1.5 ºC Long-term Global Goal and Decarbonization of Energy System

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Workshop on Energy Decarbonisation Pathways

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Sources of information in slides below include, among others::

1. IPCC WGIII AR5
2. Updated synthesis report on the aggregate effect of INDCs - published 2 May 2016, FCCC/CP/2016/2, UNFCCC, http://unfccc.int/focus/indc_portal/items/9240.php
3. Rogelj et.al., Nature Climate Change | Vol 5 | June 2015
4. Fawcess et al, Science, 2015
5. Sterner et al. 2016
6. Kolp and Nakicenovic. 2016
7. Presentation on 'Structured Expert Dialogue' by Andreas Fischlin at IPCC Scoping Meeting, Geneva, August 14–17, 2016

*This presentation derives information from varied sources. The responsibility of the contents and views expressed are solely that of the presenter

Context

Adequacy of the Long Term Global Goal (LTGG) in the light of the ultimate objective of the Convention

History of 1.5ºC LTGG: 1

COP 16 (held in Cancun) recognized "that **deep cuts in global greenhouse gas emissions are required according to science, and as documented in the *Fourth Assessment Report*** of the Intergovernmental Panel on Climate Change, with a view to reducing global greenhouse gas emissions so as to **hold the increase in global average temperature below 2 °C above pre-industrial levels**, and that Parties should take urgent action to meet this long-term goal, consistent with science and on the basis of equity".

History 1.5ºC LTGG: 2

The COP also decided to **periodically review the adequacy of this long-term global goal** in the light of the **ultimate objective of the Convention** (theme 1 of the 2013–2015 review), and overall progress towards achieving the long-term global goal, including a consideration of the implementation of the commitments under the Convention (theme 2).

The 2013–2015 review was also tasked with the consideration of the **strengthening the long-term global goal**, referencing various matters presented by the science, including in relation to a temperature rise of 1.5 °C. The COP carried out the 2013–2015 review with assistance from a joint SBSTA/SBI contact group. COP 18 established the SED to support the work of the joint contact group and ensure the scientific integrity of the review through a focused exchange of views, information and ideas.

COP18 Established Structured Expert Dialogue

Scope:

Adequacy of the **long-term global goal in the light of the ultimate objective of the Convention**; and the overall progress made towards achieving the long-term global goal, including a consideration of the commitments under the Convention

Outcomes of SED

5. The 2 °C limit should be seen as a defence line

10. While science on the 1.5 °C warming limit is less robust, efforts should be made to push the defence line as low as possible

What to do to limit warming below 2 °C?

Limiting global warming to below 2 °C is still feasible and will bring about many co-benefits, but poses substantial technological, economic and institutional challenges

- Costs are manageable
- Iteratively reassessing feasibility
- Periodic reviews would provide opportunity to (re)assess overall progress

COP21 Decisions from Paris

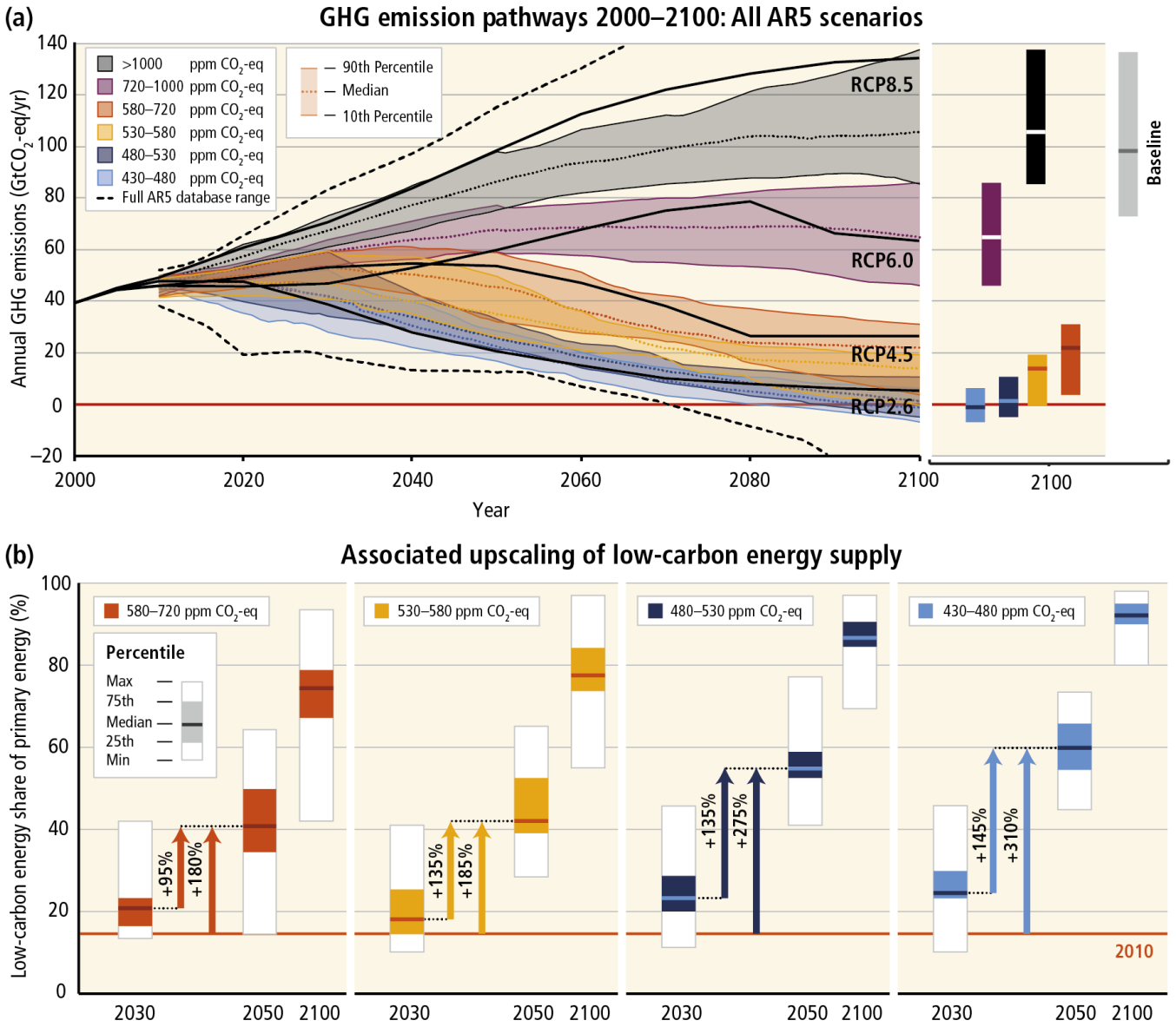
1/CP.21

21. *Invites* the Intergovernmental Panel on Climate Change to provide a special report in 2018 on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways;

17. *Notes with concern* that the estimated aggregate greenhouse gas emission levels in 2025 and 2030 resulting from the intended nationally determined contributions do not fall within least-cost 2 °C scenarios but rather lead to a projected level of 55 gigatonnes in 2030, and *also notes* that much greater emission reduction efforts will be required than those associated with the intended nationally determined contributions in order to hold the increase in the global average temperature to below 2 °C above pre-industrial levels by reducing emissions to 40 gigatonnes or to 1.5 °C above pre-industrial levels by reducing to a level to be identified in the special report referred to in paragraph 21 below;

1.5 °C Long-term Global Goal
&
Framing of Decarbonisation Scenarios for the Energy Sector

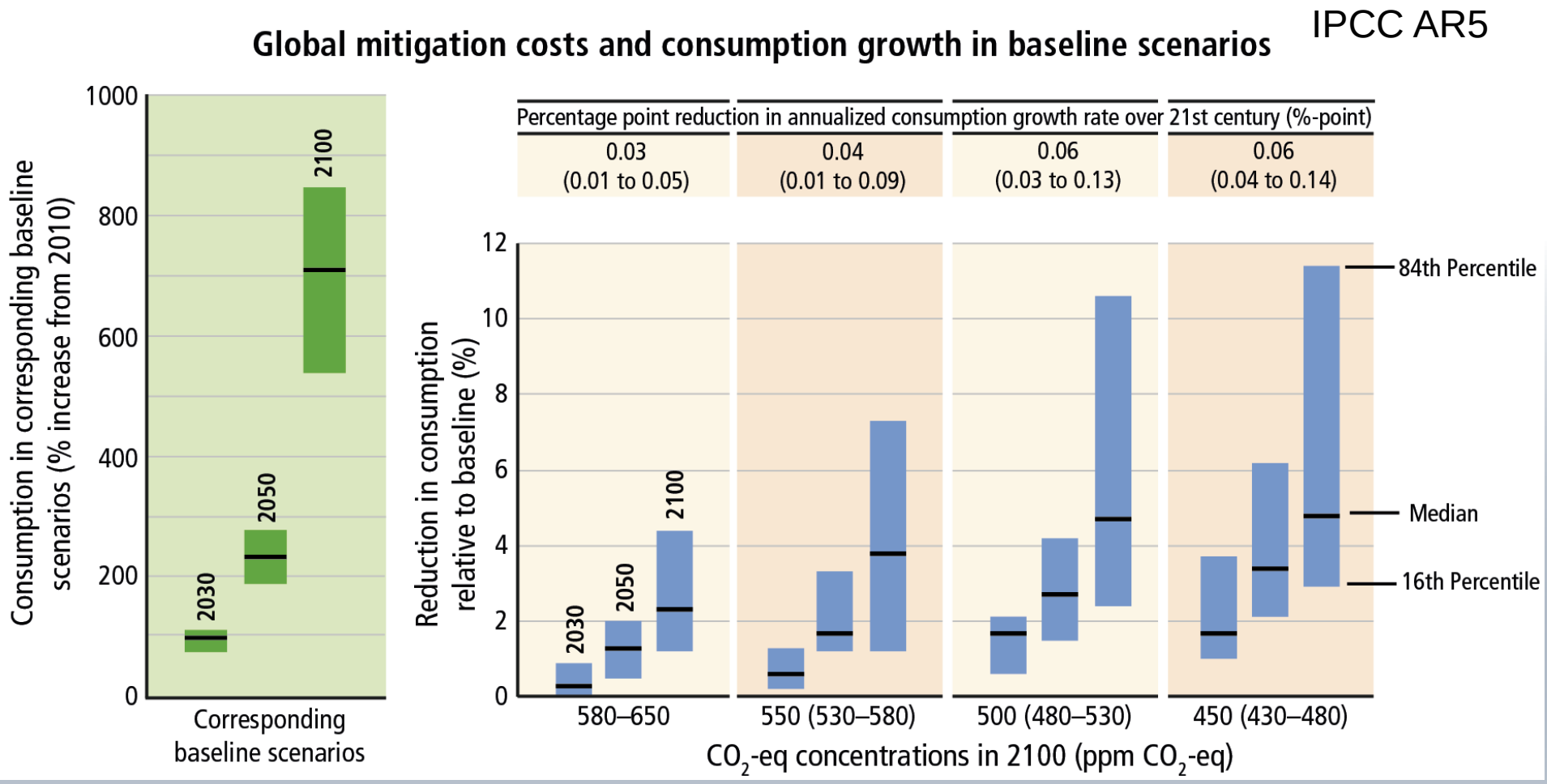
Emissions Pathways and Associated low carbon energy supply (IPCC AR5)



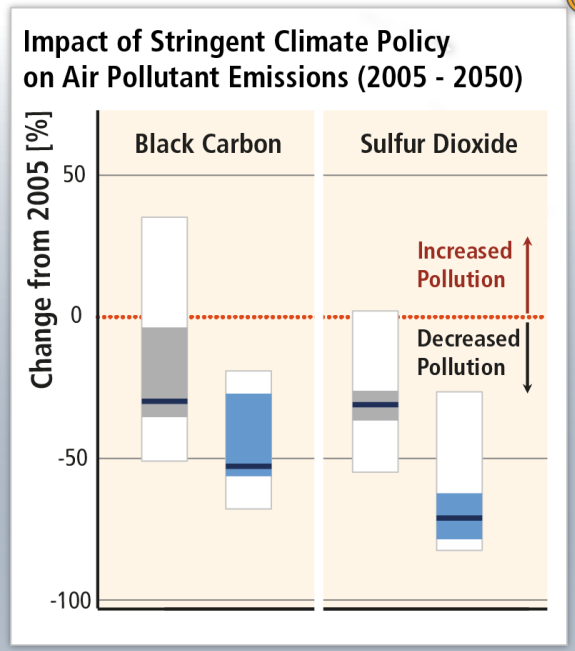
IPCC AR5

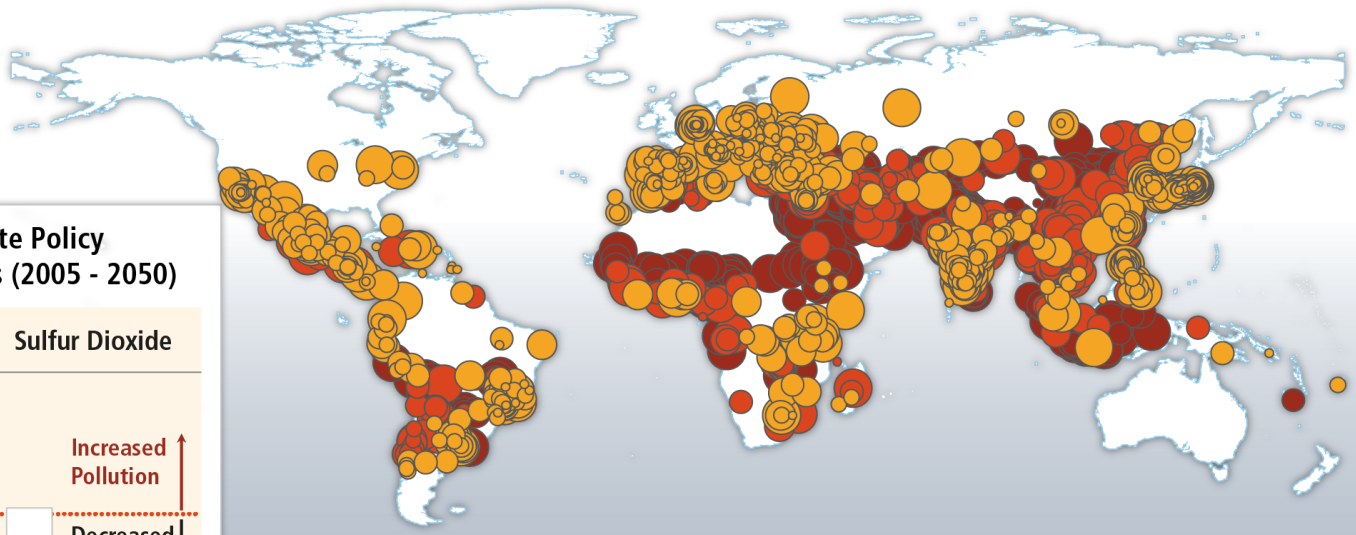
Global Mitigation Costs and Consumption Growth (IPCC AR5)

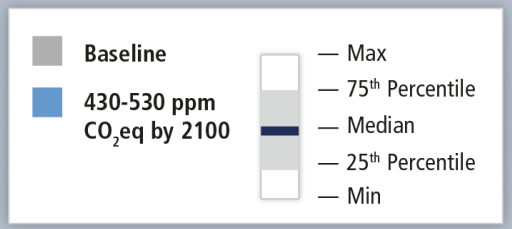
IPCC AR5

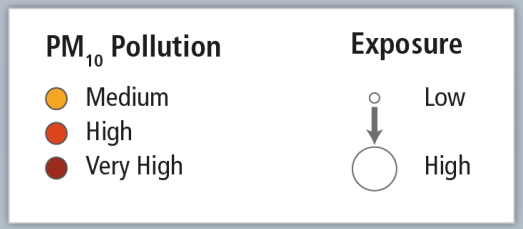


Climate change mitigation can result in co-benefits for human health and other societal goals (IPCC AR5)



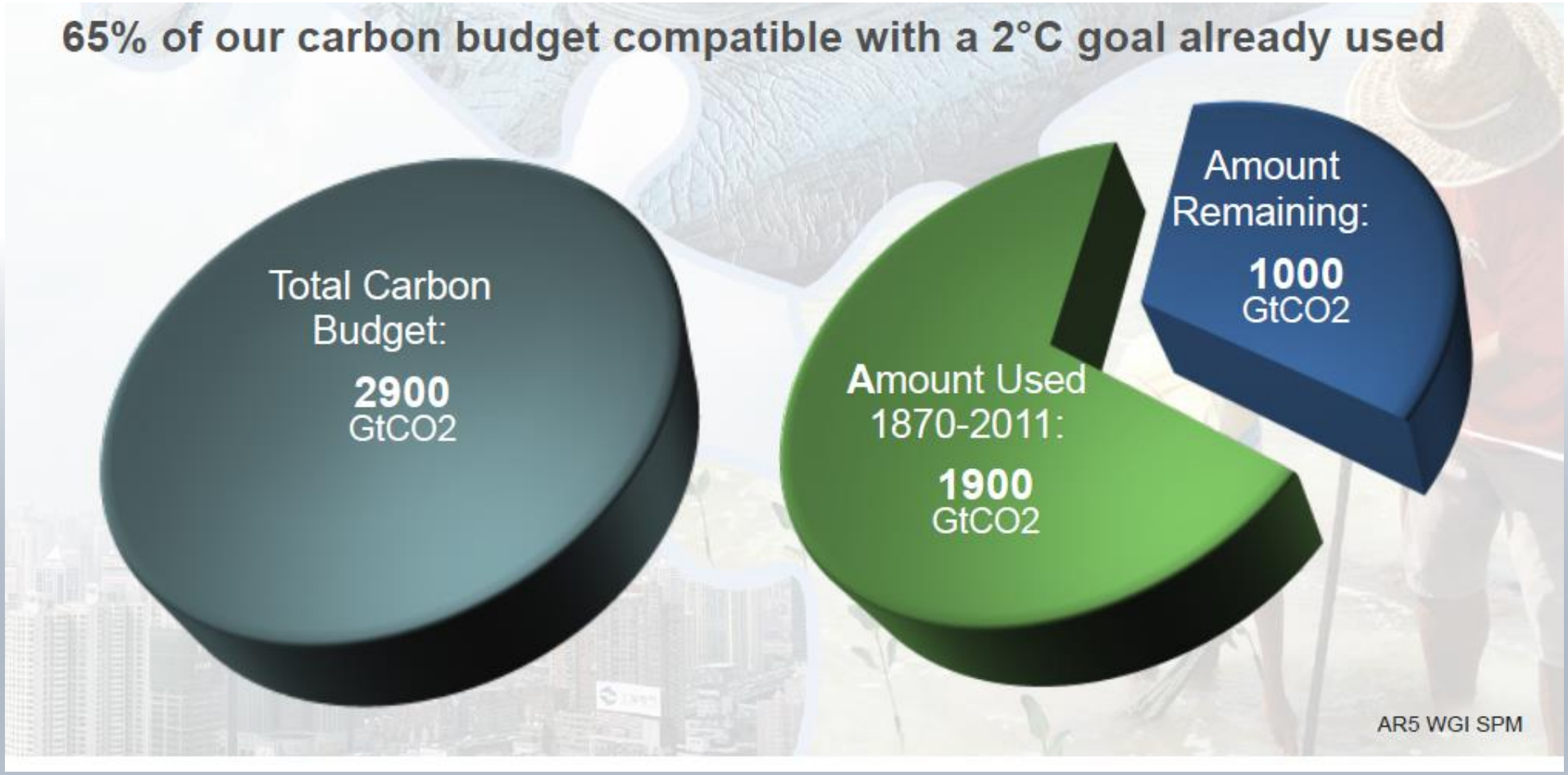






Based on Figures SPM.6 and 12.23

2^0C Budget (AR5): Closing Mitigation Window



IPCC AR5 WGI SPM

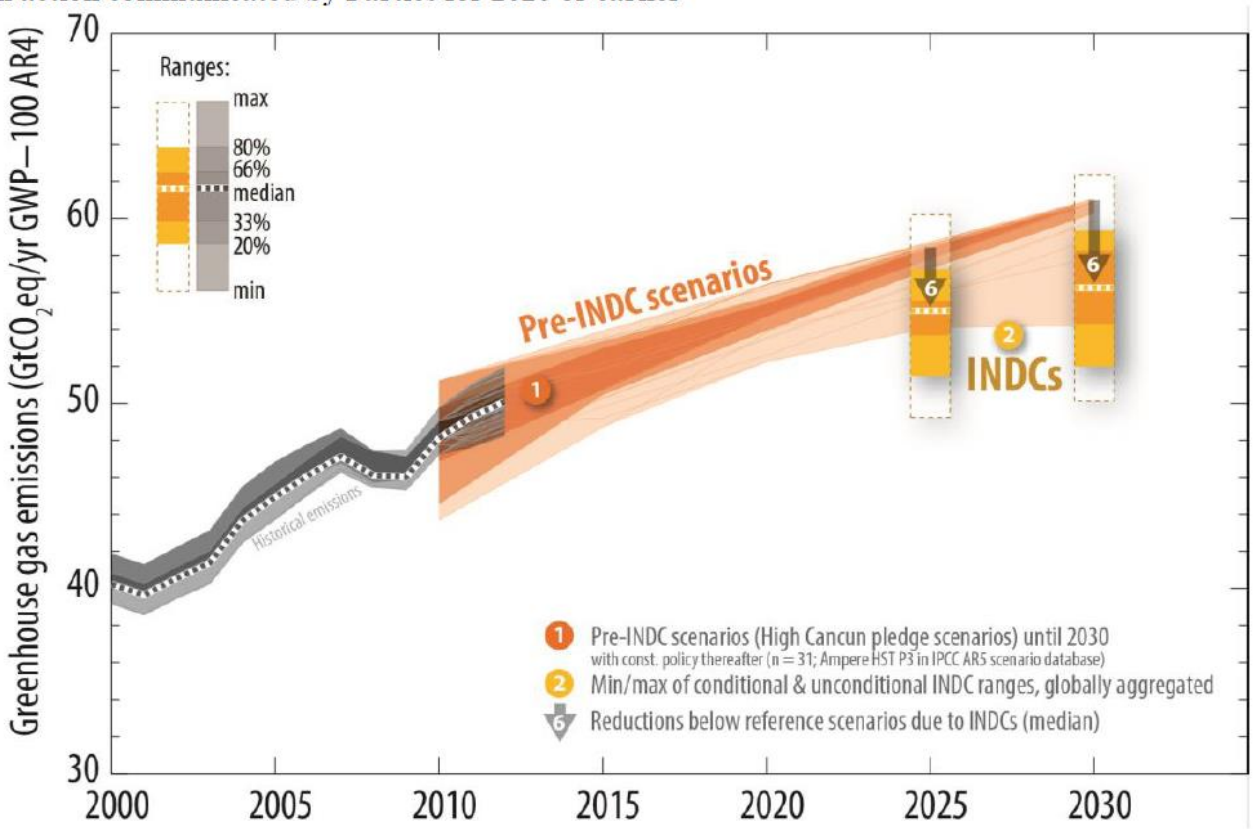
Post-AR5: INDCs + Paris Agreement

Updated synthesis report on the aggregate effect of INDCs - published 2 May 2016,
FCCC/CP/2016/2, UNFCCC,
http://unfccc.int/focus/indc_portal/items/9240.php

Cancun Pledges (2020) and Post-INDC (2025-30) Scenarios

Figure 7

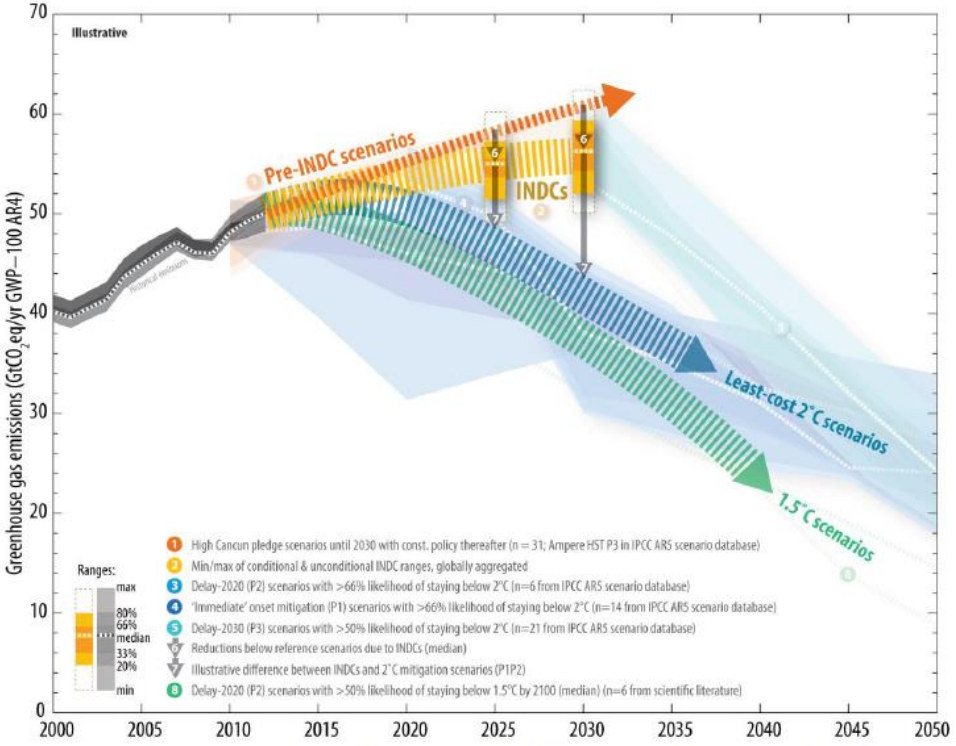
Global emission levels resulting from the implementation of the communicated intended nationally determined contributions by 2025 and 2030 in comparison with emission trajectories consistent with action communicated by Parties for 2020 or earlier



Source: Intergovernmental Panel on Climate Change Fifth Assessment Report scenario database and own aggregation.

Global Emissions: INDC vs. 2 °C & 1.5 °C Scenarios

Figure 2
Comparison of global emission levels in 2025 and 2030 resulting from the implementation of the intended nationally determined contributions and under other scenarios



Sources: Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report scenario database, 1.5 °C scenarios from scientific literature (see footnote 18), IPCC historical emission database and intended nationally determined contribution quantification.

Abbreviations: AR4 = Fourth Assessment Report of the Intergovernmental Panel on Climate Change, GWP = global warming potential, INDC = intended nationally determined contribution, IPCC AR5 = Fifth Assessment Report of the Intergovernmental Panel on Climate Change, n = number of scenarios, yr = year.

CO_2 Emissions Budget for Staying Below 2 °C

Figure 11

Comparison of cumulative CO_2 emissions under different scenarios

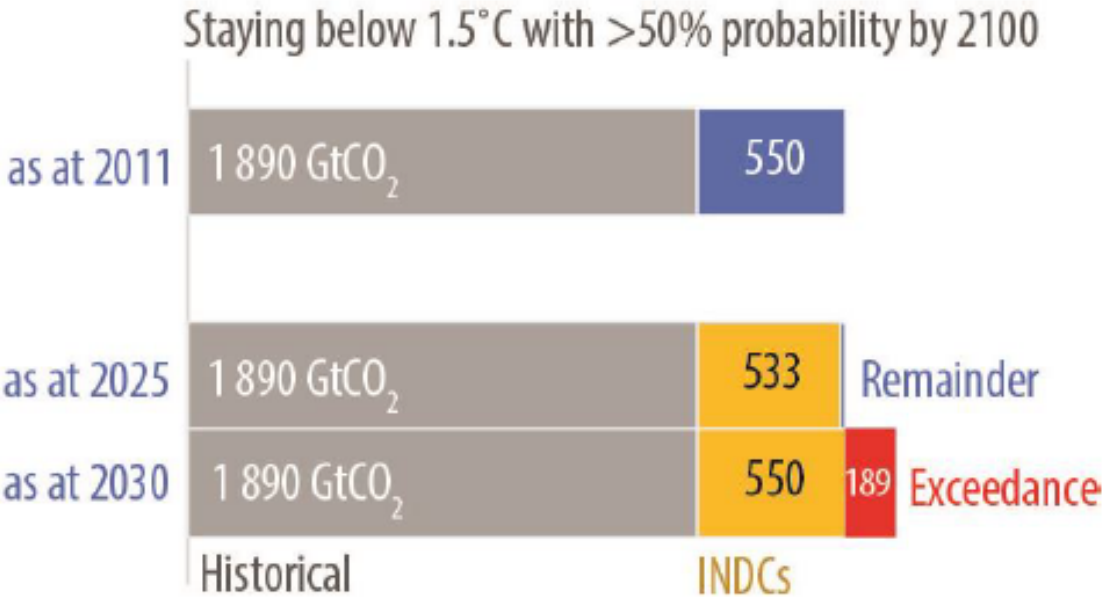
Source: Intergovernmental Panel on Climate Change Fifth Assessment Report scenario database and own aggregation.

Abbreviation: INDCs = intended nationally determined contributions.

CO_2 Emissions Budget for Staying Below 1.5^0C

Figure 13

Cumulative CO_2 emissions consistent with the goal of keeping global average temperature rise below 1.5 °C



Source: Intergovernmental Panel on Climate Change Fifth Assessment Report scenario database and own aggregation.

Abbreviation: INDCs = intended nationally determined contributions.

1.5^{0}C and Energy Transformation

nature climate change

PERSPECTIVE

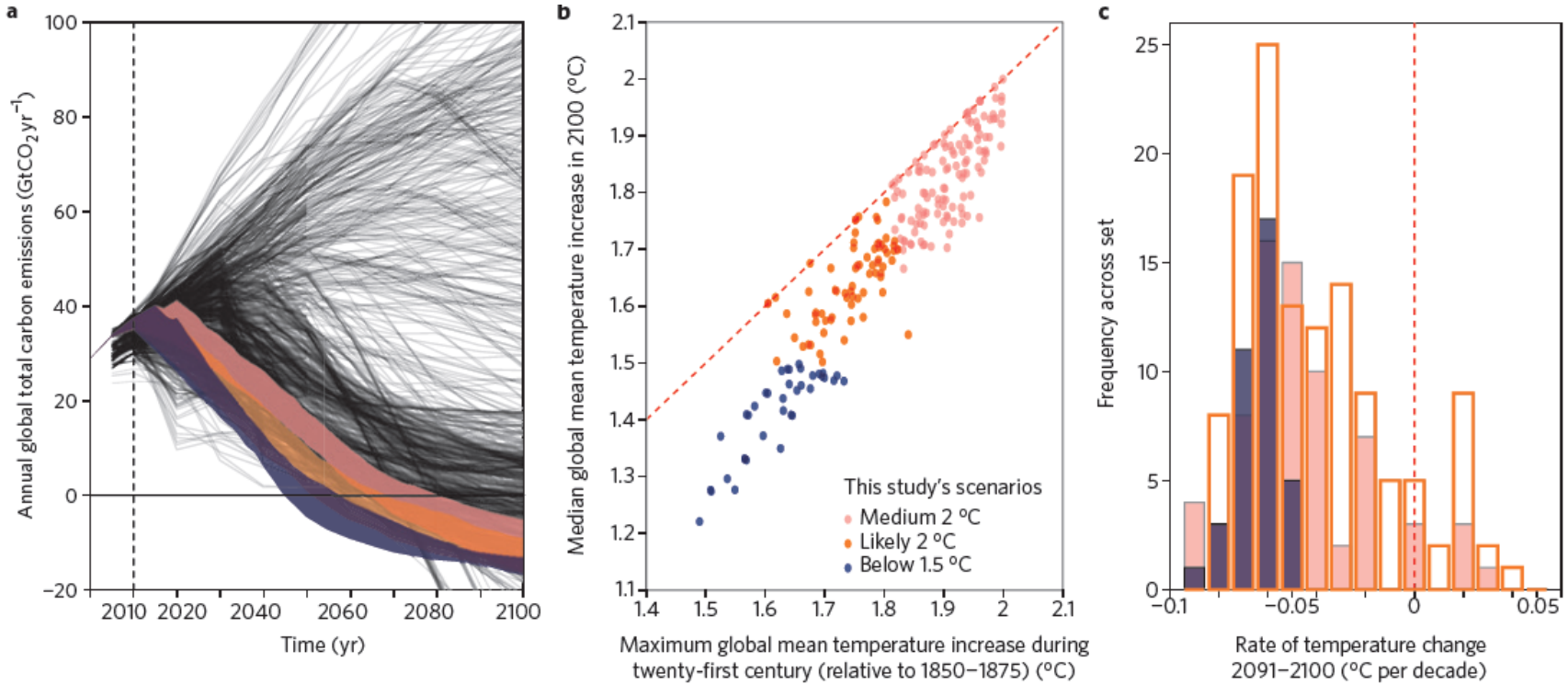
PUBLISHED ONLINE: 21 MAY 2015 | DOI: 10.1038/NCLIMATE2572

Energy system transformations for limiting end-of-century warming to below 1.5 °C

Joeri Rogelj[1,2*], Gunnar Luderer[3*], Robert C. Pietzcker[3], Elmar Kriegler[3], Michiel Schaeffer[4,5], Volker Krey[1] and Keywan Riahi[1,6]

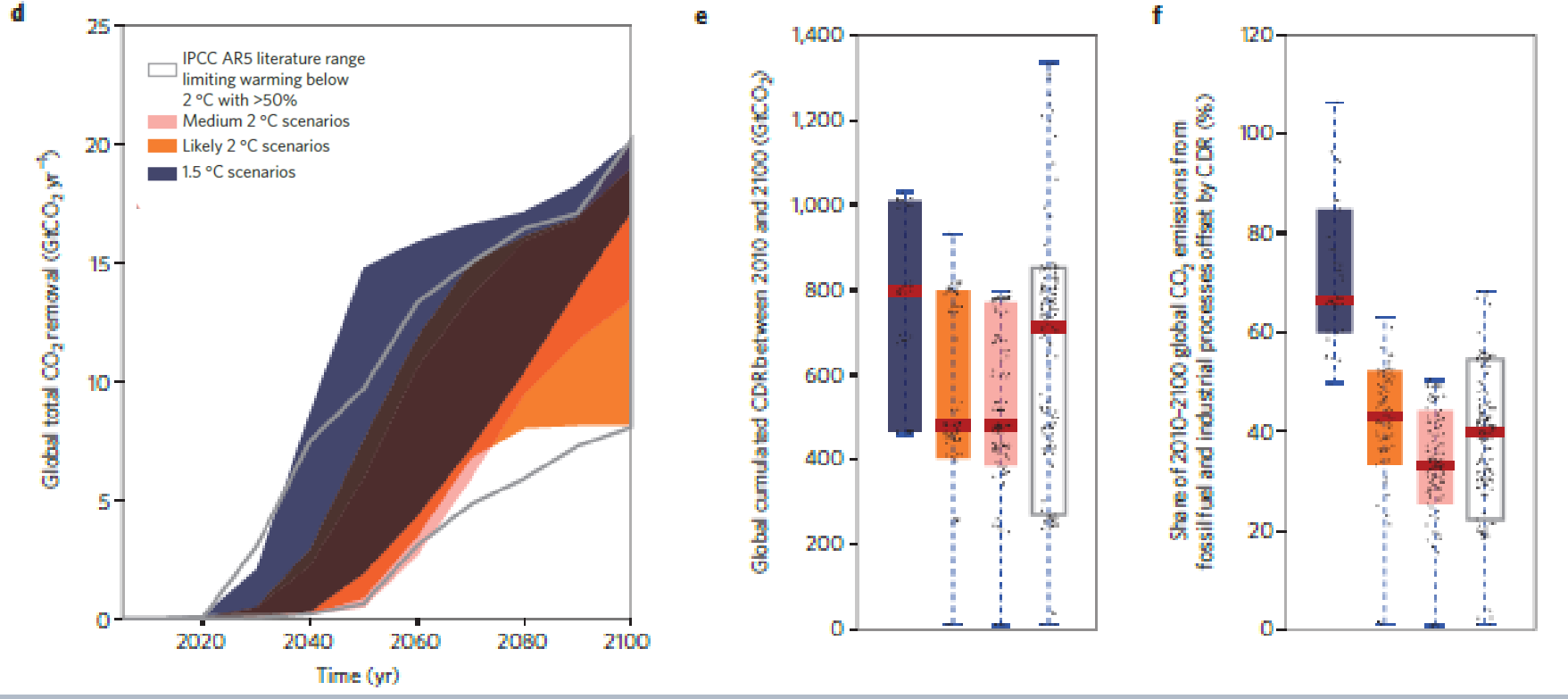
Emissions profiles & temperature outcomes of 1.5°C Scenario

Figure 1 | Emission profiles and temperature outcomes of 1.5 °C-consistent scenarios.



Ref: Rogelj et.al., Nature Climate Change | Vol 5 | June 2015

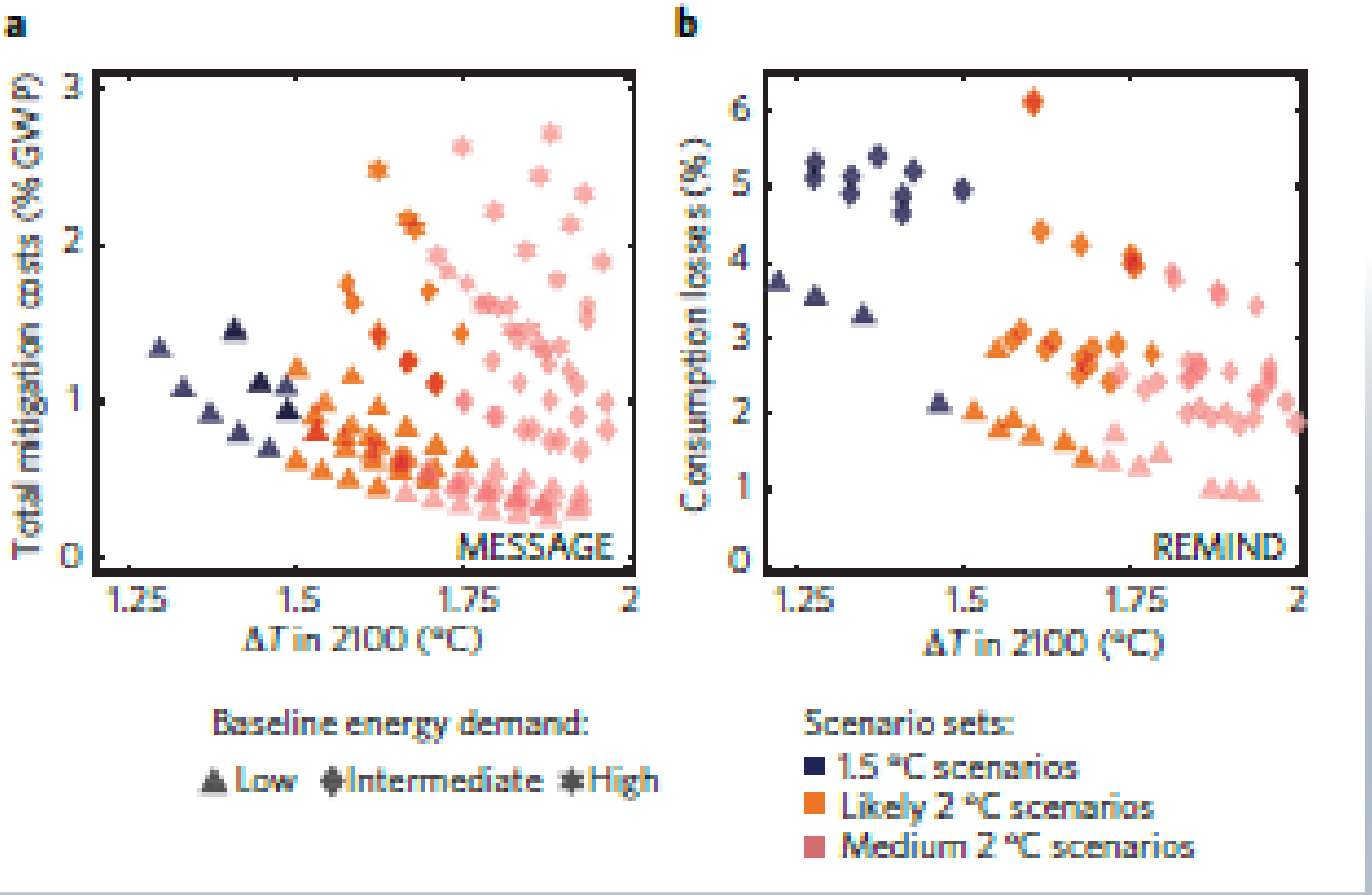
Global Decarbonization Overview



Ref: Rogelj et.al., Nature Climate Change | Vol 5 | June 2015

Mitigation Costs for 1.5 °C and 2 °C Scenarios

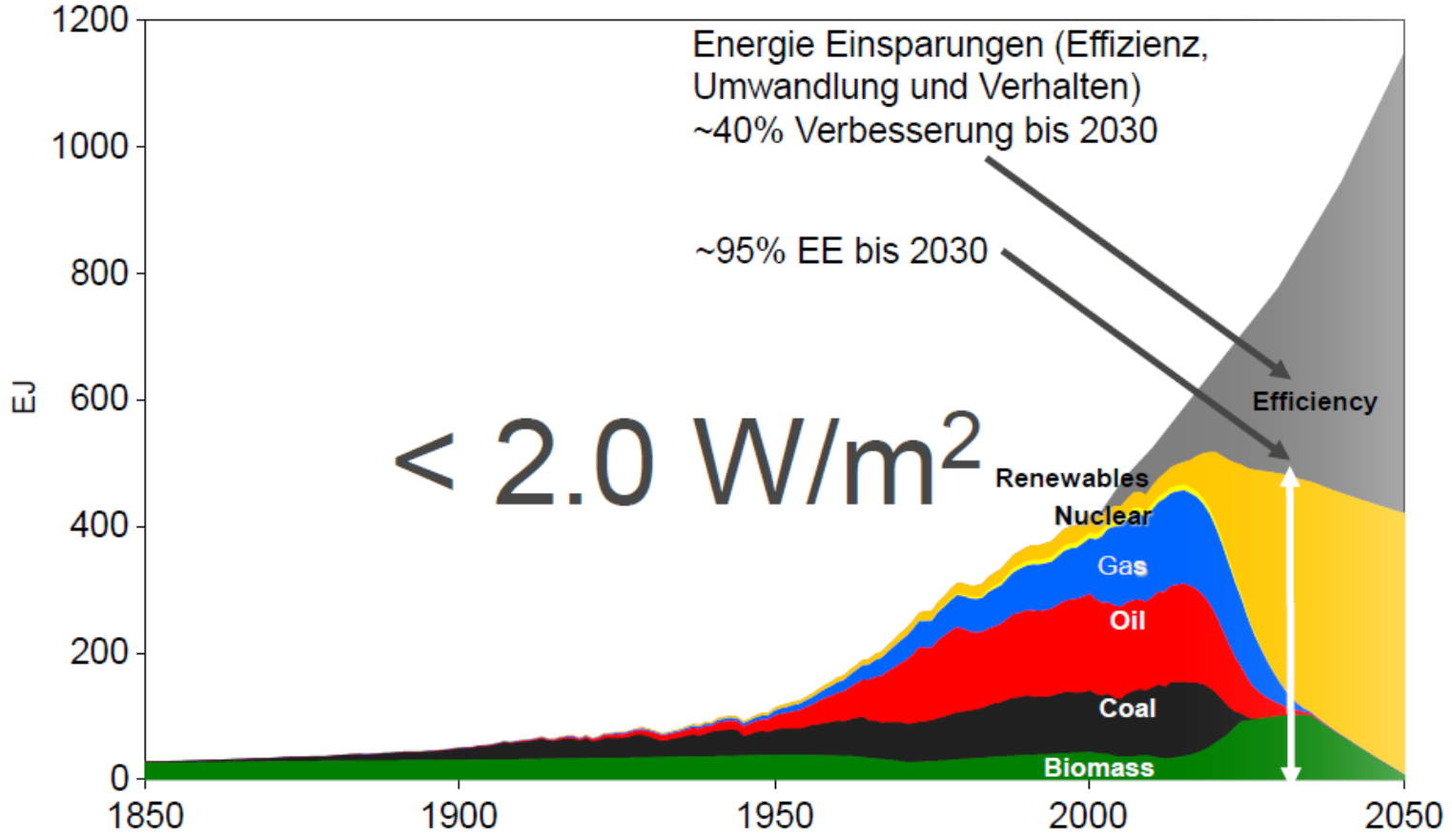
Figure 4 | Mitigation costs for 1.5 °C and 2 °C scenarios.



Ref: Rogelj et.al., Nature Climate Change | Vol 5 | June 2015

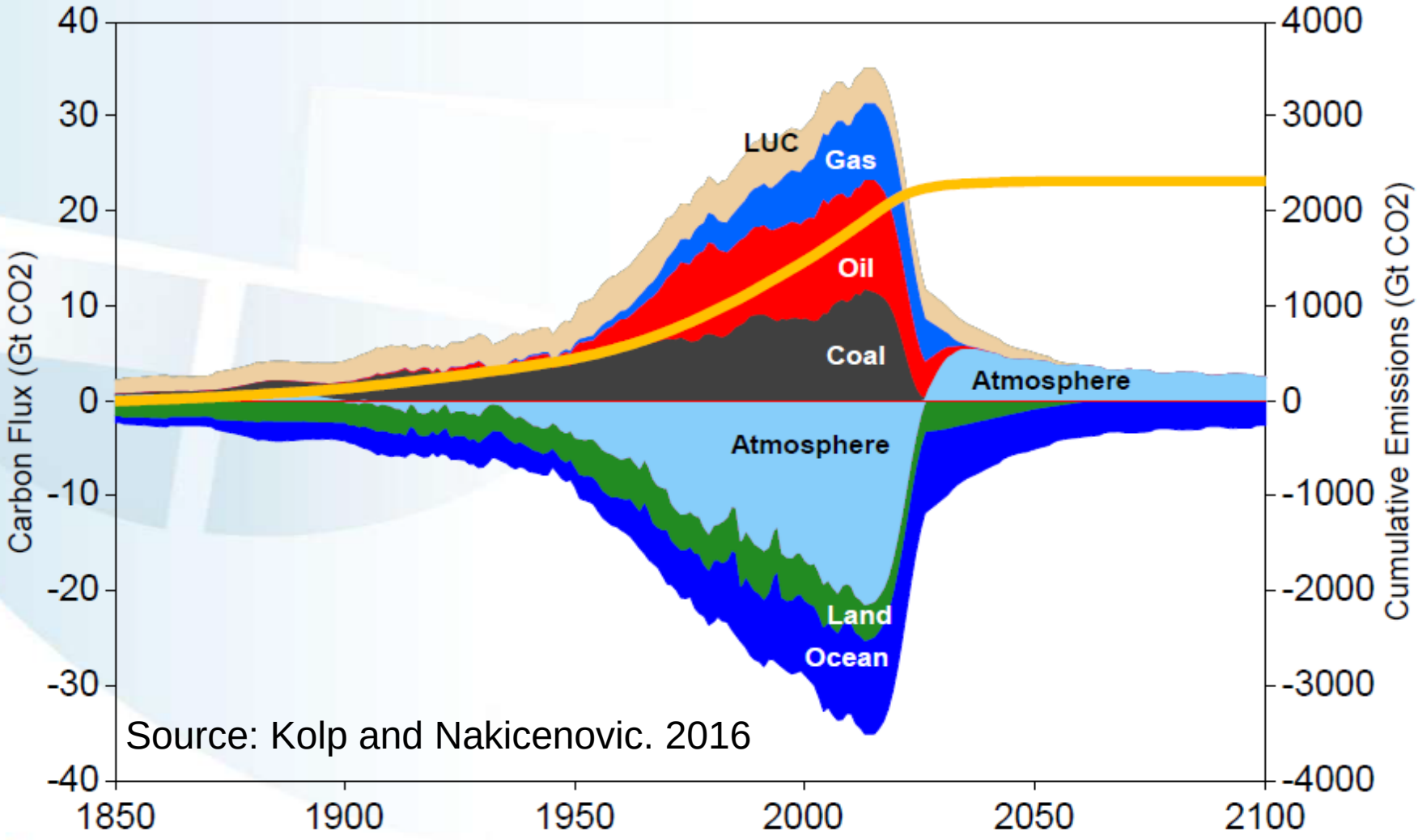
1.5^0C and Energy System Transformation

Initial thoughts on 1.5 °C Scenario: What does it mean to the Energy System?



Source: Sterner et al. 2016 after WBGU, 2011

Carbon Flux



Source: Kolp and Nakicenovic. 2016

Mitigation Risks of 1.5 ^{0}C versus 2^{0}C? The Pending Agenda of decarbonization

- How much higher are mitigation costs?
- Impacts on sustainable development including poverty eradication
- Technology needs, including negative emissions, and risks not to meet them
- Impacts on food security, e.g. by BECCS
- Impacts on biodiversity, e.g. by BECCS
- Impacts on carbon cycle by more ambitious mitigation (e.g. forests)
- Overshoot risks (temperature, atmos. GHG conc.), irreversibility

Reframing the Assessment

- **Timing: Closing window of opportunity**
  - Innovation cycle
  - Behavior and institutions

- **Cost-benefit Framing: Looking through ethical lens**
  - Irreversibility
  - Uncertainty
  - Equity (Inter and intra generational)

- **Reframing**
  - Bottom-up country driven assessments
  - Prevent creating new lock-ins
  - Implementation Focus (Technology cooperation)

IPCC WGIII: www.mitigation2014.org

Thank you