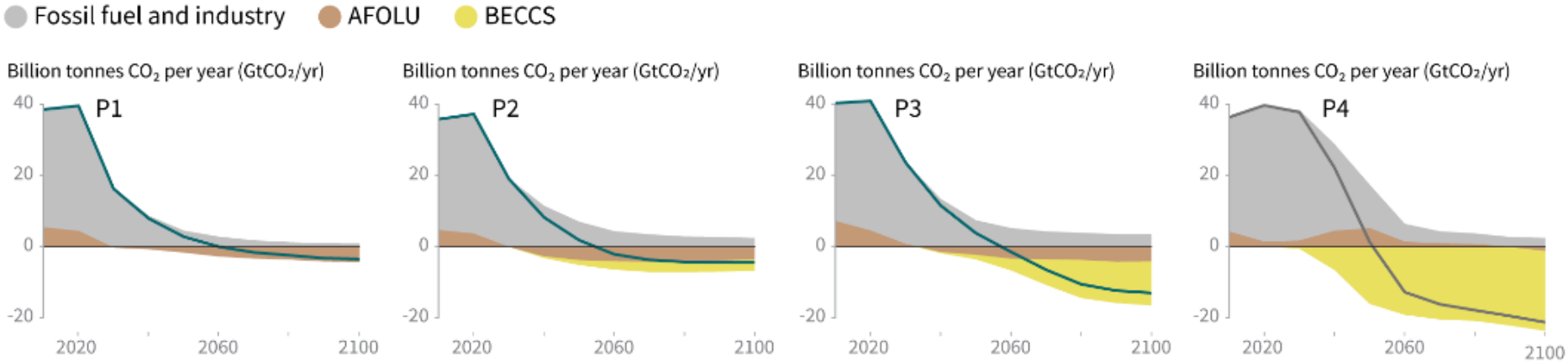


INTERGOVERNMENTAL PANEL ON climate change

Carbon budget and urgency

- Currently emitting about 42 billion tonnes of CO_2 per year
- In 10 to 14 years we will use up our C budget for a 2/3rds chance of staying below 1.5^{o}C
- To stay within1.5^{o}C CO_2 emissions decline 45% by 2030 and reach near zero by around 2050
  - still need some negative emissions
- For 2°C target – decline by 20% by 2030 and net zero by 2075
- Reducing emissions would have direct and immediate health benefits

Illustrative 1.5ºC compatible pathways



P1: A scenario in which social, business, and technological innovations result in lower energy demand up to 2050 while living standards rise, especially in the global South. A down-sized energy system enables rapid decarbonisation of energy supply. Afforestation is the only CDR option considered; neither fossil fuels with CCS nor BECCS are used.

P2: A scenario with a broad focus on sustainability including energy intensity, human development, economic convergence and international cooperation, as well as shifts towards sustainable and healthy consumption patterns, low-carbon technology innovation, and well-managed land systems with limited societal acceptability for BECCS.

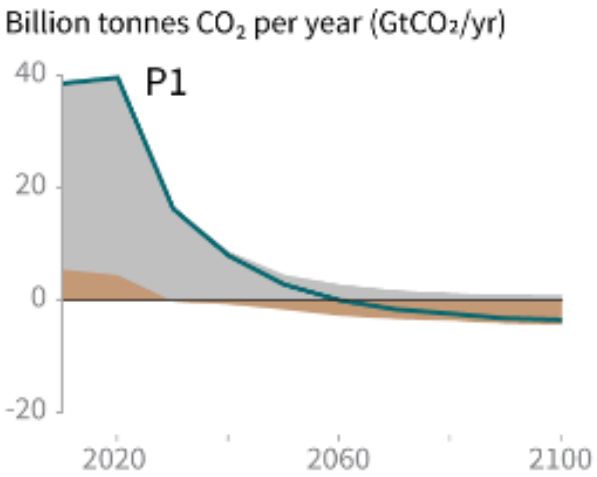
P3: A middle-of-the-road scenario in which societal as well as technological development follows historical patterns. Emissions reductions are mainly achieved by changing the way in which energy and products are produced, and to a lesser degree by reductions in demand.

P4: A resource and energy-intensive scenario in which economic growth and globalization lead to widespread adoption of greenhouse-gas intensive lifestyles, including high demand for transportation fuels and livestock products. Emissions reductions are mainly achieved through technological means, making strong use of CDR through the deployment of BECCS.

IPCC 2018

Illustrative 1.5ºC compatible pathways

Indicator	
CO_2 emissions in 2050 (% change)	-93
Renewable share of electricity (%)	77
Primary energy from coal (% change)	-97
Primary energy from oil (% change)	-87
Primary energy from gas (% change)	-74
Cumulative CCS/BECCS to 2100 ($GtCO_2$)	0
Land for bio-energy (Mha)	22
Agricultural methane (% change)	-33



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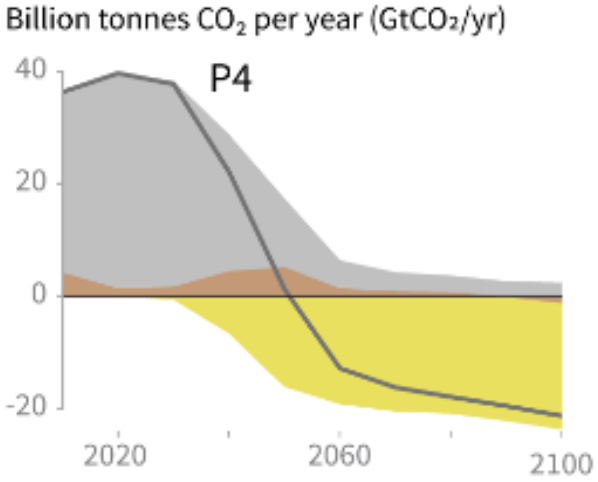
Illustrative 1.5ºC compatible pathways

Indicator	
CO_2 emissions in 2050 (% change)	-97
Renewable share of electricity (%)	70
Primary energy from coal (% change)	-97
Primary energy from oil (% change)	-32
Primary energy from gas (% change)	-48
Cumulative CCS/BECCS to 2100 ($GtCO_2$)	1218
Land for bio-energy (Mha)	724
Agricultural methane (% change)	2



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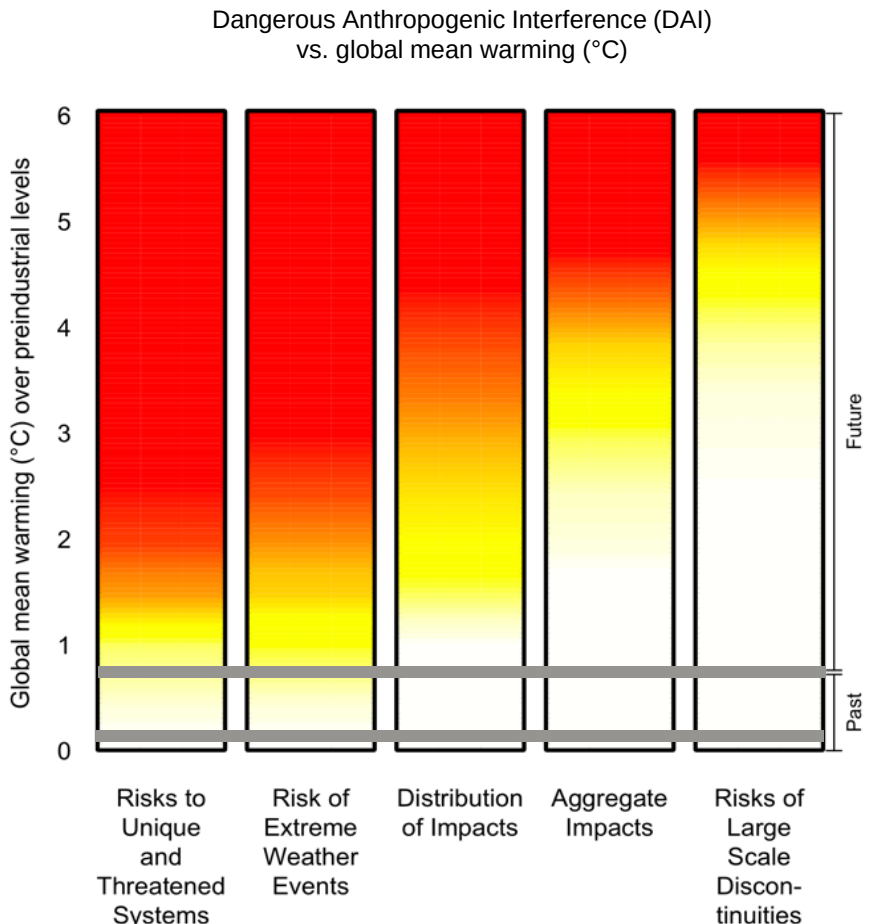
Reasons for Concern: 2001

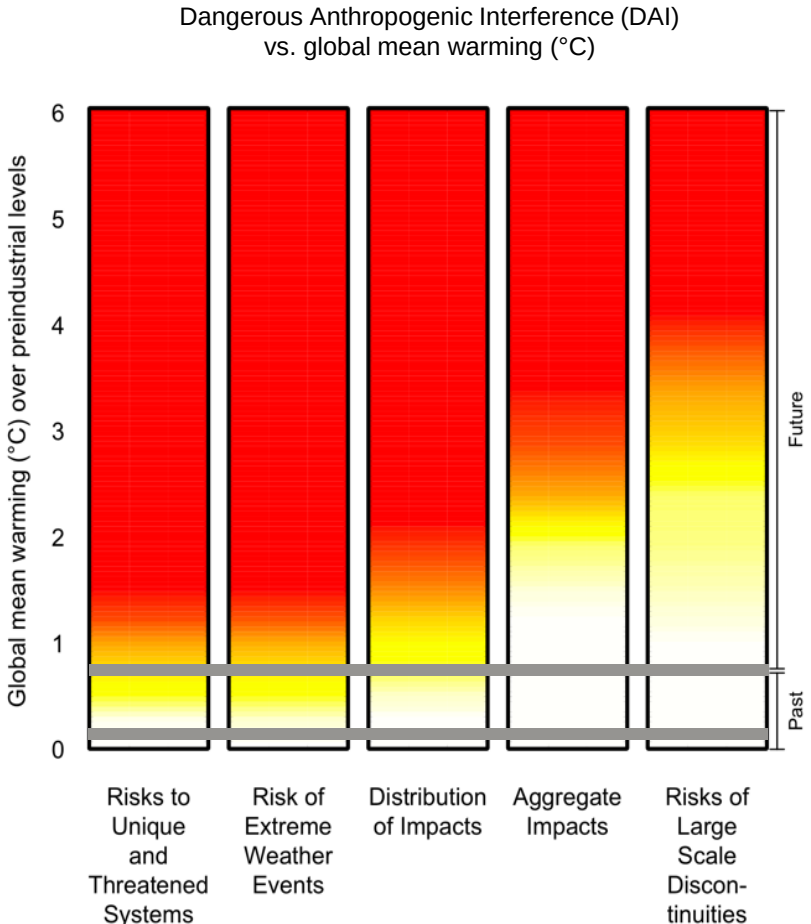
Knowledge
AR3
2001



INTERGOVERNMENTAL PANEL ON climate change

Reasons for Concern: 2007

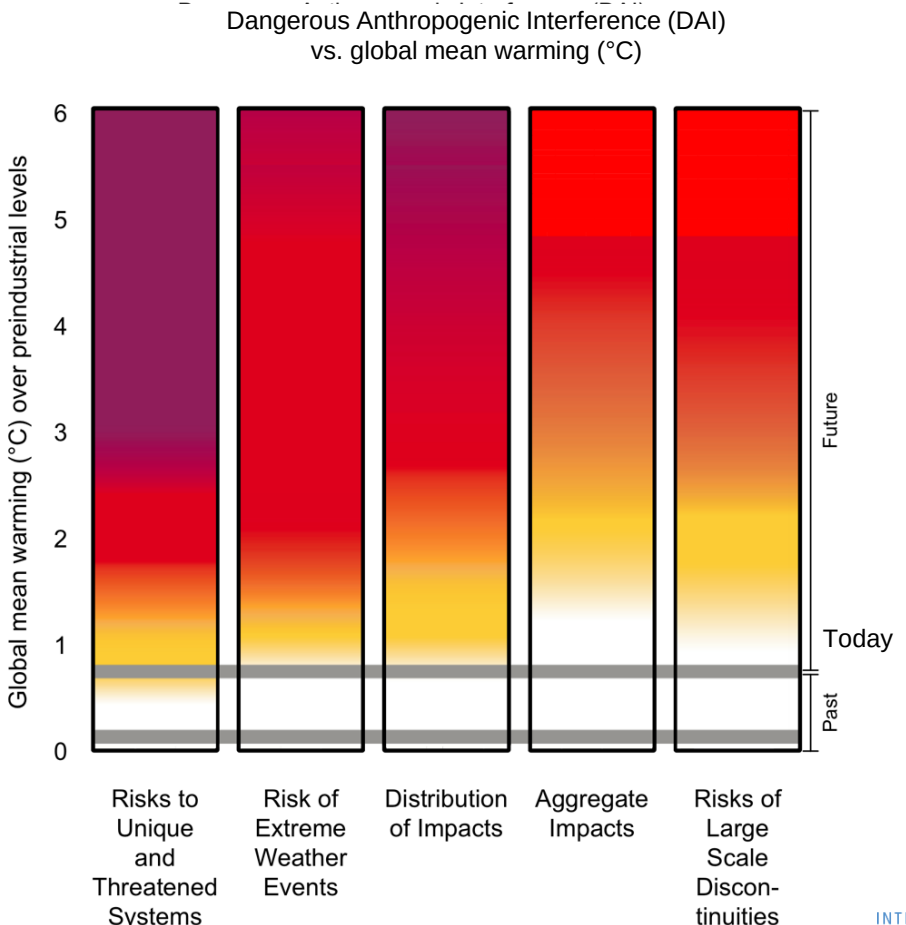
Knowledge
AR4
2007



INTERGOVERNMENTAL PANEL ON climate change

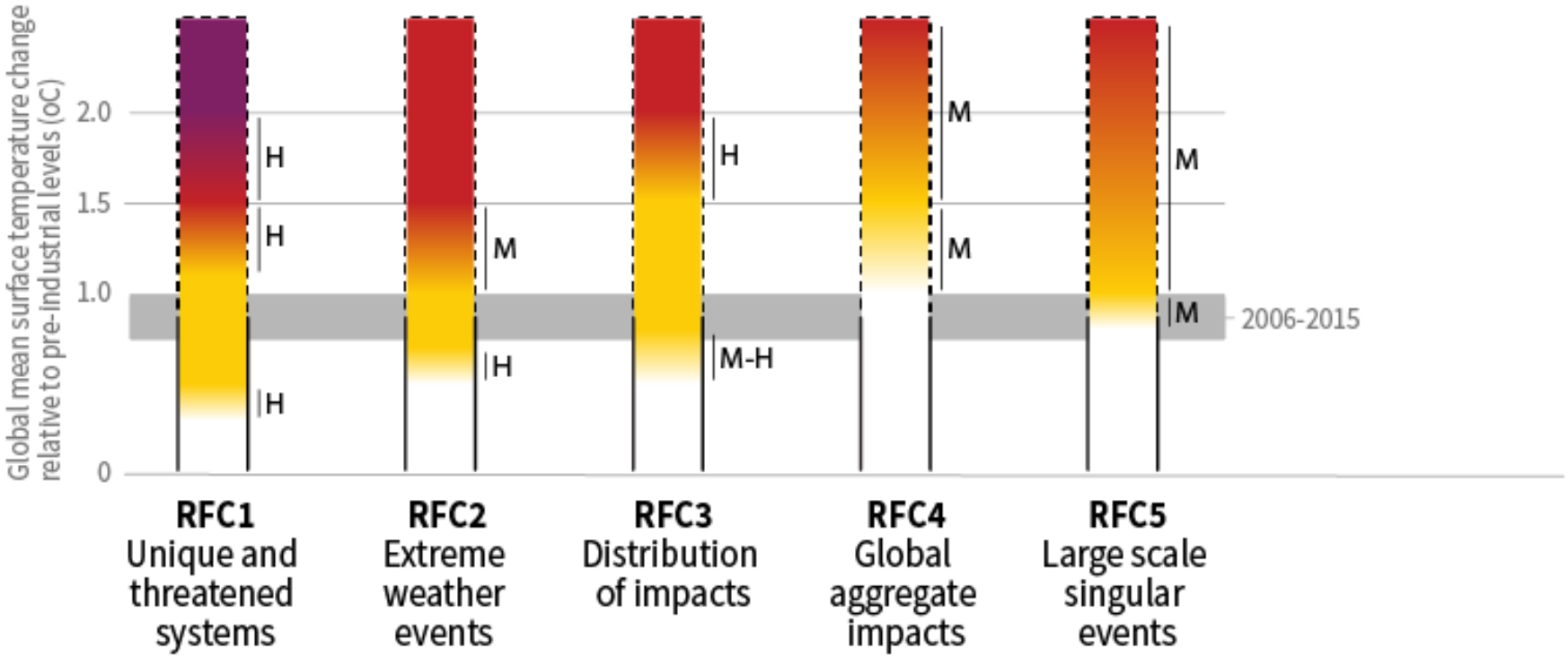
Reasons for Concern: 2014

Knowledge
AR5
2014



INTERGOVERNMENTAL PANEL ON climate change

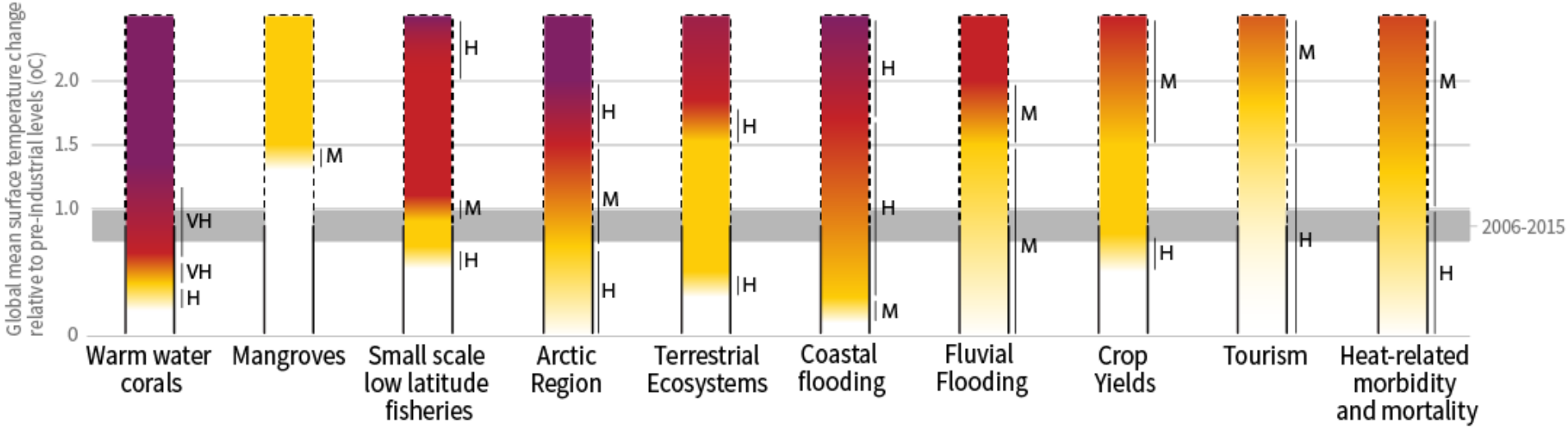
Reasons for Concern: 2018



Confidence level for transition: L=Low, M=Medium, H=High and VH=Very high

Reasons for Concern: 2018 sectoral

Impacts and risks for selected natural, managed and human systems



Confidence level for transition: L=Low, M=Medium, H=High and VH=Very high

Coral Reefs

First back-to-back global mass bleaching and mortality events

+ 1.0°C (today)

First global mass bleaching and mortality event

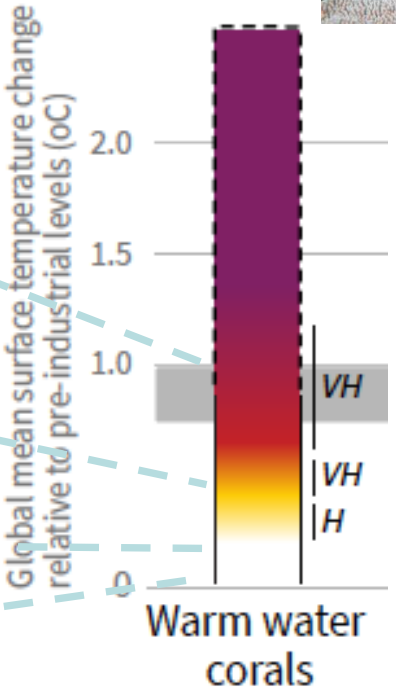
+ 0.4°C (circa 1998)

Localised mass coral bleaching reported

+ 0.2°C (circa 1980)

No reports of mass coral bleaching

+ < 0.1°C (< 1980)



Glynn 1983, Hoegh-Guldberg 1999, Hughes et al 2017a,b

Terrestrial ecosystems

Biome shifts and species range losses escalate to very high levels – adaptation options very limited

> 2.0°C

Extensive shifts of biomes with doubling or tripling of the plants, animals or insects losing over half of their climatically determined geographic ranges

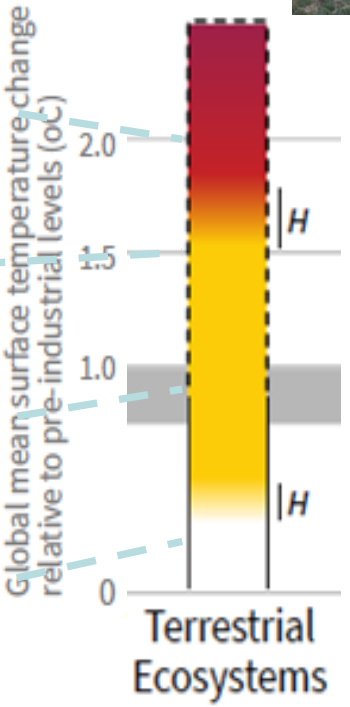
+ 1.5 to 2.0°C

Some climate change impacts evident

+ 1.0°C (today)

No detection and attribution of impacts of global warming on terrestrial ecosystems

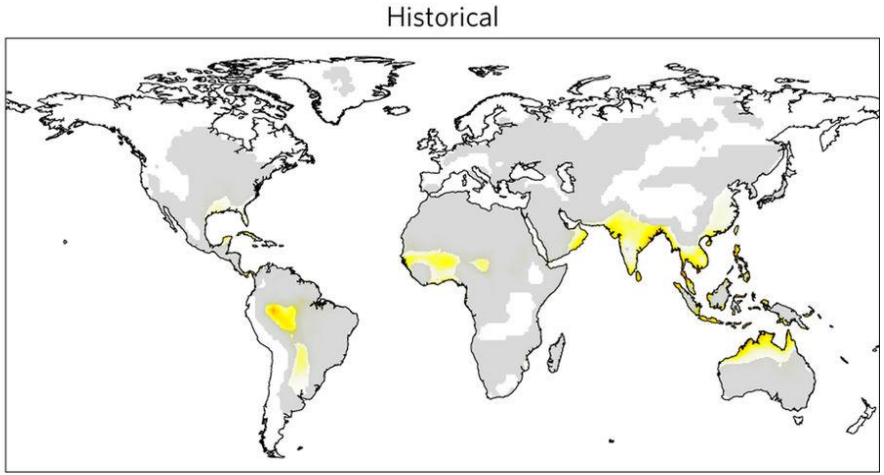
+ < 0.3°C (< 1975)

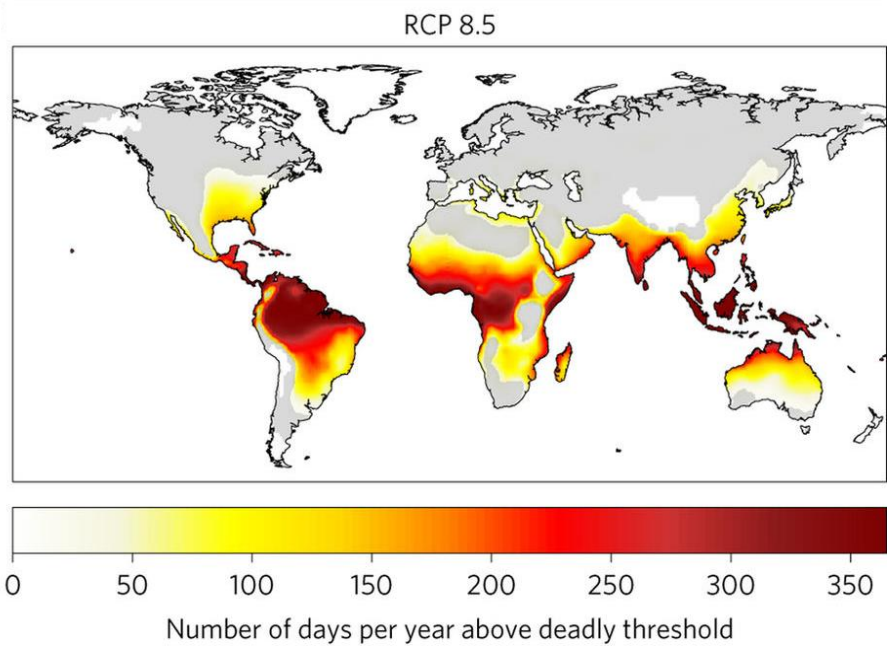


Benefits of 1.5ºC vs 2ºC

- Fewer and less severe droughts, floods, fires, weather extremes especially in the sub-tropics and mid-latitudes
- Lower sea level rise (10cm by 2100) with 10M+ fewer people affected
- Halving the exposure to water shortages
- Up to several hundred million fewer people exposed to climate-related risk and susceptible to poverty by 2050
- Reduced food insecurity
- Reductions in impacts on biodiversity and the natural resource base

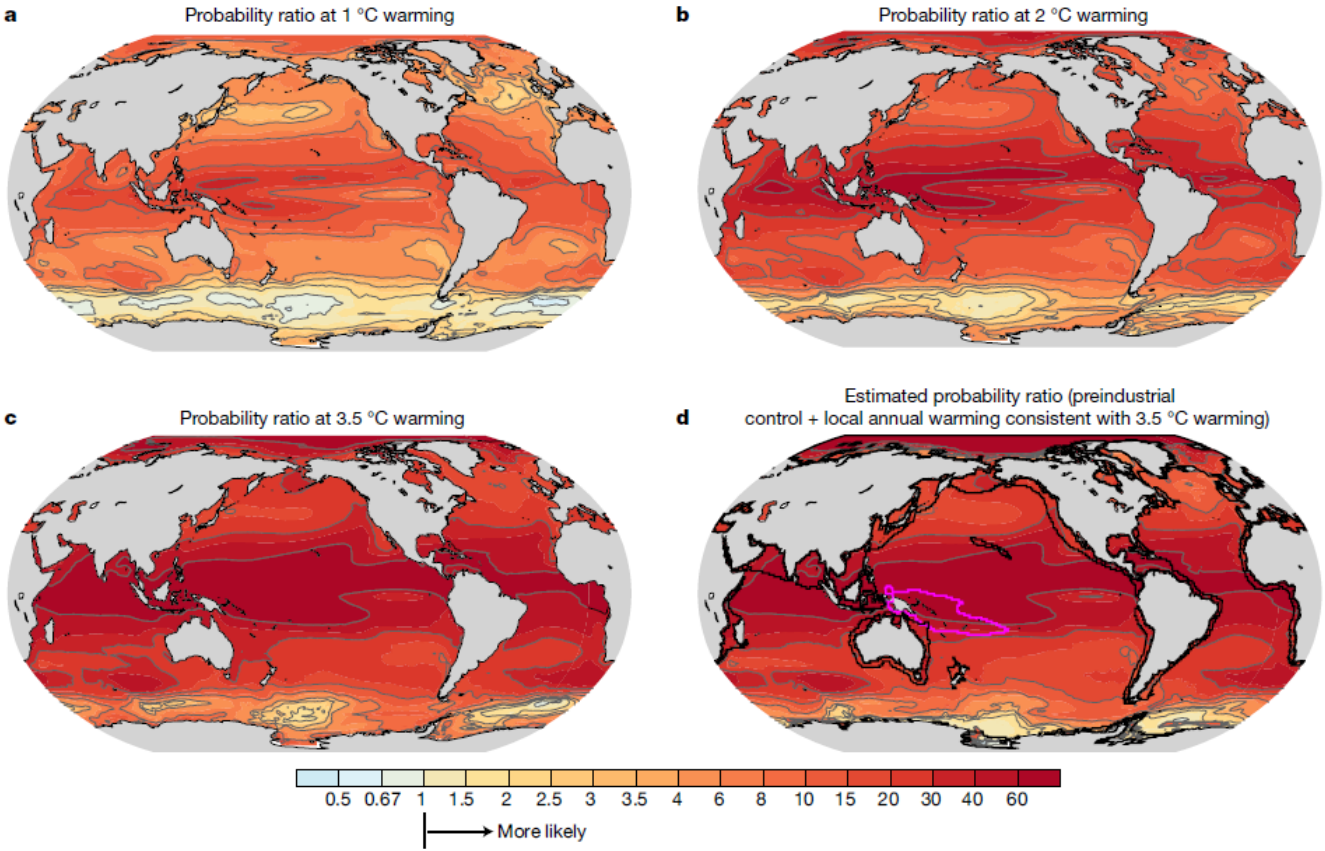
Heat stress frequency: global





Mora et al. 2017

Marine heatwaves increasing

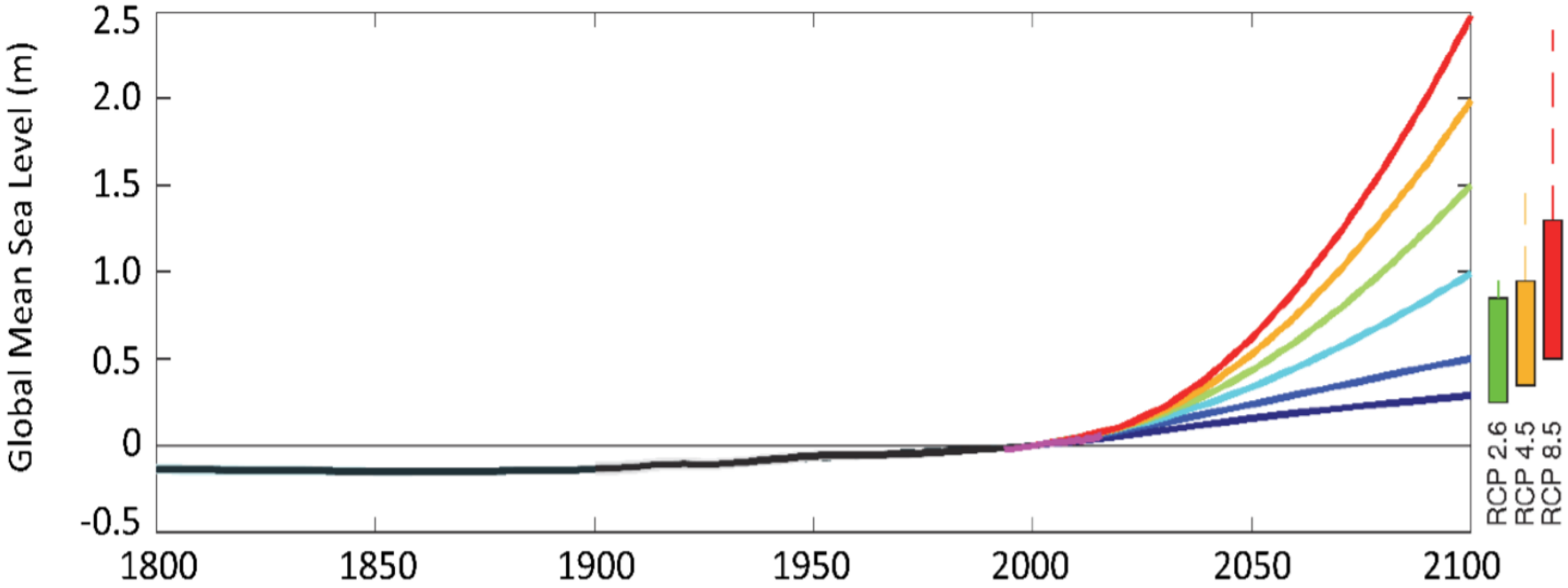


- Between 1982 and 2016 there was a doubling in marine heatwave days
- Today, 86% of heatwaves are attributable to human emissions
- The frequency, extent and severity of heatwaves is likely to increase

Frolicher et al. 2018

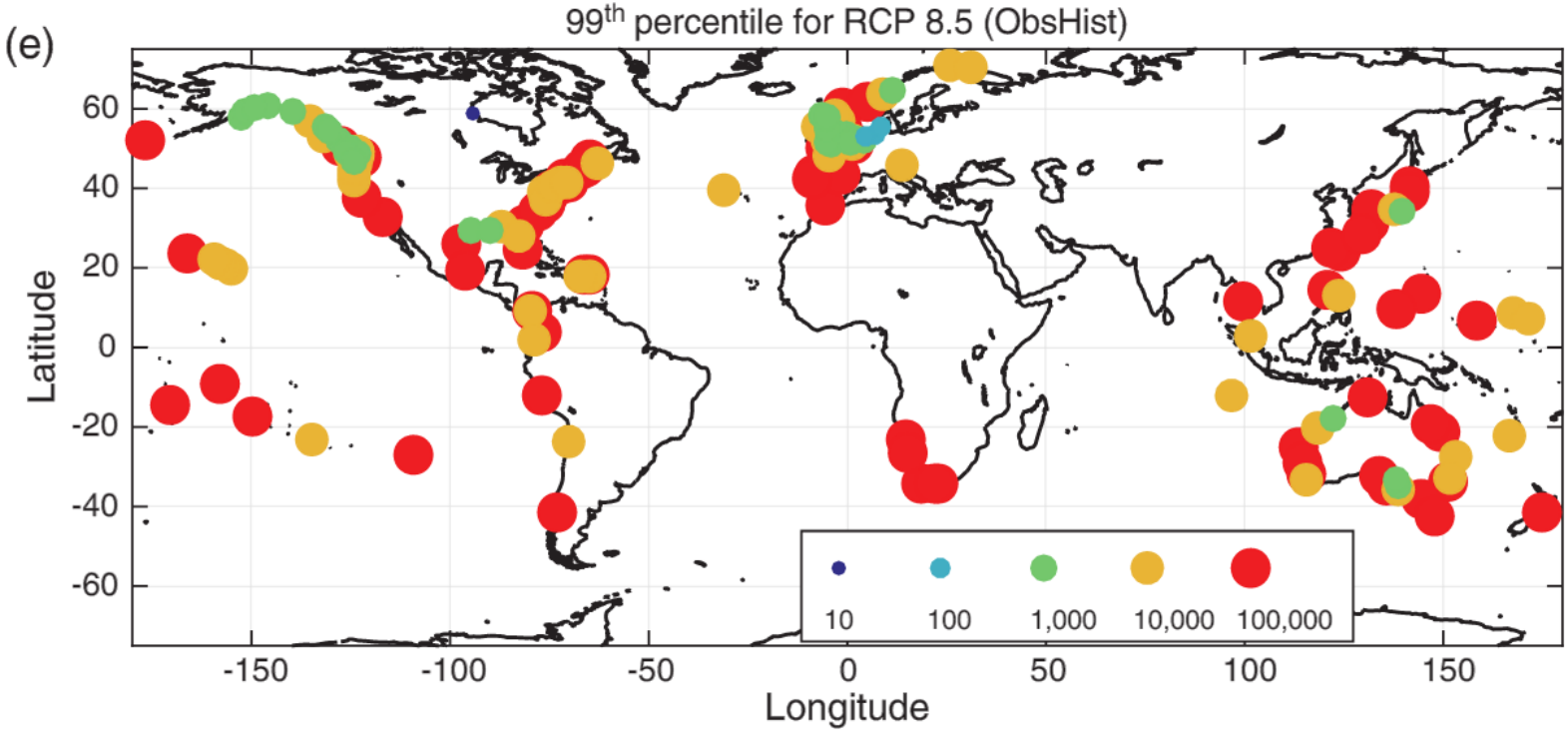
Future sea levels: increasingly of concern

Upper estimate of 2.5m global sea level rise by 2100



NOAA 2017

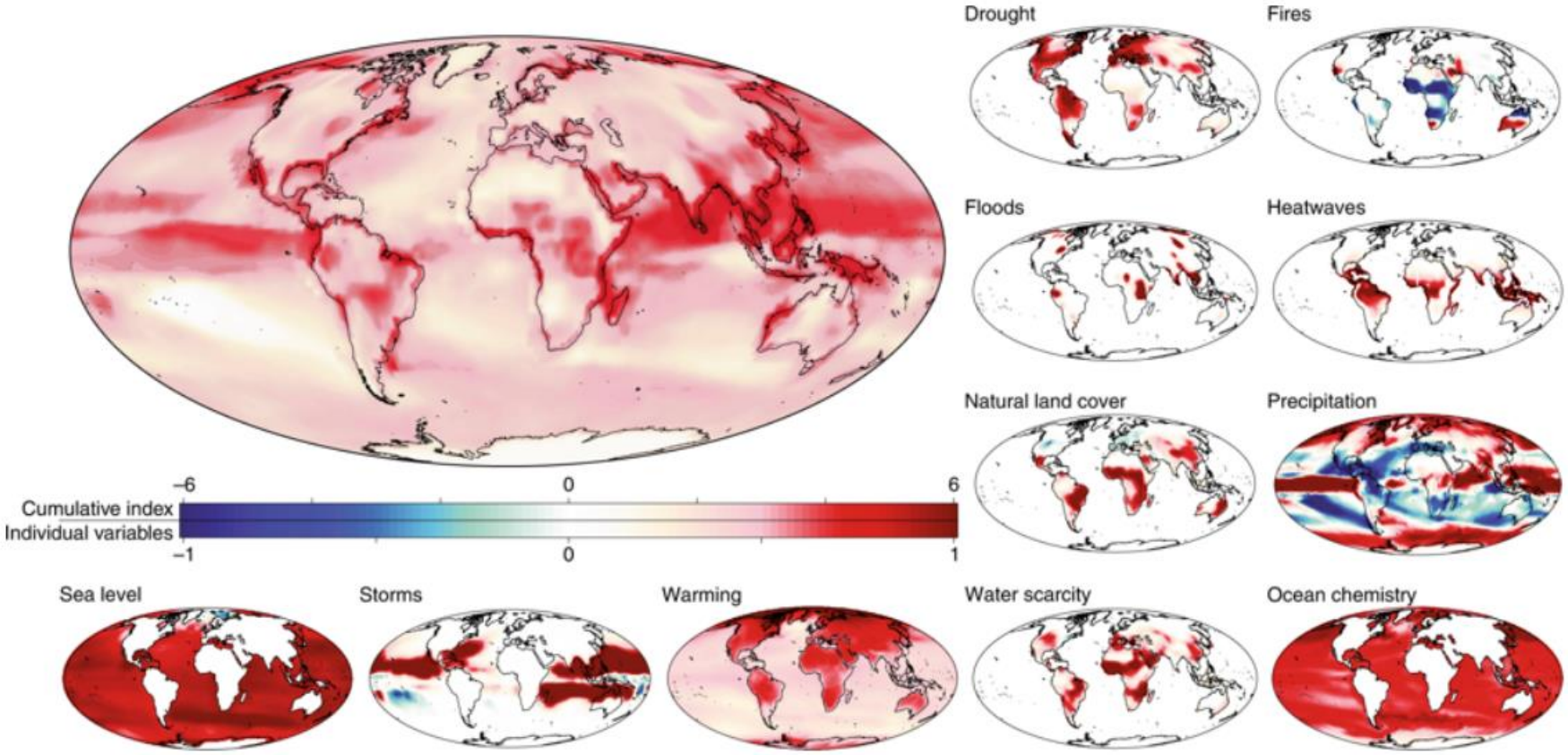
Increased risk of extreme sea level events



- 10,000x means that a current once-a-century flooding level is reached nearly every few days at normal high tide

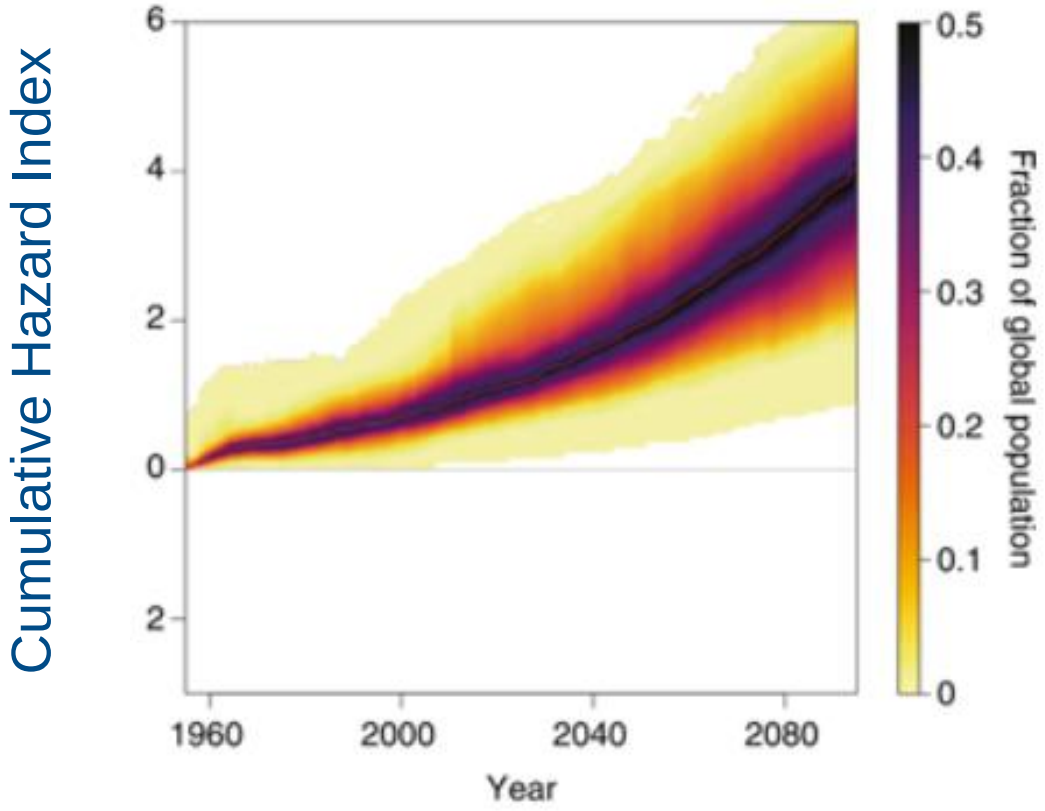
Goodwin et al. 2017

Multiple hazards from climate change



Mora et al. 2018

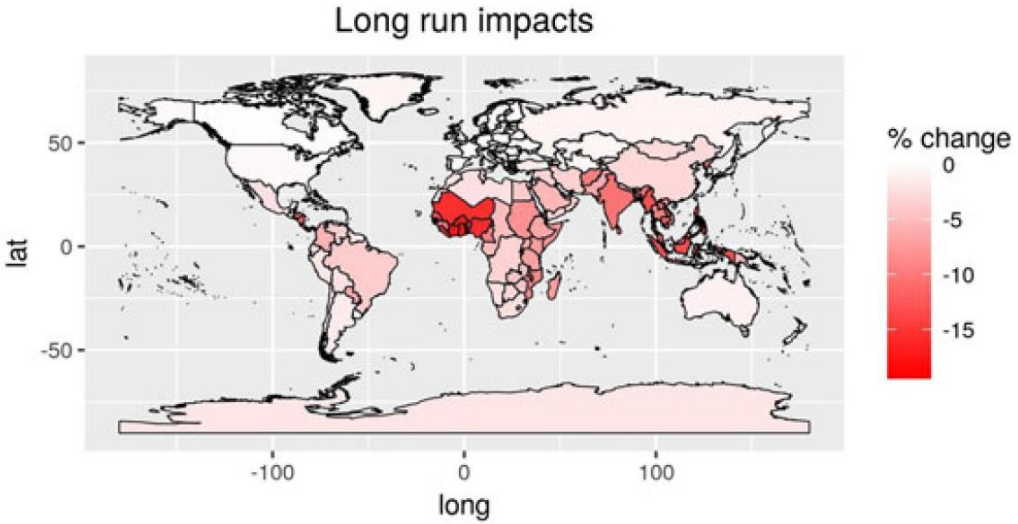
Increasing number of people affected



Mora et al. 2018

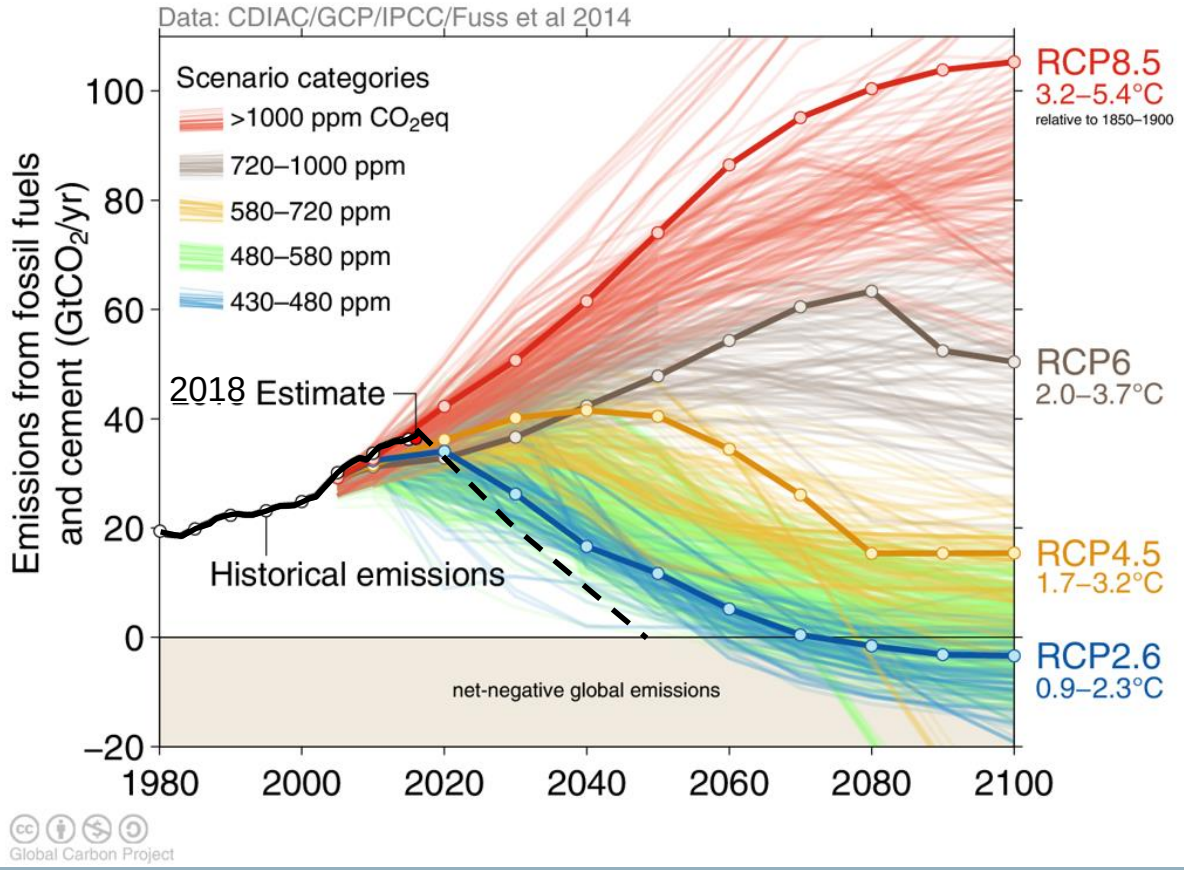
Global economic benefits and costs

- The global gains from complying with the 2ºC target vs 4ºC are ~ US$17 trillion per year in the long run (year 2100)
- The median global social cost of carbon is US$417 per tonne CO_2



Kompas et al. 2018; Ricke et al. 2018

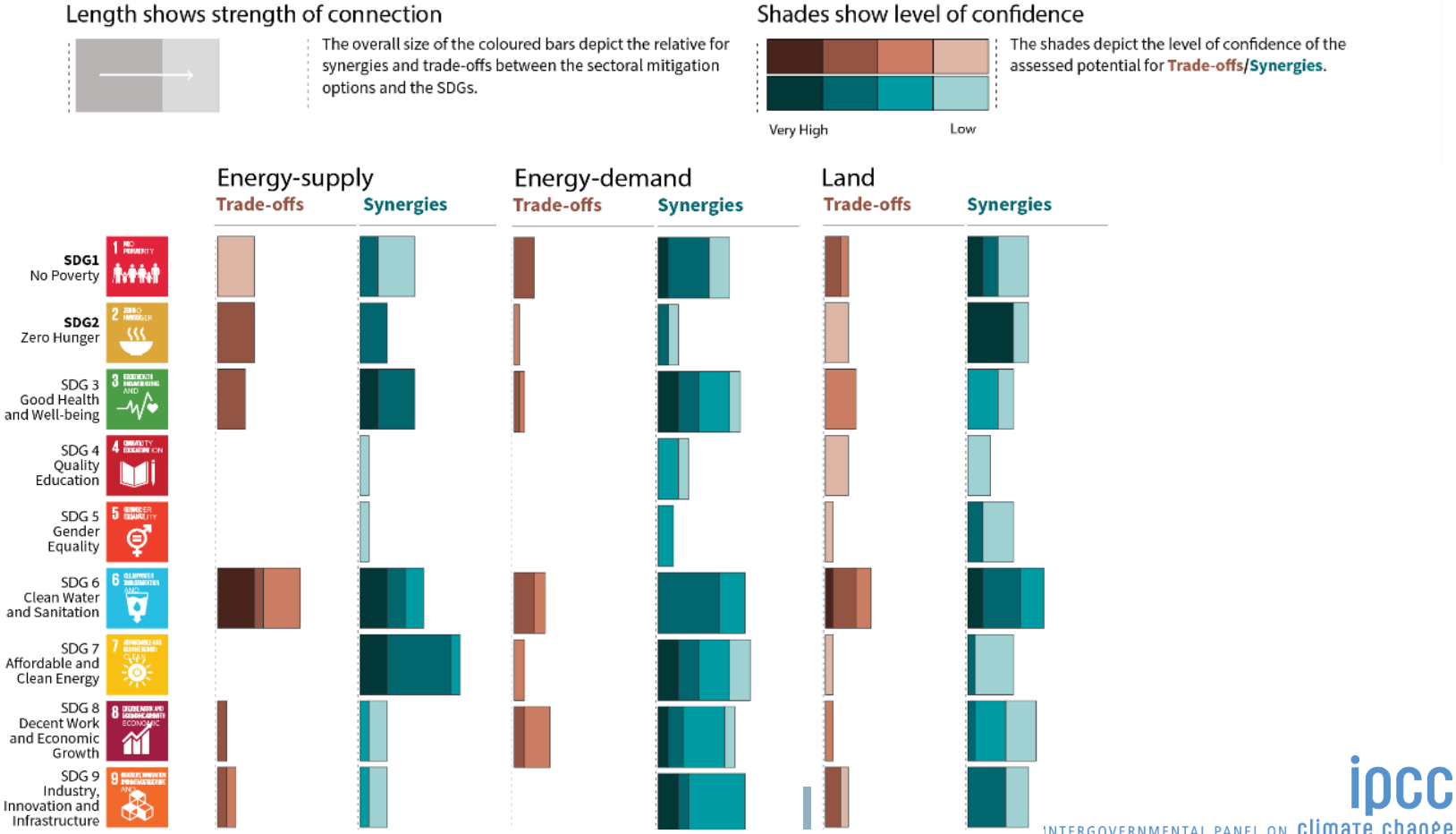
Choices: emissions trajectories



What is needed ?

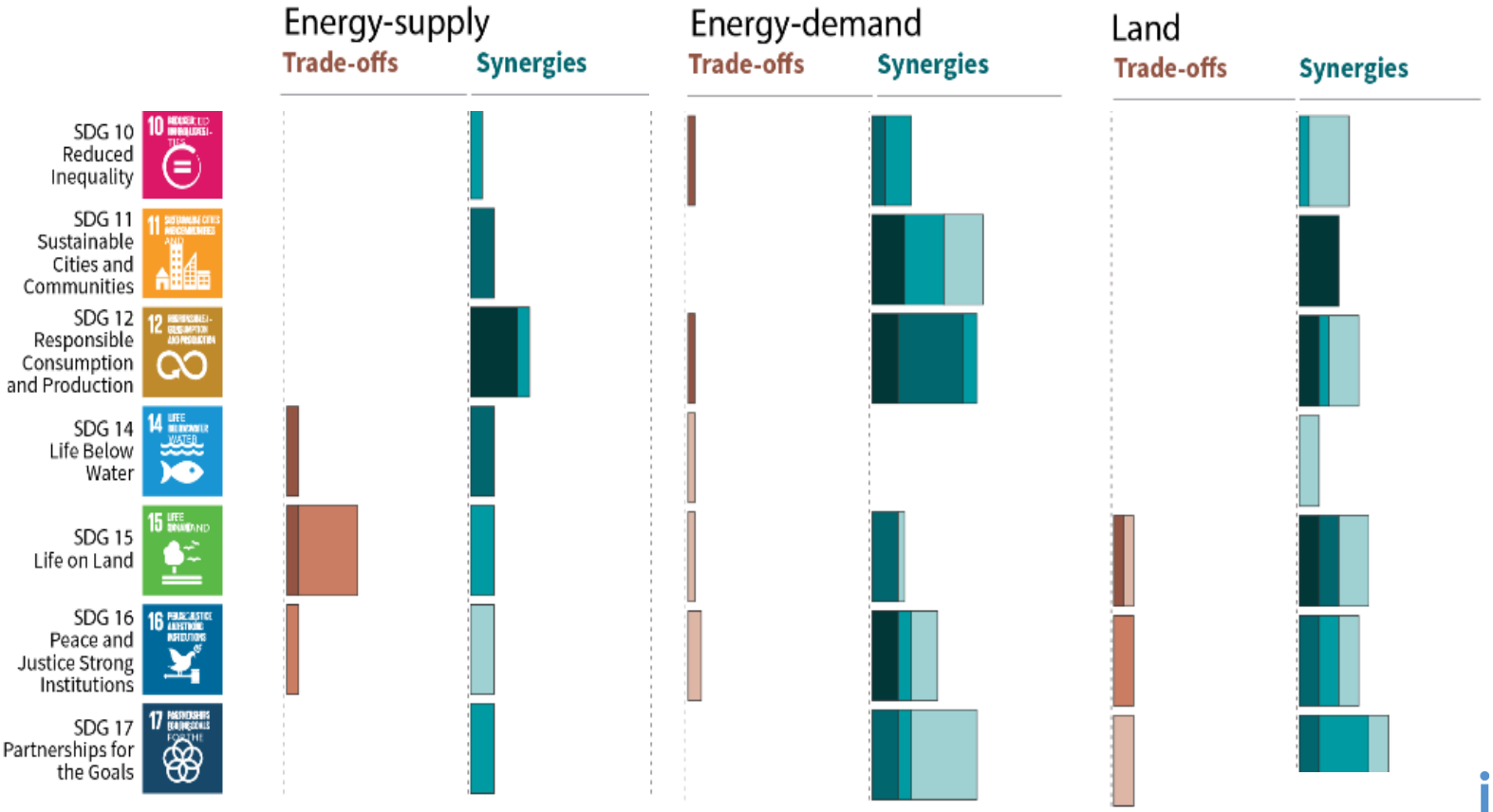
- Current national commitments are not enough to keep to either 1.5^{o}C or 2°C
- Would require deep changes in all aspects of society (e.g. energy, land, buildings, transport, food & diets, cities)
- New technologies, efficiency, cleaner energy sources, less deforestation, new land uses, sustainable agriculture
- Good news is there is movement in the right direction in lots of these areas but would need to do more, faster
- But this would require greater collective ambition

Mitigation and sustainable development



INTERGOVERNMENTAL PANEL ON climate change

Mitigation and sustainable development



Ethical and just transitions

- Any transitions need to be done responsibly and sustainably, limiting unintended consequences (tradeoffs)
- The sooner emissions fall, the more options we keep on the table and the lower the cost of emission reduction and unwanted impacts
- Doing more now brings a range of benefits now and in the future
- Doing less now would shift the burden of responsibility to later generations

Ultra-short summary

- Each year matters
- Each half a degree matters
- Each choice matters

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Thankyou

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