# Carbon cycle and global vulnerability

by Stephen Sitch

## Outline

Introduction

- Green gas CO2
- Atmospheric Observation
- Vulnerability

The Carbon cycle

- Carbon Budget of Earth System components
- Contemporary Carbon Balance (1999s)
- Terrestrial Carbon Cycle: Past, present, future
- Climate-Carbon Cycle Feedbacks and mitigation

Conclusions

## Vulnerability

Exposure

- Indirect effect carbon cycle via its impact on climate
- Direct CO2 effect on plant production

Sensitive

- E.g. Agricultural yields, forestry, carbon feedbacks, water issues

Adaptive Capacity

- Local/regional studies on adaptability of human-environment system to climate change

## Mitigation

- Reforestation
- Iron Fertilisation Southern Ocean
- Reduce Emissions

## Conclusion

- Future increase in atm. CO2 will have enormous impact on Human-environment system (via climate change)
- Terrestrial biosphere and Ocean play an active role in global carbon cycle, sequestering Fossil CO2-although future potential limited.
- Historical Period. Large opposing land fluxes due to LU change balanced by natural biosphere sink (effect of CO2 fertilization, N deposition on plant production).
- Frequency and strength of El Nino likely to increase – with large regional impacts for fire, crop yields, human health, dease control.
- Very poor agreement between Climate models in prediction of future precipitation (leads to large uncertainy in both the sign and magnitude of the terrestrial biosphere response)
- New coupled carbon and climate models predict strong positive feedback, due to enhanced soil respiration in warmer climates and possible large-scale vegetation dieback.
- Best Mitigation strategy is to reduce emissions.

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