

The Role of Energy in Sustainable Development

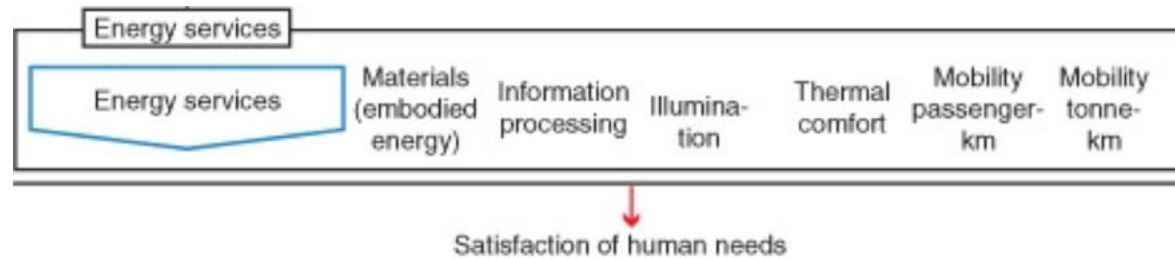
An overview of this talk

1. Energy systems
2. Climate change
3. The energy transition
4. Eradicating poverty within climate goals
5. Sustainable development

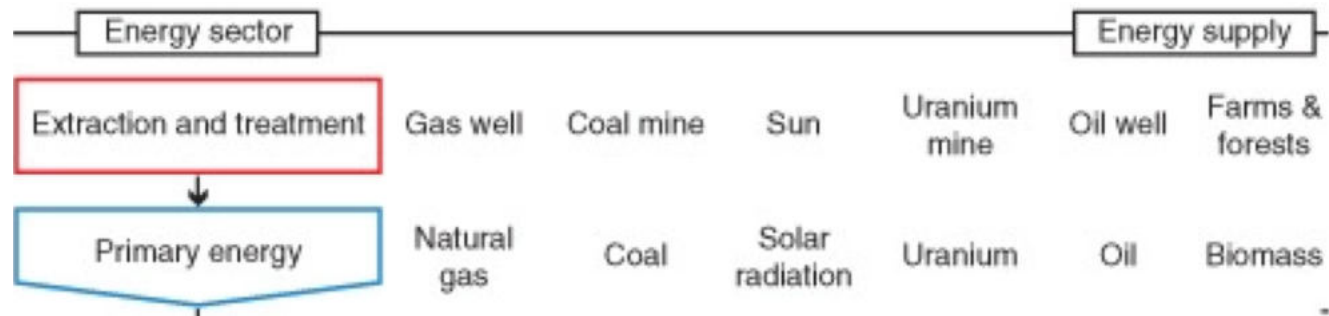
A note on the energy system

From extraction to use

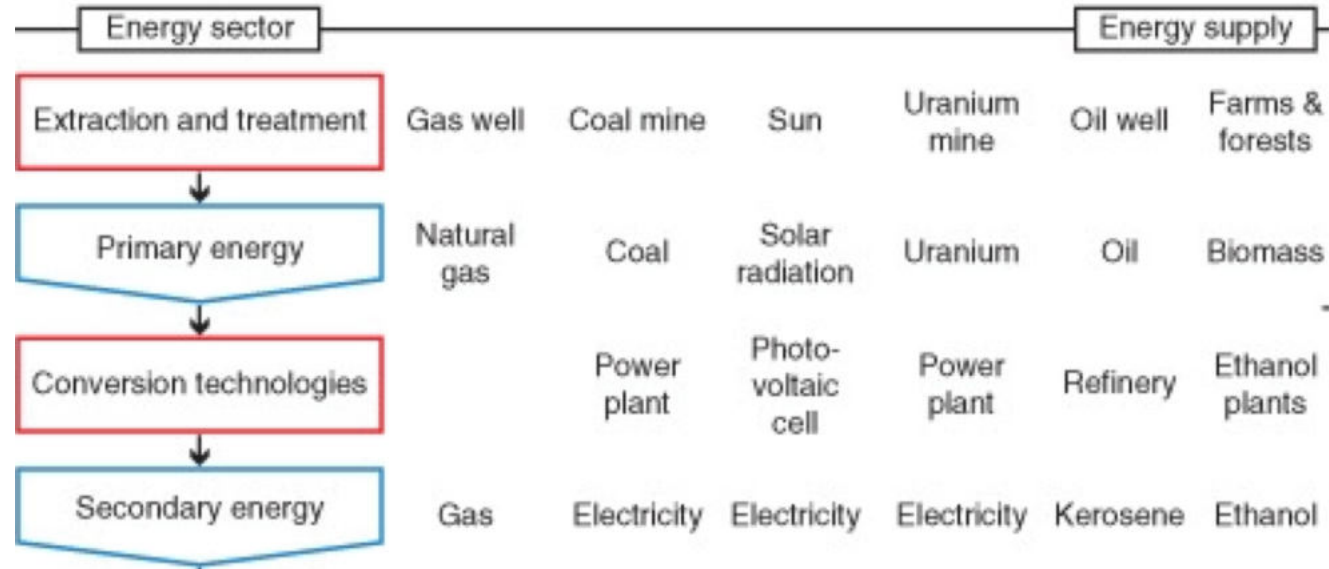
What do we need energy for?



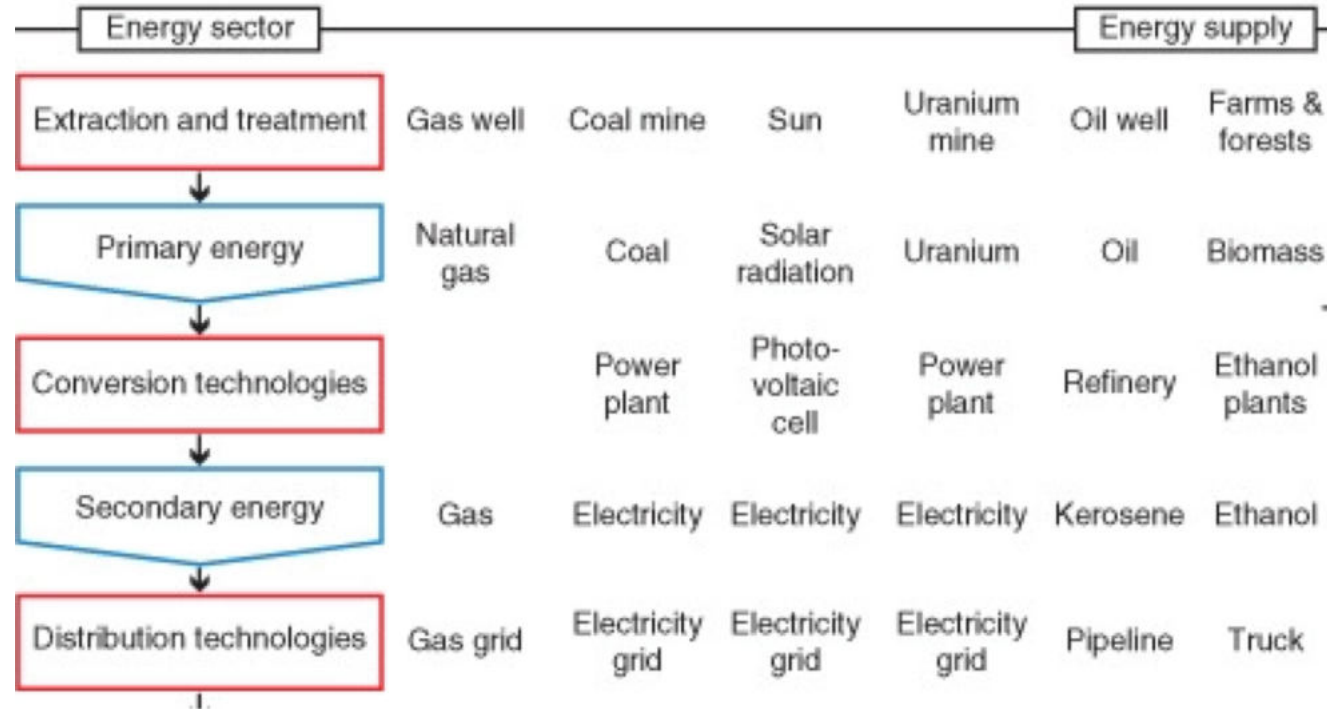
Where does energy come from?



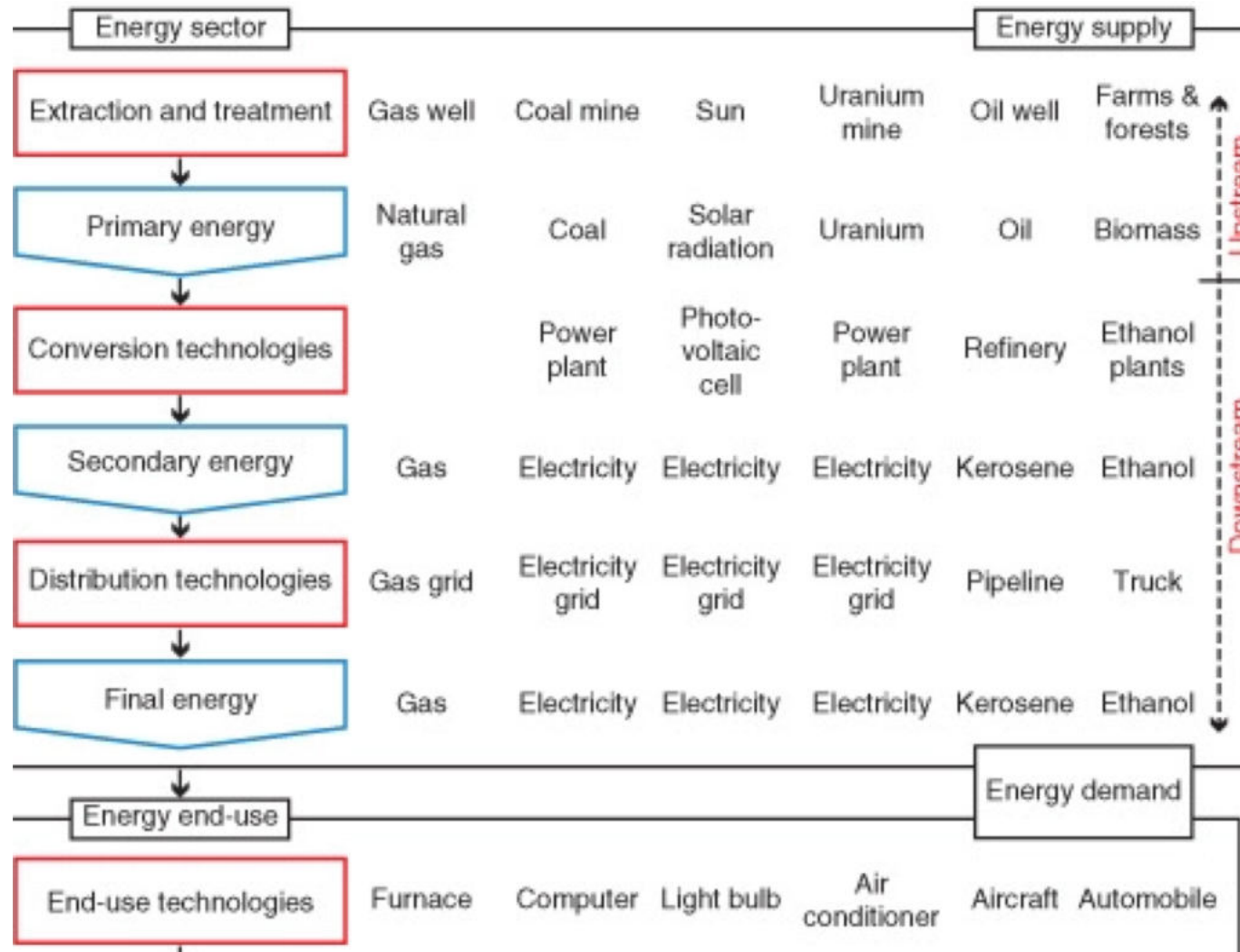
How do we make energy useful?



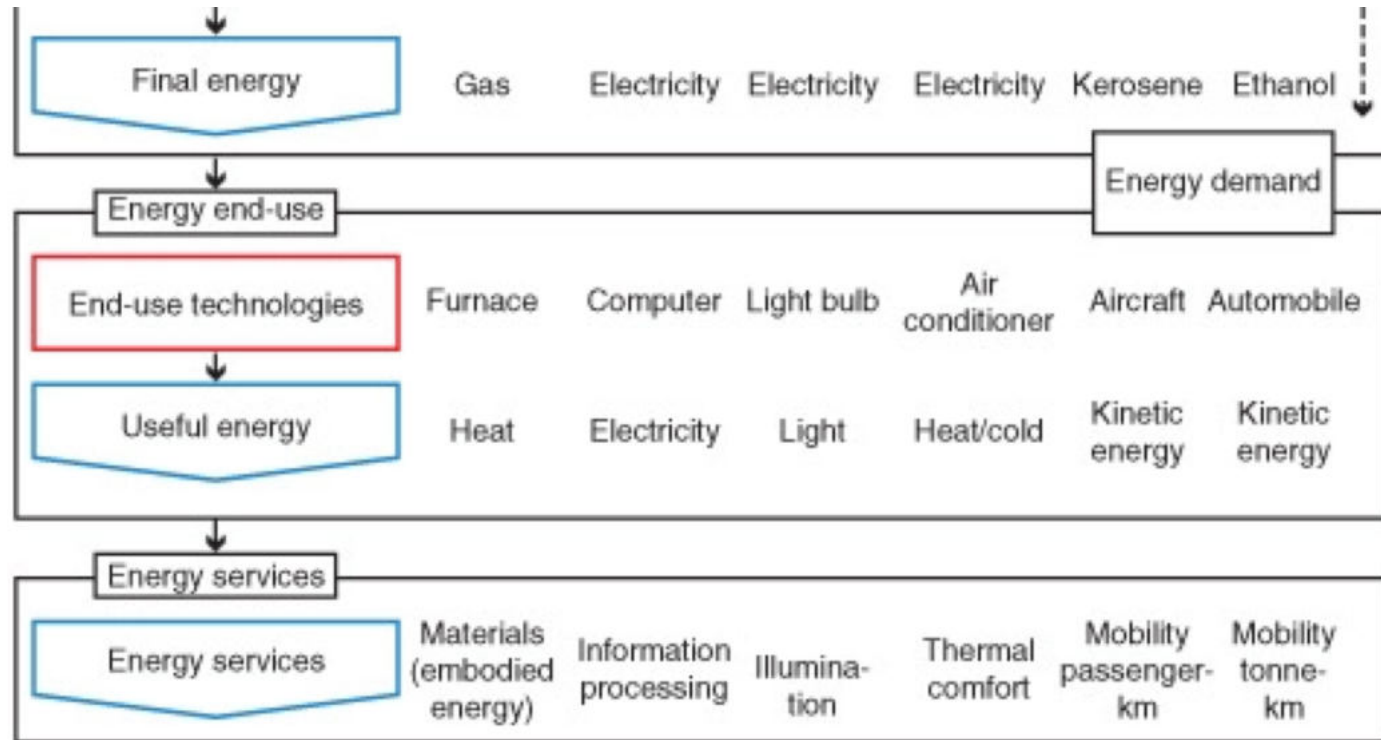
How do we make energy useful?

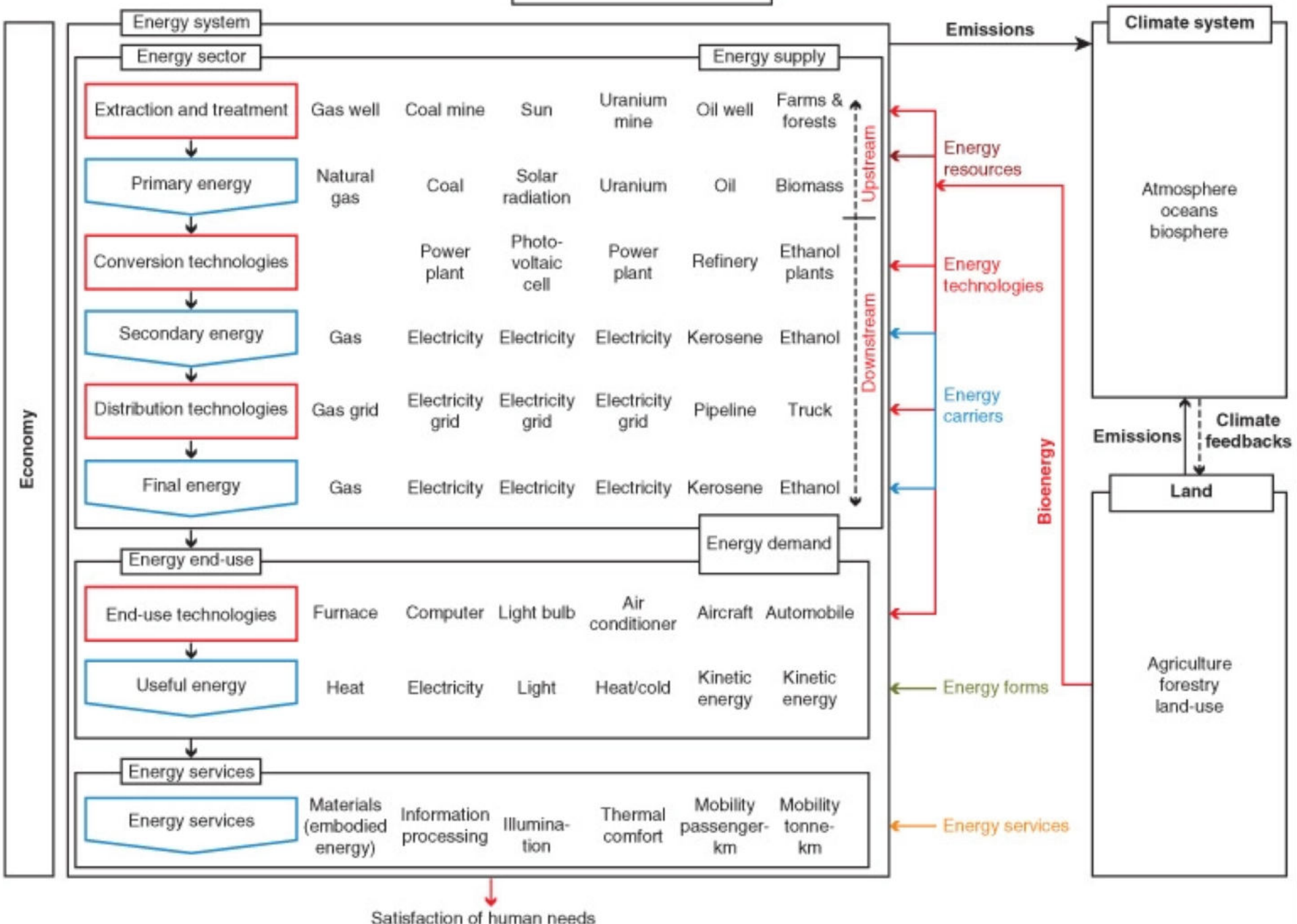


How do we make energy useful?



How do we make energy useful?



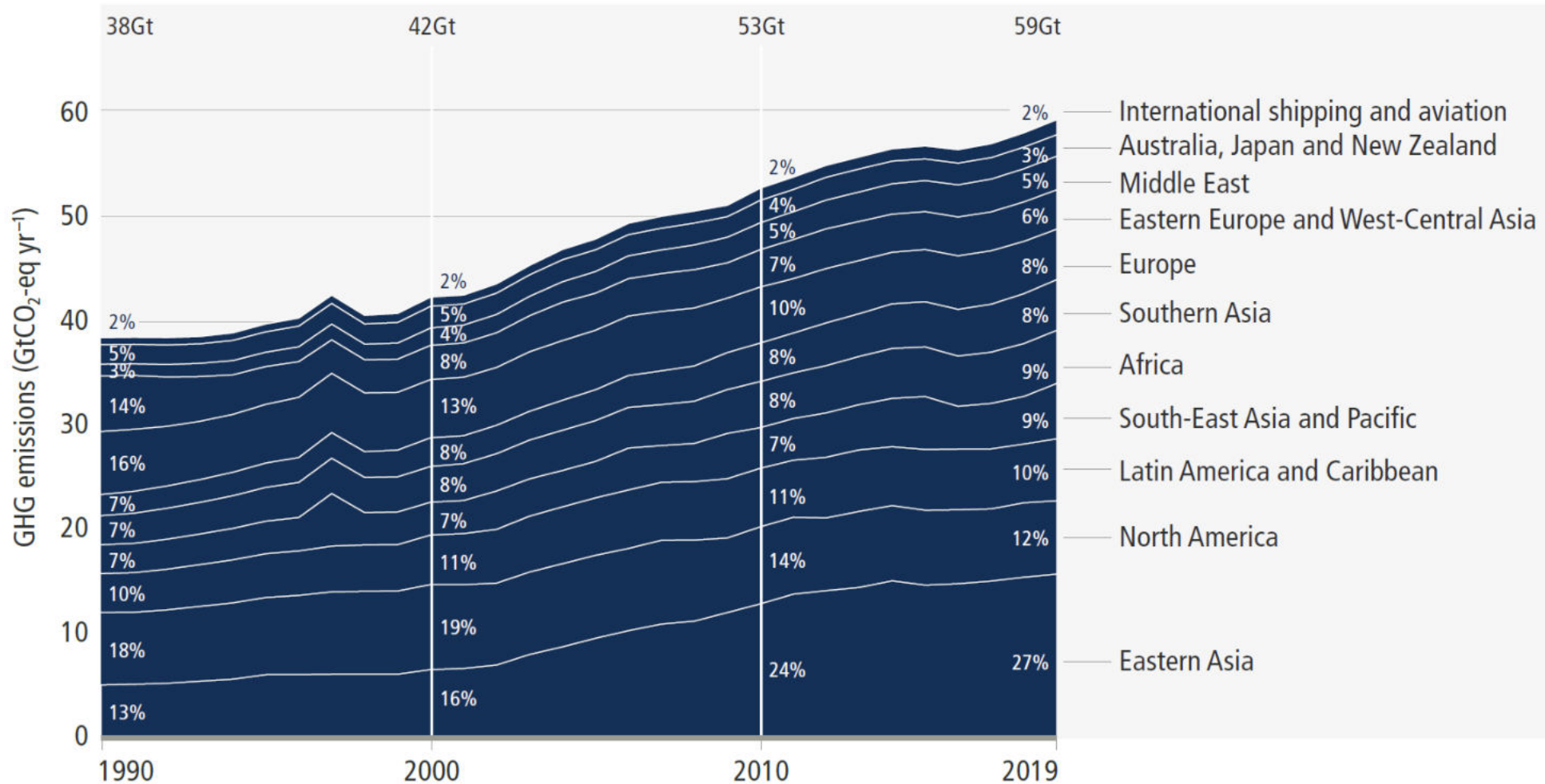


A background note on climate change

What happened? What is to be done?

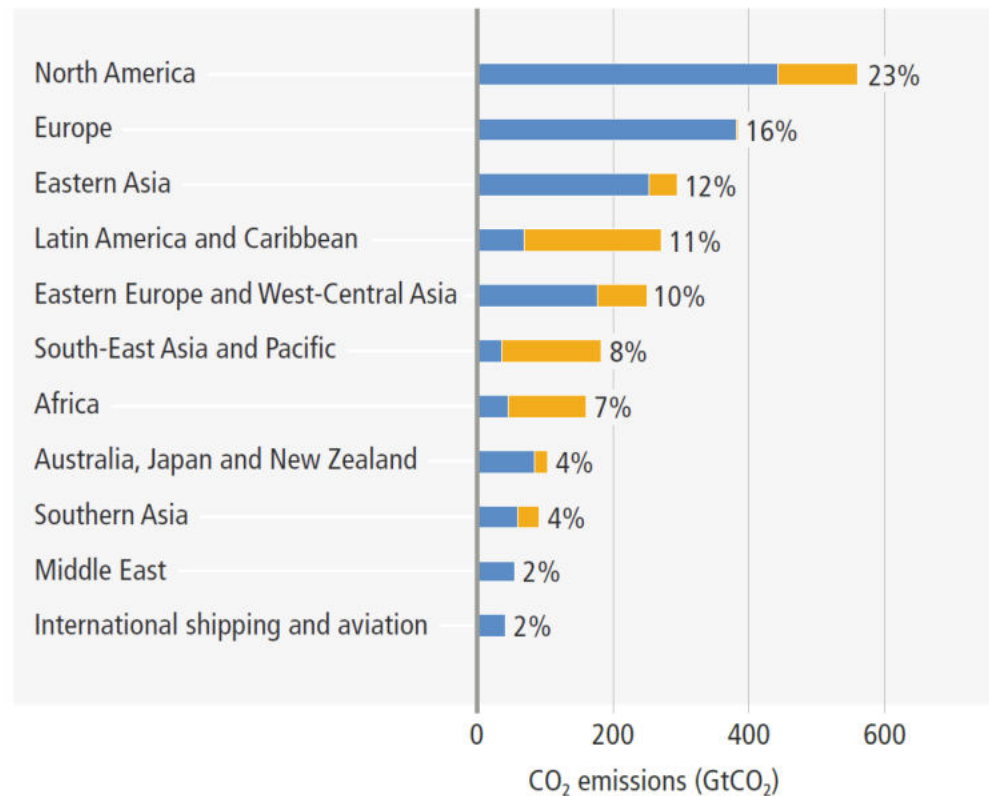
Emissions have been going up

a. Global net anthropogenic GHG emissions by region (1990–2019)

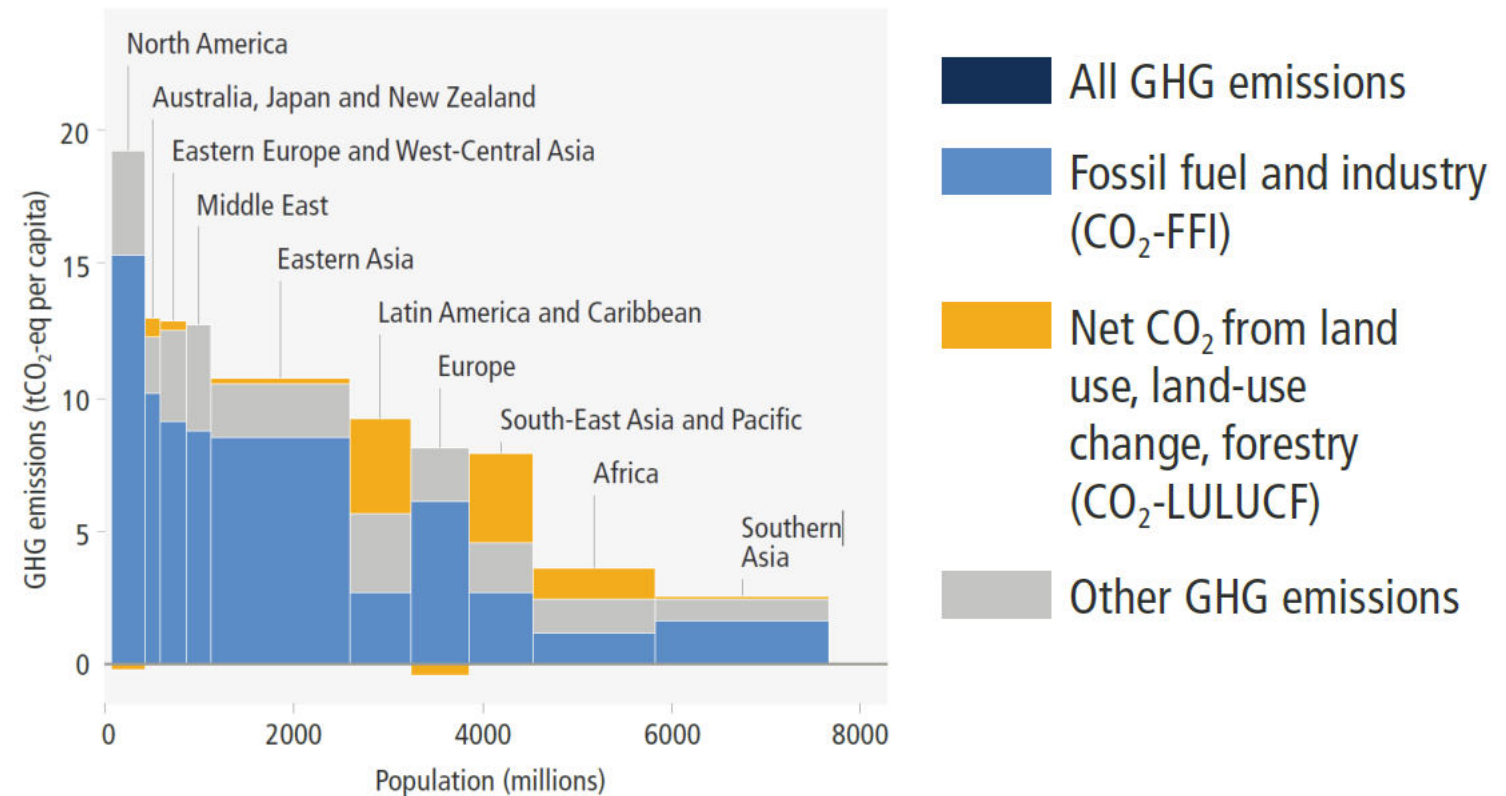


Emissions by region and by source

b. Historical cumulative net anthropogenic CO₂ emissions per region (1850–2019)



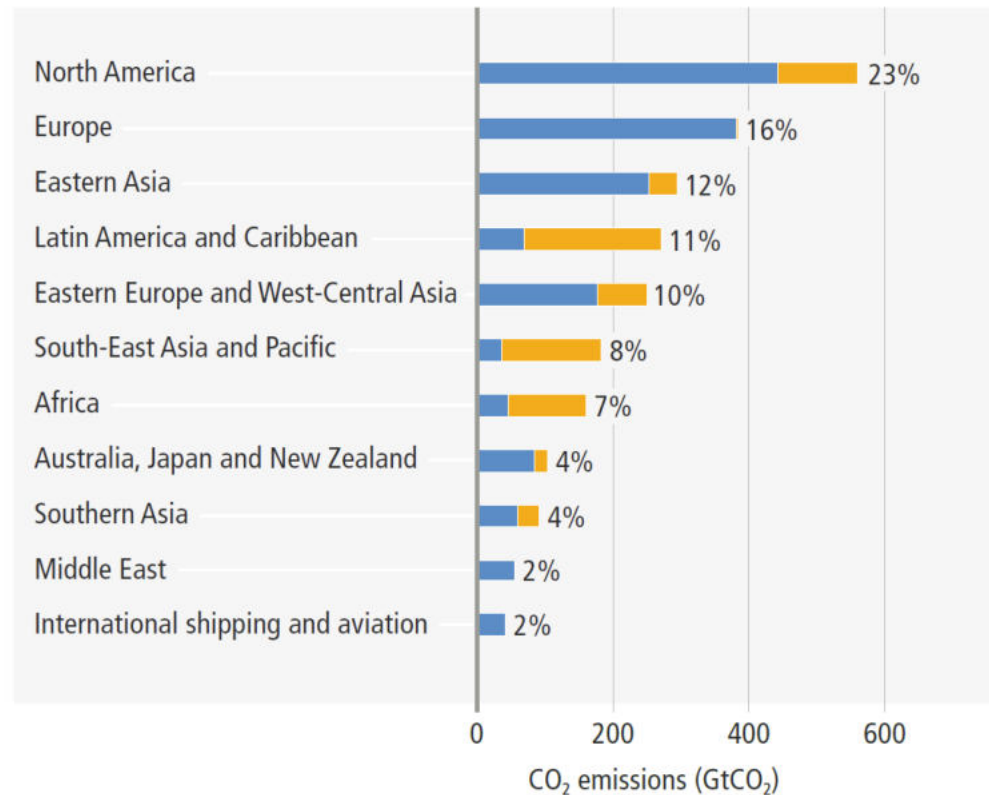
c. Net anthropogenic GHG emissions per capita and for total population, per region (2019)



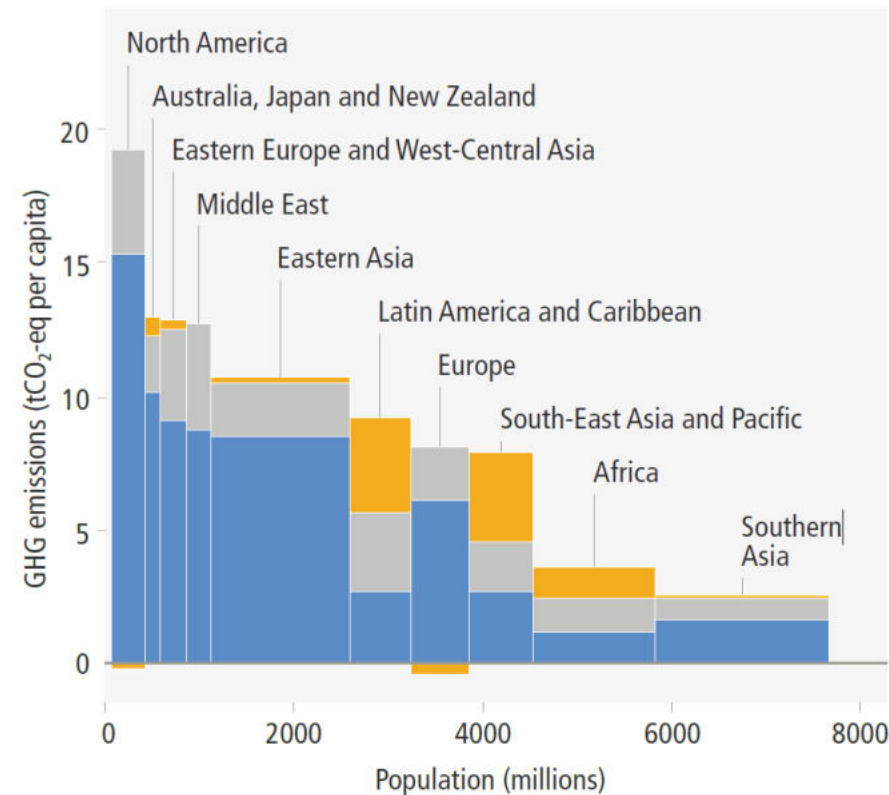
- All GHG emissions
- Fossil fuel and industry (CO₂-FFI)
- Net CO₂ from land use, land-use change, forestry (CO₂-LULUCF)
- Other GHG emissions

Emissions by region and by source





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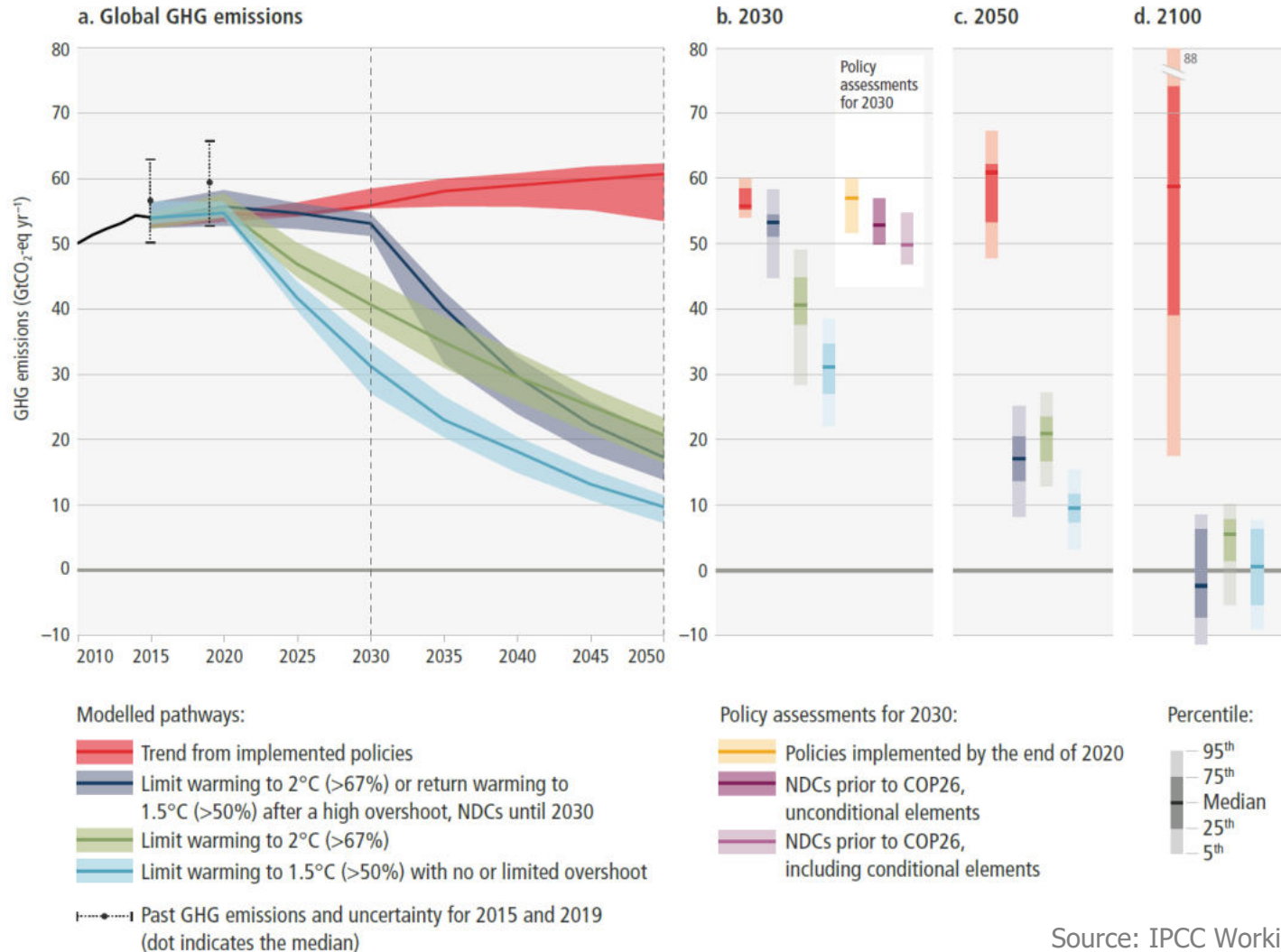


Mostly energy

-  All GHG emissions
-  Fossil fuel and industry (CO₂-FFI)
-  Net CO₂ from land use, land-use change, forestry (CO₂-LULUCF)
-  Other GHG emissions

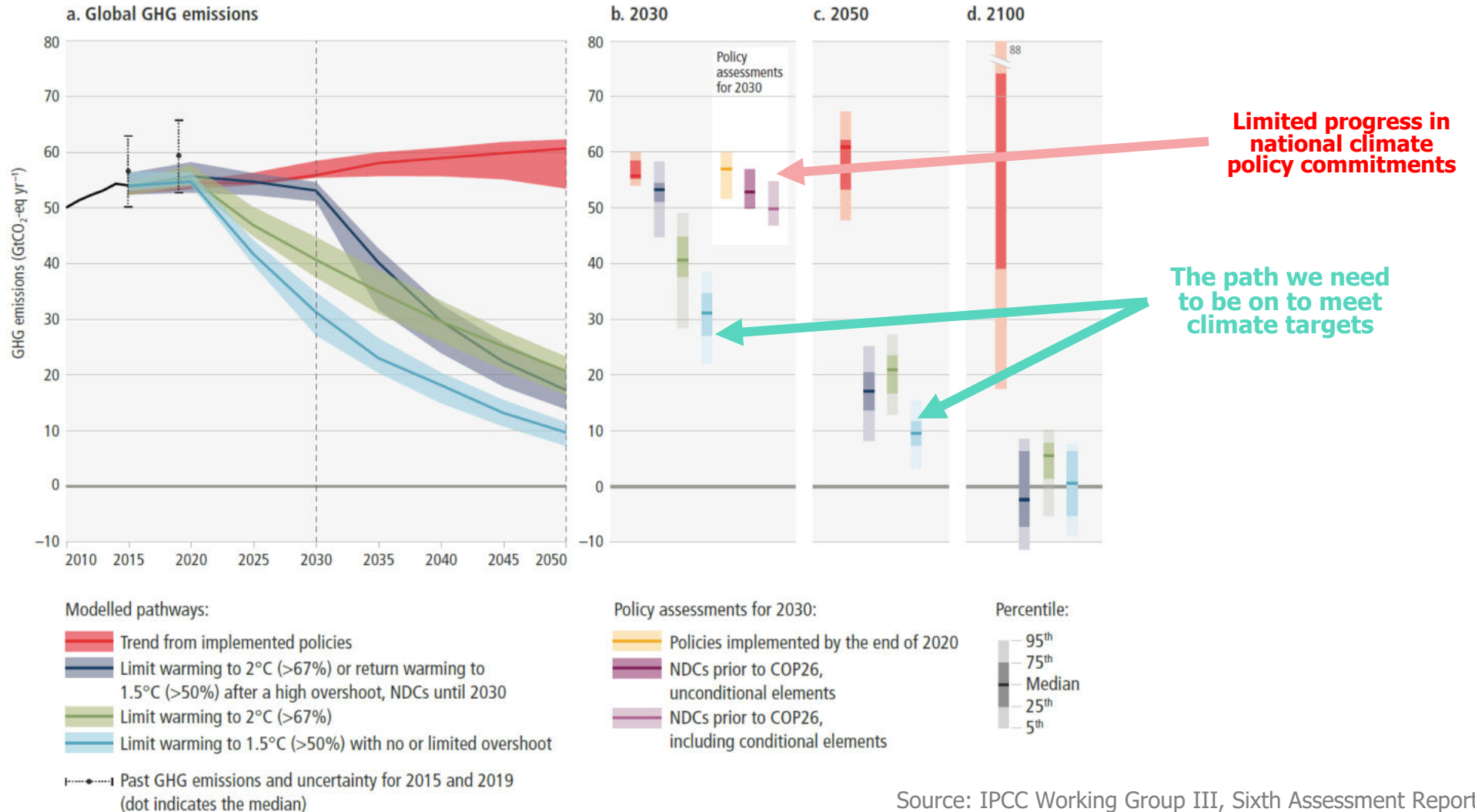
(Far) too little is being done. But not nothing.

Projected global GHG emissions from NDCs announced prior to COP26 would make it *likely* that warming will exceed 1.5°C and also make it harder after 2030 to limit warming to below 2°C.



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The role of energy in meeting climate goals

Supply and demand

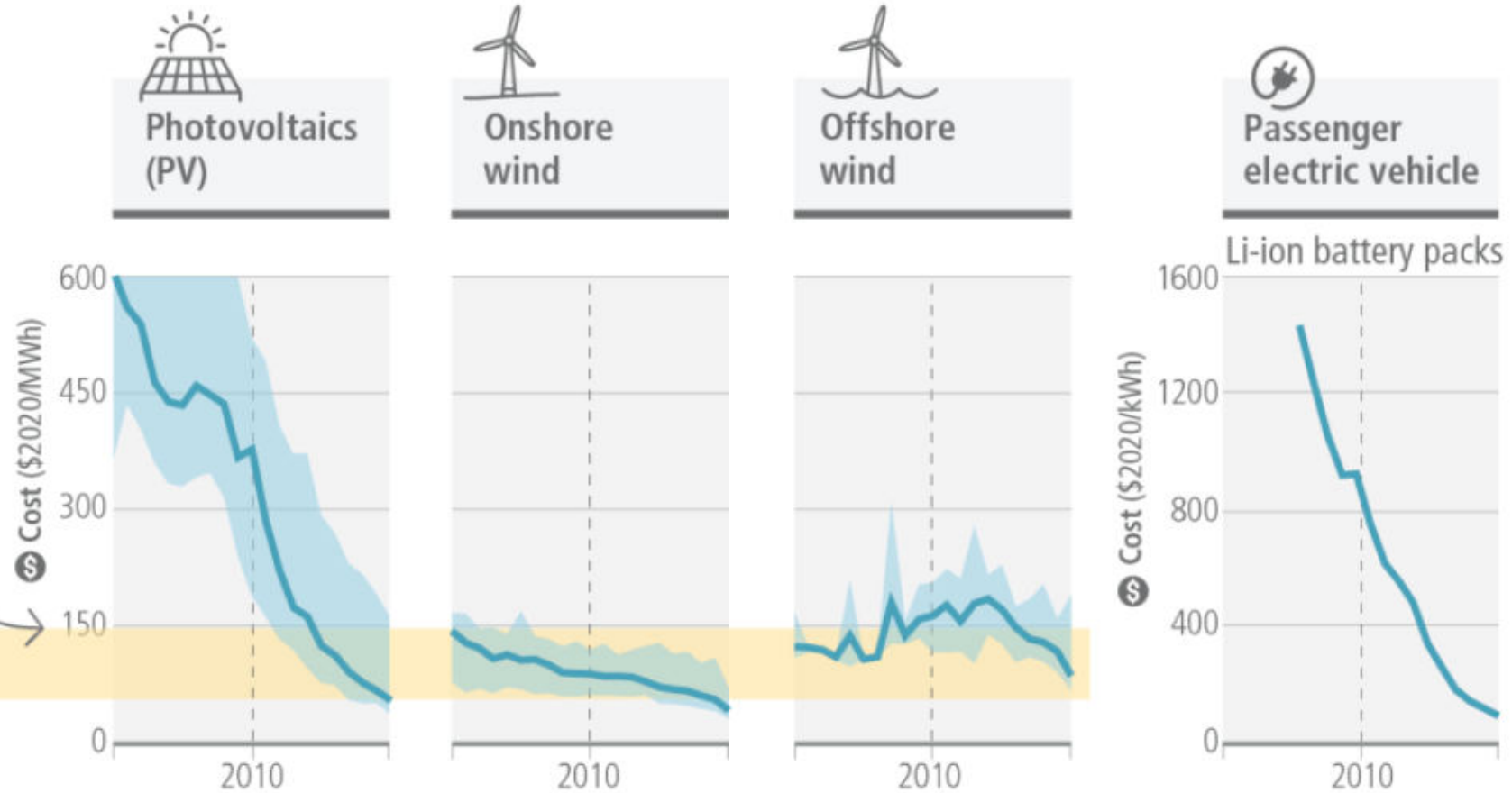
Mitigation is becoming cheaper

a) Market Cost

Since AR5, the unit costs of some forms of renewable energy and of batteries for passenger EVs have fallen.

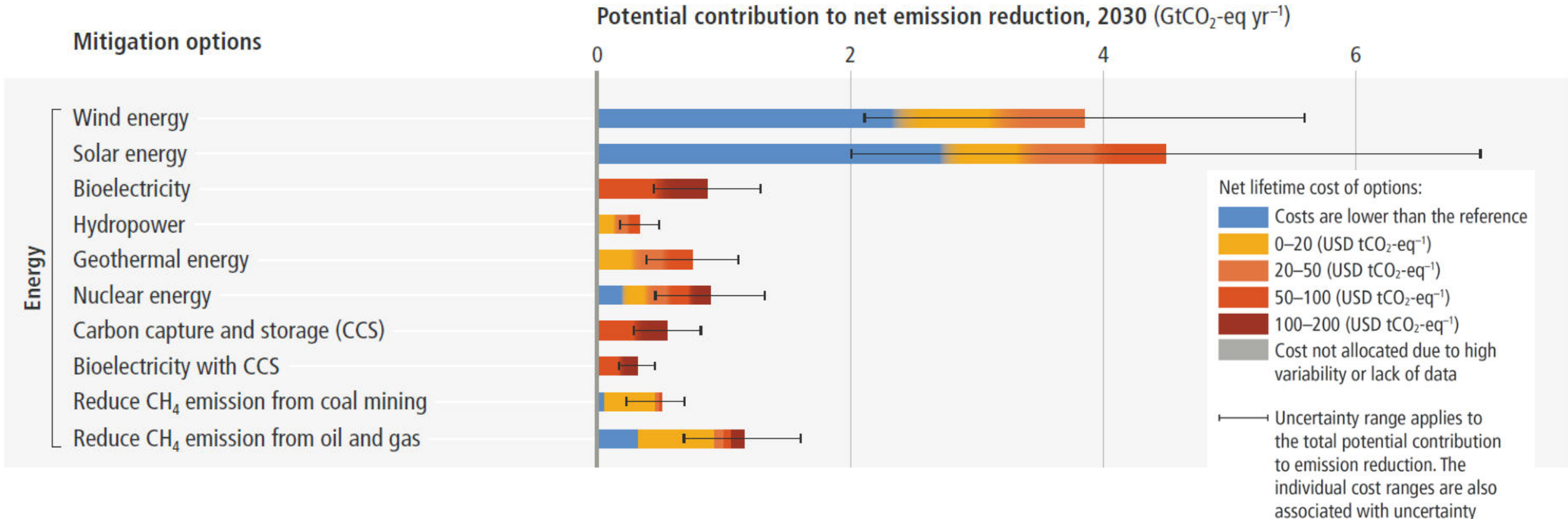
below this point, costs can be less than fossil fuels

Fossil fuel cost (2020)

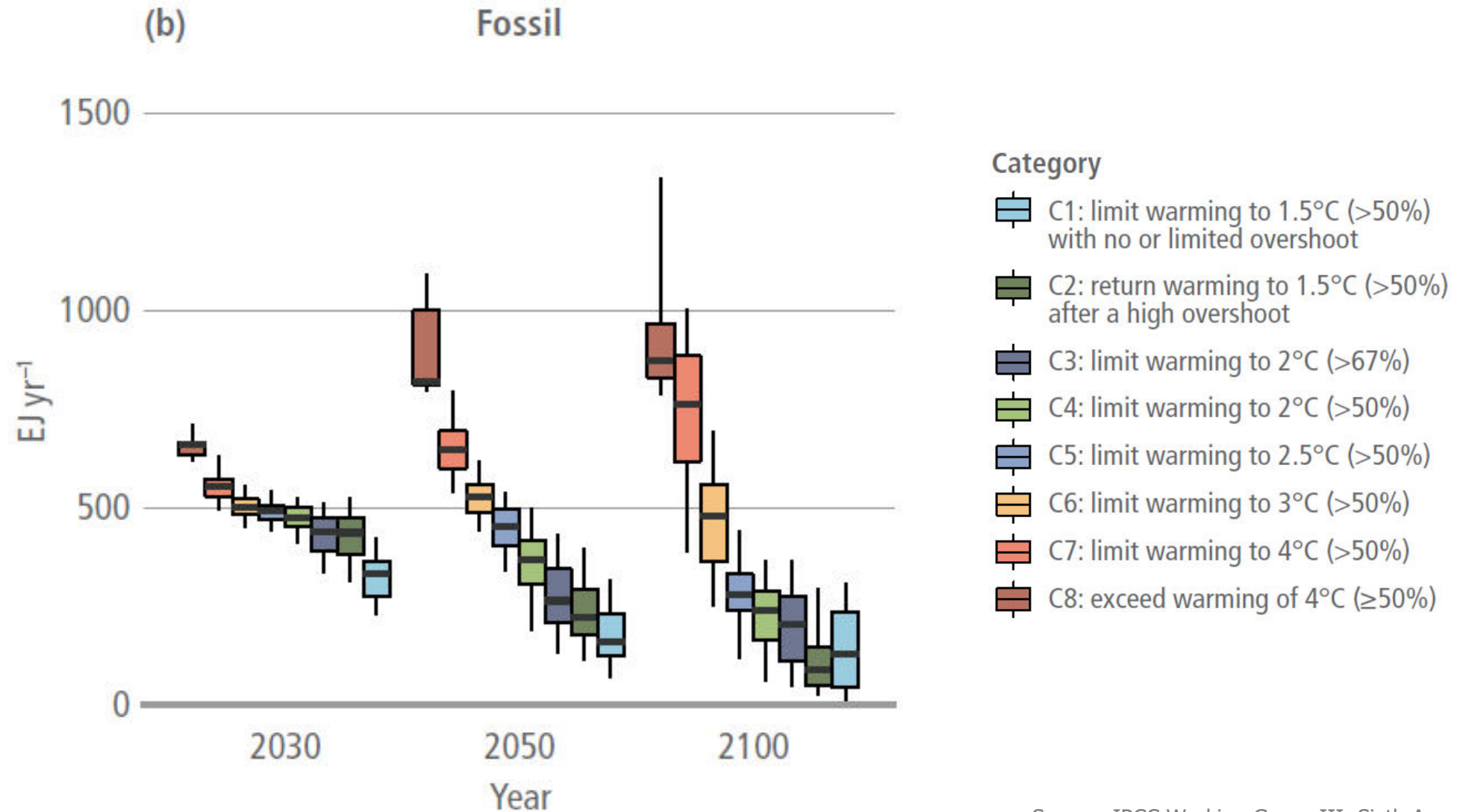


The role of energy supply

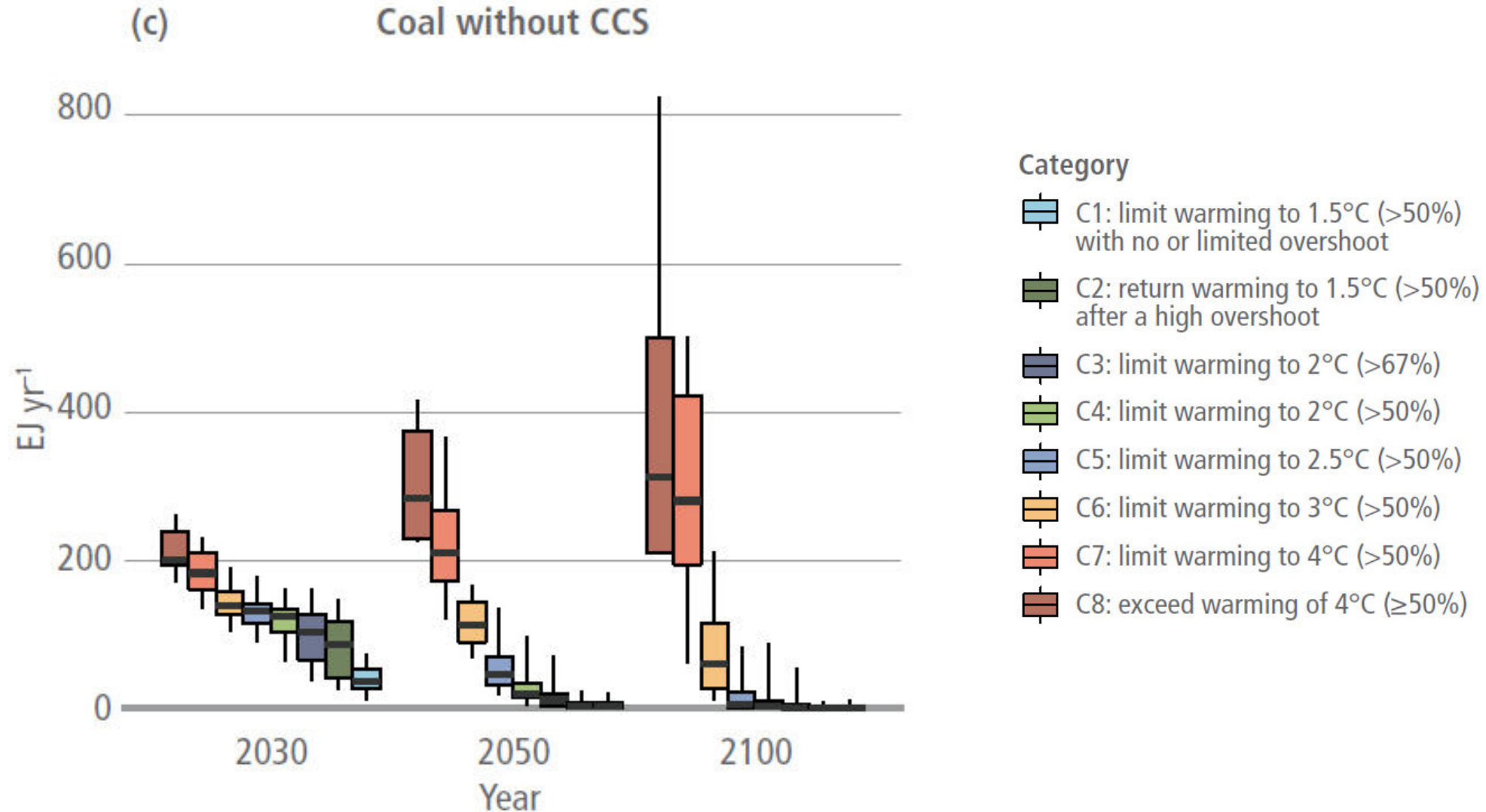
Many options available now in all sectors are estimated to offer substantial potential to reduce net emissions by 2030. Relative potentials and costs will vary across countries and in the longer term compared to 2030.



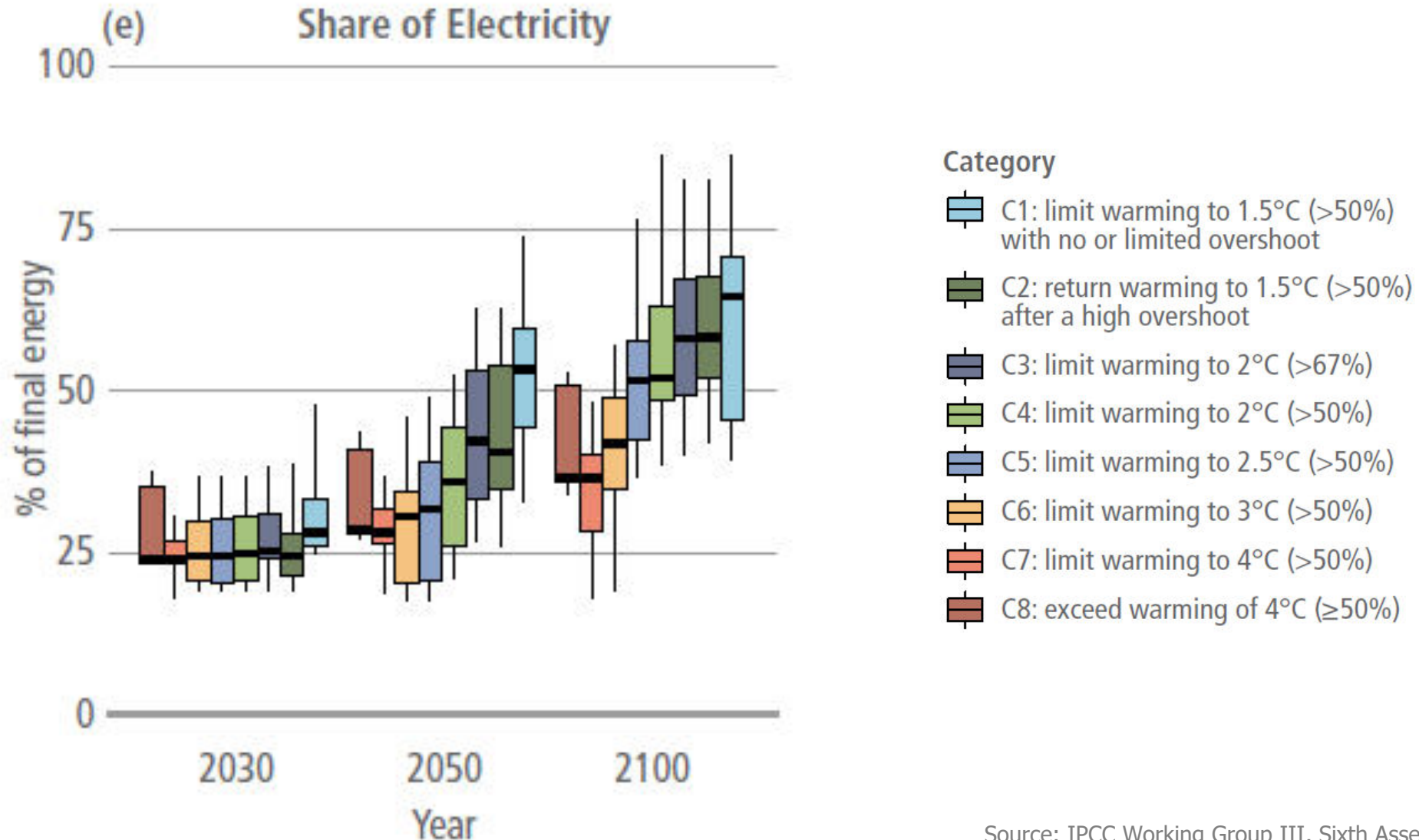
The role of energy supply: fossils go down fast



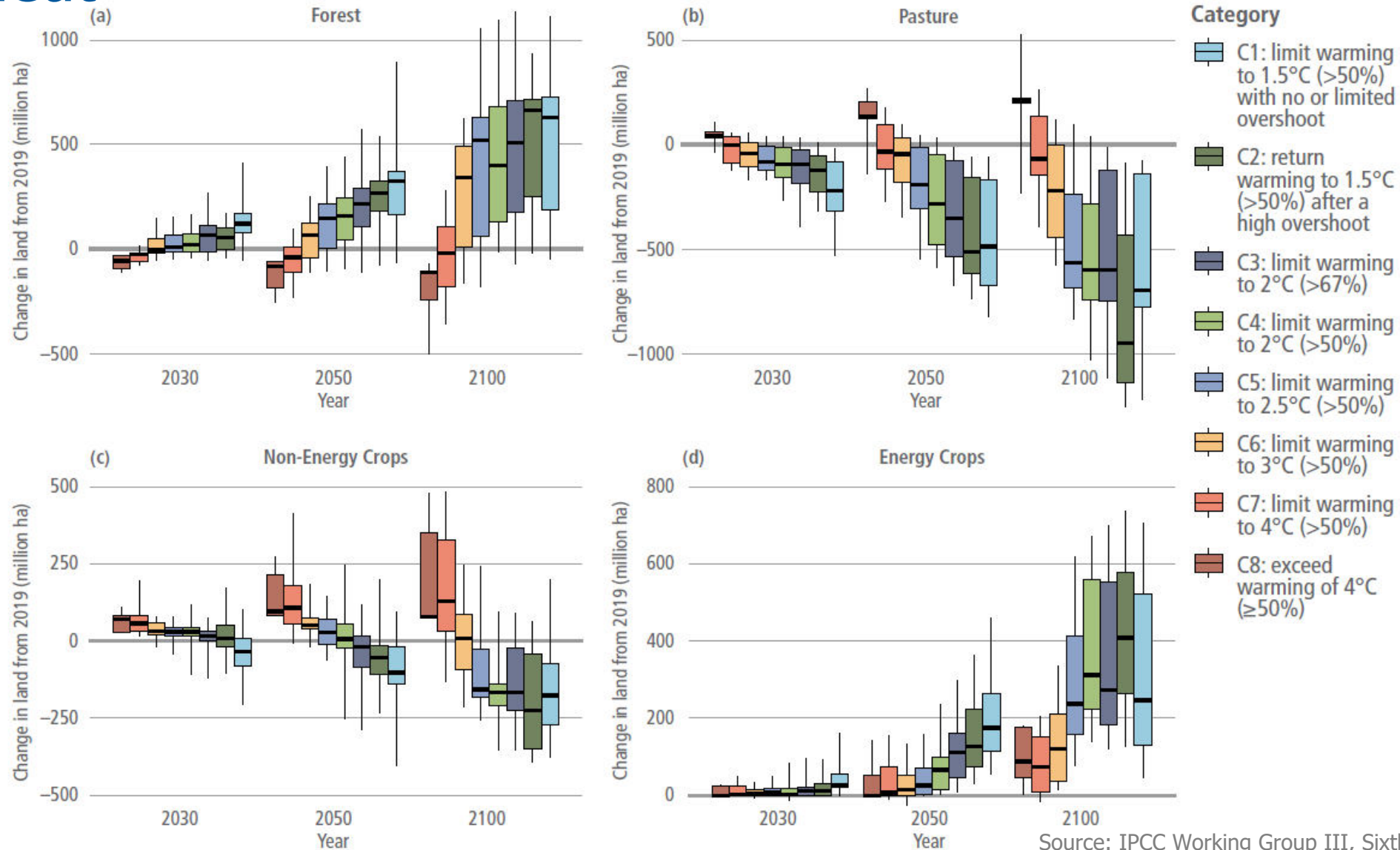
The role of energy supply: coal needs to go



The role of energy supply: electrify everything!



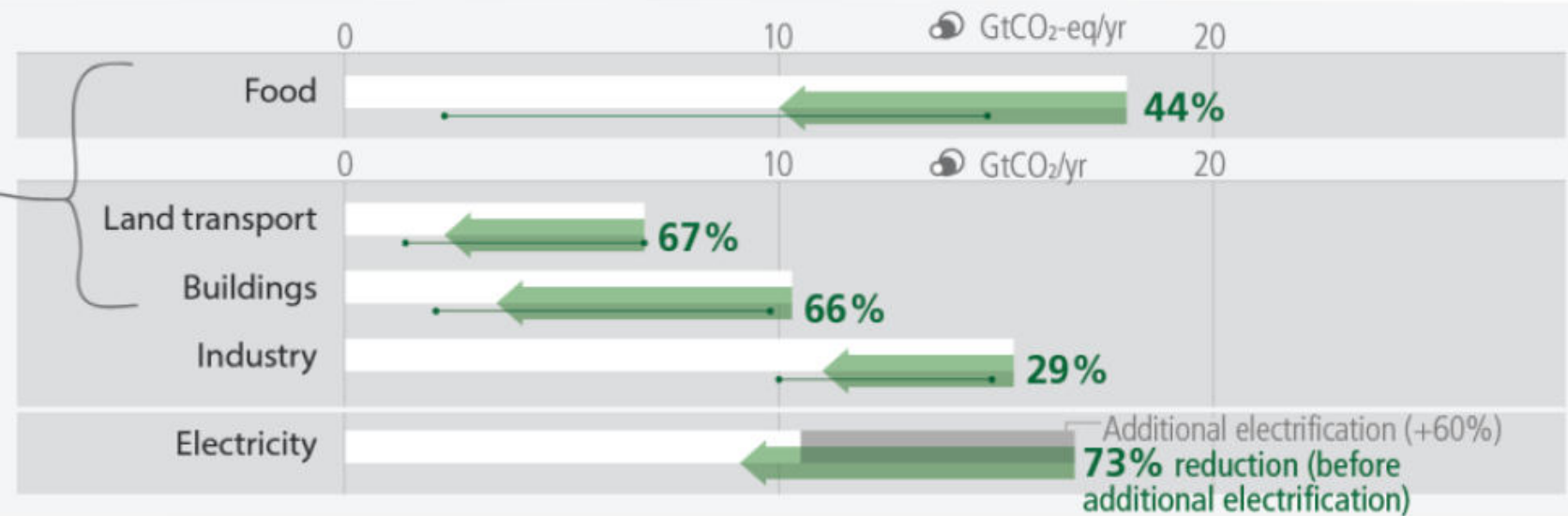
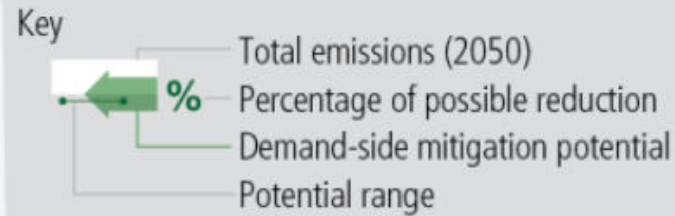
The fight for land: more forest (for energy), less for meat



The role of energy demand

b) Potential of demand-side mitigation options by 2050

the range of GHG emissions reduction potential is 40-70% in these end-use sectors



Three types of energy demand options:

Avoid

- Travel less

Shift

- Travel by public transport instead of private car

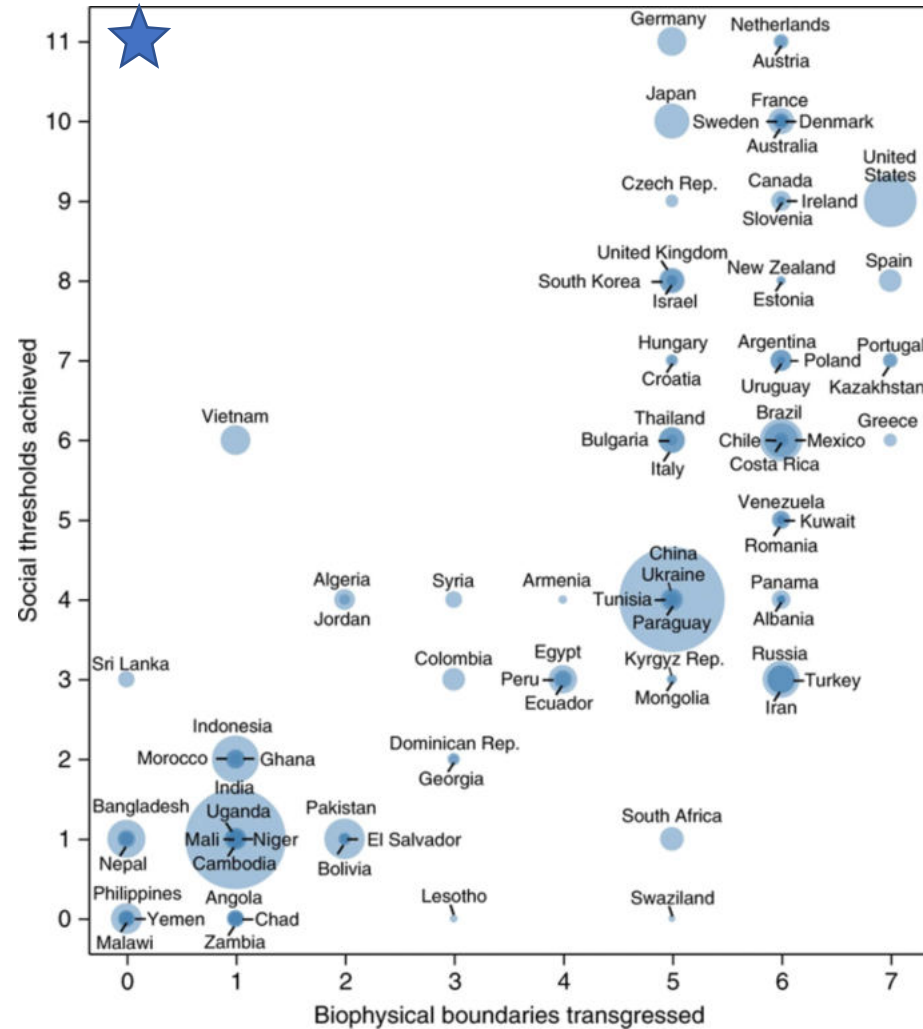
Improve

- Efficiency of cars

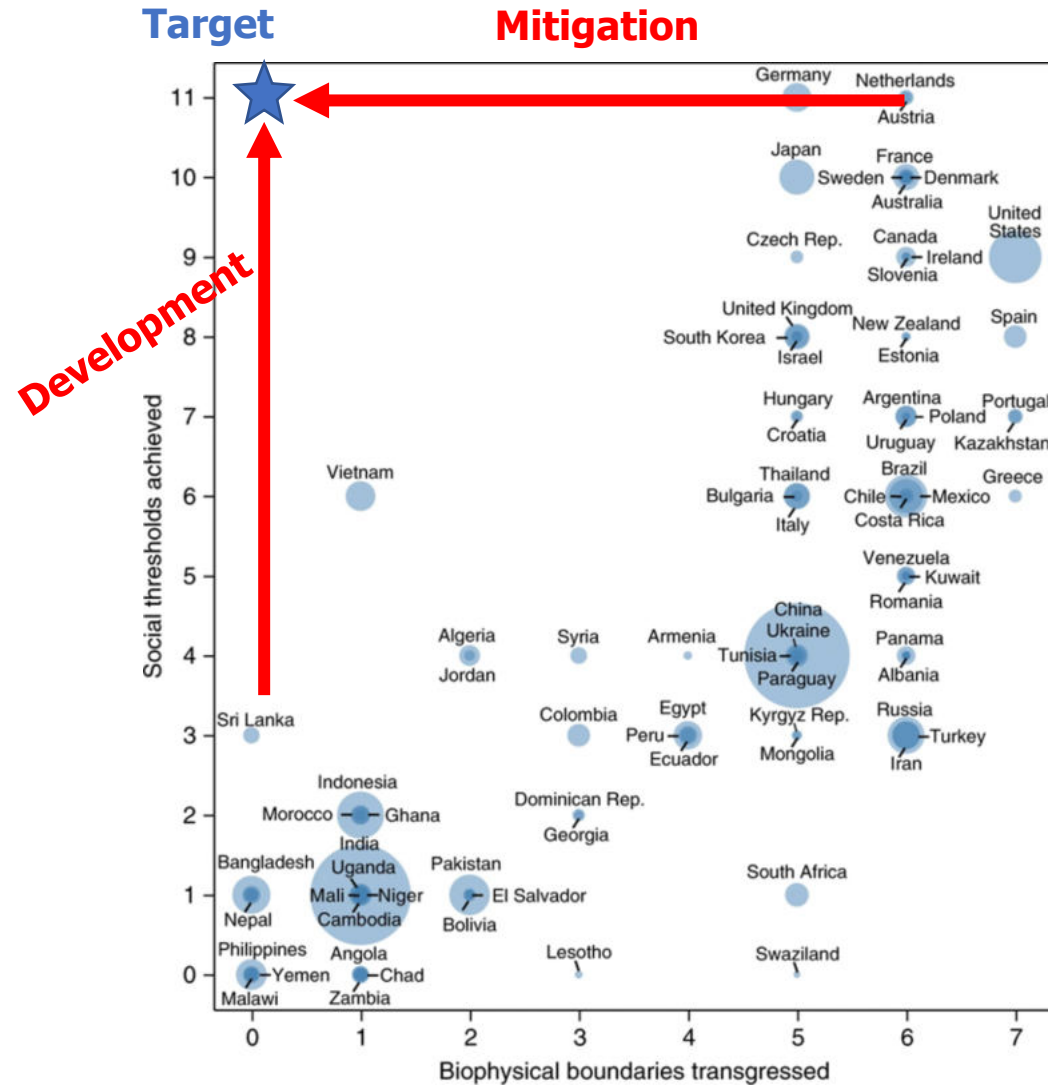
A dual challenge

A dual challenge

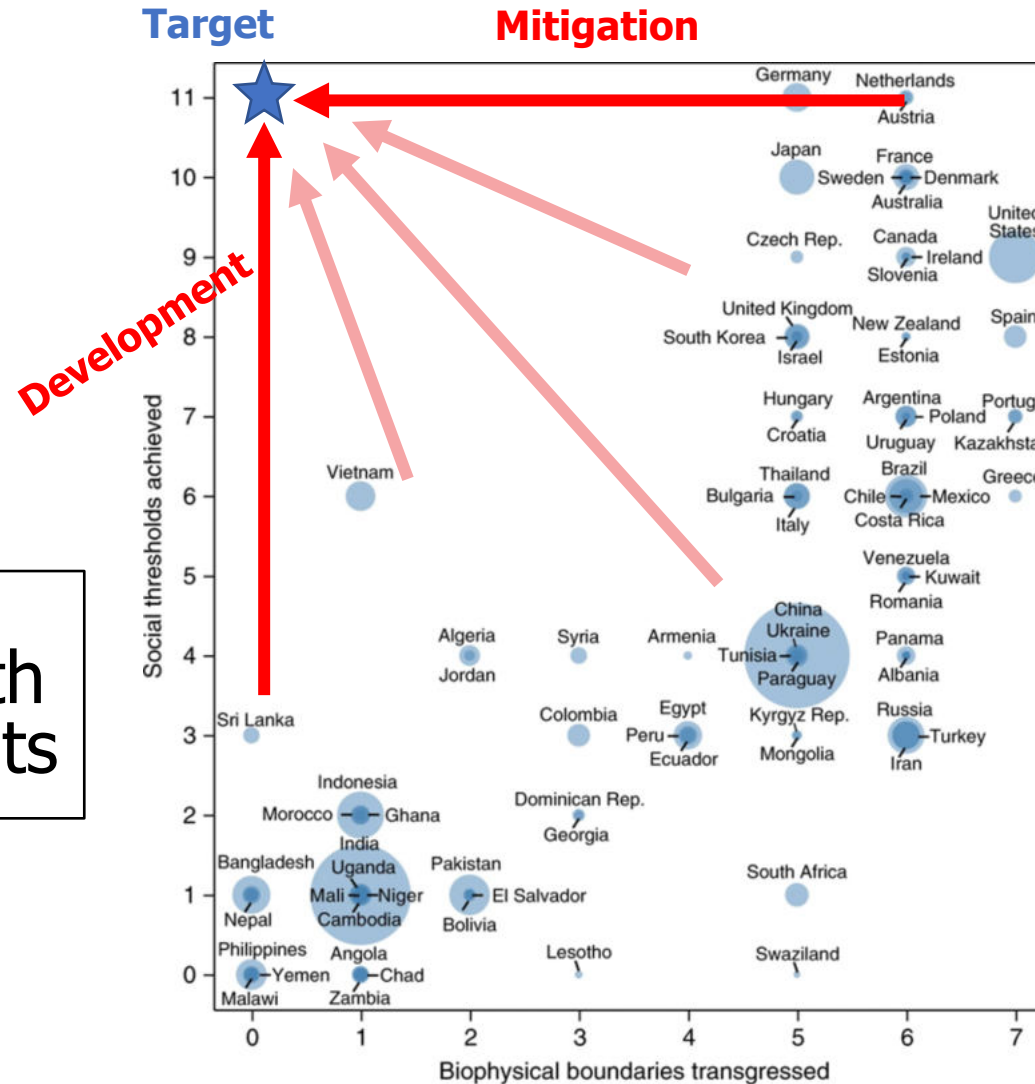
Target



A dual challenge



A dual challenge

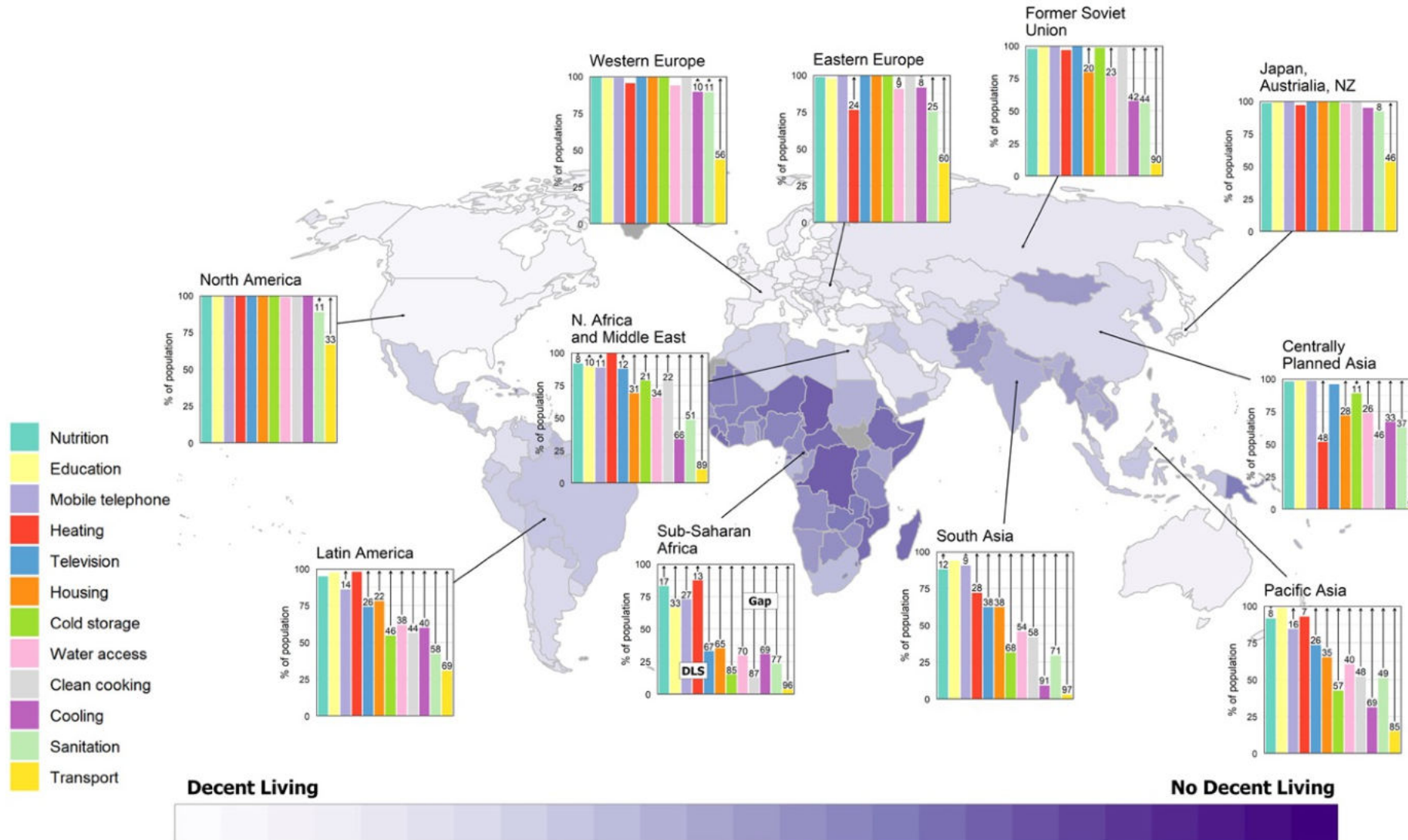


Pathways combining human development with environmental constraints

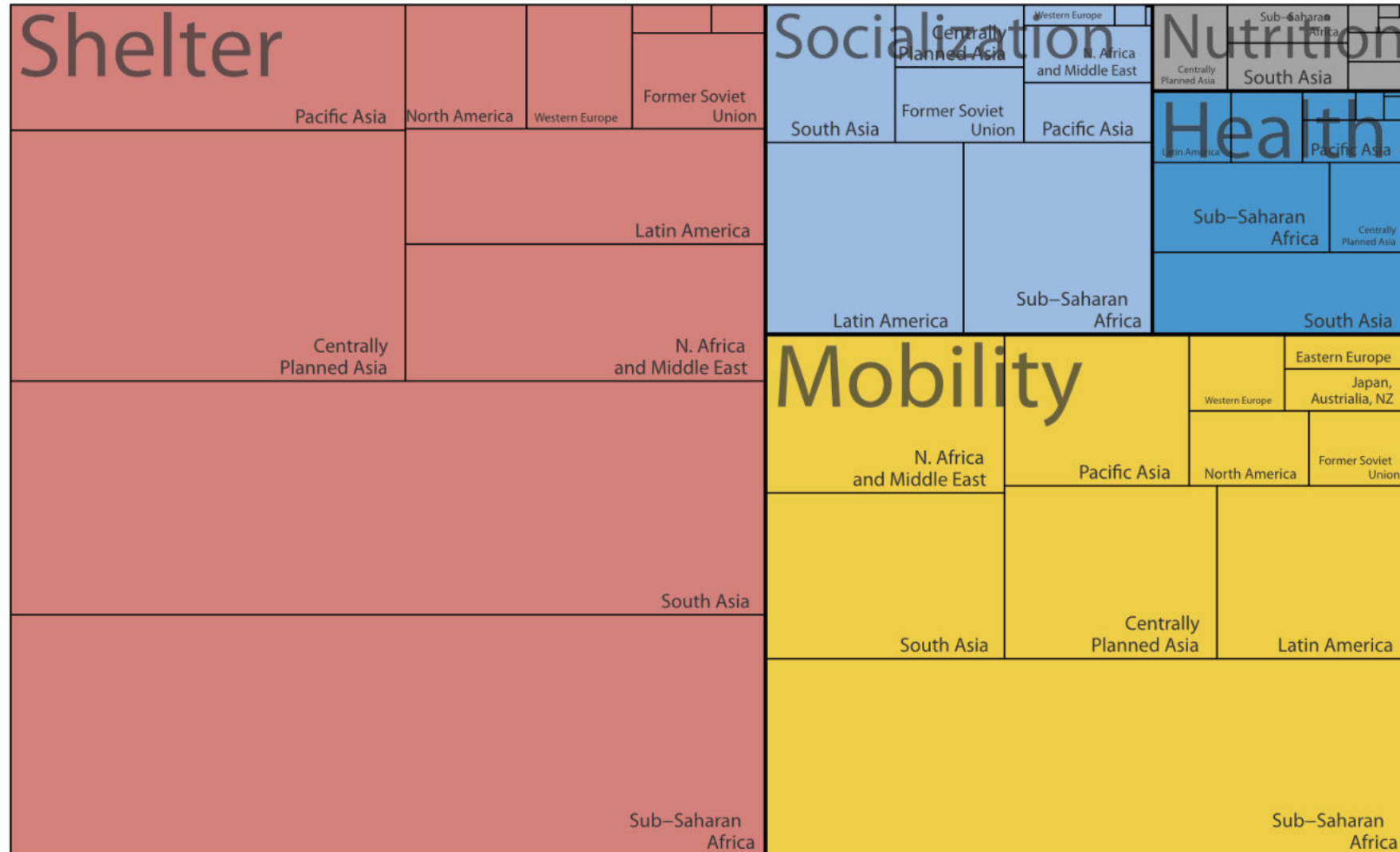
Can we eradicate poverty and meet climate goals?

The idea of “Decent Living Standards” and minimum energy requirements

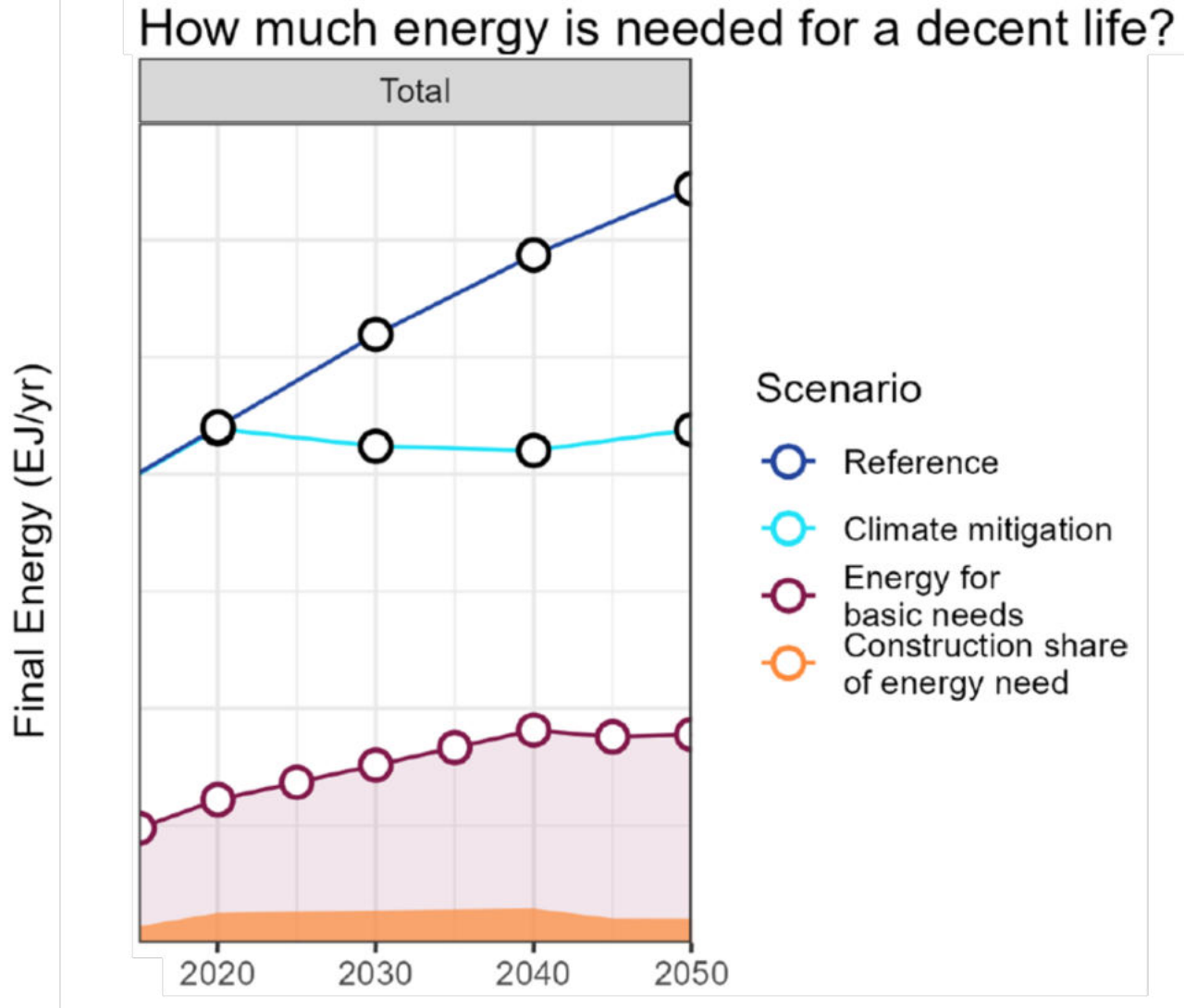
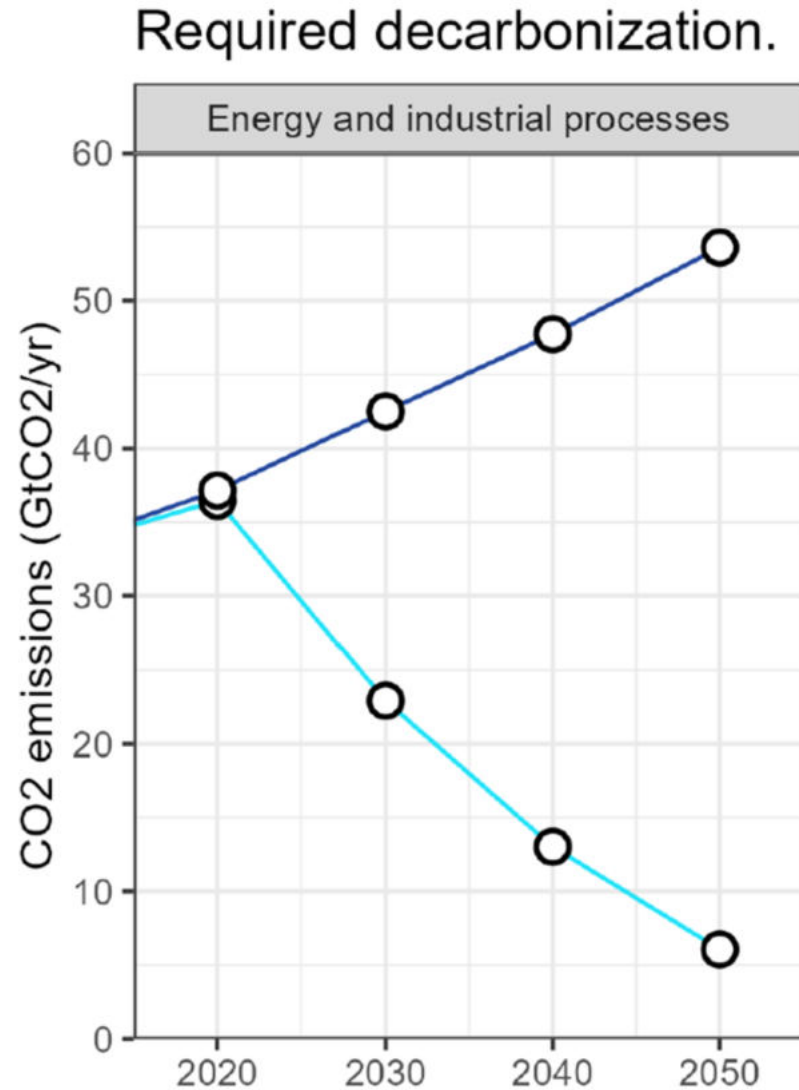
Gaps in services around the world



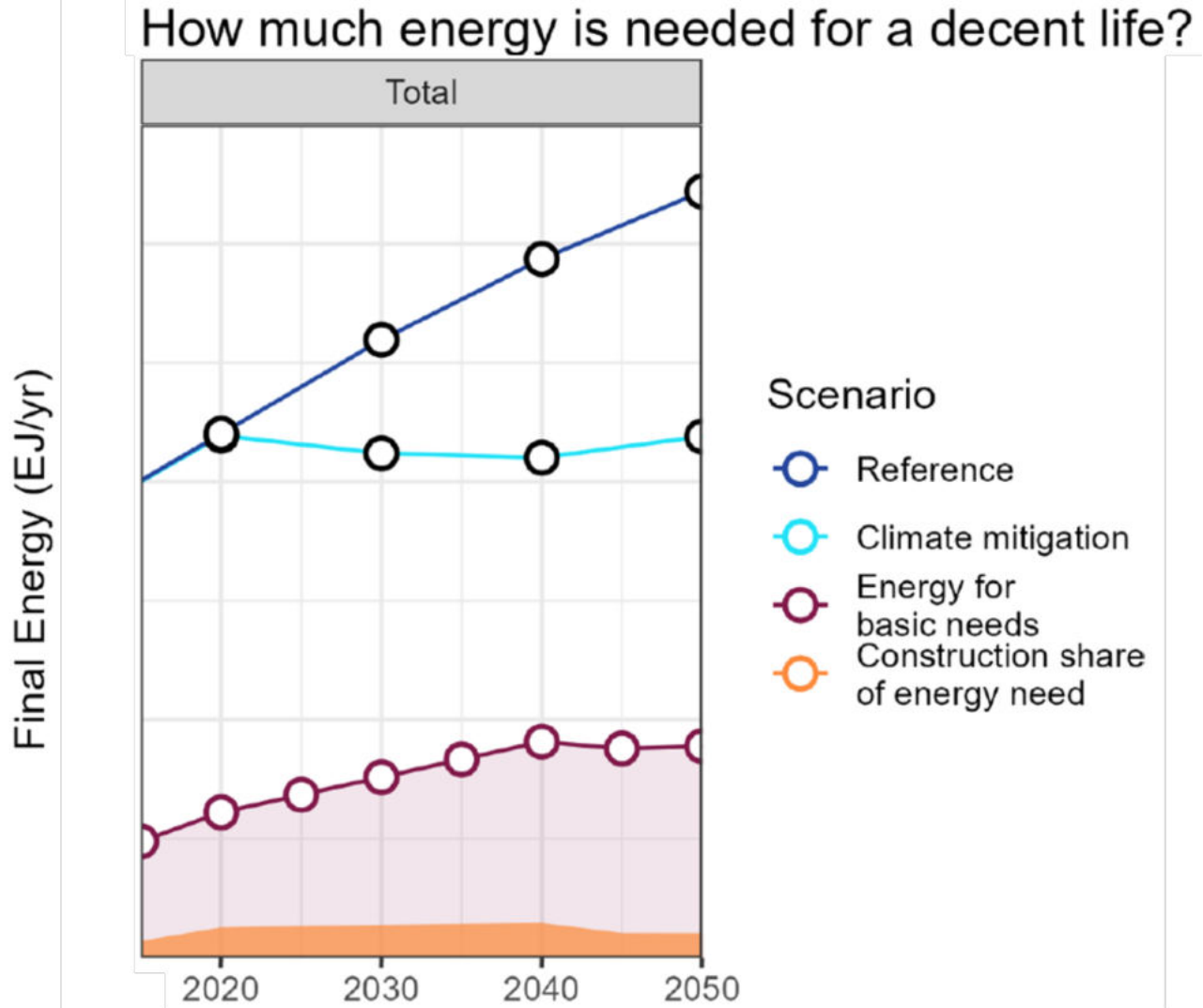
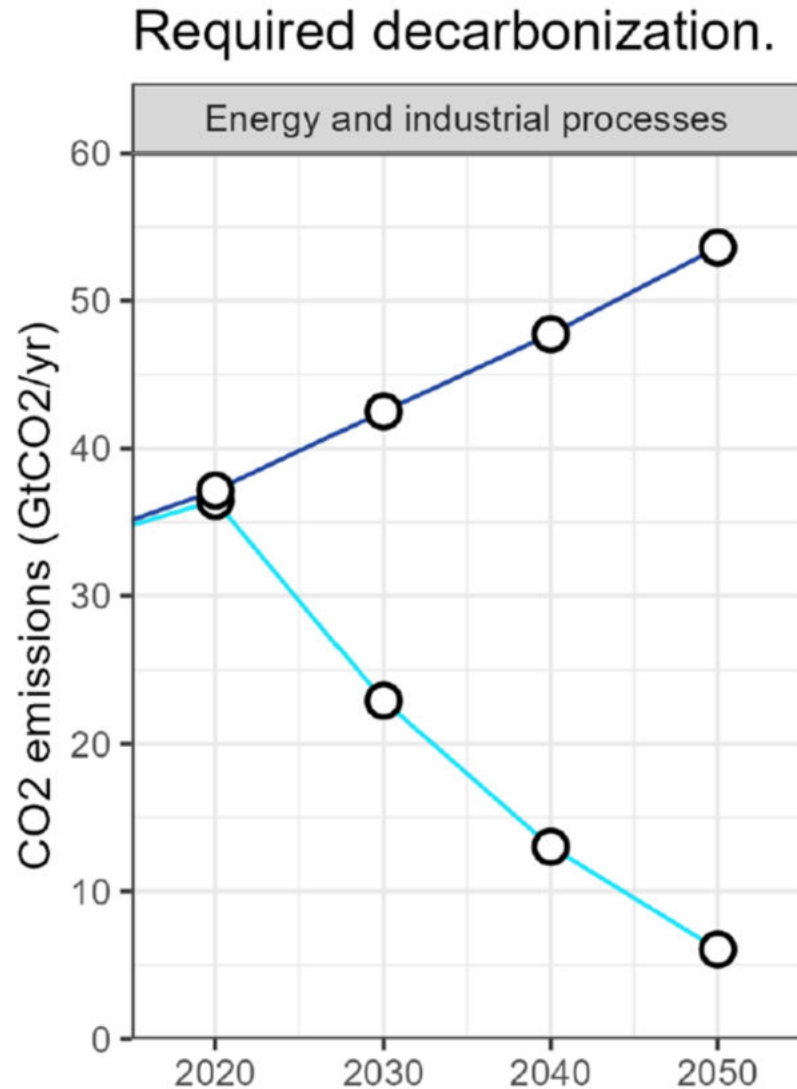
Closing the gaps: building new infrastructure



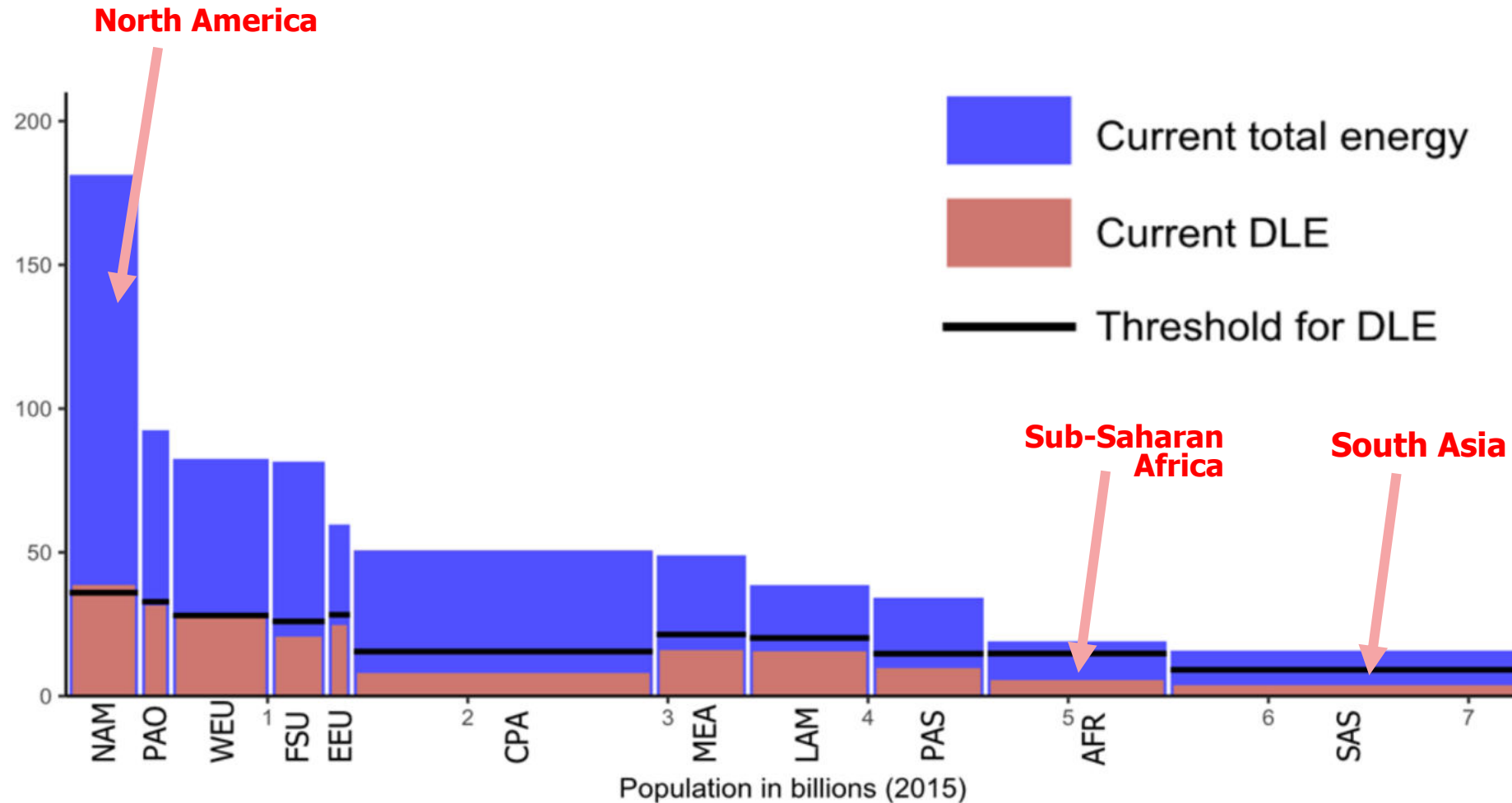
Closing the gaps: while meeting climate targets



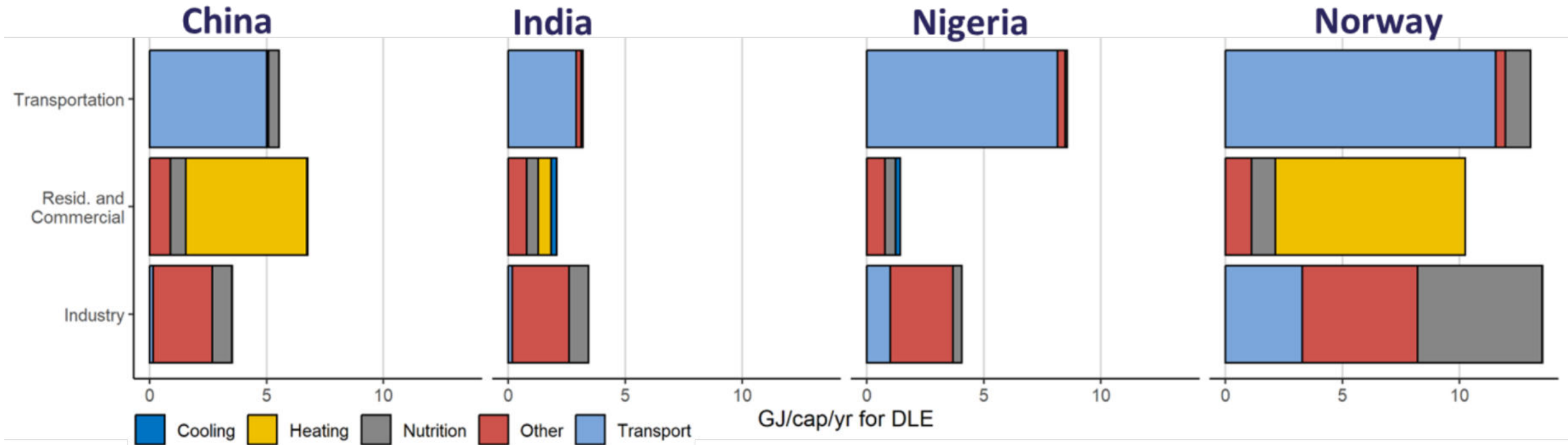
Closing the gaps: some countries need more



Some countries could use less: large inequality

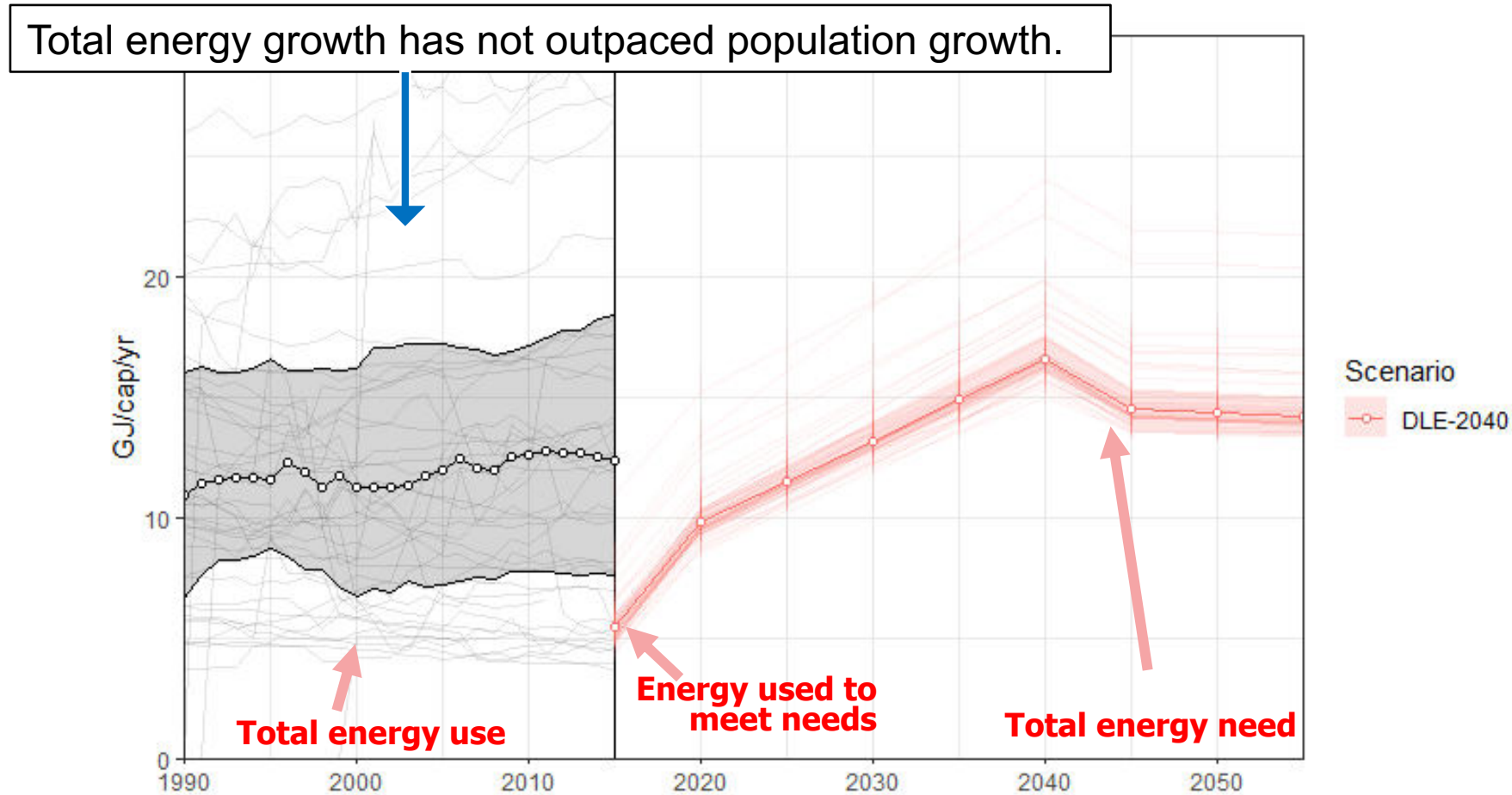


Closing the gaps: energy needs are different, ... even if human needs are the same



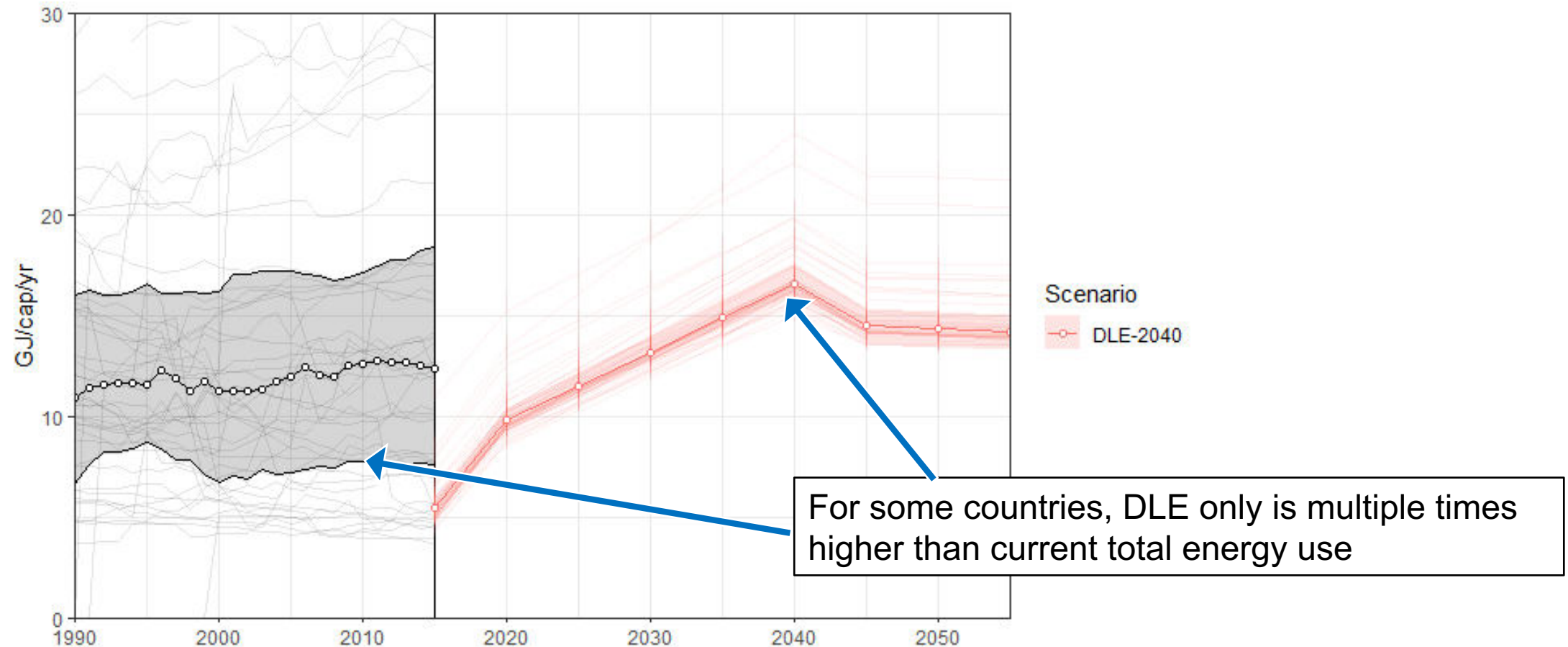
Closing the gaps: some countries need to grow

Country-level look (Sub-Saharan Africa) reveals size of challenge.



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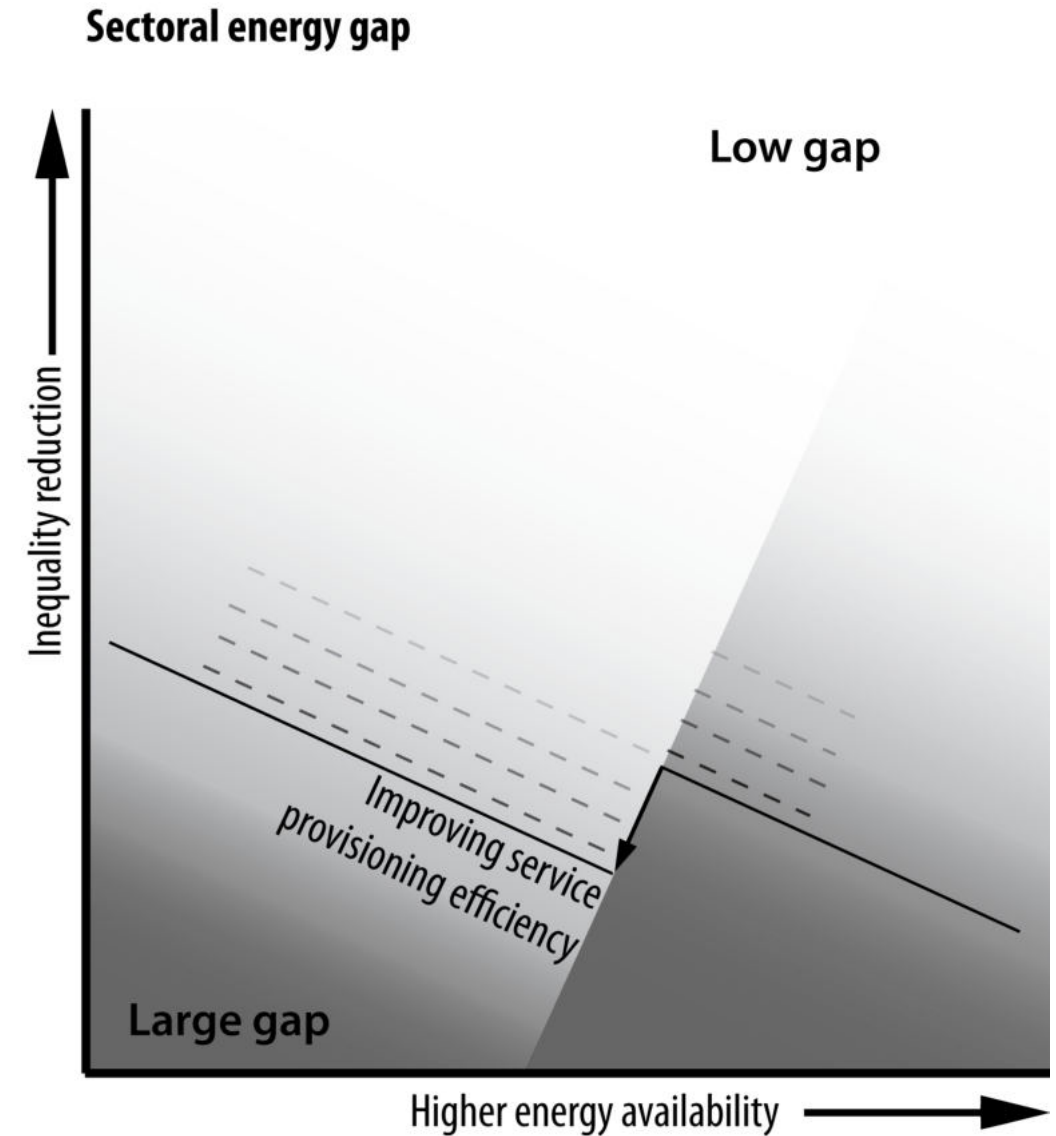
What types of sustainable development pathways exist?

... and what role does energy play in the whole?

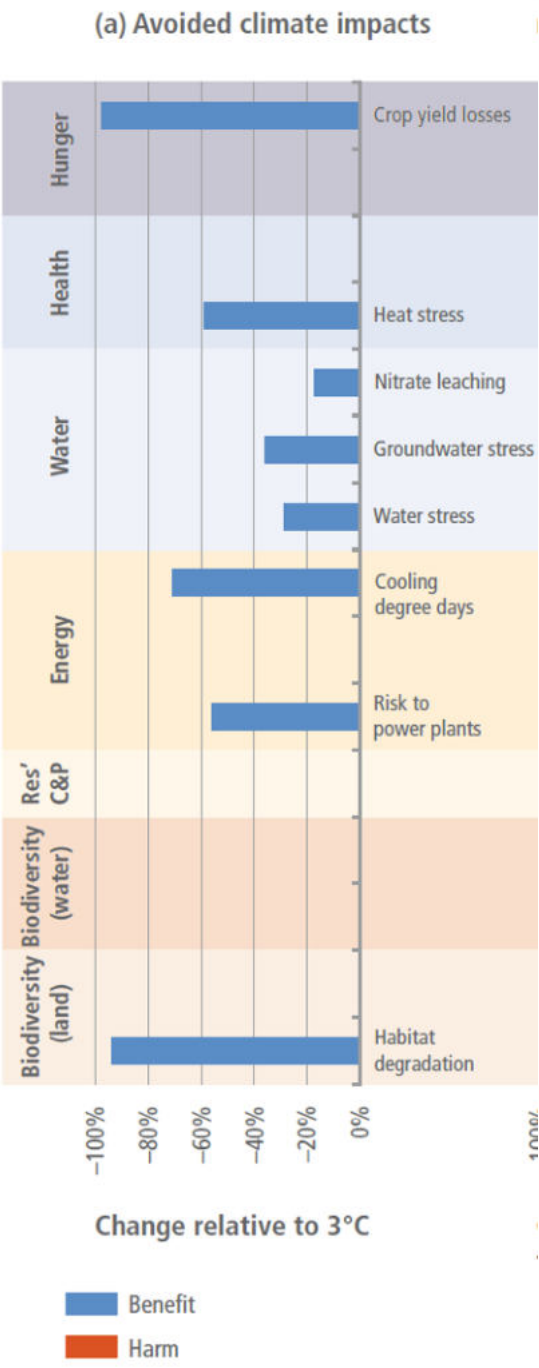
Illustrating the options

Options to reduce poverty ...:

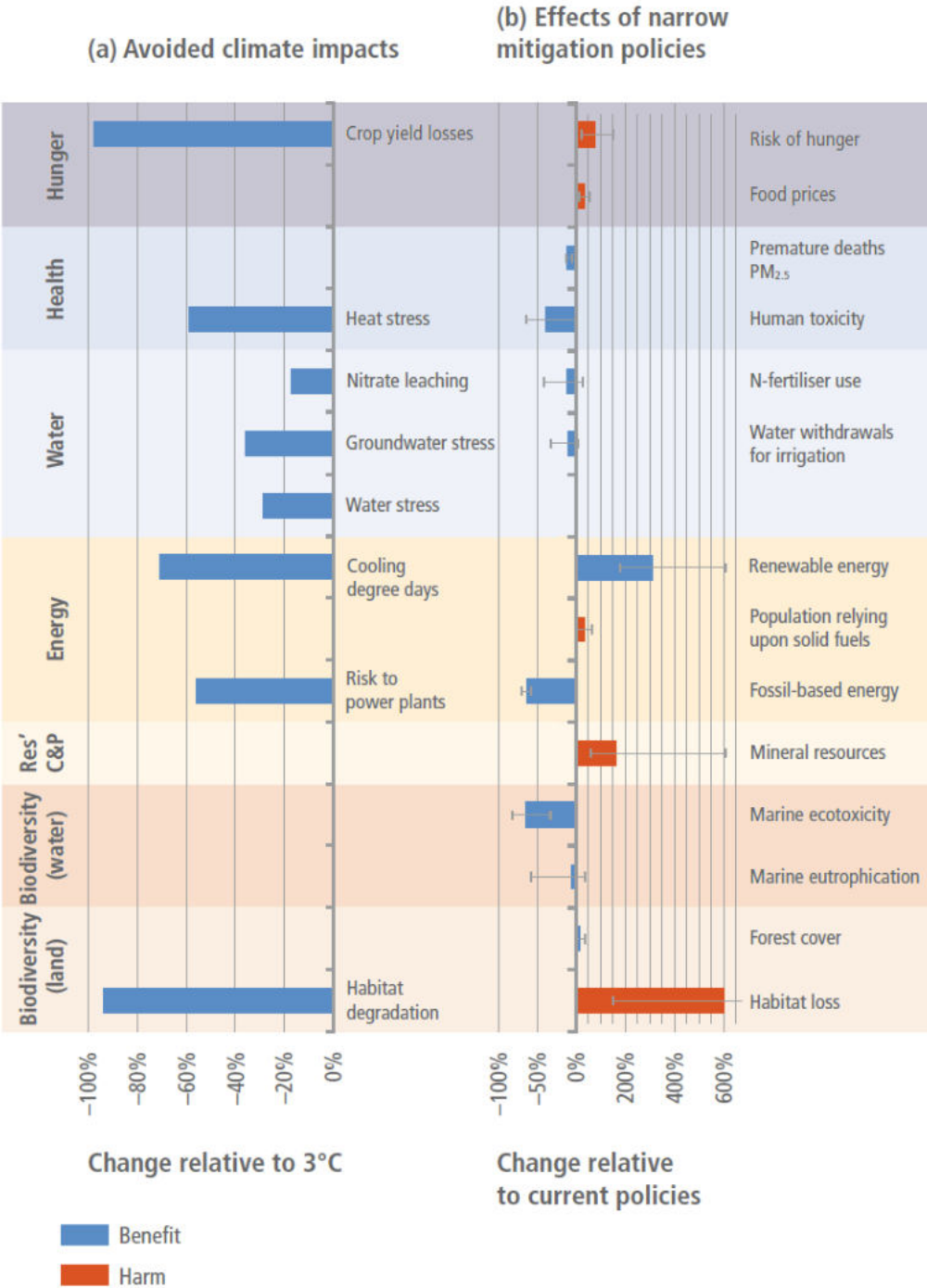
- **More growth where needed**
- **More equality**
- **Better service provisioning systems**



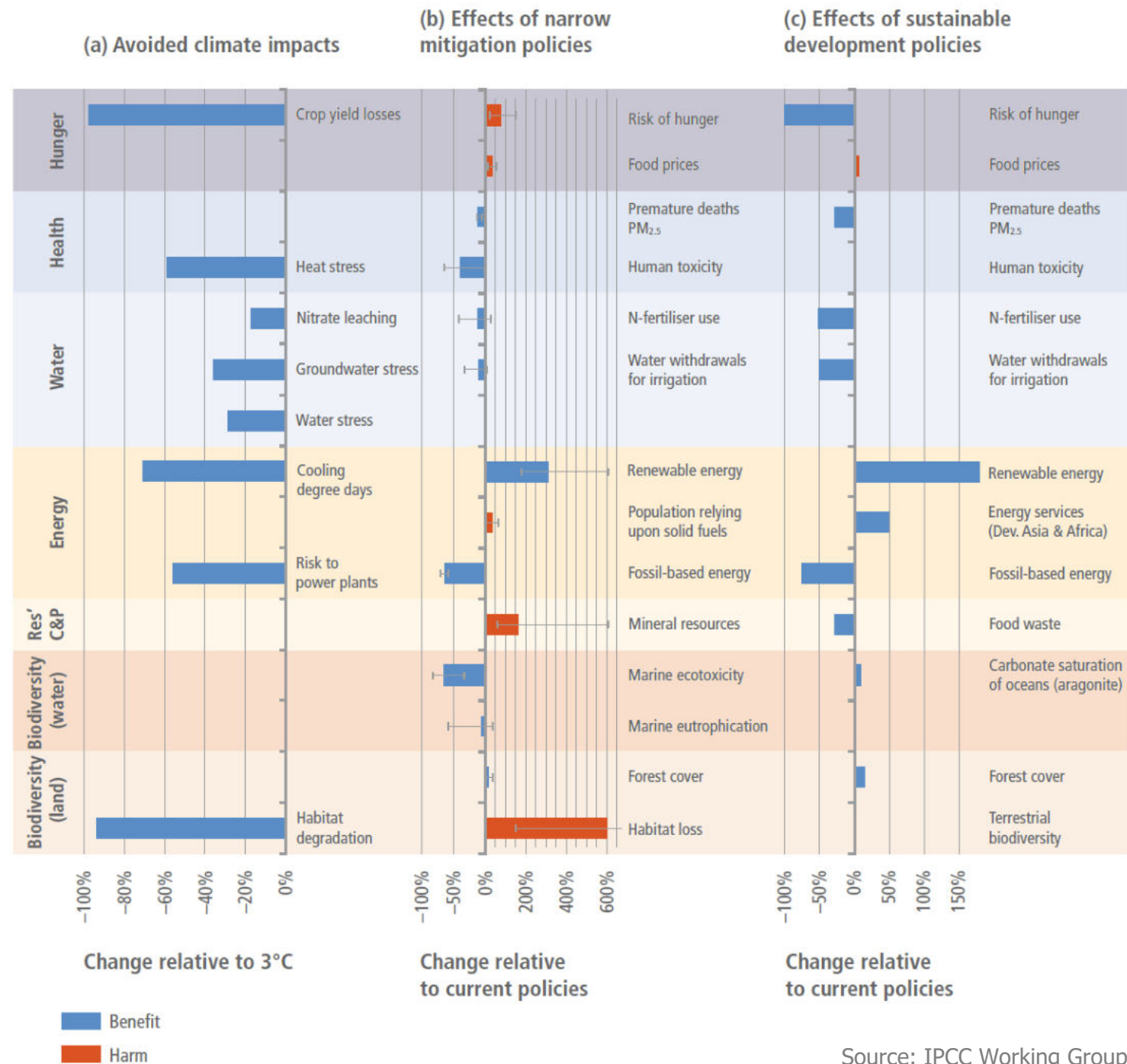
The need for holistic climate policies



The need for holistic climate policies



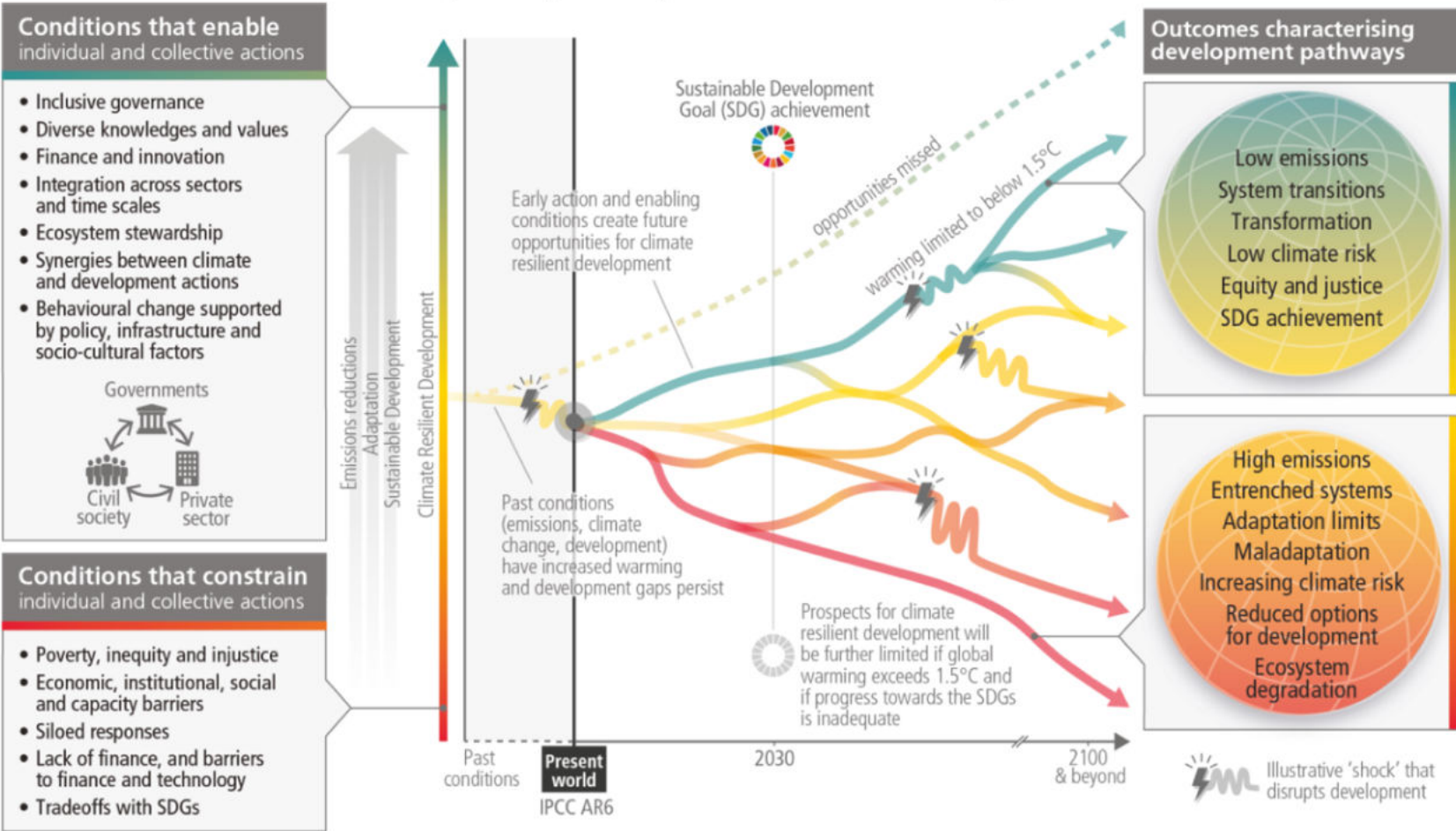
The need for holistic climate policies



Climate resilient development

There is a rapidly narrowing window of opportunity to enable climate resilient development

Multiple interacting choices and actions can shift development pathways towards sustainability



Thank you so much for your attention!

Questions?

Jarmo Kikstra
ECE program, IIASA
Grantham Institute and CEP, Imperial College London
kikstra@iiasa.ac.at