Climate Change: Mitigation, Adaptation, and Resilience

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Yokohama, Japan

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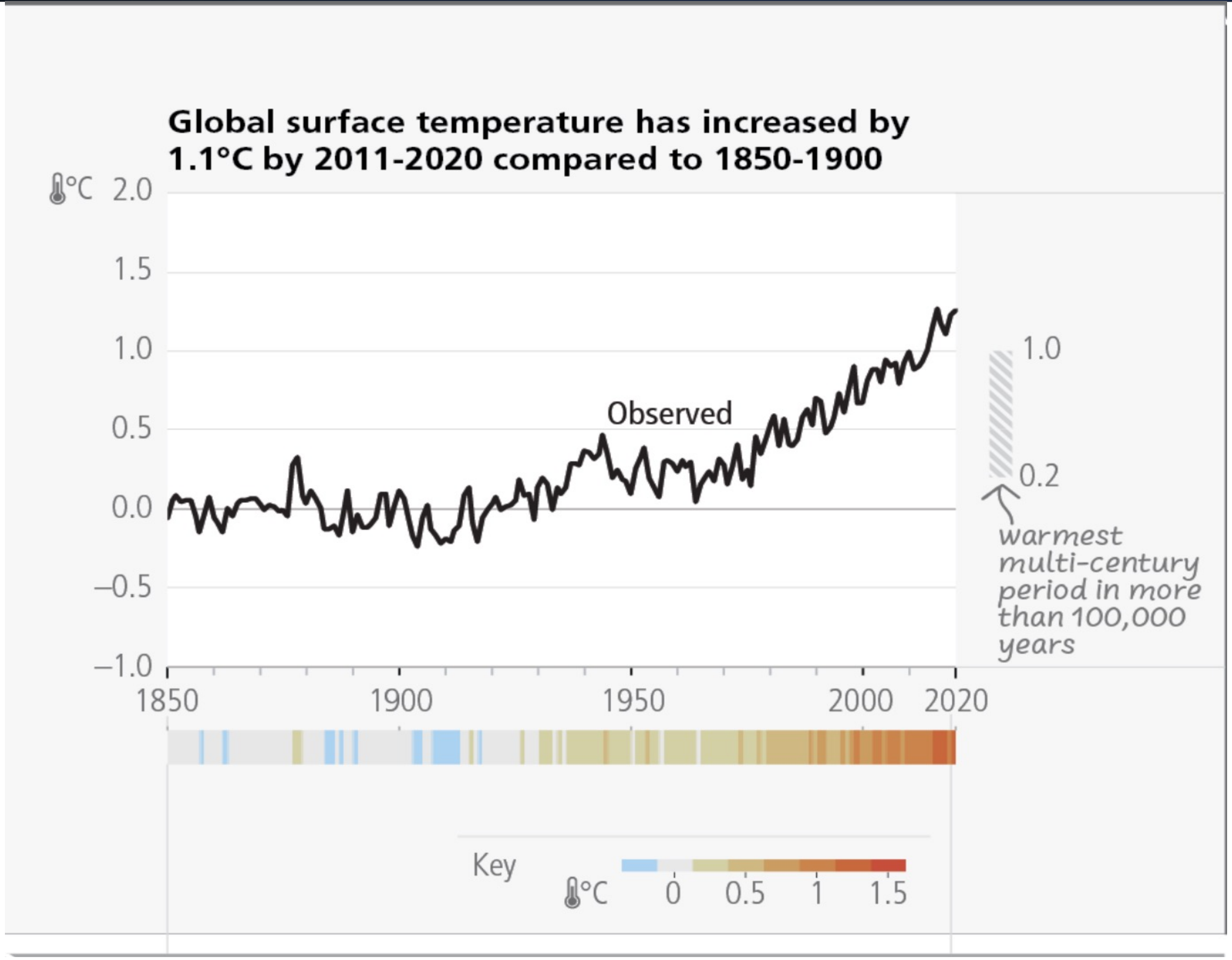
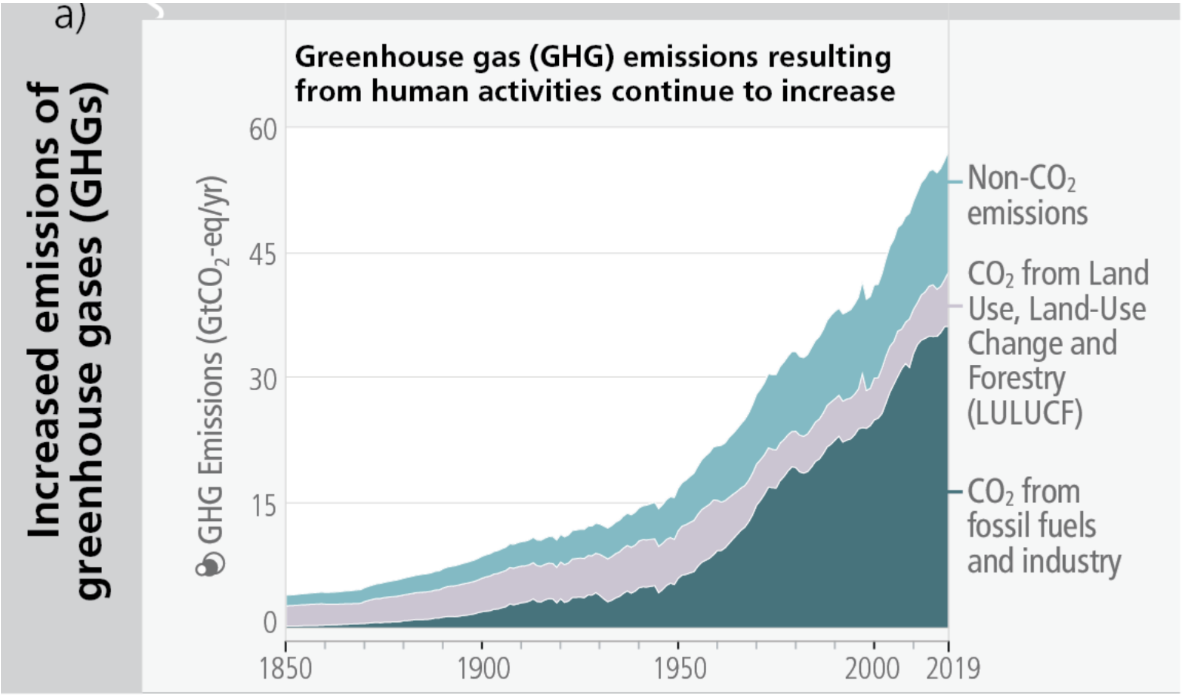
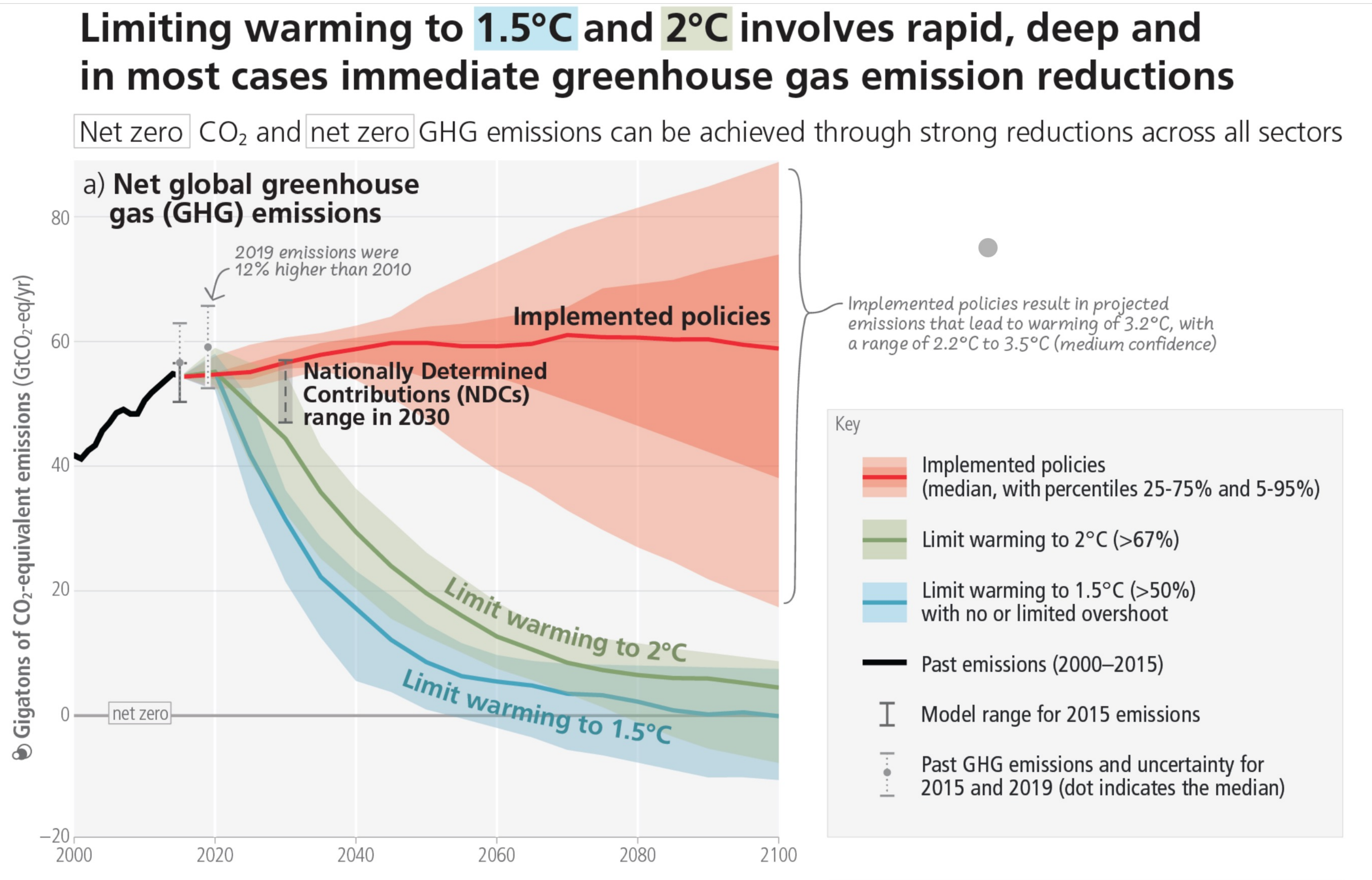
What Has Already Happened?





Source: IPCC AR6 2023

What May Happen?

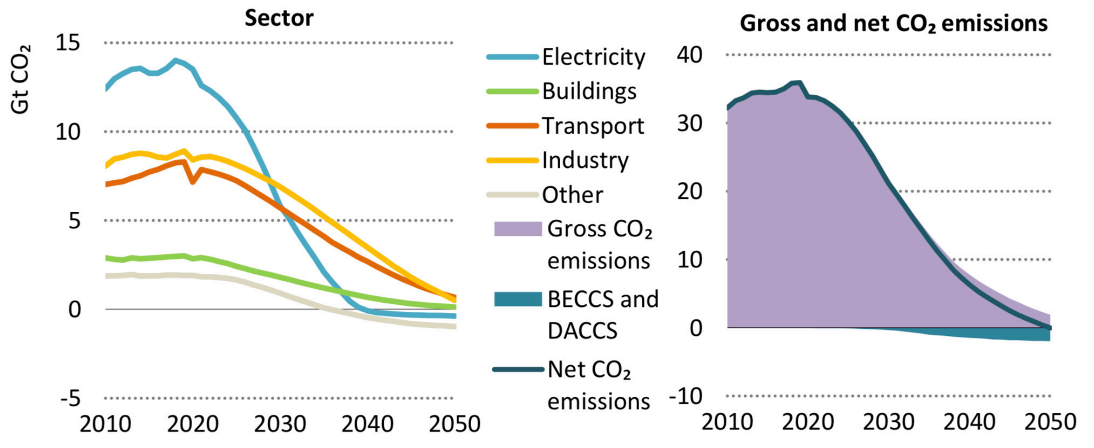


Substantial global warming is going to occur.

Source: IPCC AR6, 2023

Mitigation: IEA Net Zero

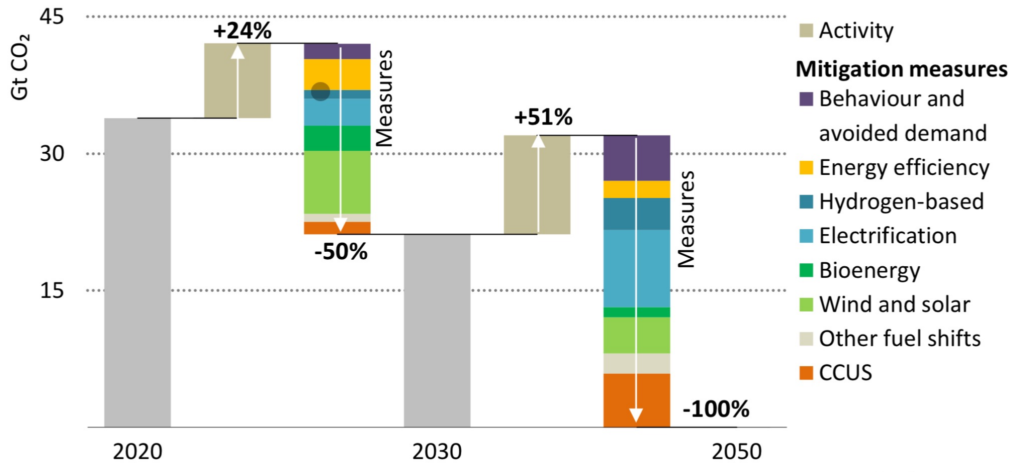
Figure 2.3 ▹ **Global net-CO_2 emissions by sector, and gross and net CO_2 emissions in the NZE**



Emissions from electricity fall fastest, with declines in industry and transport accelerating in the 2030s. Around 1.9 Gt CO_2 are removed in 2050 via BECCS and DACCS.

Notes: Other = agriculture, fuel production, transformation and related process emissions, and direct air capture. BECCS = bioenergy with carbon capture and storage; DACCS = direct air capture with carbon capture and storage. BECCS and DACCS includes CO_2 emissions captured and permanently stored.

Figure 2.12 ▹ **Emissions reductions by mitigation measure in the NZE, 2020-2050**

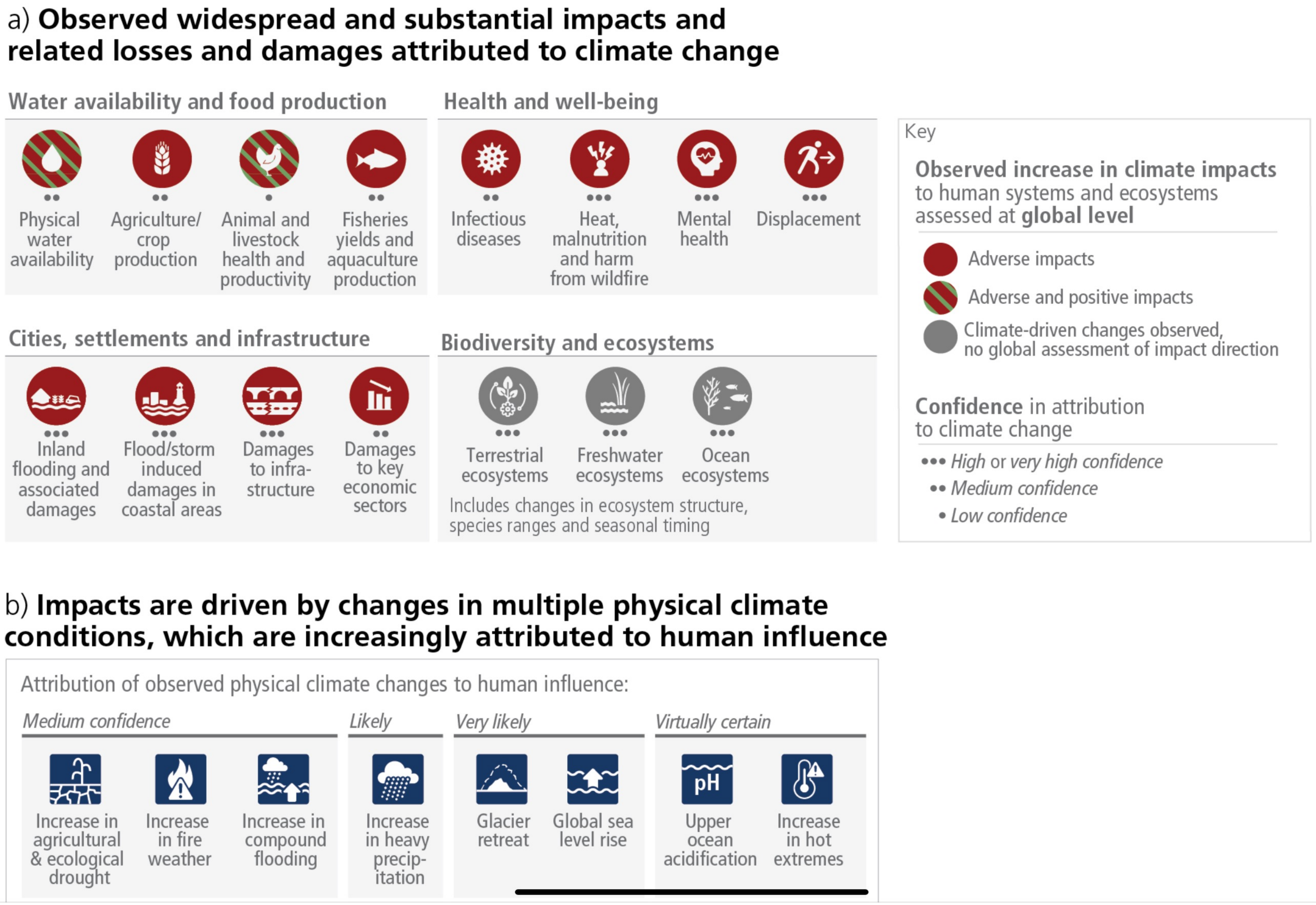


Solar, wind and energy efficiency deliver around half of emissions reductions to 2030 in the NZE, while electrification, CCUS and hydrogen ramp up thereafter

Notes: Activity = energy service demand changes from economic and population growth. Behaviour = energy service demand changes from user decisions, e.g. changing heating temperatures. Avoided demand = energy service demand changes from technology developments, e.g. digitalisation. Other fuel shifts = switching from coal and oil to natural gas, nuclear, hydropower, geothermal, concentrating solar power or marine.

Source: IEA Net Zero, 2021

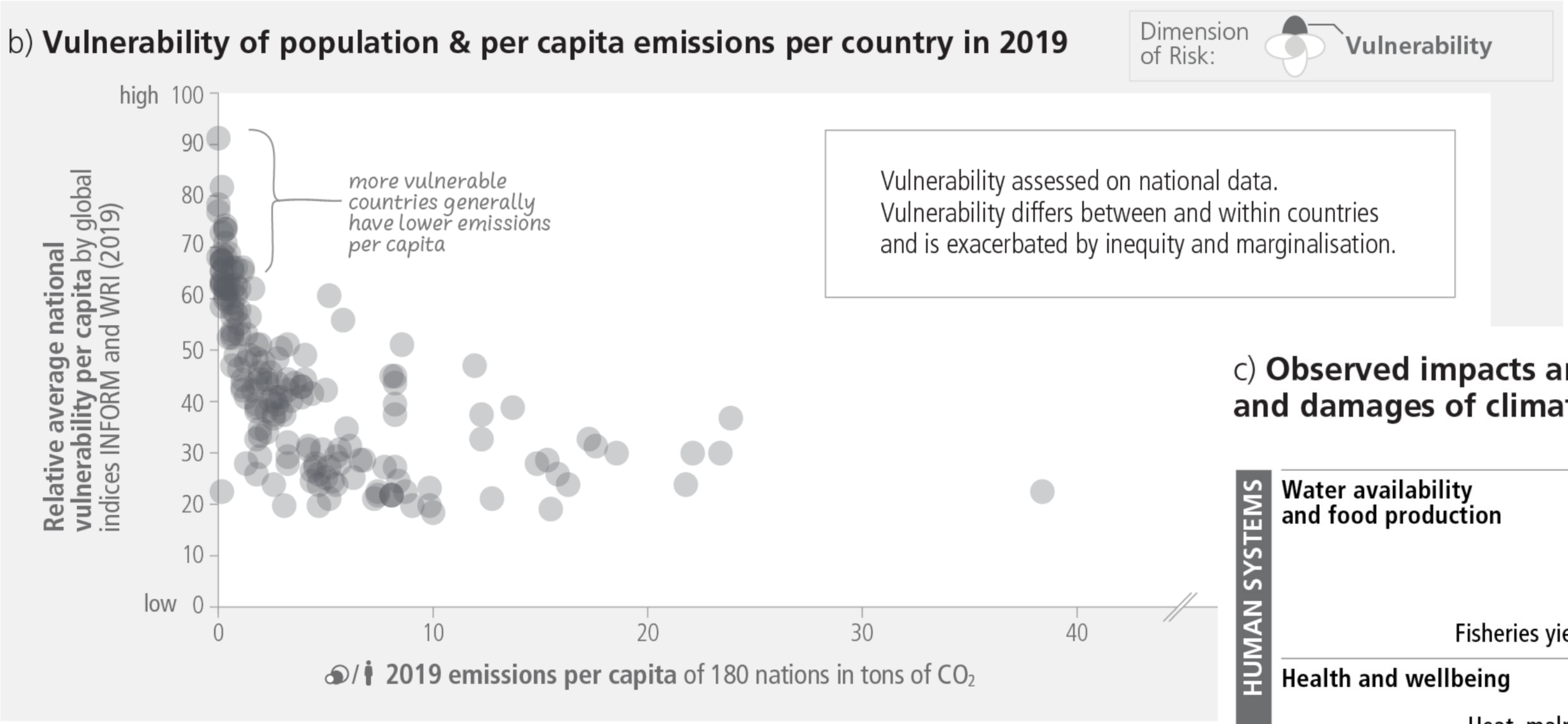
Impacts of Climate Change

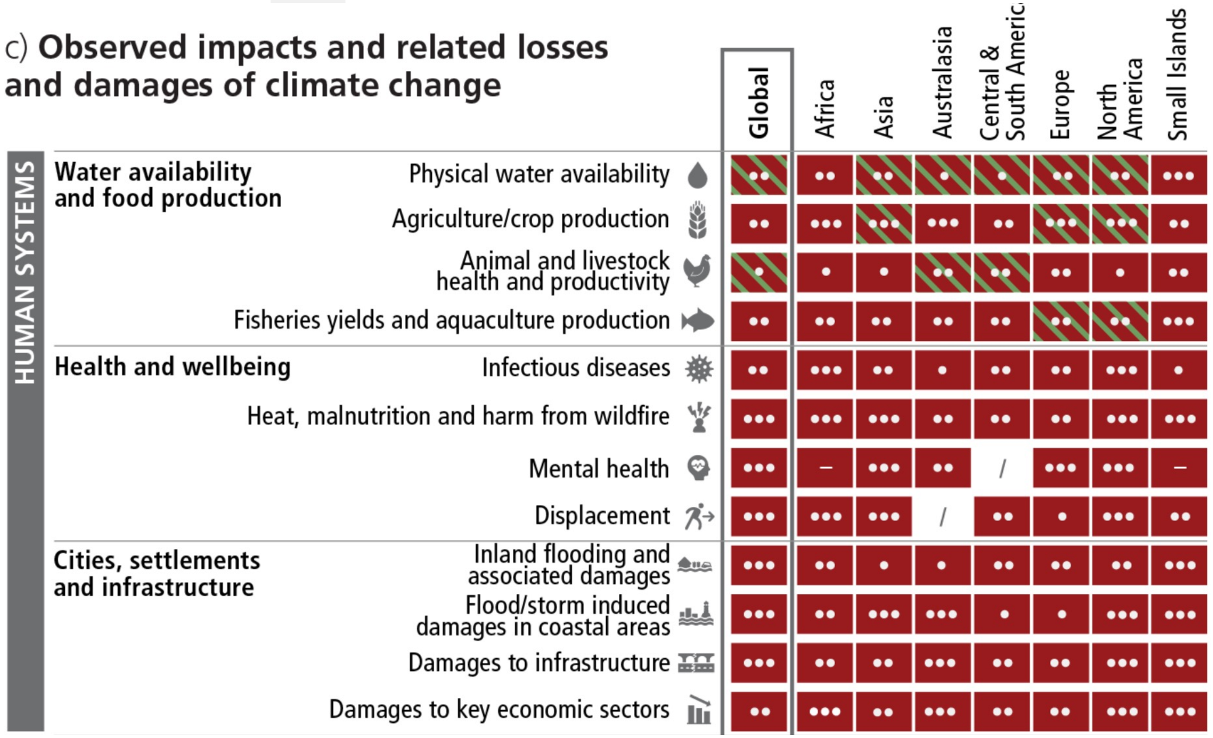


Adaptation and resilience are crucial

Source: IPCC AR6, 2023

Equity and Justice Issues are Central





Source: IPCC AR6, 2023

Adaptation, Resilience, and Mitigation Can Be Synergistic

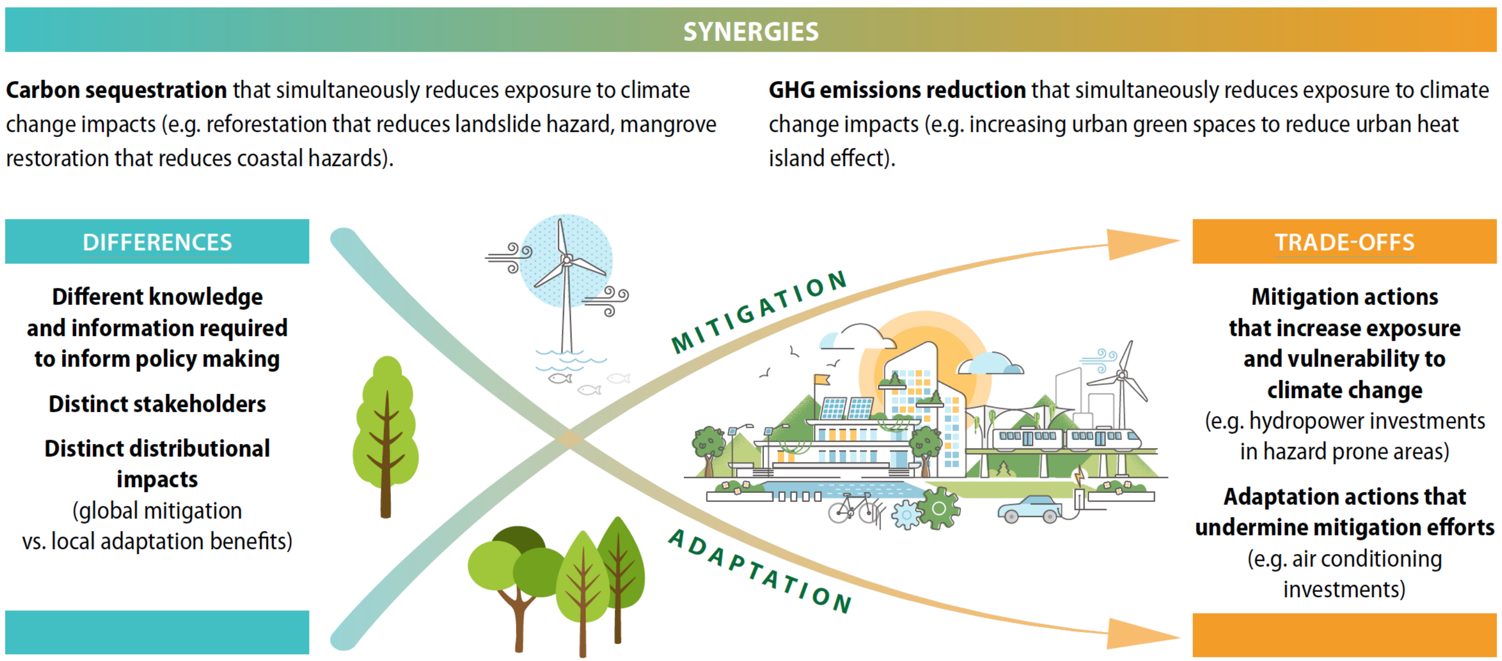


FIGURE 2. **Aligning climate change mitigation and adaptation policies: differences, synergies and trade-offs**

- **Distributed energy systems can enable greater renewable integration as well as resilience to extreme events**
- **Resource optimization in agriculture can be better adapted to future arid climate and higher temperatures**
- **Electrification of transportation can yield better public health outcomes with cleaner air**

Source: OECD, 2021

What Can We Do?

- Numerous opportunities in mitigation, adaptation, and resilience
- Most problems require multidisciplinary collaboration including sciences, engineering, social sciences, humanities, business, and law
- Research to innovation to implementation is critical
- Scaling of solutions is relatively well understood for mitigation but in infancy for adaptation and resilience
- Solutions should be implementable in the developing countries