IPCC 6th Assessment Report – Working Group 1: The Physical Science of Climate

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Chapter 5: Carbon and Biogeochemical Feedbacks

Climate : Climate Change is widespread, human driven, rapid and intensifying

Carbon: Climate Stabilization requires strong, rapid and sustained CO_2 reductions

science & innovation
Department:
Science and Innovation
REPUBLIC OF SOUTH AFRICA

Presidential Climate Change Commission Presentation

SOCCO

75 YEAR ANNIVERSARY

CSIR
Touching lives through innovation

- *Carbon (CO_2) as our main lever towards 1.5°C*

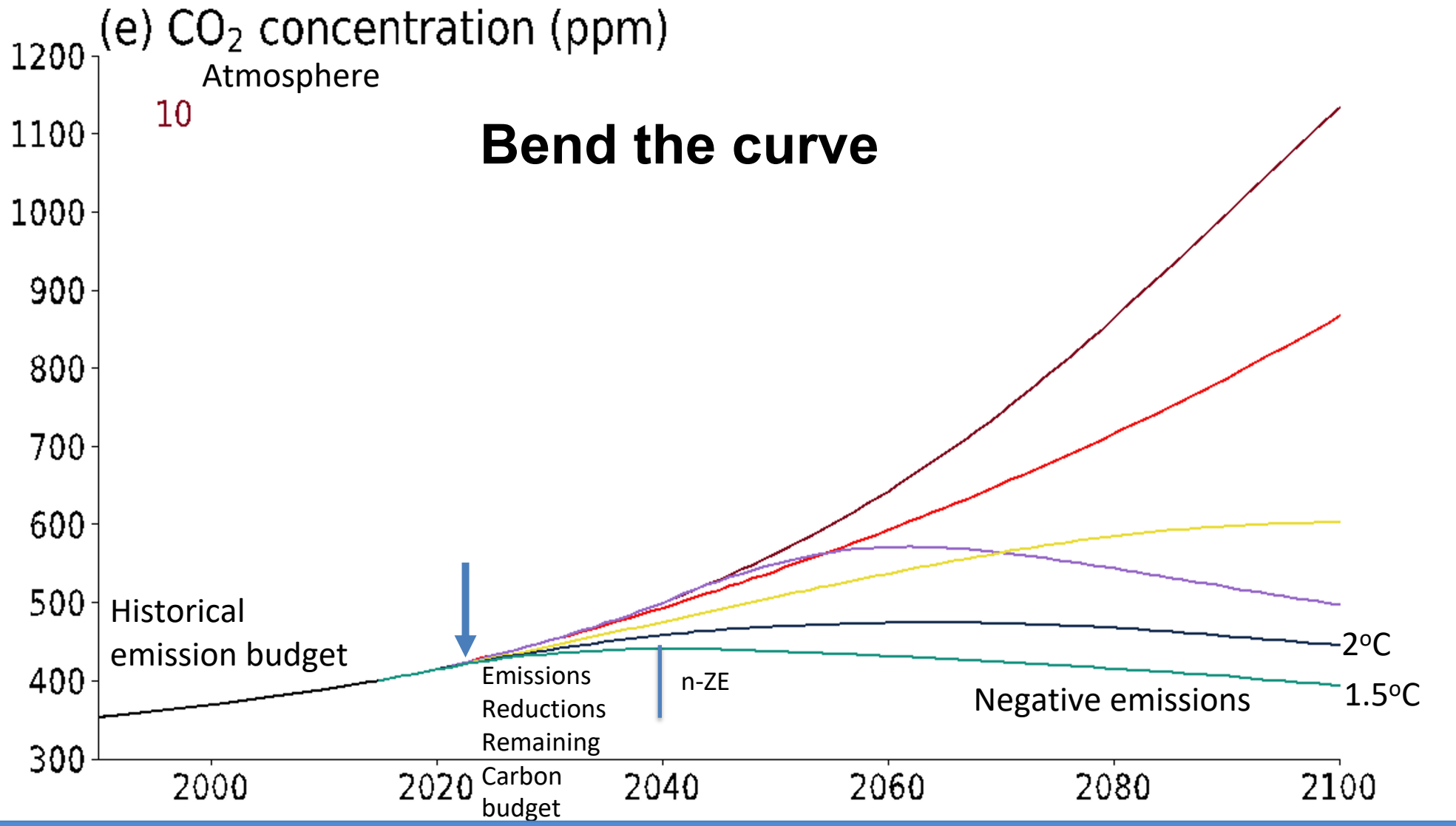
- *Commitment, Irreversibility and*

  Low Likelihood – High Impact events - Tipping Points

Carbon: three requirements to stabilize warming at 1.5°C target temperature throughout the 21st century

- **Net Zero Emissions – every ton CO_2 emitted adds to global warming**
- **Remaining carbon budget – sets future warming to temperature target**
- **Negative emissions: address legacy warming from historical emissions**

Gtons = Pg = 10^{15} g
$GtCO_2$ = 3.6 x GtC



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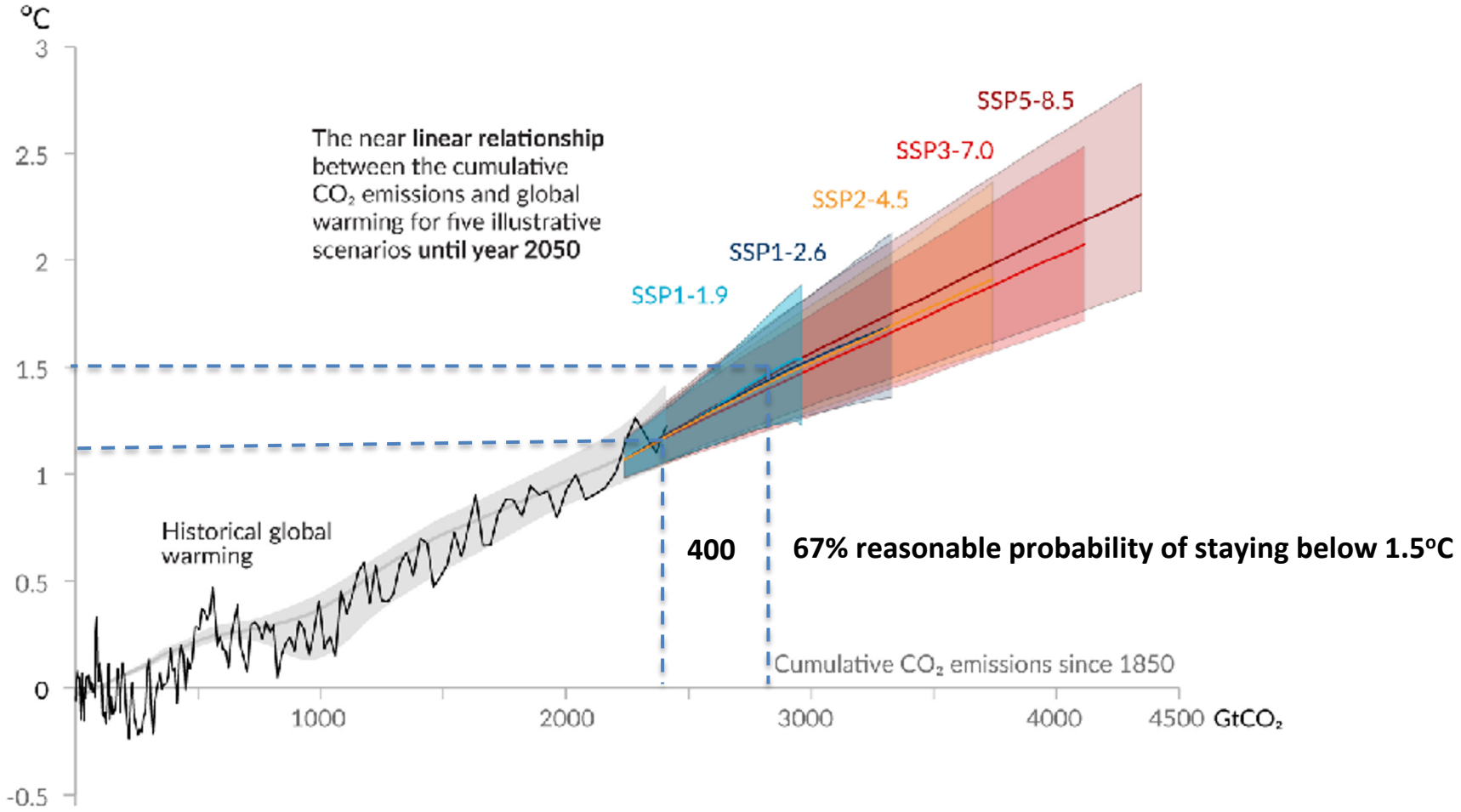
INTERGOVERNMENTAL PANEL ON climate change

Every tonne of CO_2 emissions adds to global warming

Figure SPM.10

Global surface temperature increase since 1850-1900 (°C) as a function of cumulative CO_2 emissions ($GtCO_2$)



So what do net-Zero Emissions and Remaining Carbon Budget mean for South Africa?

1. Challenges – paradox for the just transition

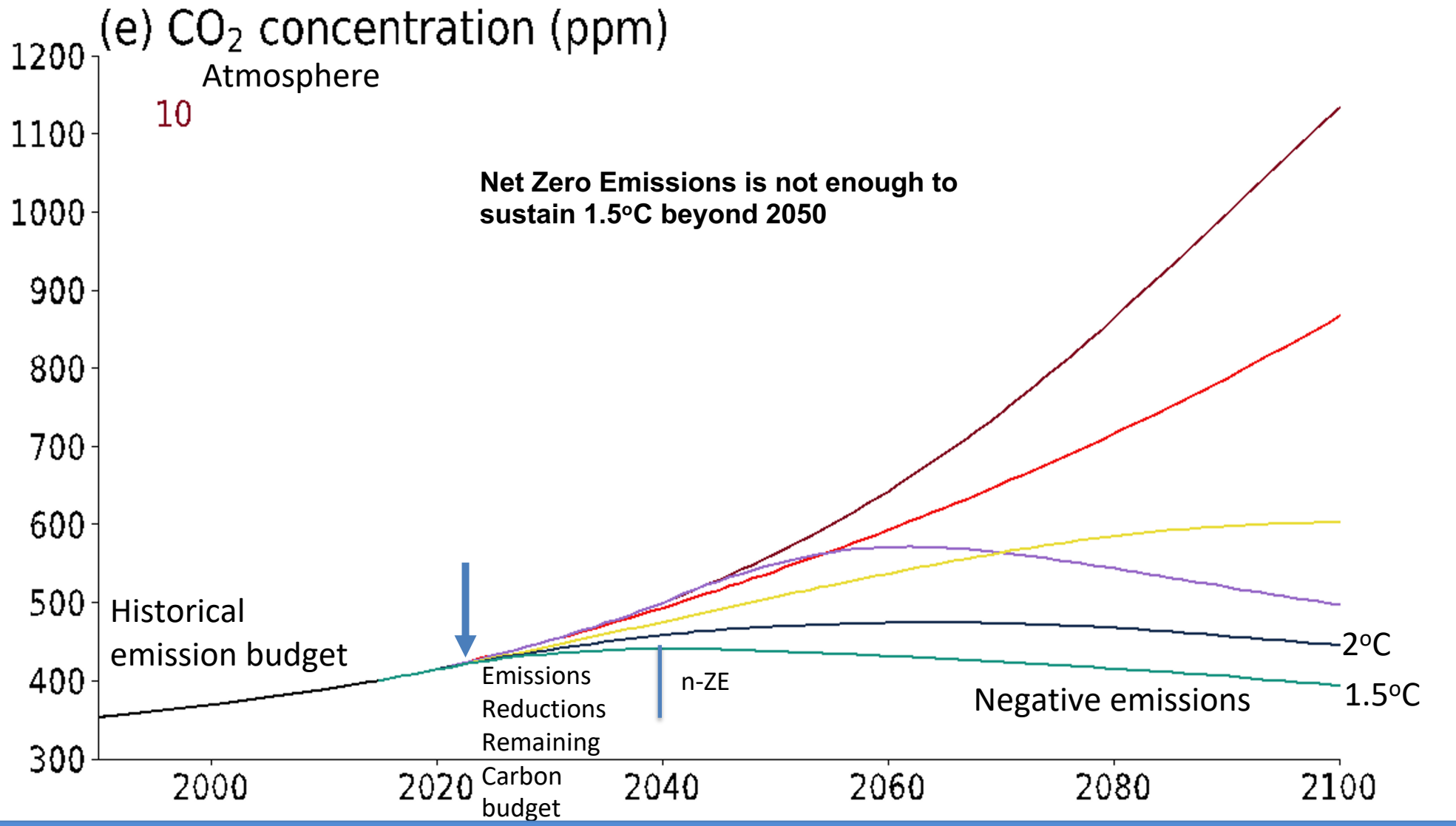
- Shift by SA from a 2°C to 1.5°C carbon objective
- Shift the endurance of the SA share of the 1.5°C remaining carbon budget (4GtCO_2) from 10 years to 30 years – deep cuts

2. Conditions for a just transition to a modern very low carbon 21st century economy in SA – start now: strong diplomacy to support global

strong, rapid and sustained CO_2 reductions

STORY OF THE DAY

Let the sunshine in: Eskom's De Ruyter paints a greener future for Africa's top greenhouse gas emitter



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1. **What do negative emissions mean for South Africa?**

2. Essential but still no effective approach

3. Emerging Opportunities for Science and Engineering Innovation in South Africa

    1. restore /grow freshwater and marine wetlands
    2. Regenerative farming (soil carbon)
    3. Terrestrial Bioenergy CCS (water)
    4. Ocean alkalinization
    5. Direct air capture

4. Strengthen South African Earth System – Climate Science –Global projection

1. Strengthen its commitment to observations in the atmosphere, oceans and land – platform for technology innovation – **carbon pricing** will depend on much better constraints on the carbon system

Negative emissions may grow to become an economic sector as big as the fossil fuel industry in the future

Climate change / Carbon sequestration

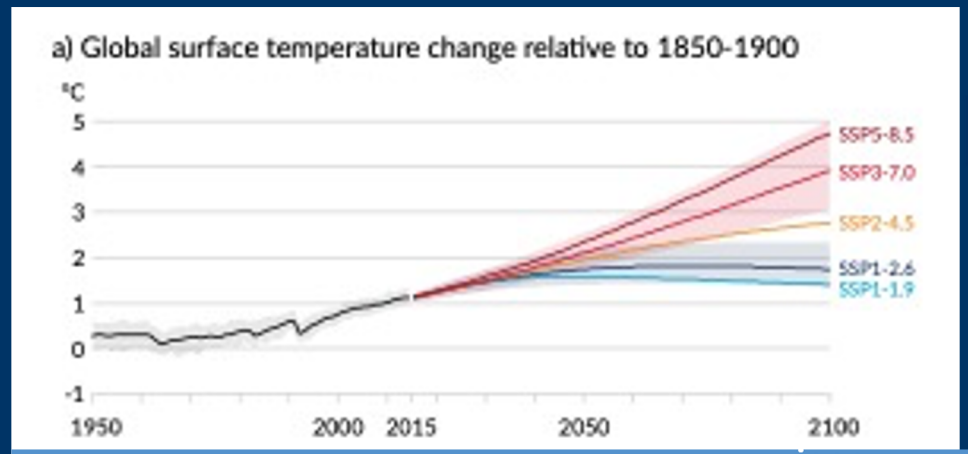
The UN climate report pins hopes on carbon removal technologies that barely exist

The planet is on track to exceed very dangerous warming levels, leaving us with fewer and fewer options.

by **James Temple** August 9, 2021

MIT Technology Review

What can we change and what can't we change?

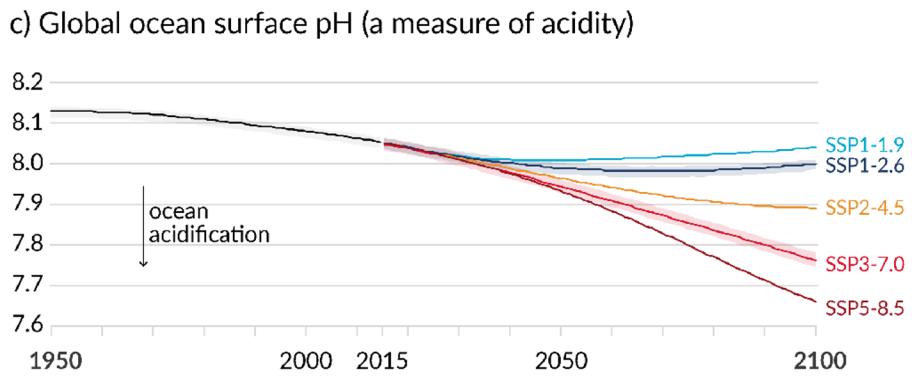


"…However, some changes could be slowed and others could be stopped by limiting warming.

SIXTH ASSESSMENT REPORT
Working Group I – The Physical Science Basis

Human activities affect all the major climate system components, with some responding over decades and others over centuries

Figure SPM.8



INTERGOVERNMENTAL PANEL ON climate change

Commitment & Irreversibility:

[Credit: Jenn Caselle | UCSB]

"There's no going back from some changes in the climate system…

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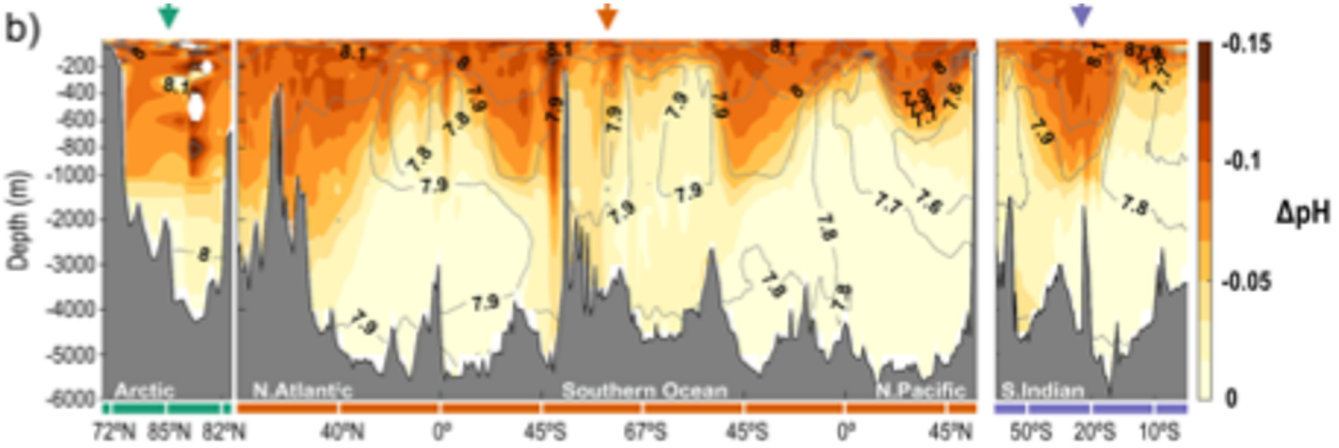
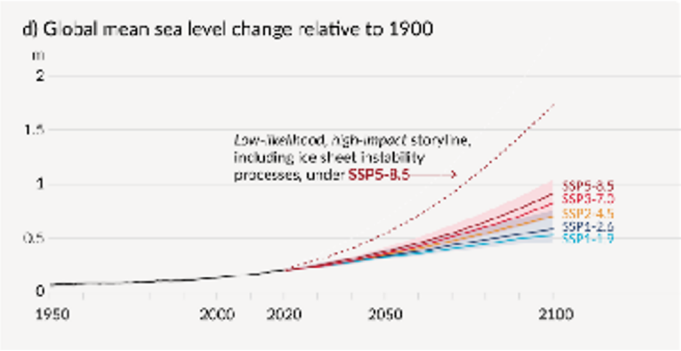
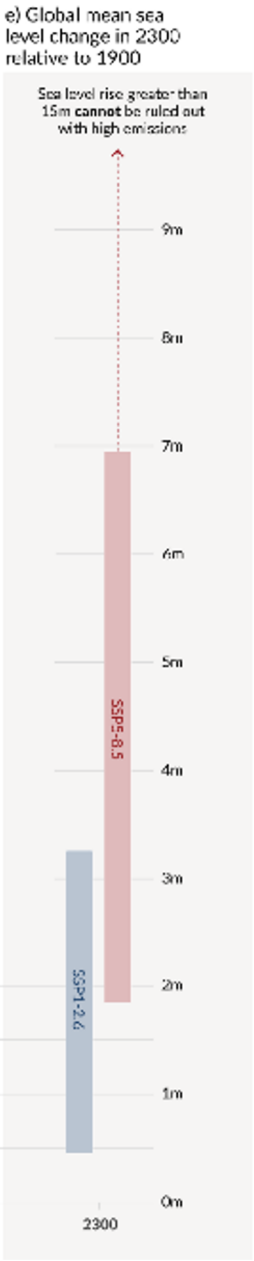
Human activities affect all the major climate system components, with some responding over decades and others over centuries



- Acidification of the deep ocean
- Warming of the deep ocean
- De-oxygenation
- Ice sheets and Ice shelves





SLR – continues to rise for centuries and millennia due to committed ocean warming and ice-sheet thaw

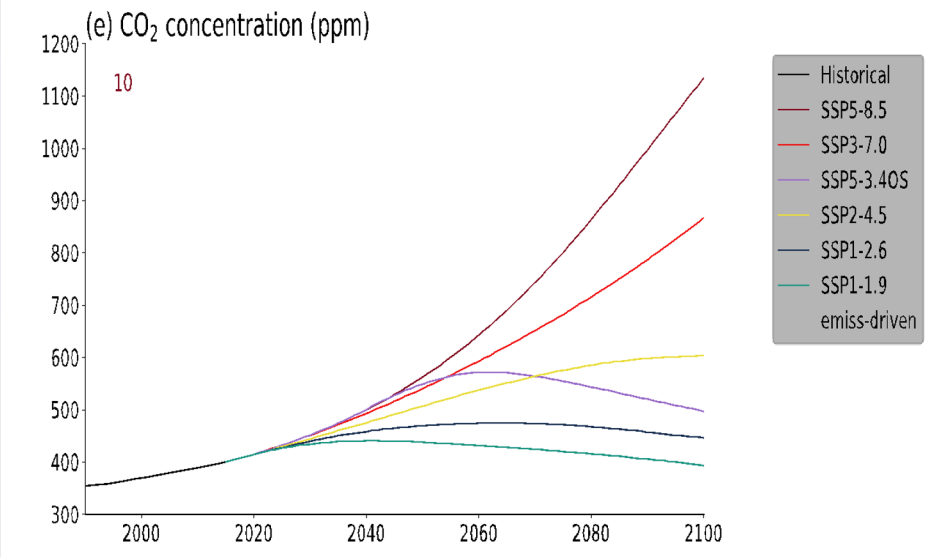
- Acceleration?
- Scenario sensitive
- Low Likelihood - High Impact

Potential Abrupt Change and Tipping Points

Outlook

Low Likelihood – High Impact (LLHI)

(low confidence but cannot be written off)

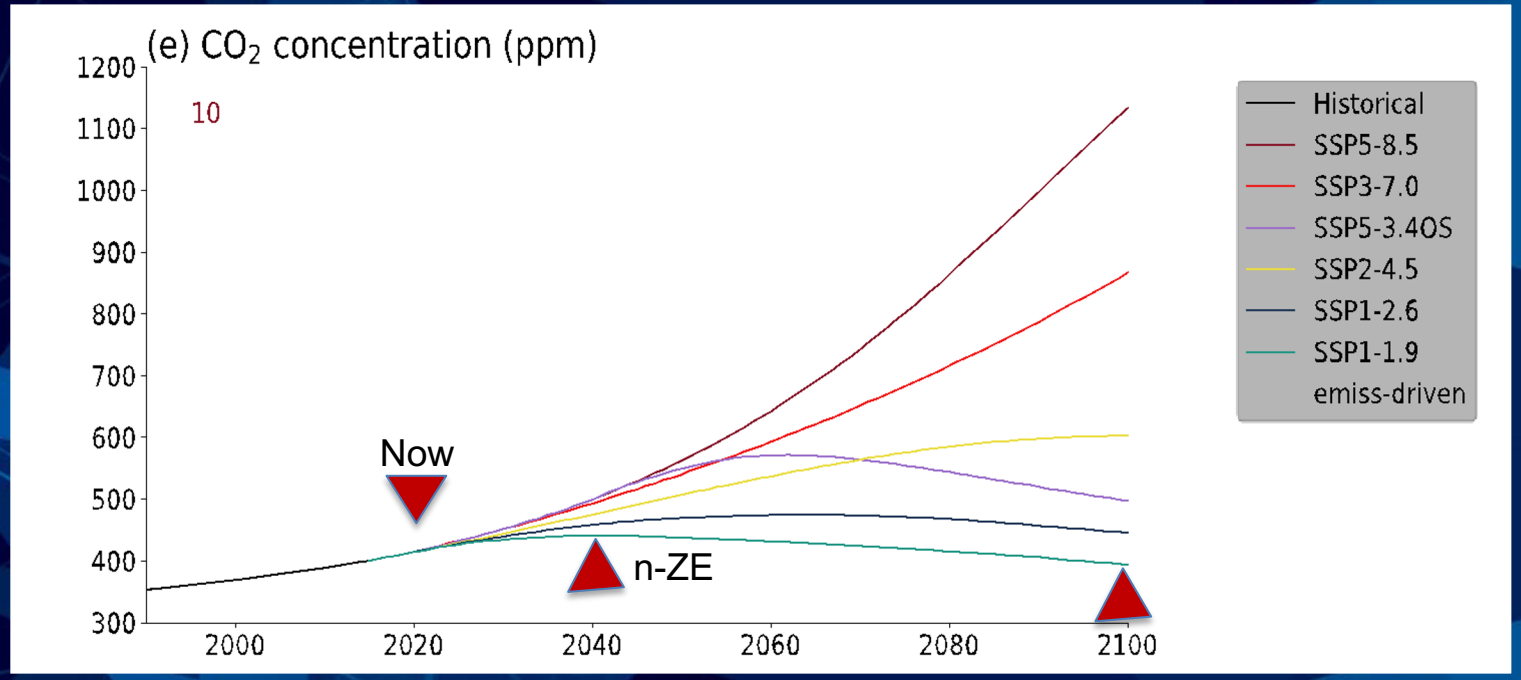


Land: Amazon forest; Permafrost; (carbon)

Cryosphere: Greenland & W Antarctic Ice Sheets (sea level rise)

Ocean: Meridional Overturning Circulation (carbon and heat)

It is in South Africa's national interest that these global potential tipping points are not ignored



The 1.5ºC future is still in our hands
but that future window is closing rapidly
at a present rate of 40GtCO_2 per year = 10 years

Thank You

OUR BURNING PLANET OP-ED

The IPCC's latest assessment report on the climate crisis: Five 'take-home' messages for South Africa