AVOID 2

Can we avoid dangerous climate change?

Implications of INDCs on emissions, temperature and impacts

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19th November 2015

Funded by

Met Office

Grantham Institute Climate Change and the Environment An institute of Imperial College London

Tyndall Centre for Climate Change Research

Walker Institute University of Reading

Department of Energy & Climate Change

Department for Environment Food & Rural Affairs

NERC Science of the Environment

Agenda

1. Why 2^{O}C?
2. What should we do to achieve 2^{O}C?
3. What do the INDC pledges add up to?
4. What benefits could these pledges have?
5. What more needs to be done?
6. Key messages

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Where could our emissions pathway lead us?

2 billion people with increased water scarcity

10-12 billion people/year exposed to heatwaves

70-90 million people/year affected by river flooding

Cooling demands 2x

50% of plant species lose > half habitat

60% of cropland less suitable for agriculture

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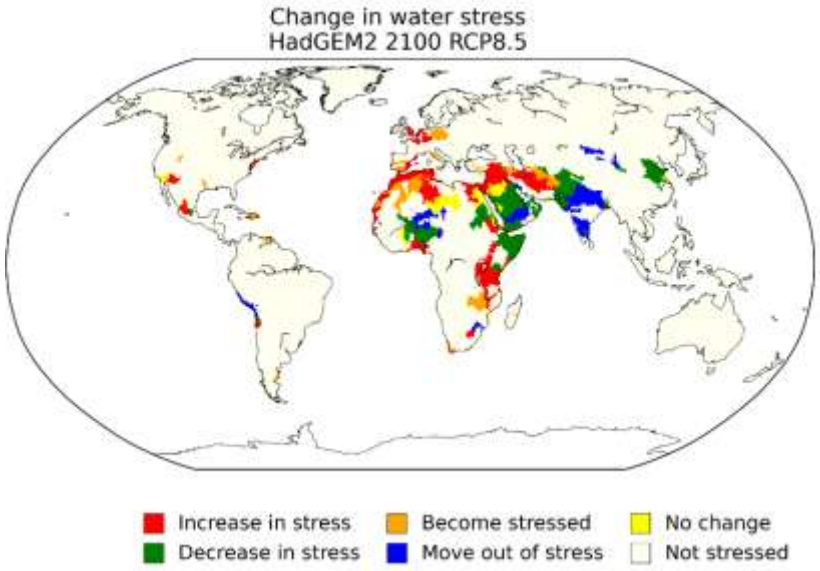
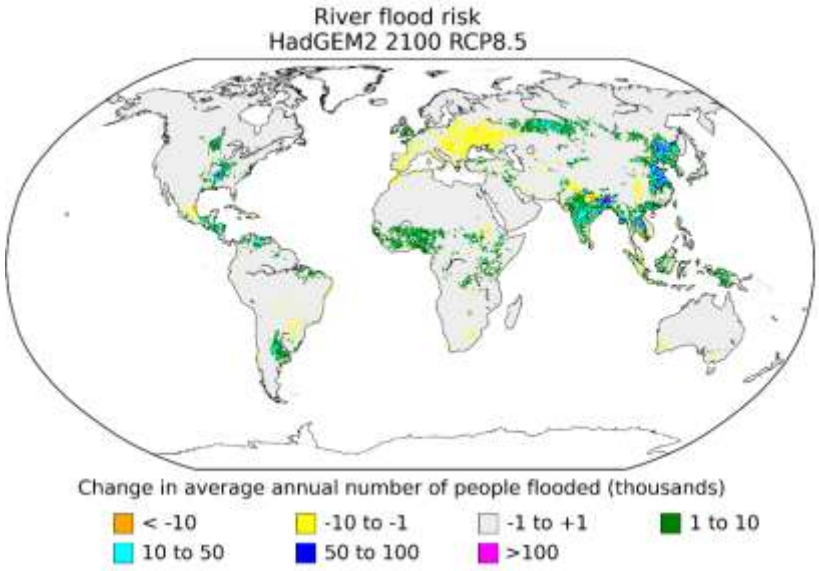
There are some potential benefits

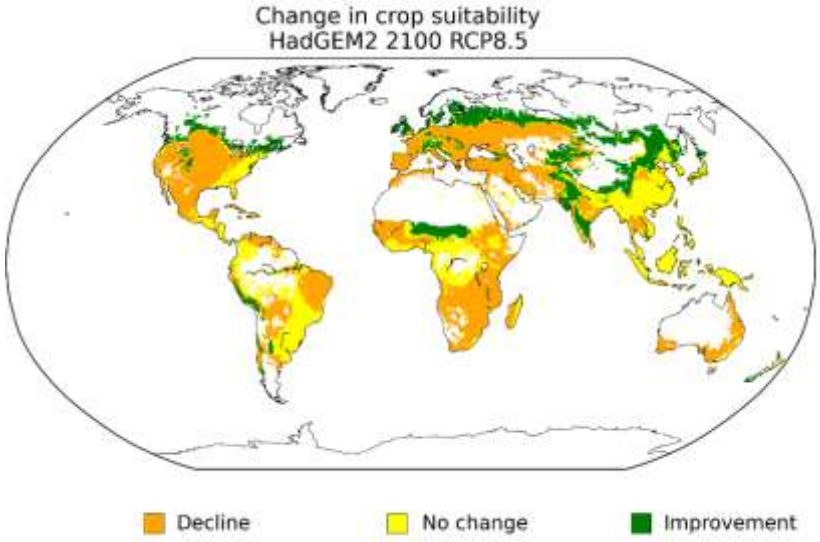
- Some water-stressed people may have more water
- Some flood-prone people could be flooded less frequently
- Some cropland would see an improvement in suitability for agriculture
- Higher CO_2 concentrations could improve the productivity of some crops

But not all of these benefits may be realised in practise

Impacts vary between regions







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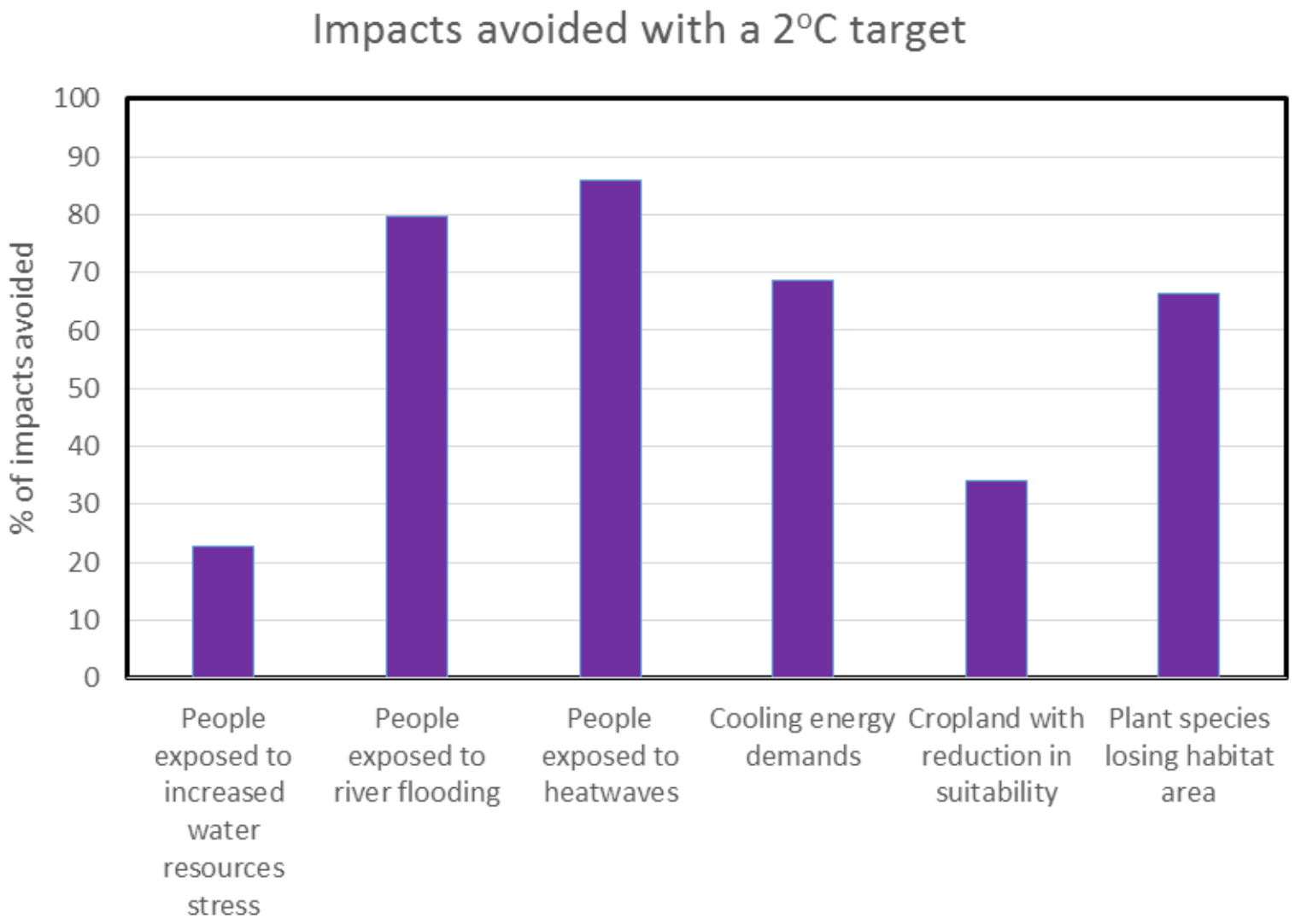
Which impacts could we avoid if we achieve 2°C?



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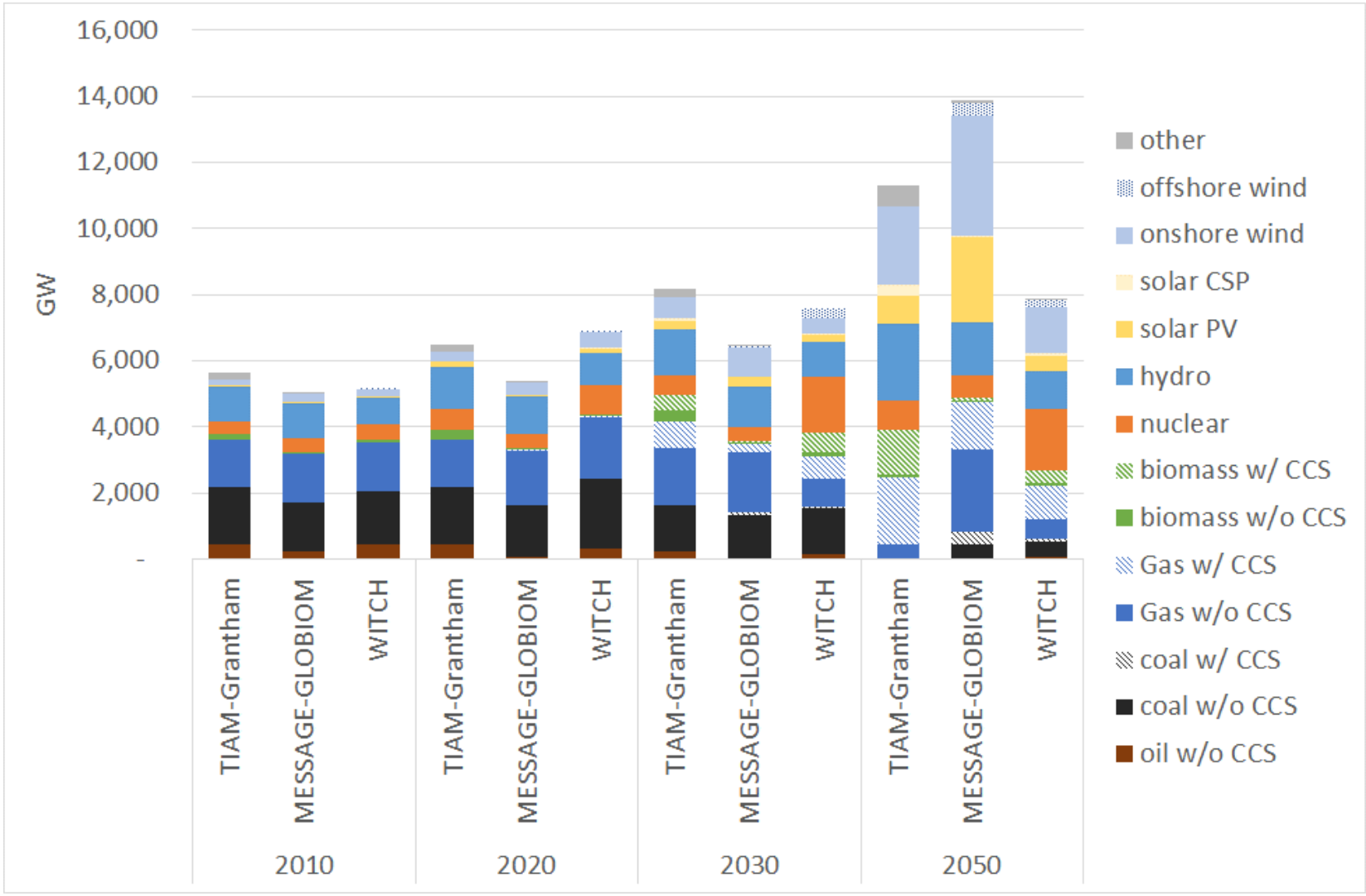
In a 2°C scenario, electricity is highly decarbonised by 2050



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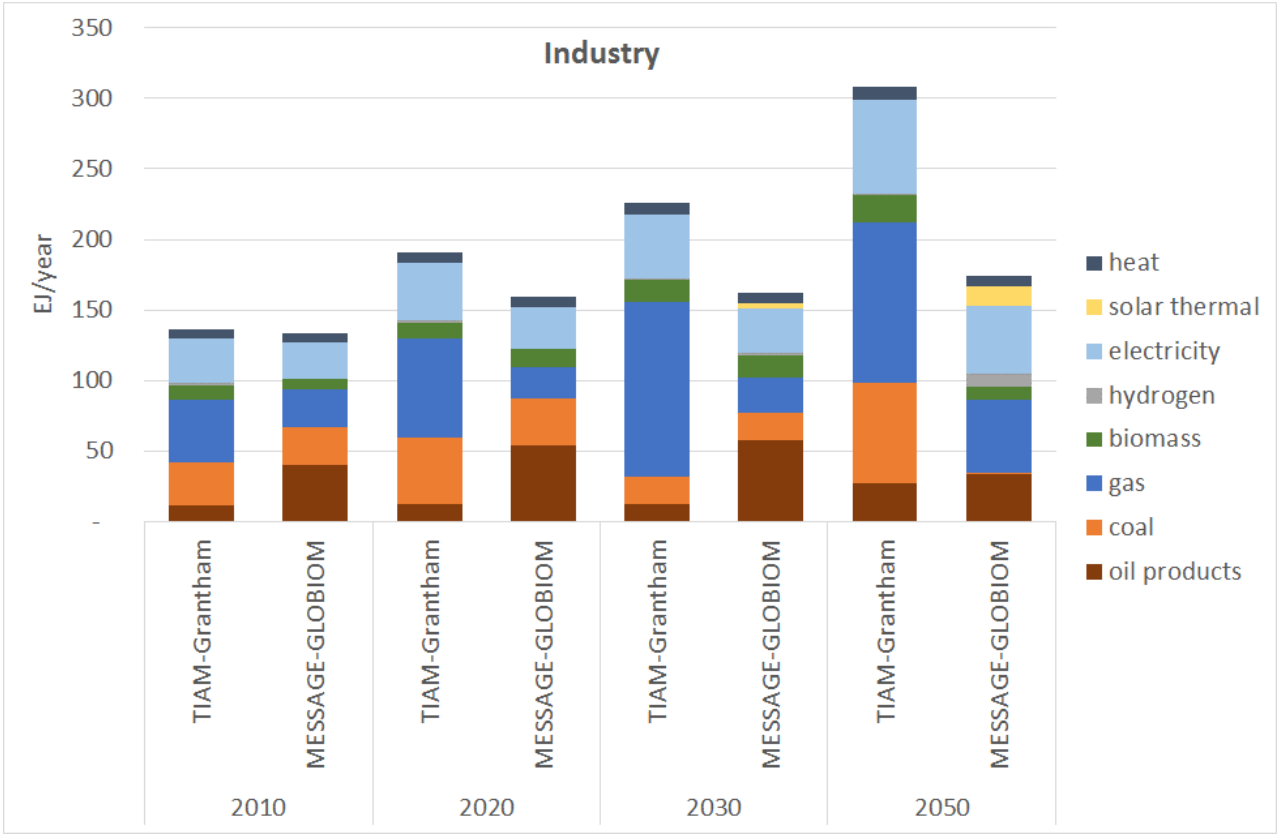
In a 2°C scenario, the fuel mix in end-use sectors shifts to electricity and other low-carbon fuels



- **Industry** sees increasing:
  - electrification
  - gas replacing coal
  - CCS (not shown)
- **Transport** sees oil replaced by:
  - biofuels
  - electricity (electric vehicles, plug-in hybrids)
  - hydrogen (fuel cell vehicles)
- **Buildings** see increased:
  - electrification (heat pumps)
  - less coal and oil for heating

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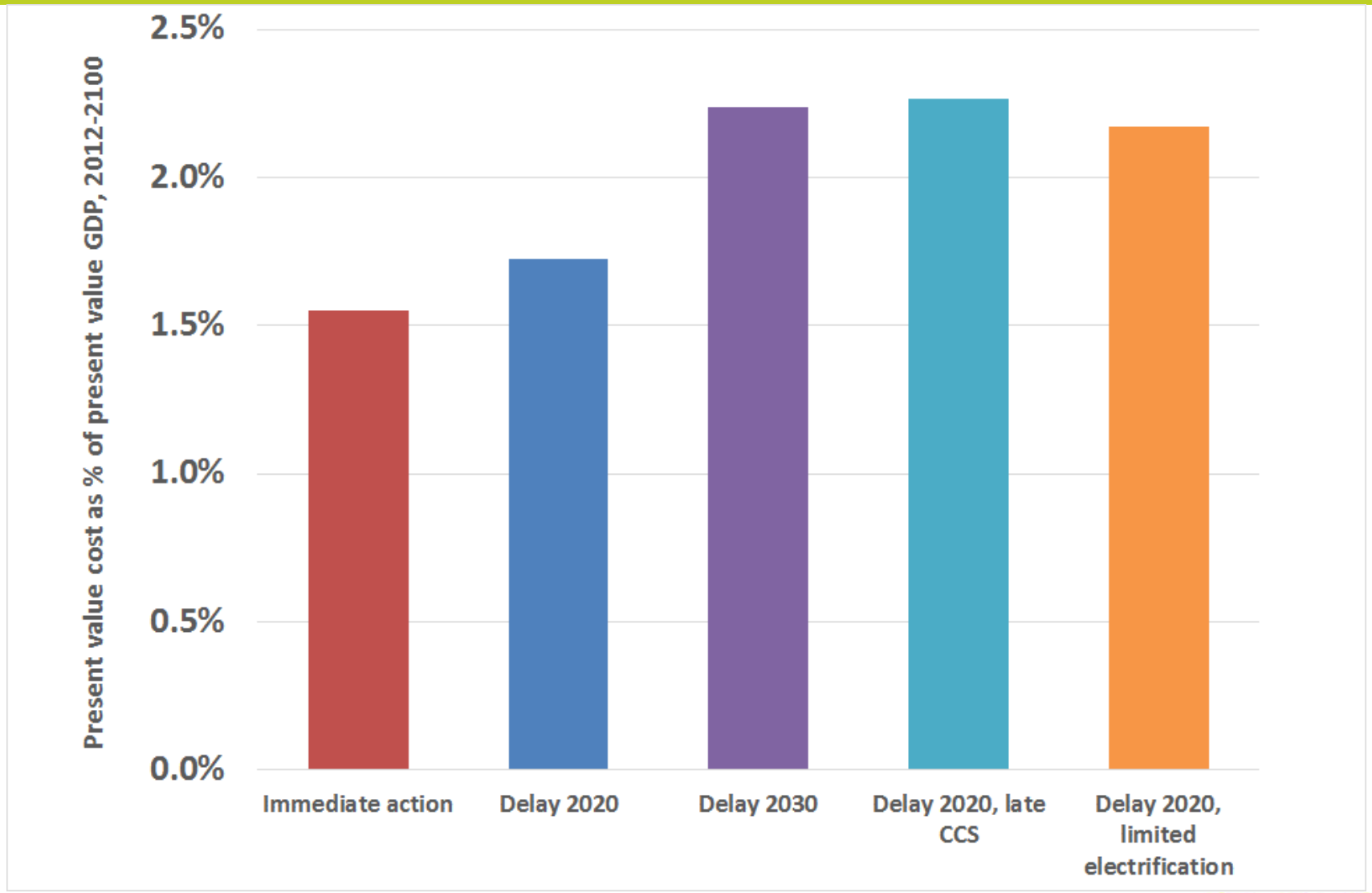
2°C could cost of the order 2% of GDP



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INDC analysis – summary of outcomes for 2030

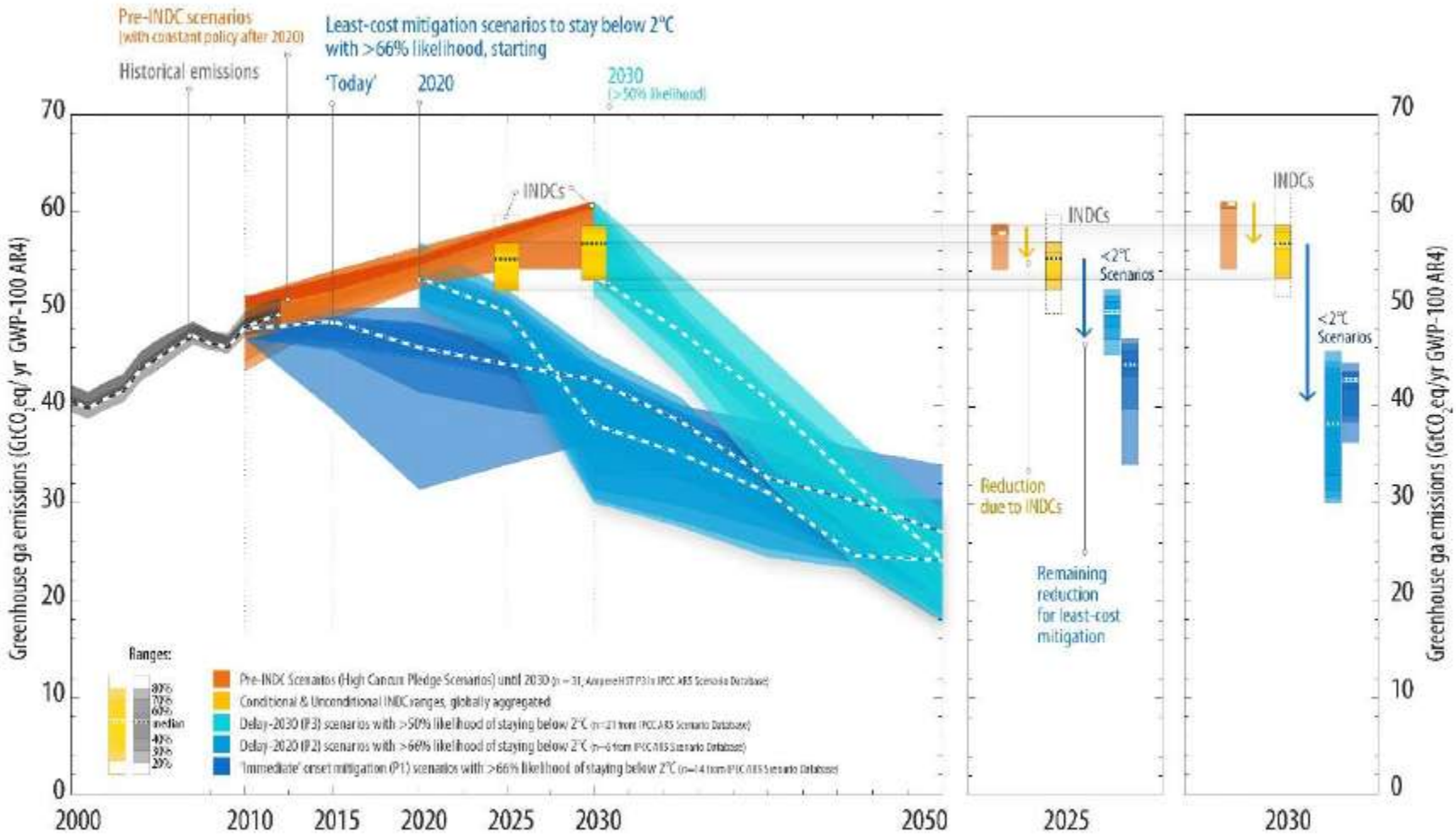
- UNFCCC synthesis report (30 October 2015)
  - As at 1st October, 148 Parties' INDCs submitted, covering 87% of global population, 94% of global GDP, 80% of global emissions
  - 2030 median estimate is 57 $GtCO_2e$ (range 53-59 $GtCO_2e$)
  - 2.8 $GtCO_2e$ below pre-INDC level of 2030 emissions

- Climate Action Tracker
  - INDCs lead to a 53-55 GtCO2e level of 2030 emissions

- AVOID 2:
  - INDCs lead to a 54 $GtCO_2e$ level of 2030 emissions

- Differences and uncertainties result from:
  - LULCUF accounting,
  - Estimates of future GDP growth
  - Estimates of future Business-as-Usual emissions
  - Conditionality of estimates

Comparison of INDCs to 2°C mitigation pathways



Source: UNFCCC synthesis report on INDCs

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What 2100 temperature changes could the INDCs lead to?

- JRC: “around 3^{O}C”
- AVOID 2: no back-tracking = 3^{O}C
- IEA World Energy Outlook (special report): 2.6^{O}C
- Climate Action Tracker: 2.7^{O}C
- MIT Energy and climate outlook: 3.9^{O}C (assumes no new policy beyond 2030)
- Methods vary, but rely heavily on assumptions around post-2030 trajectory, following:
  - Energy intensity improvements
  - Continued phase-out of fossil fuels
  - Increasing CO_2 pricing in line with initial efforts

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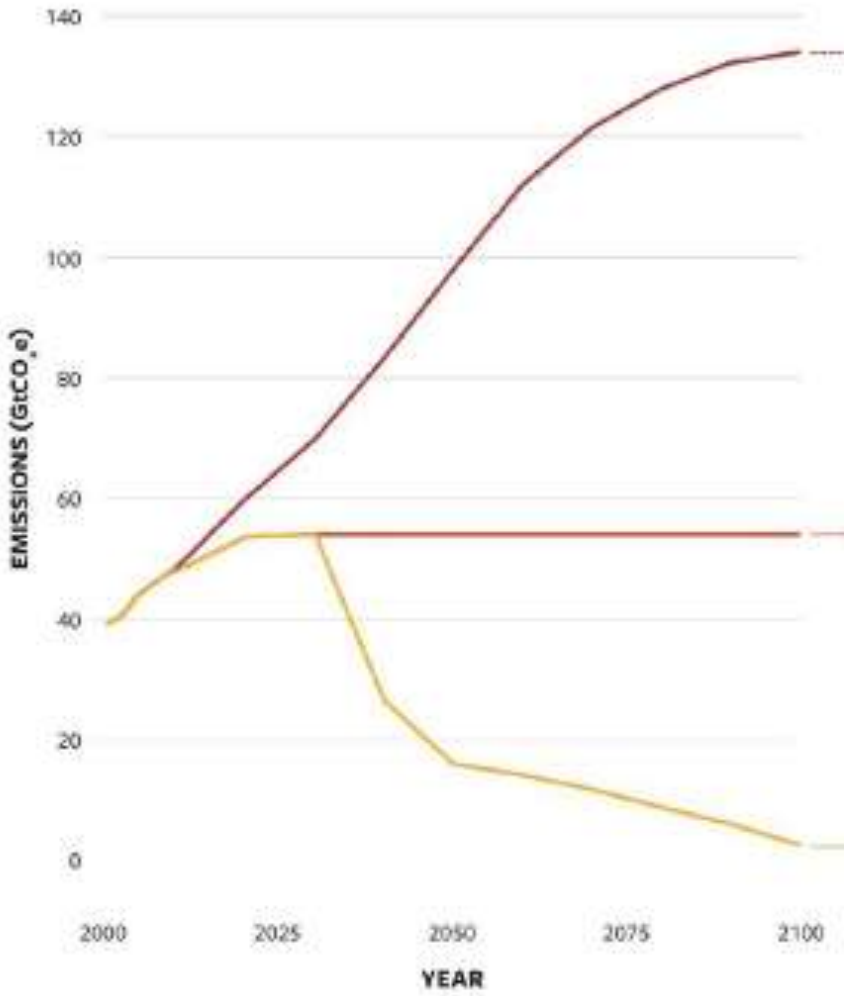
INDC analysis – summary of outcomes for 2100



Reference – what if no mitigation action? 5.3°C

What if no backtracking? 3.0°C

What if global coordinated action to 2°C? 2.0°C

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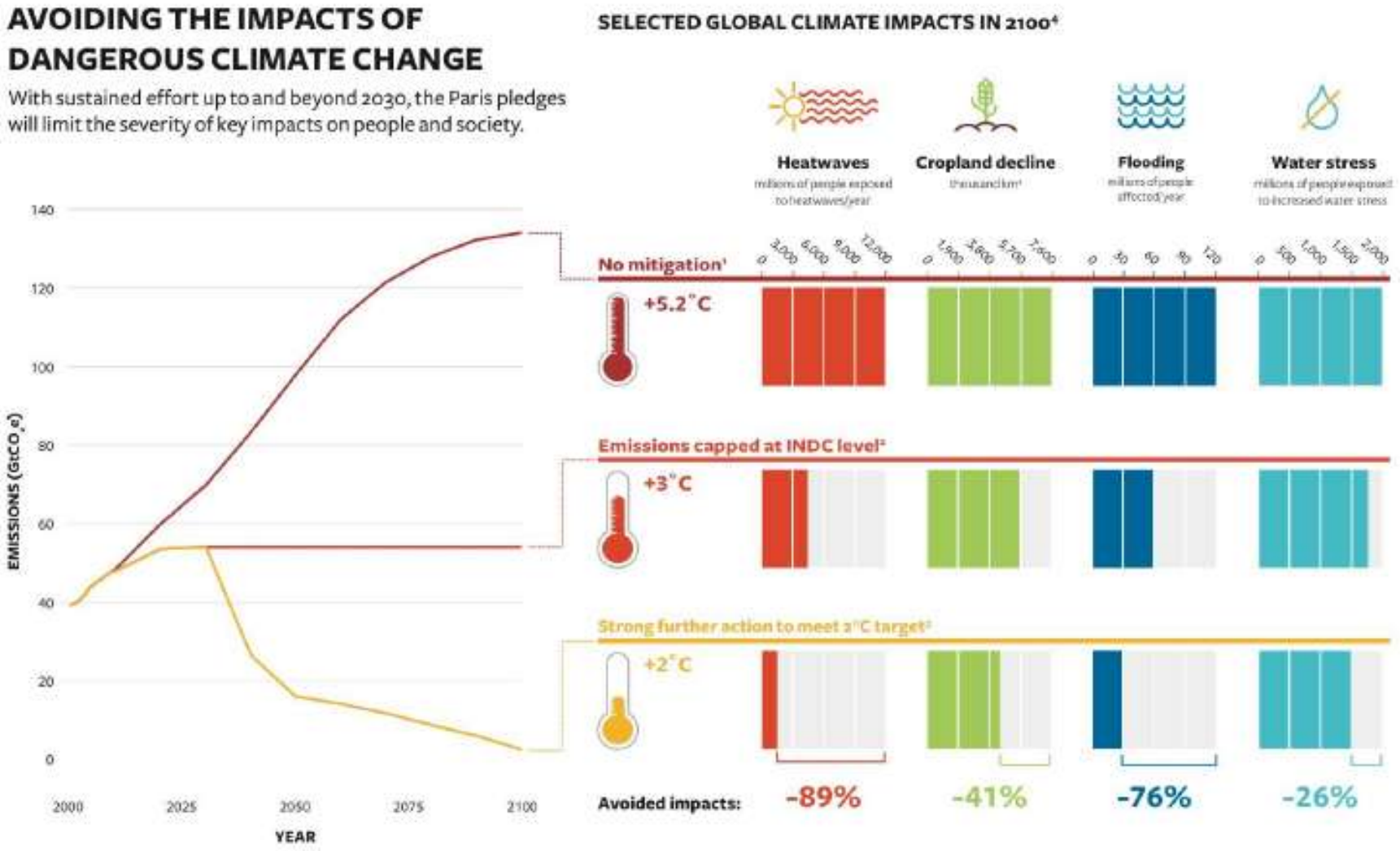
What impacts do the different scenarios avoid?



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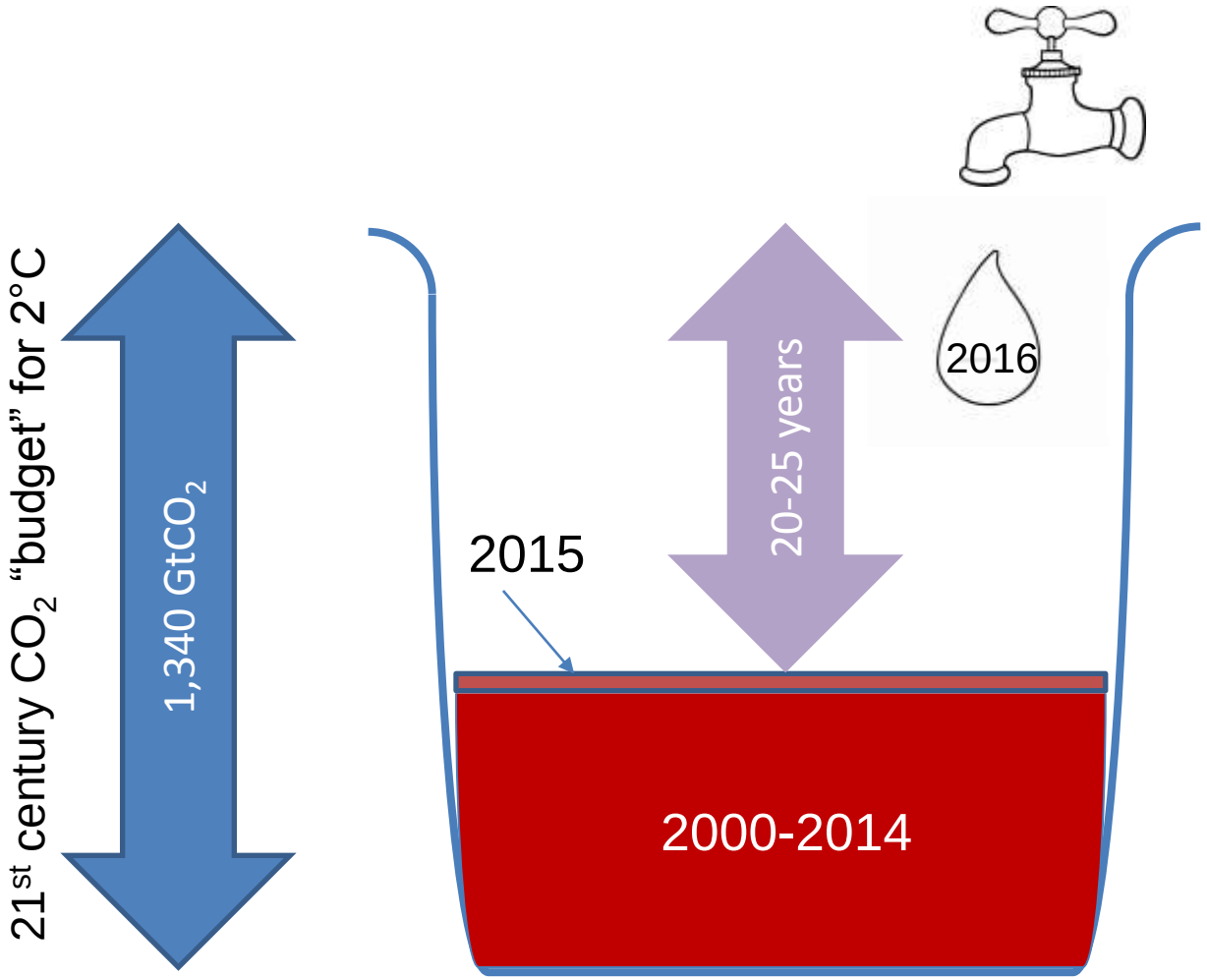
Are the INDCs 2°C-consistent?



We should be significantly reducing emissions by 2030

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Earlier action = lower costs and slower rates of decarbonisation

WAITING UNTIL 2030...

...will cost 33-66% more

4% fastest known rate of decarbonisation[4]

...means decarbonising two to three times as fast as if we start in 2020[6]

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Earlier action means less aggressive technology deployment

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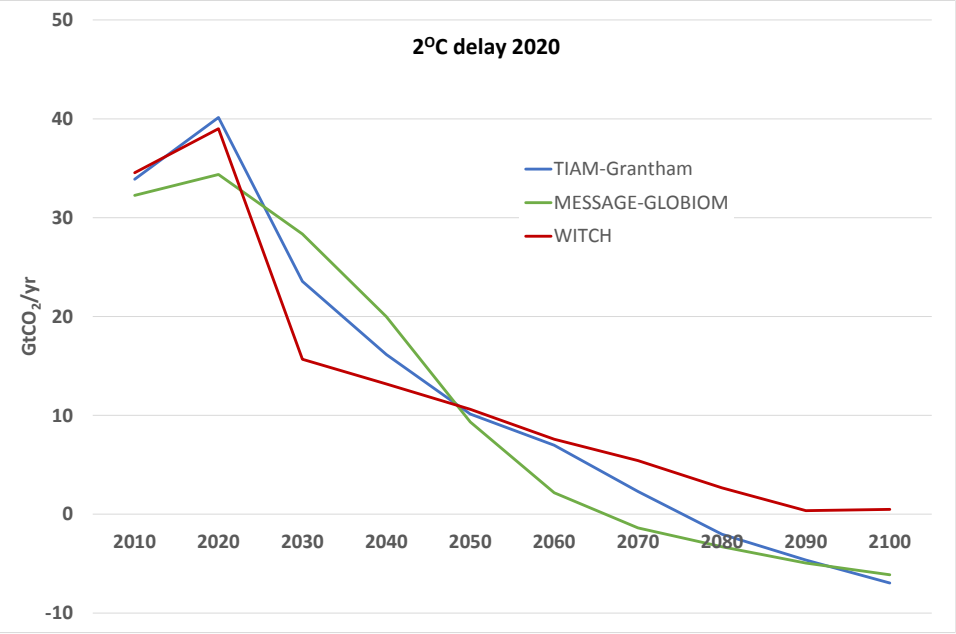
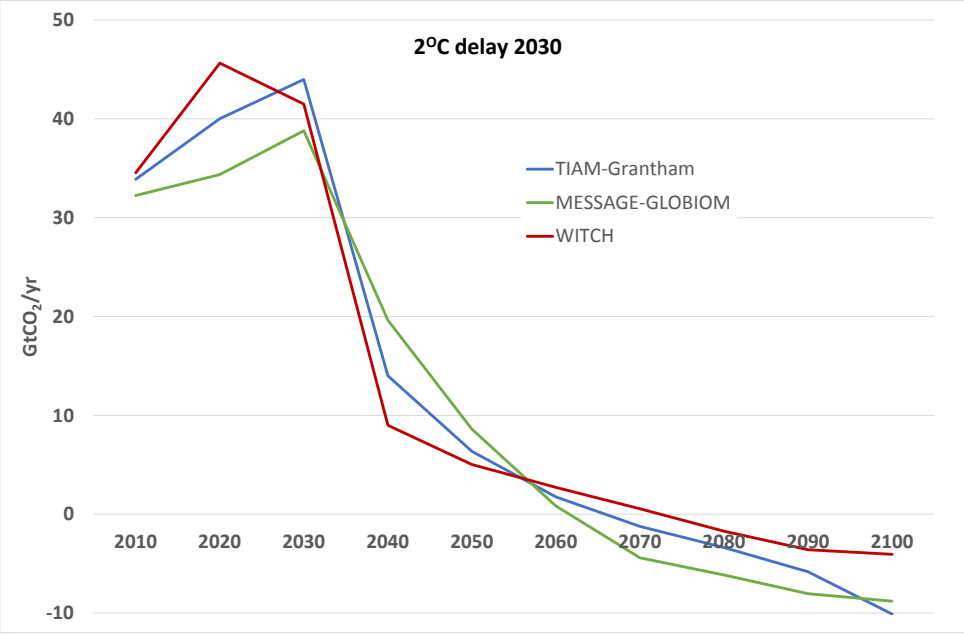
Earlier action means less negative emissions





Delaying action 10 years (i.e. to 2030) means three times as much negative emissions in the 21st century

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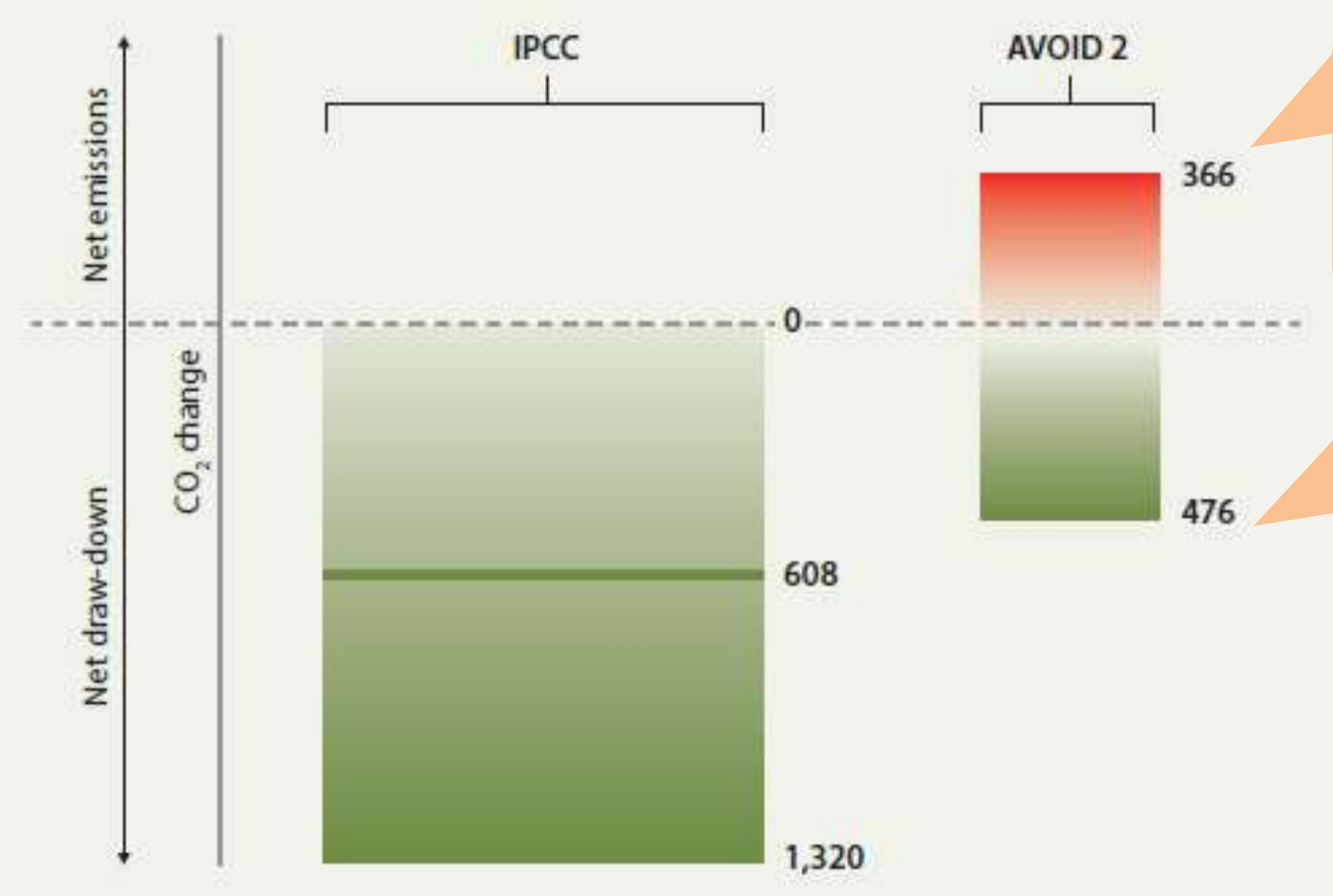
Bio-energy with CCS (BECCS) is key to achieving 2°C - but several uncertainties remain



If bio-energy uses existing forest land, it could result in net +ve emissions

NET removal of 476 $GtCO_2$ over the 21st century is possible

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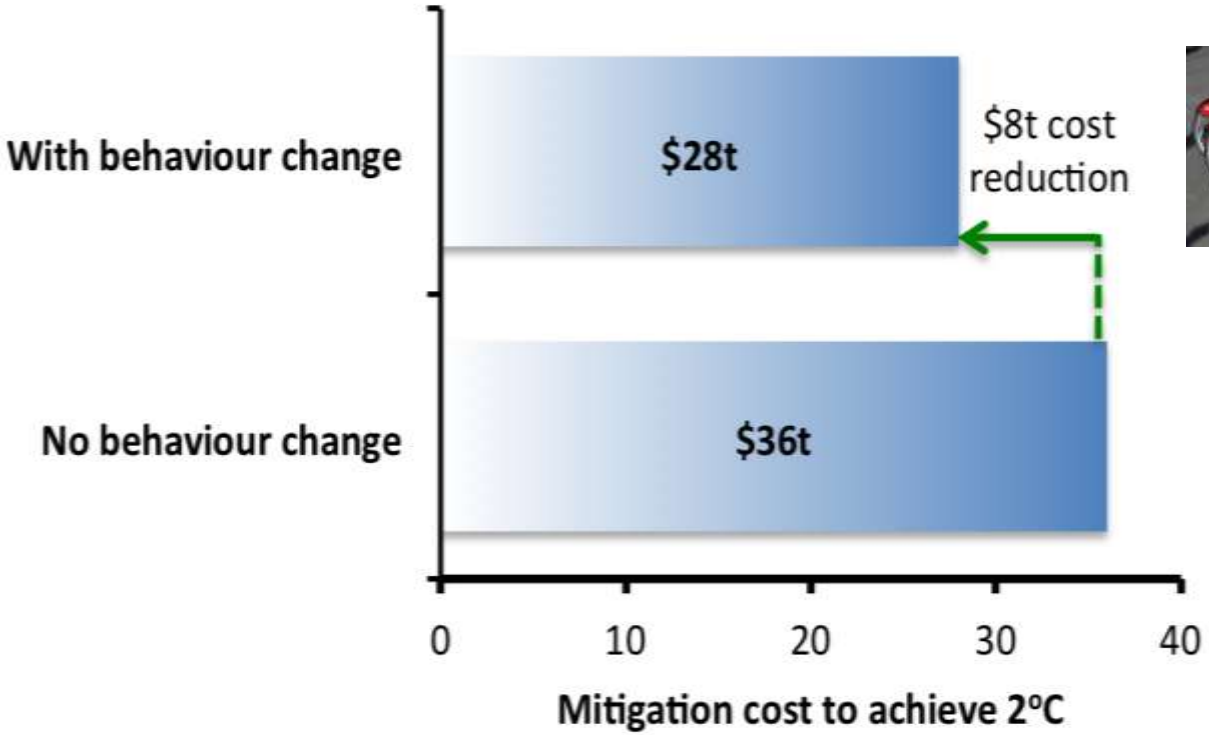
Energy efficiency can help keep costs manageable



We have the policies to fulfil significant energy efficiency potential

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Key points - summary

- 2^{O}C or less is a goal which would avoid significant adverse climate impacts
- This requires a transition to much lower fossil fuel electricity, industry, transport and buildings
- The INDCs add up to about 54GtCO_2e in 2030 according to AVOID 2
- Long-term temperature implications of INDCs in the range 2.6-3^{O}C by 2100, *assuming that policies and actions increase after 2030*
- This cuts emissions from a reference scenario of closer to 70GtCO_2e in 2030, which could avoid significant climate impacts, depending on the post-2030 emission pathway
- Mitigation costs, reliance on unproven negative emissions technologies, and ultimately the risk of not achieving the 2^{O}C goal, all increase with delay
- So the INDCs are the start, and Paris should begin a process of increasing ambition so as to keep the 2^{O}C goal within reach – a “ratchet” mechanism is key to this.