



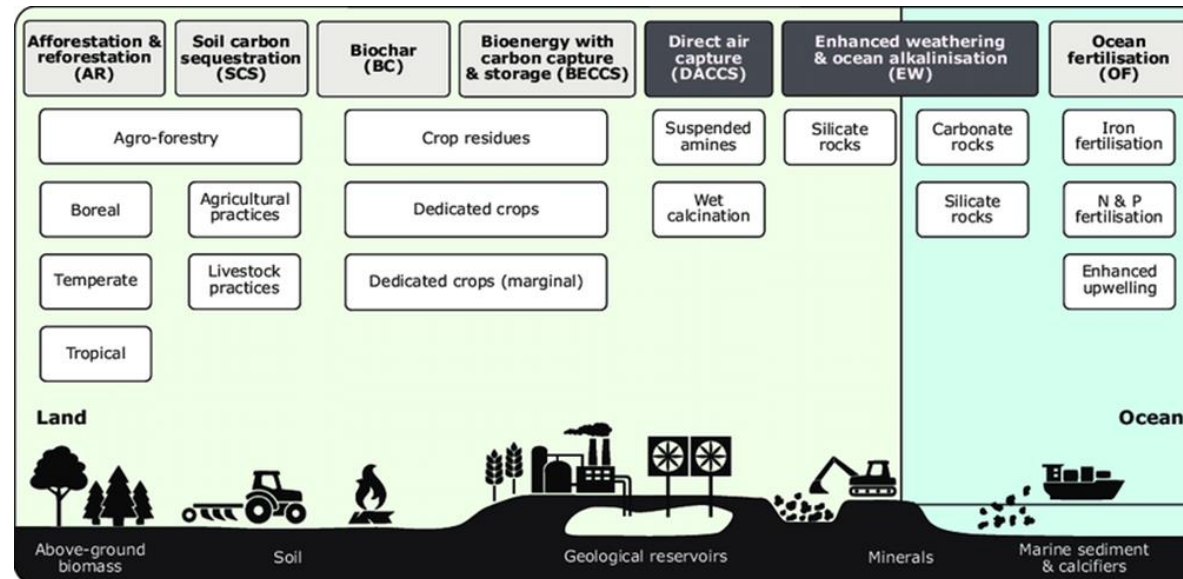
INSTITUTE *for* CARBON REMOVAL LAW AND POLICY

The sustainable development implications of carbon removal technologies in the context of net-zero climate pathway.

Raphael Apeaning

Background & Research Question.

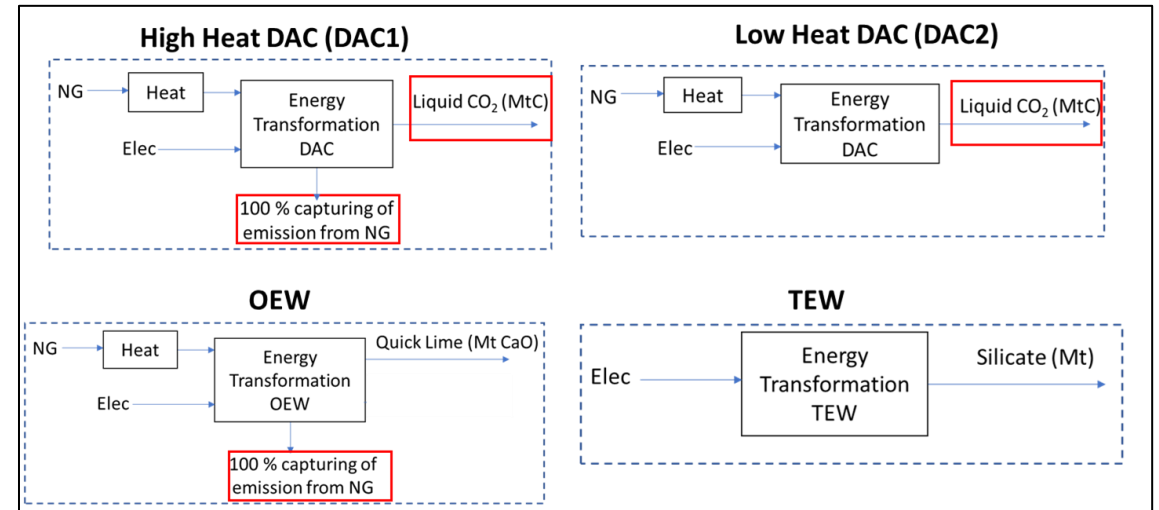
- The biophysical, social and environment risk of deploying BECCS at scale, calls for a broader portfolio of other (non-land based) engineering CDR solutions for deep decarbonization.
- Will a broader portfolio of engineering (non-land based) CDR solutions worsen, balance or improve the sustainability implications of BECCS ?



Method and Scenario setup

- **Technology options model in GCAM v5.3**

- Direct Air Capture (DAC)
- Terrestrial Enhanced Weathering (TEW)
- Ocean Enhanced Weathering (OEW)



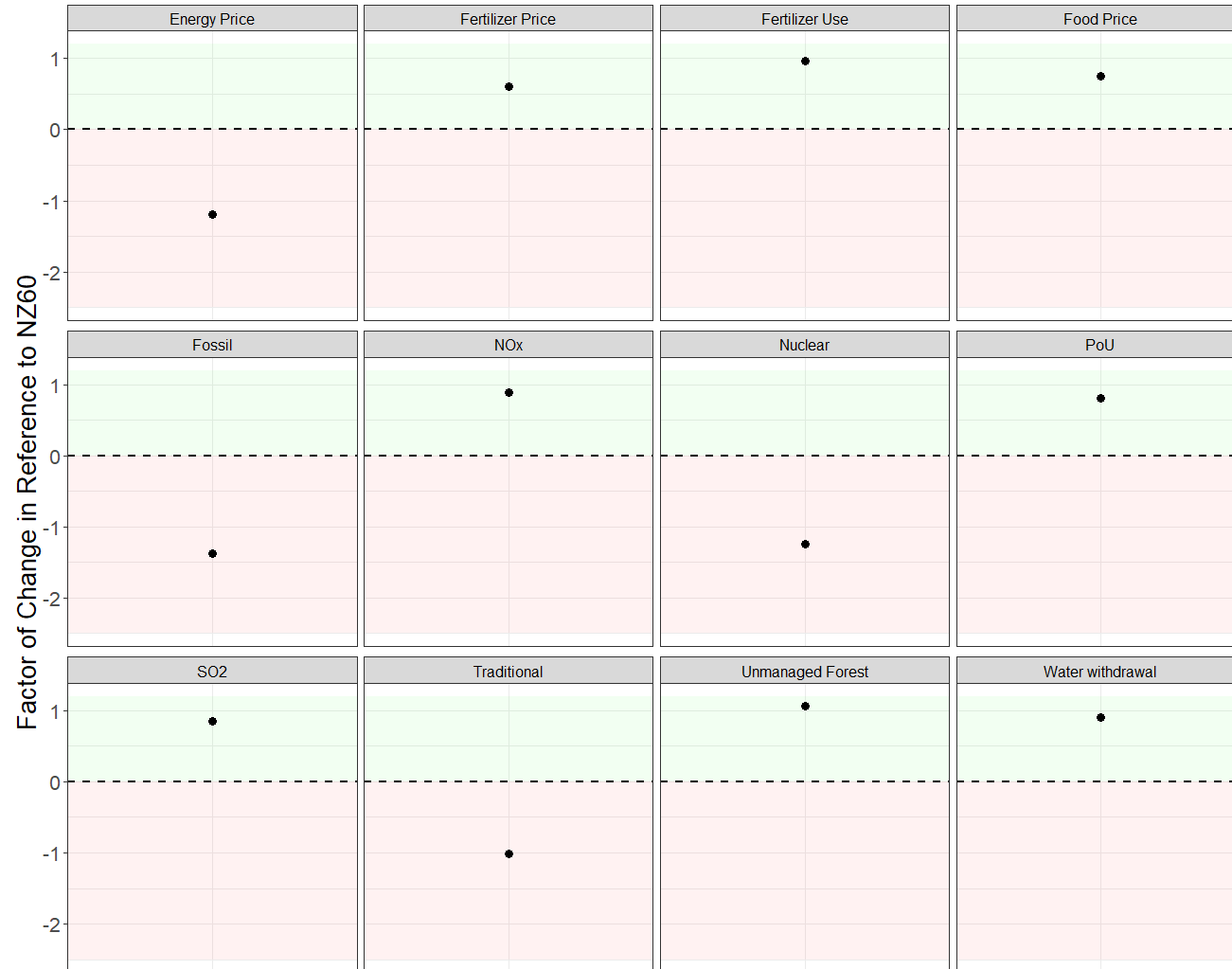
- **Climate and Socio-economic Assumption**

- SSP2 (Med. Miti. and Adapt. Challenge)
- start of climate policy is 2025
- Net Zero GHG year is 2060

Technology scenarios

Name	Description
NZ60	Only BECCS is available
NZ60+CDR	Limited Biomass to 100 EJ/yr with other CDR option DAC, OEW and TEW

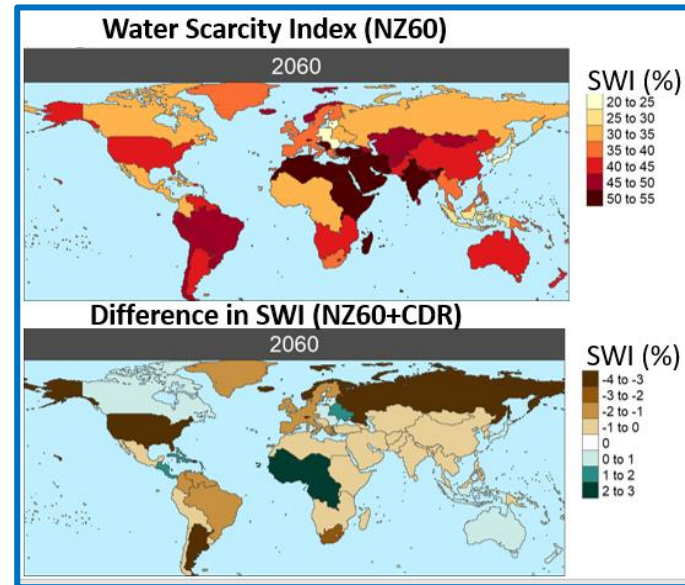
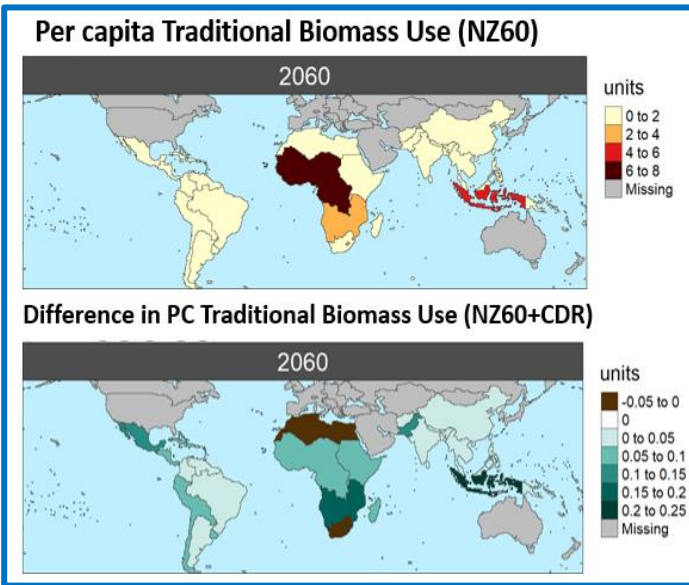
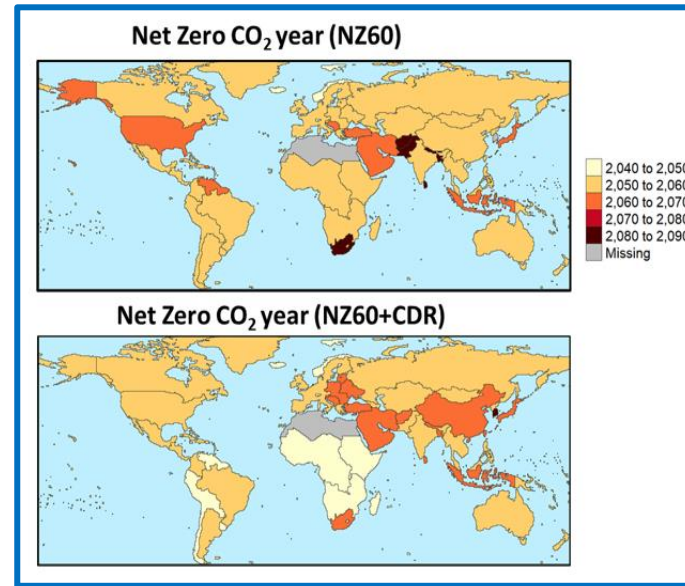
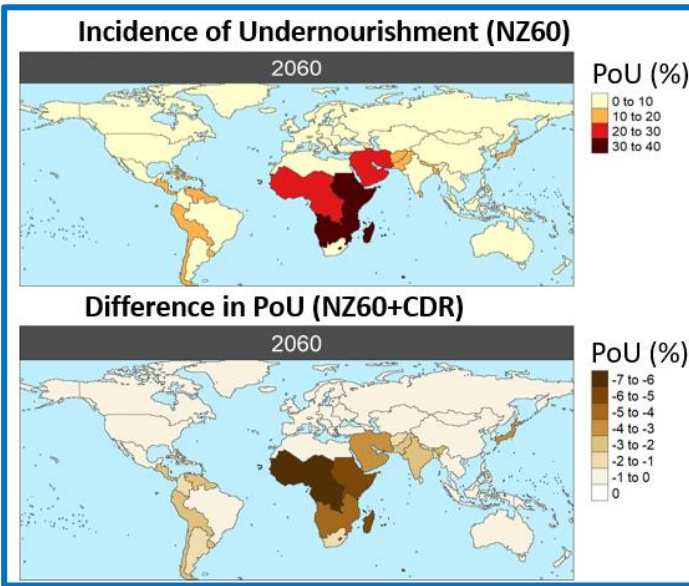
Results : Positive and Negative Effects



- Positive effects :
 - **SDG 2 (Zero Hunger)** : Decrease in food prices and the prevalence of undernourishment
 - **SDG 15 (Life on land)** : Decrease in the use of virgin land.
 - **SDG 14 (Life below water)** : Decrease in fertilizer use.
 - **SDG 3 (Good health and well-being)** : Decrease in pollutants i.e., SO₂ & NO_x emissions.
 - **SDG 6 (Clean Water)** : Decrease in water withdrawal.
- Negative effects :
 - **SDG 12 (Responsible Con. & Prod.)** : Increase in the of fossil and nuclear resources.
 - **SDG 7 (Energy)** : Increased use of traditional cooking fuels and the exposure to higher energy prices.

Results : Positive and Negative Effects

- A broad portfolio of CDR technologies can :
 - reduce the global incidence of undernourishment (about 18%) especially in vulnerable regions likes sub-Saharan Africa.
 - enabling the early phase-out of residual CO₂ emission for most regions.
 - reduce global water withdrawal, however the net benefits are moderate for water stressed regions.
 - increase in the reliance of crude cooking fuels in developing regions.



Ongoing extension

- Testing the sensitivity of the NET Zero year in the context of a high versus a low climate risk.
- Extending analysis to the end of the century (2100).
- Model improvement by incorporate the co-benefit of TEW.

Extra Slides

