Trade and Industrial Waters Forum
Hamilton. 14-16 July, 2023

Does Climate Change Water?

Impacts of climate change on water and wastes

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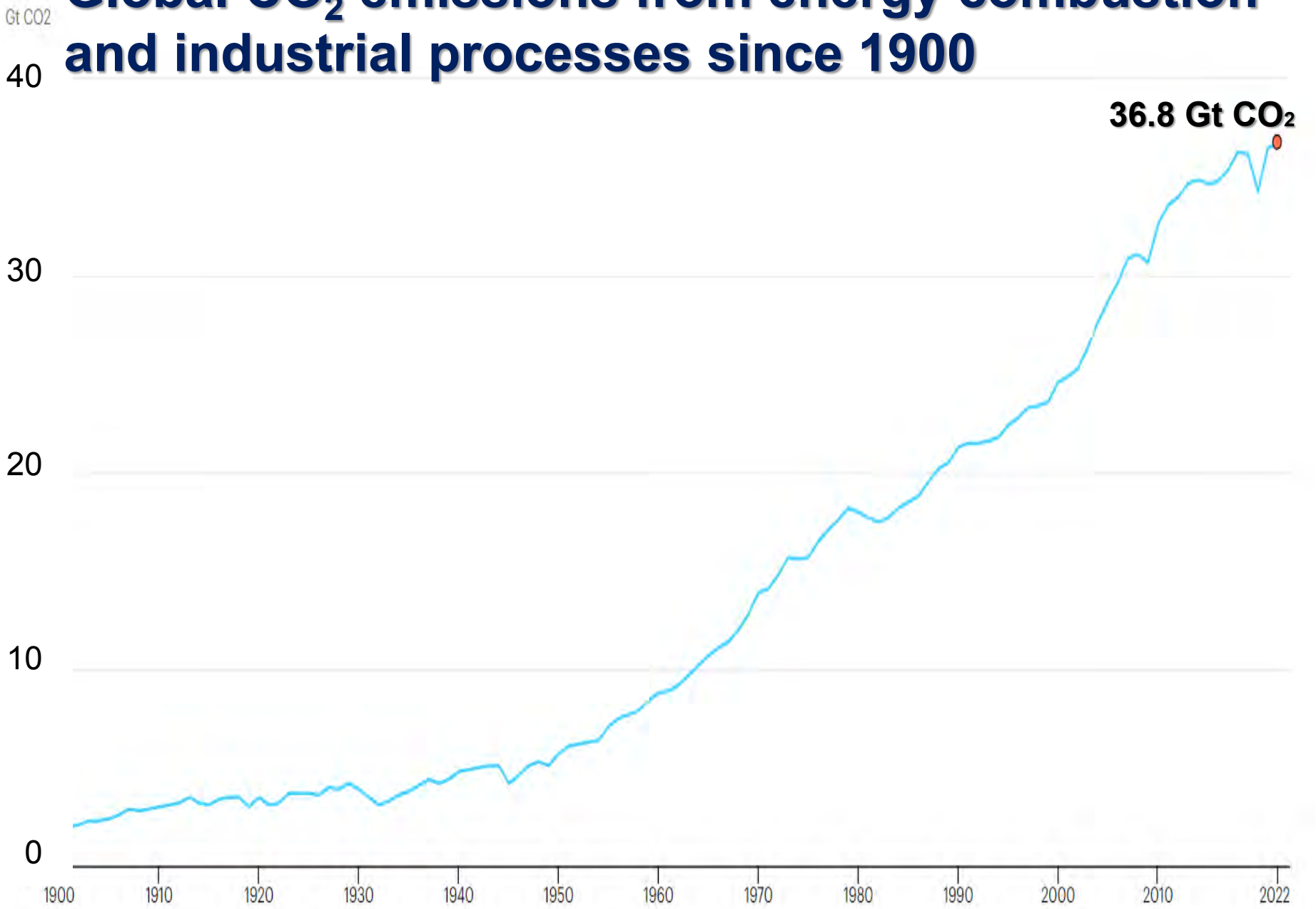
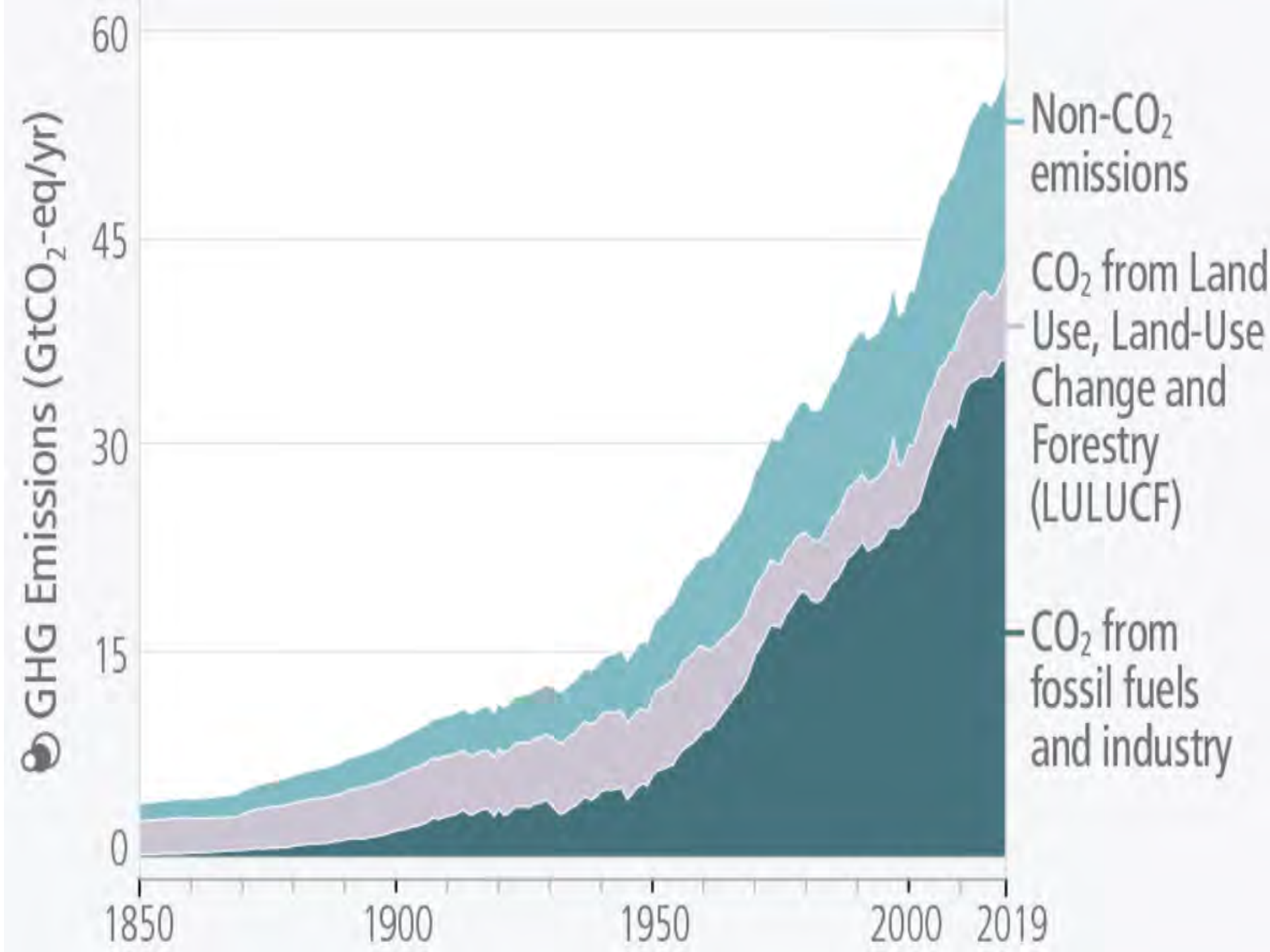
Climate change is already happening.

- New Zealanders have become more aware after recent extreme climate events.
- But few have reduced their carbon footprints.
- Therefore our gross annual emissions have not declined.
- We now have to learn how to adapt – for example, “managed retreat”.
- Global GHG emissions continue to rise.
- Around 70% is CO_2 from fossil fuel combustion – often heavily subsidised.
- Global food supply produces 24% of emissions
- It is too late to stay below 1.5 ºC as targeted in the 2015 Paris Climate Agreement.

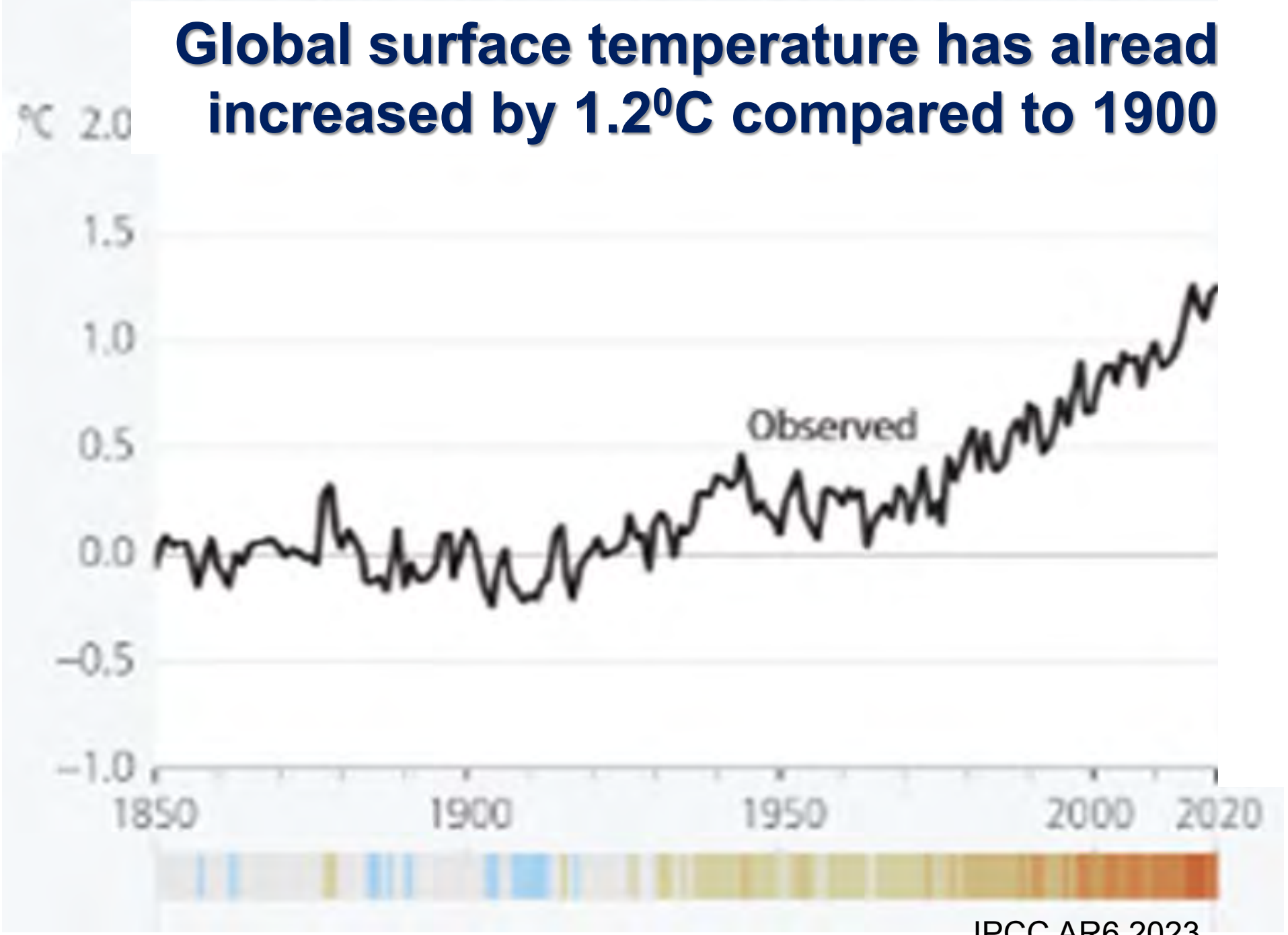
Global CO_2 emissions from energy combustion and industrial processes since 1900



IEA, 2023


GHG Emissions (GtCO2-eq/yr)
60
45
30
15
0
1850
1900
1950
2000
2019
Non-CO2 emissions
CO2 from Land Use, Land-Use Change and Forestry (LULUCF)
CO2 from fossil fuels and industry

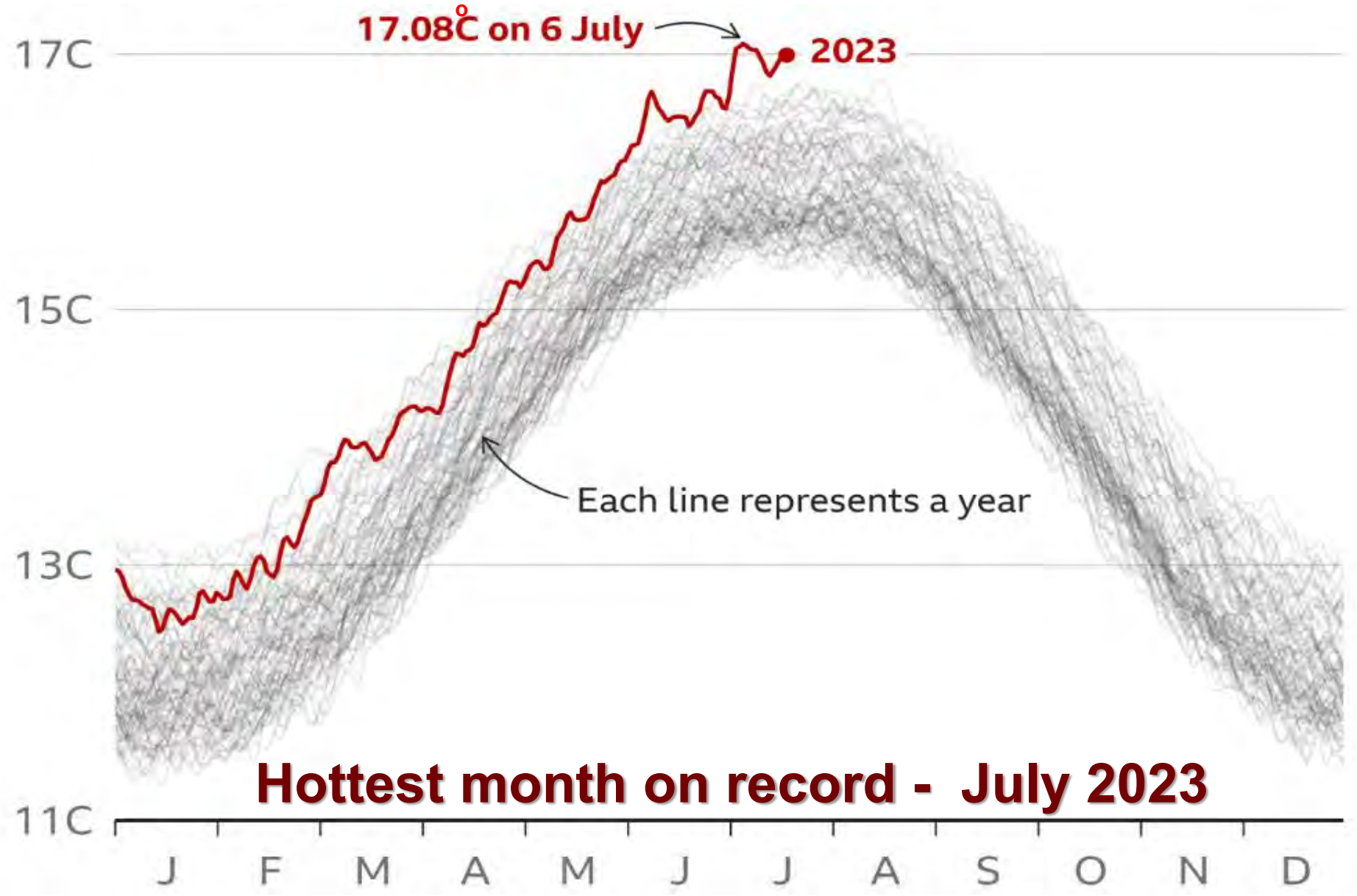
Global surface temperature has alread increased by 1.2^{0}C compared to 1900



IPCC AR6 2023

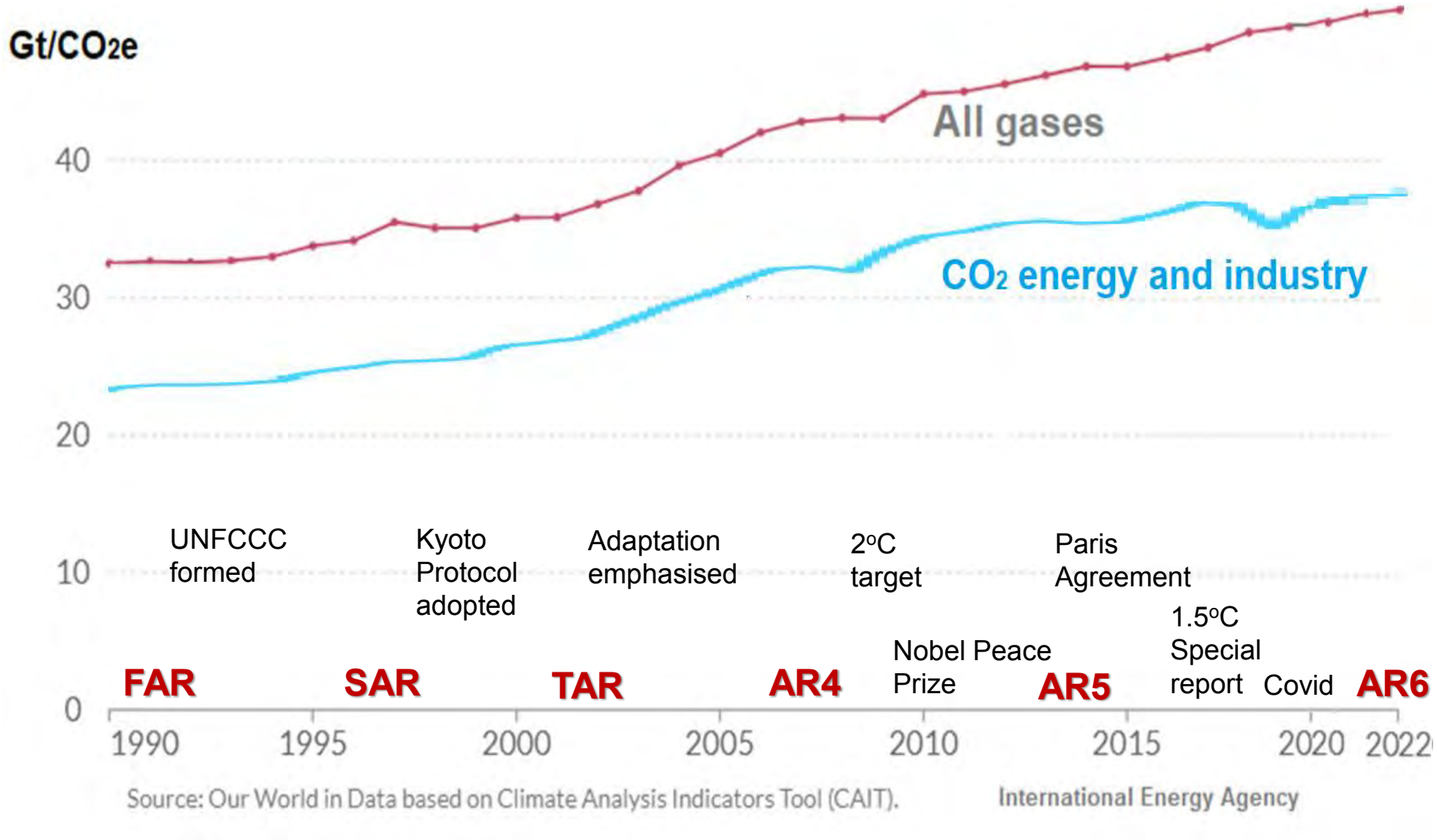
Daily average global air temperature 1940-2023

Hottest day on record

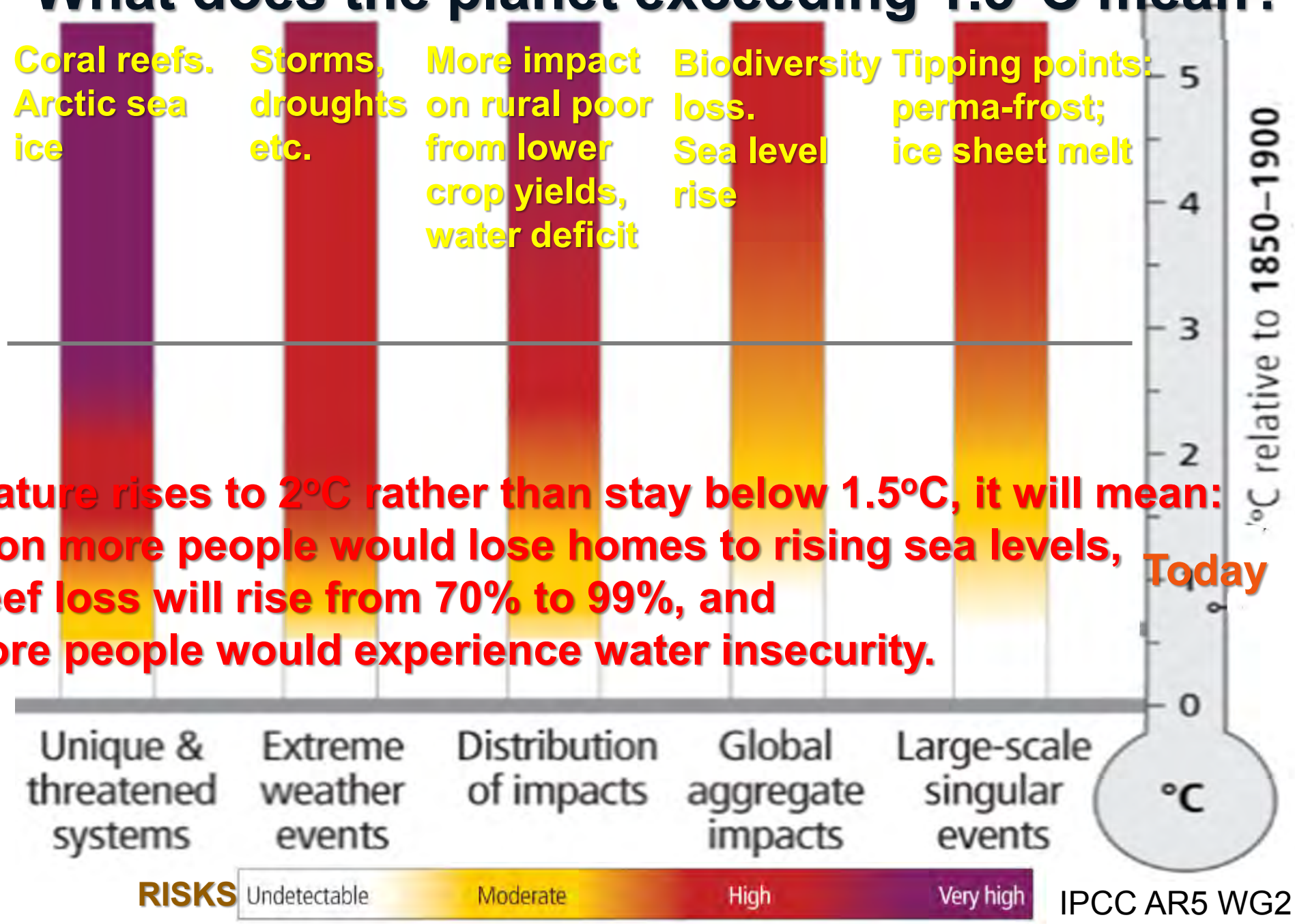


Hottest month on record - July 2023

In spite of six IPCC Assessments and advice given to policy makers over 33 years, global GHGs continue to rise



What does the planet exceeding 1.5°C mean?



If temperature rises to 2°C rather than stay below 1.5°C, it will mean:

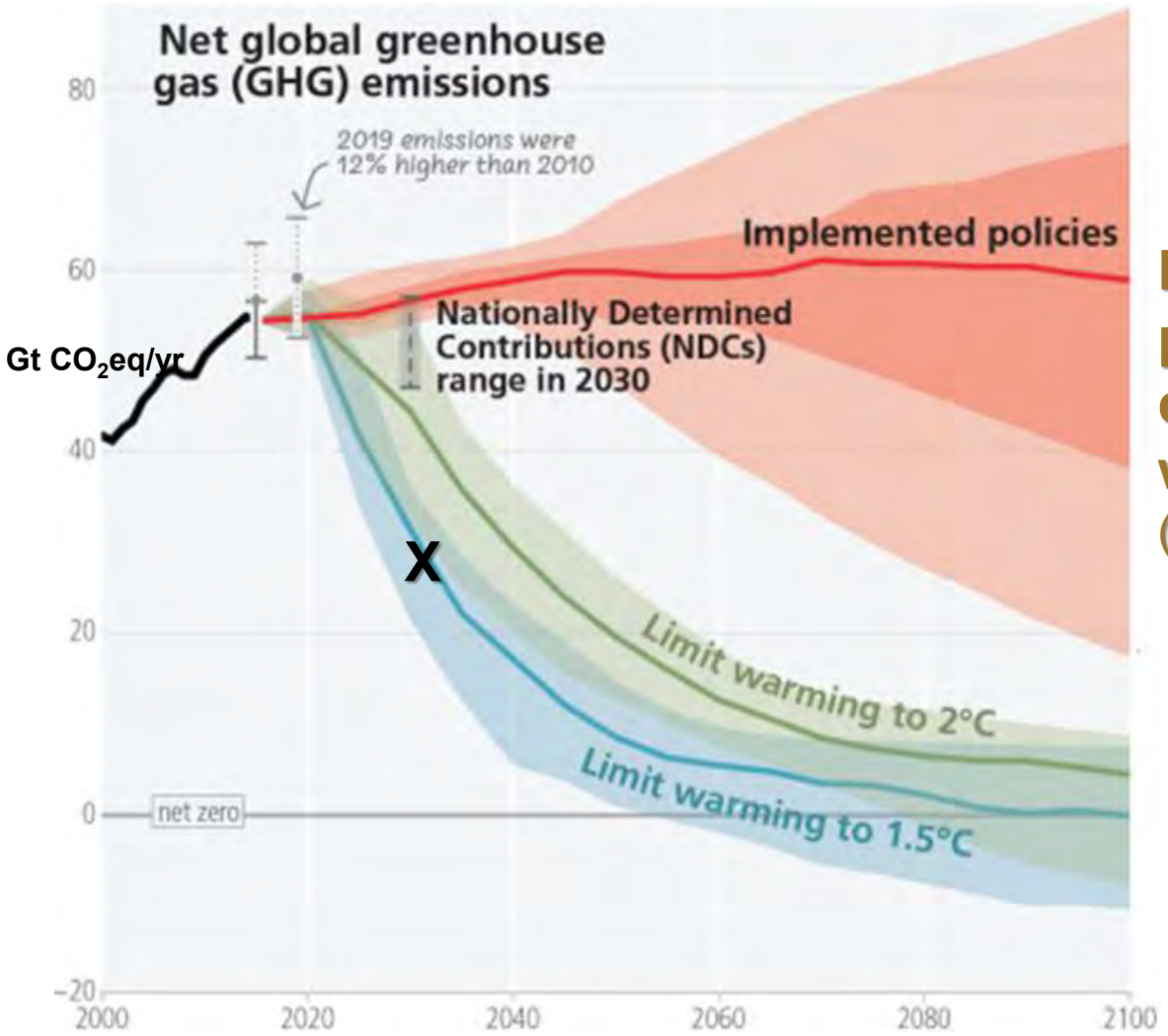
> 10 million more people would lose homes to rising sea levels,

> coral reef loss will rise from 70% to 99%, and

> 50% more people would experience water insecurity.

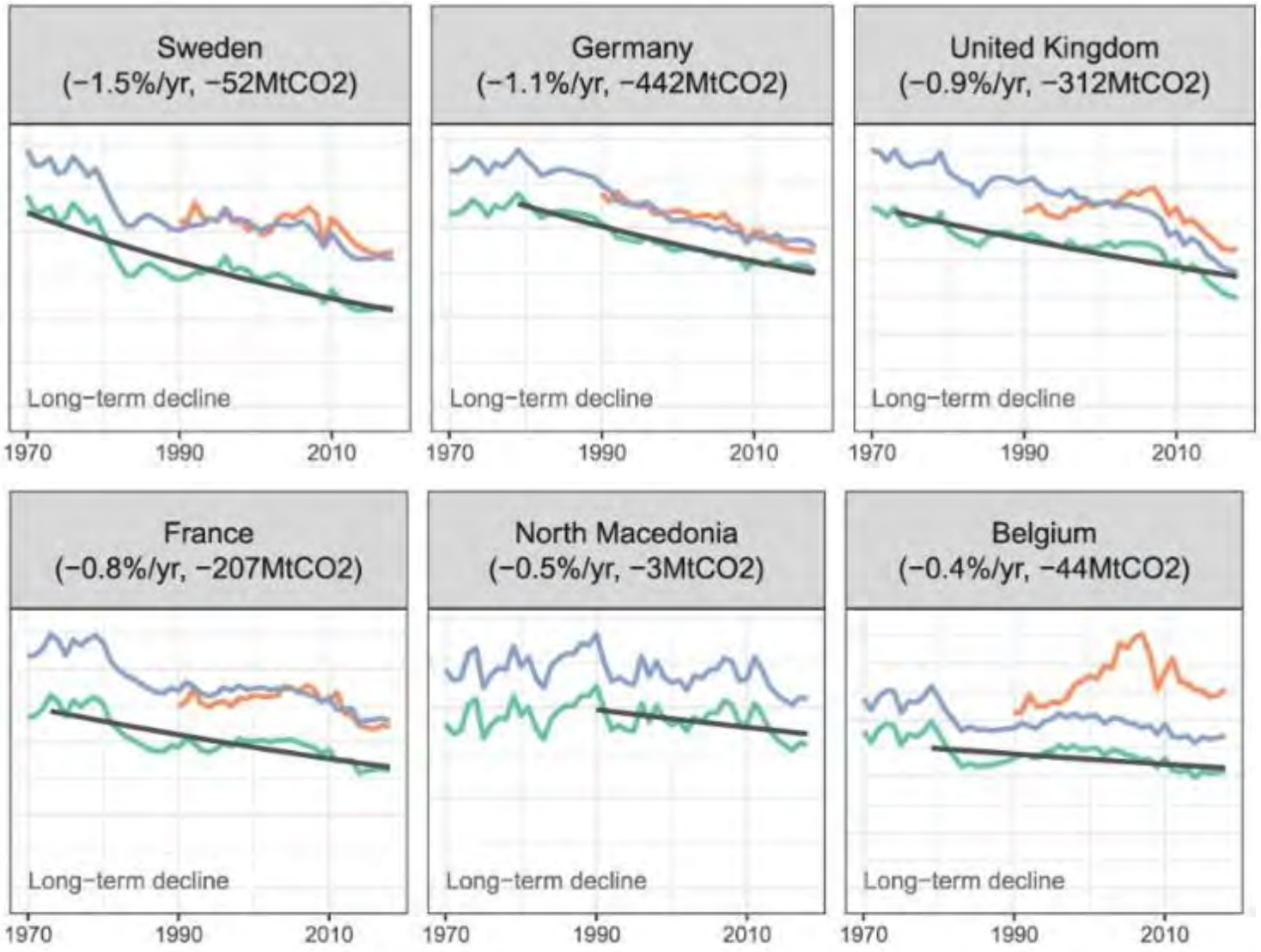
IPCC AR5 WG2

If warming is to be limited to below 1.5°C, emissions should be decreasing by now and will need to be cut by almost half by 2030.

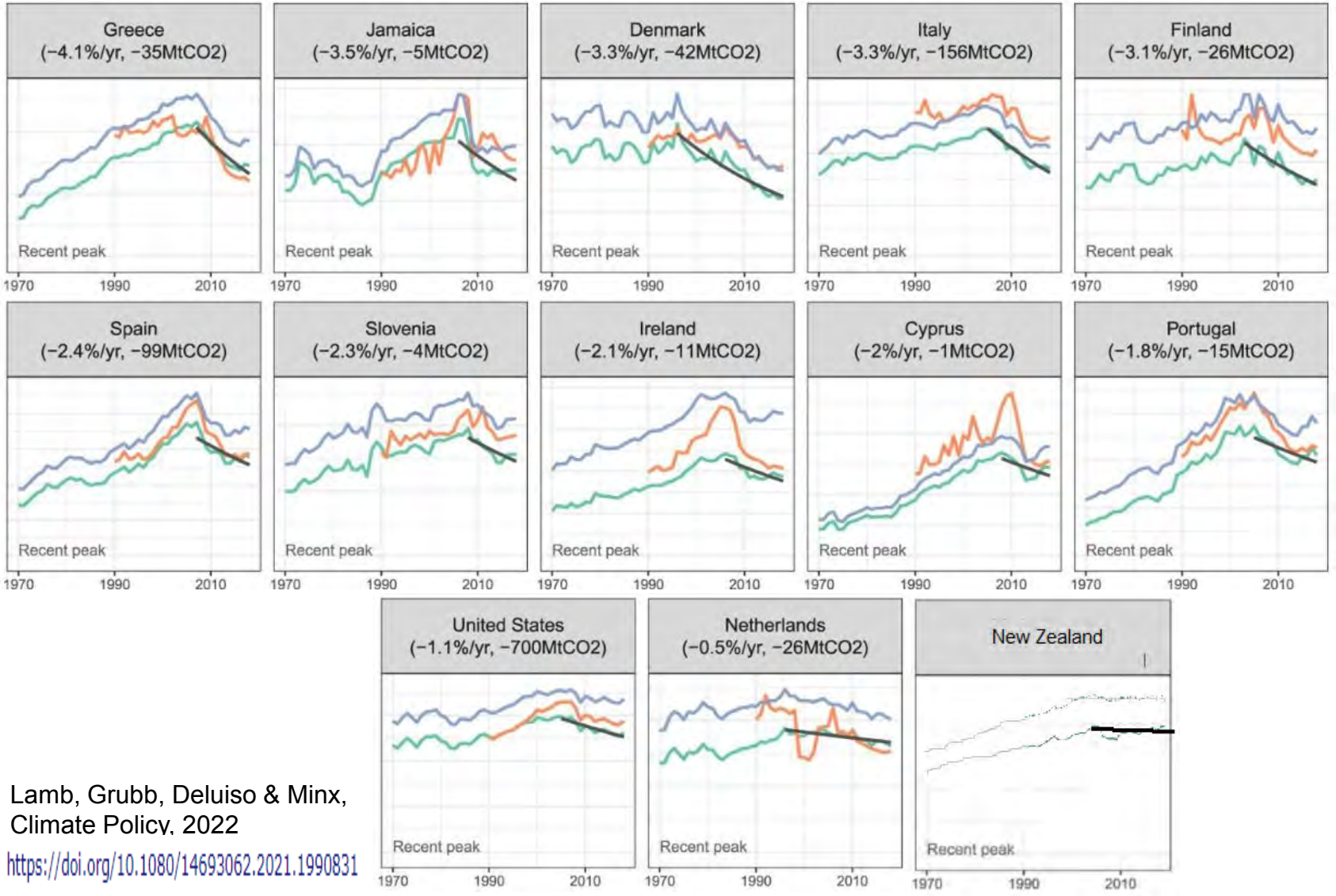


Emission reduction policies implemented to date lead to a 3.2°C warming -
(uncertainty range 2.2 – 3.5°C)

Countries with sustained gross and CO_2 emission reductions over several decades



Countries with decline in total and CO_2 emissions after reaching a recent peak



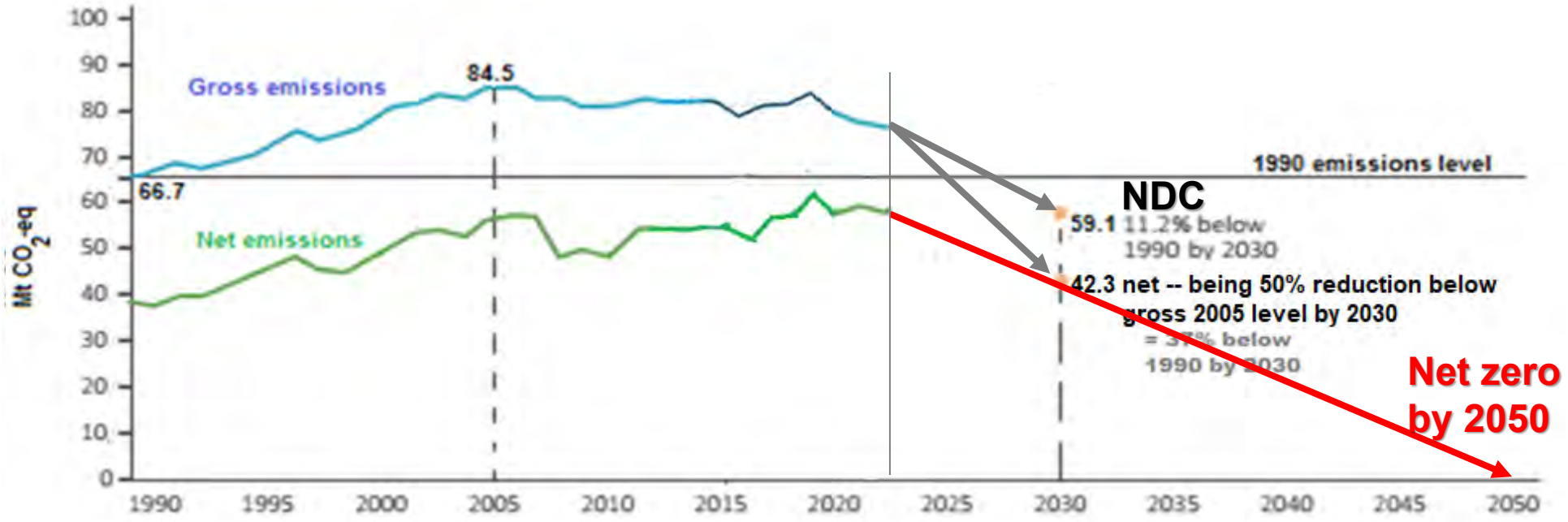
Lamb, Grubb, Deluiso & Minx,
Climate Policy, 2022

https://doi.org/10.1080/14693062.2021.1990831

Relevant quotes from IPCC 6th Assessment Report 2023.

- **Increasing weather and climate extreme events have exposed millions of people to acute food insecurity and reduced water security.**
- **The projected increase in frequency and intensity of heavy precipitation (*high confidence*) will increase rain-generated local flooding (*medium confidence*).**
- **Climate change has caused substantial damages, and increasingly irreversible losses in terrestrial, freshwater, and coastal ecosystems.**
- **Roughly half of the world's population currently experience severe water scarcity for at least part of the year due to a combination of climatic and non-climatic drivers.**
- **Effective adaptation options in agriculture include on-farm water management and storage, soil moisture conservation, and irrigation (given that agriculture consumes around 70% of global freshwater demand).**
- **Continued global warming is projected to further intensify the global water cycle, increase its variability and lead to very wet and very dry weather patterns, and increased climate impact events.**

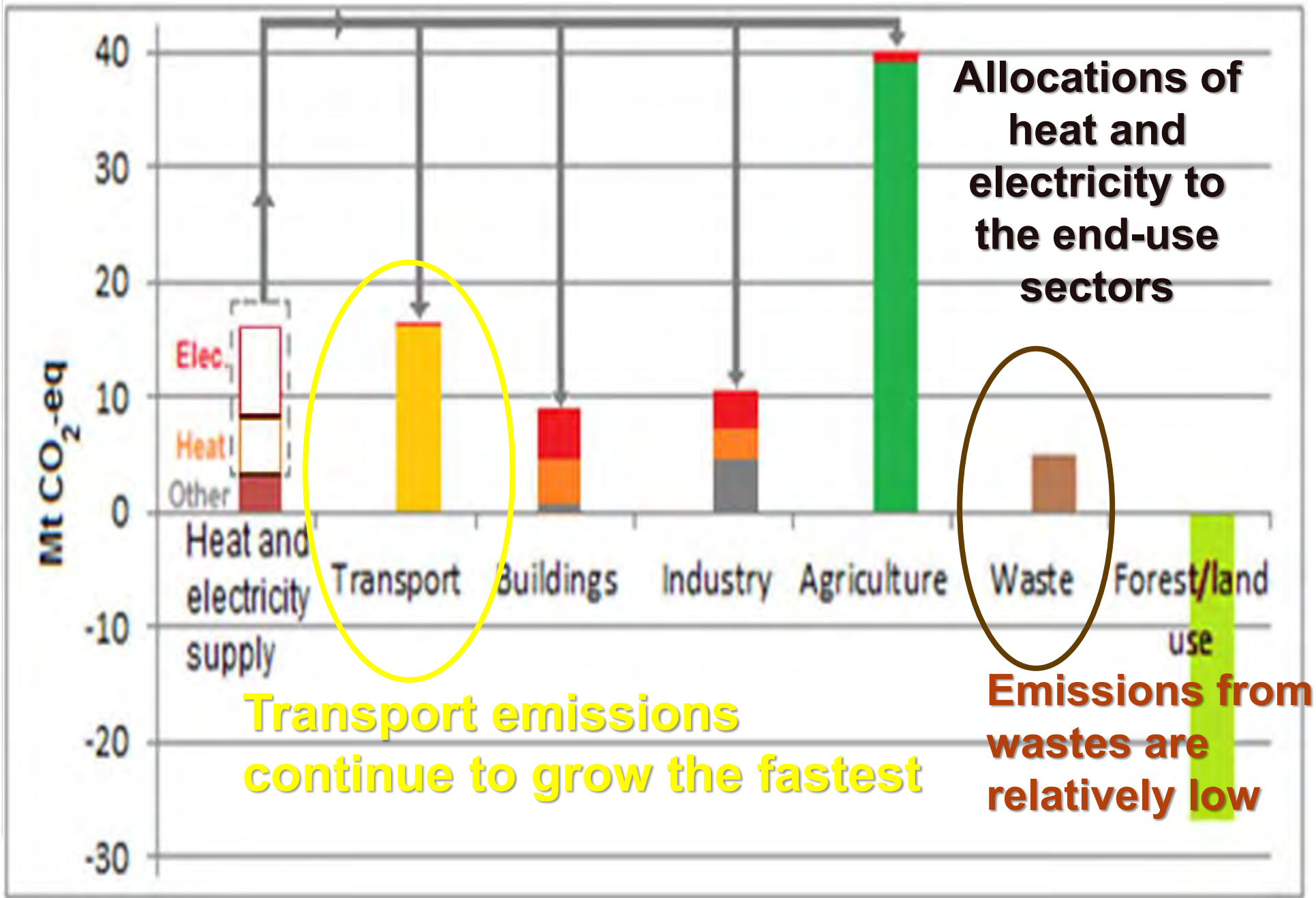
New Zealand's total greenhouse gas emission targets, and our Nationally Determined Contribution



Subject to international agreement, our NDC can be met by a combination of:

- **CO_2 removals e.g. by planting more forests;**
- **purchasing carbon credits from other countries;**
- **reducing our domestic GHG emissions.**

New Zealand's GHG emissions by sector



NZ GHG Emissions from Wastes

The main sources of emissions from wastes are:

- **82% from organic solid waste disposal;**
- **11% from wastewater treatment;**
- **5% from incineration and open burning; and**
- **2% from biological treatment of solid waste to compost.**

(*MfE data based on the latest greenhouse gas inventory).*

Future waste emissions projections

Waste projections are in the MFE's national Emissions Reductions Plan.
However, there is only one model that can assess emissions from wastes.
This could restrict analysis of the impact of future policies and the cost of reducing these emissions.

This *Waste Inventory Model*, an economic model used by MfE since 2022, estimates emissions by gas and waste category. Its database contains historical and projected waste volumes, composition of solid waste, waste levies, farm wastes, industry production wastes, regional and national population projections, regional GDP projections, and wastewater treatment plant data.

Review of Emissions Data and Modelling Systems, MOTU July 2023.

Climate Change Commission's advice

Note that the Emission Trading Scheme has been in place 14 years with little effect. NZ emissions have hardly declined and we remain one of the highest per capita in the world. The carbon price has varied from $ 5 - 80/t $CO_{2\text{-eq}}$ BUT the ETS is now being reviewed.

A new age of water is dawning

Peter Gleick, Time, August 3 2023

Most worrisome to the future of water resources, and humanity, is climate change.

Accelerating impacts are evident in every community for every natural resource - especially water resources due to :

- **changing flood and drought risks;**
- **melting ice caps, glaciers, and mountain snow;**
- **increasing demand for water to grow food; and**
- **damaging aquatic ecosystems.**

We need to recognize that water is so vital to our continued existence that we must find a new way to live with it, manage it, and protect it.

The Third Age of Water

Peter Gleick, March 2023

- We know how to use water more productively and efficiently to do the things we want.
- We can dramatically reduce total water use despite a growing economy and population.
- We know how to clean up and reuse the most contaminated wastewater, as done in Singapore, Israel, California etc.
- We are learning how to restore and protect natural ecosystems that have suffered from our past abuse, including removing river-destroying dams and protecting and restoring wetlands.
- We need to learn how to resolve disputes over water peacefully and diplomatically.
- We are starting to put in place energy and water policies that can reduce the emissions of climate-altering gases while also making our water systems more resilient to those climate impacts we can no longer avoid.

https://time.com/6300886/climate-change-water/

We need to:

- make our water systems more resilient to those climate impacts we can no longer avoid;
- provide safe water and sanitation to everyone on the planet;
- use water more productively and efficiently to reduce total water use;
- restore and protect natural ecosystems that have suffered from past abuse;
- resolve disputes over water peacefully and diplomatically;
- clean up and reuse the most contaminated wastewater, as is already being done in Singapore, Israel, and parts of California.

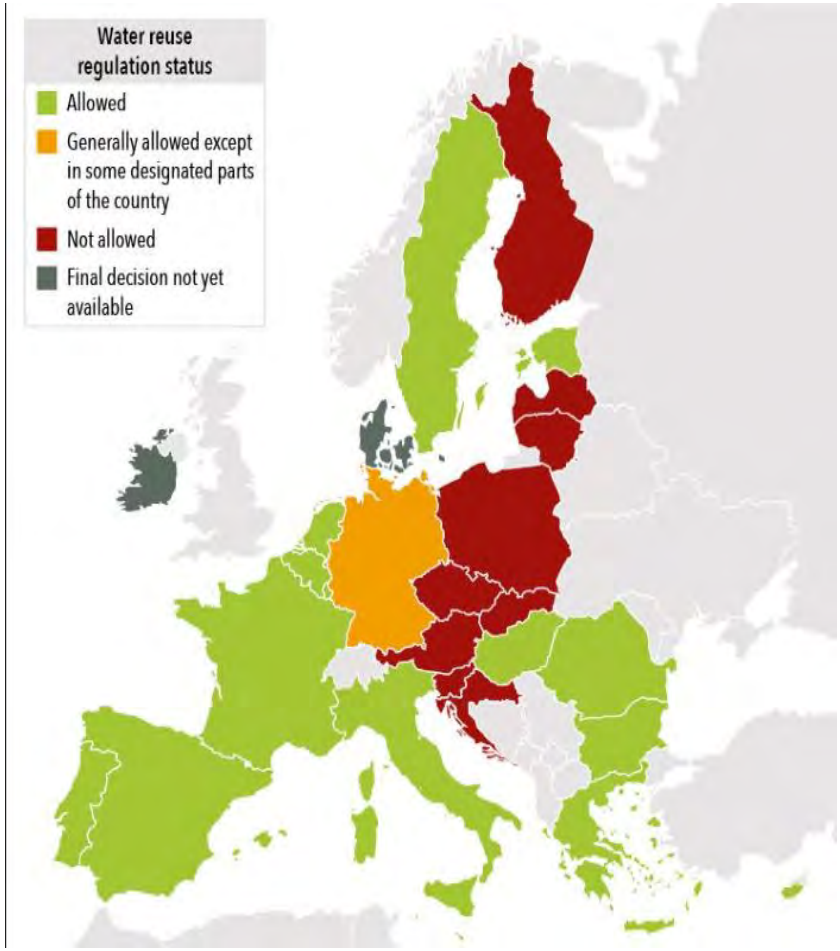
Not all uses require drinking water quality - so more water recycling and re-use reduces the pressure on fresh water resources.

- **Germany has produced new water security strategies due to climate-related pressures intensifying. Although considered rich in water resources, hotter and drier conditions have affected agricultural production and resulted in low water flows in the Rhine River that hindered navigation.**

- **France has also a new water strategy. Over 1,000 new water re-use projects have been supported; initiatives for national water supply transfer have been undertaken; water-use constraints for non-revenue purposes have been imposed.**

- **In Spain, spending on water supply over the next five years will focus on wastewater treatment, irrigation improvements, and desalination. However, achieving consensus among the various commercial stakeholders remains a core challenge.**

- Only around 2.4% of wastewater is reused in EU.
- Last month the EU implemented standards for agricultural water reuse in order to stimulate more water recycling due to anticipated climate impacts.
- 11 member countries have legislated for water reuse (green).
- In 9 member countries it is not allowed (red). However, recent unprecedented water stresses have forced re-consideration.
- More reuse will be encouraged by the new regulation and introducing treatment requirement standards.



Lara Nash, Global Water Intelligence

What we eat has an impact on our personal carbon footprint

The global food supply chain consumes one third of end-use energy, 80% of freshwater, and produces a quarter of total greenhouse gas emissions (UN FAO)

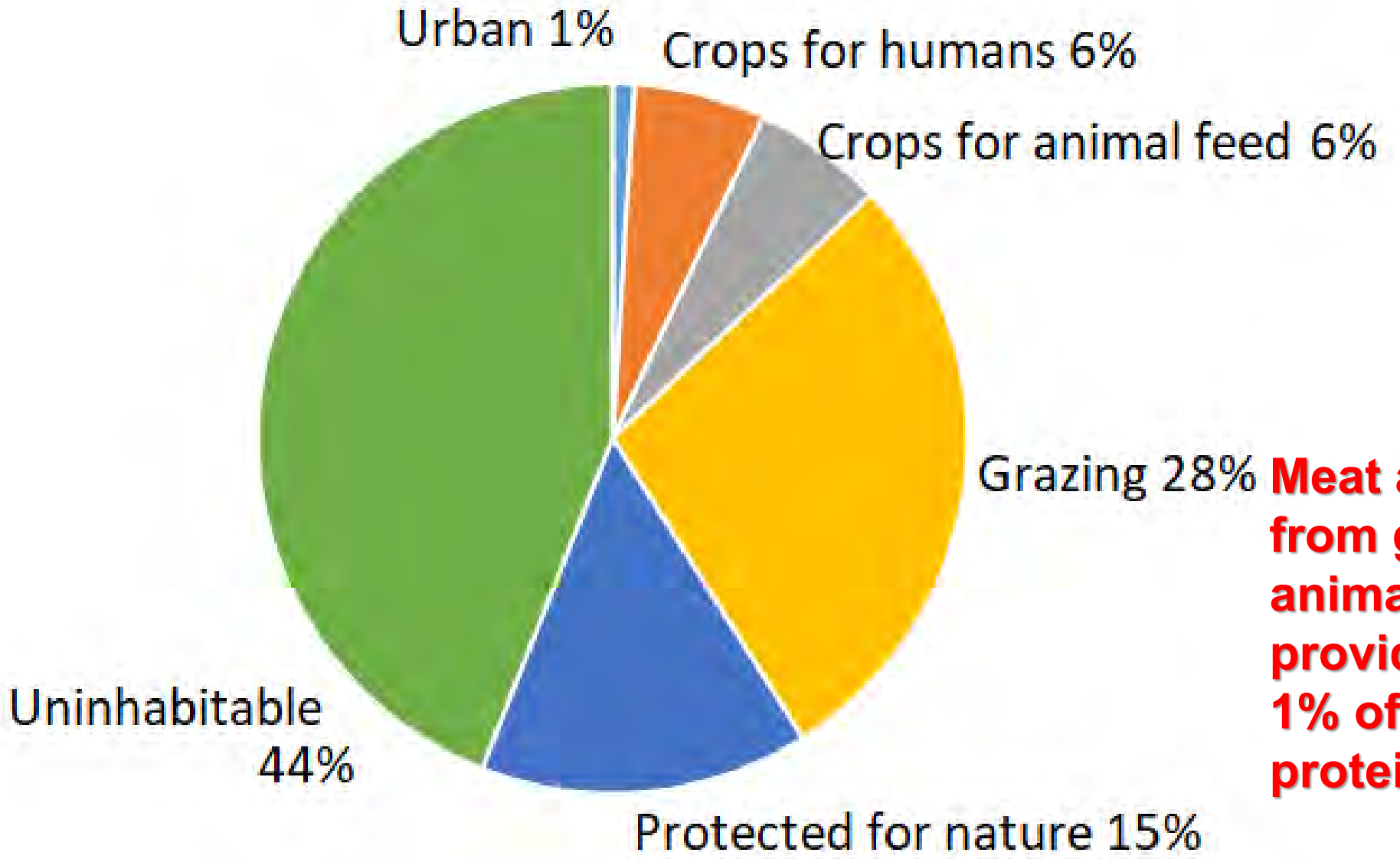
We fail to consume around one third of all the food produced.

Food production is already being impacted by climate change.

We cannot stay below 2°C without significantly reducing emissions from the food supply sector.

Animal protein consumption will have to be reduced.

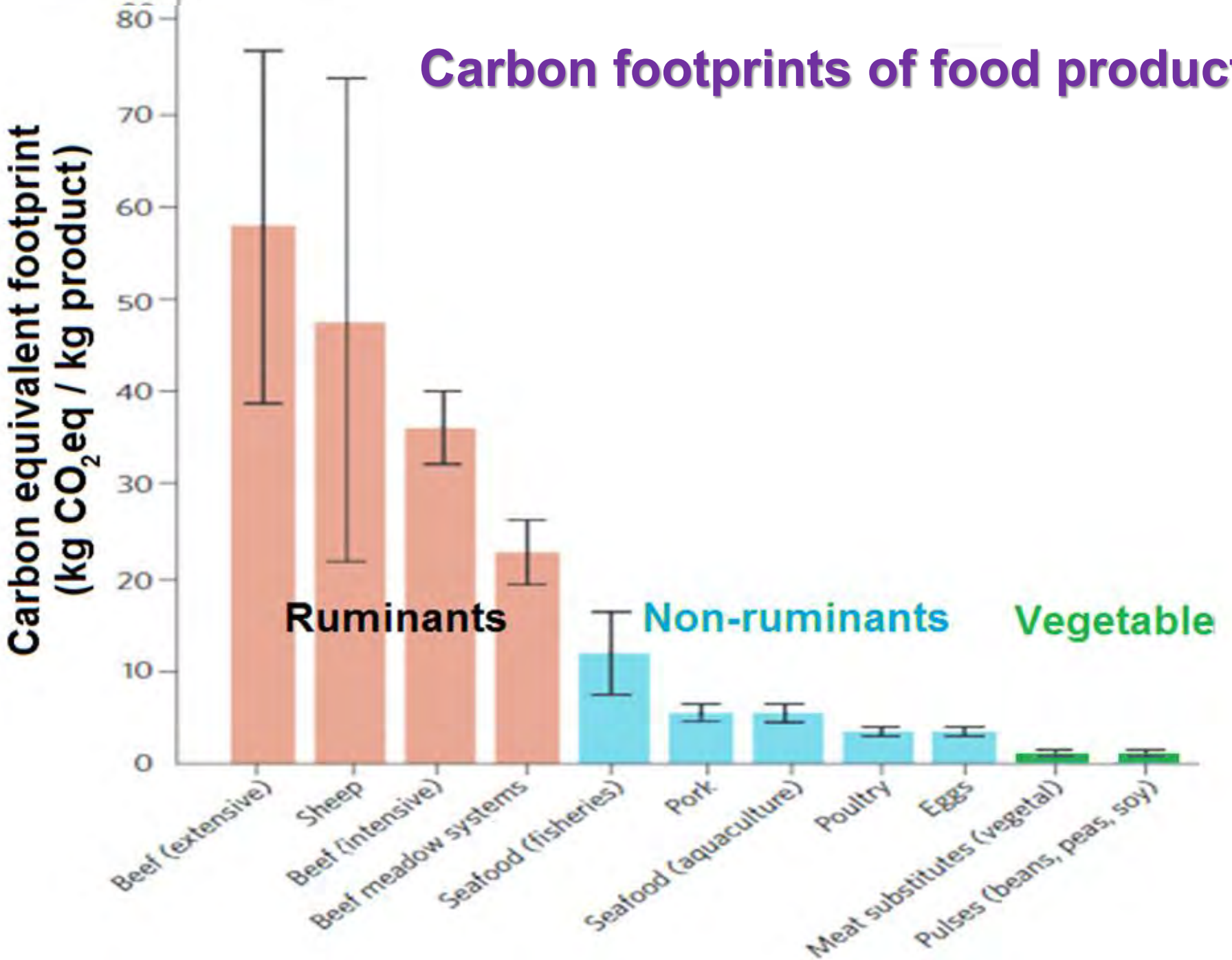
Shares of World's land area



Meat and milk from grazed animals provides only 1% of human protein.

"Re-Genesis" George Monbiot, 2023

Carbon footprints of food products



Ripple *et al.*, 2014. *Ruminants, climate change and climate policy,* Nature Climate Change 4(1), 2-5.

In summary

The New Zealand government is slowly beginning to move along the right pathways to reach net zero by 2050.

Changing behaviour of citizens and businesses will be essential to reduce carbon footprints through energy and water efficiency measures, choice of travel modes, building designs, reducing food waste, eating less animal protein, reducing industrial wastes, water reuse etc.

Co-benefits such as reducing traffic congestion, improving health, conserving water, saving money, need emphasising through a national education campaign.

Water supply systems and increasing adaptation to flooding and droughts will face challenges as a result of more frequent and extreme climate impacts.

We will have to become more resilient to an increase of such extreme weather events and better assess the risks.

Further delaying efforts to reduce greenhouse gas emissions will cost New Zealand more in the longer term.

We have to reach net zero carbon for future generations.