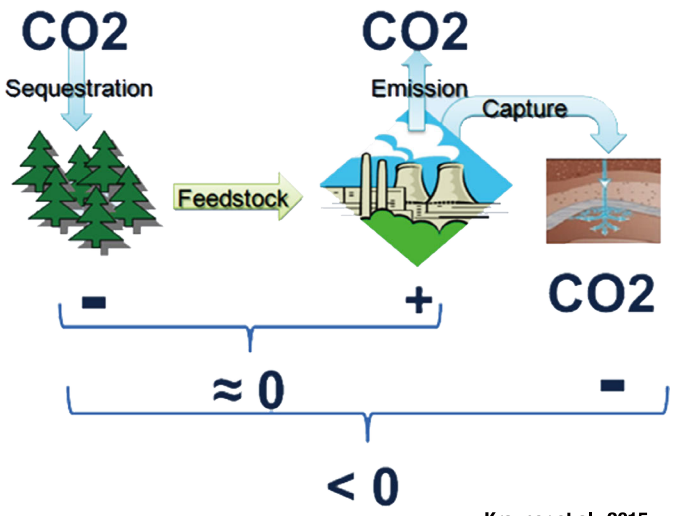
MaGNET Initiative: Background

Earth's atmospheric CO_2 level has surpassed 400ppm, which is the highest level in the last 2M years. It thus appears that we are indeed steering towards an overshoot before stabilizing greenhouse gases to keep global warming to no more than 2°C above pre-industrial levels. Can this level of GHG stabilization still be achieved? One core ingredient in the mitigation mix are negative emissions (NE)—explicitly put forth as an option also by the recent IPCC-AR5—mostly based on carbon-neutral bioenergy (due to the same amount being sequestered by feedstock growth as being emitted when combusting biomass for energy generation) combined with carbon capture and storage (BECCS), which in addition captures CO_2 during the energy production phase. But also other options are discussed including direct removal of atmospheric CO_2 by chemical means, large-scale afforestation and soil carbon sequestration. Yet, while having long appeared to be an attractive option for climate management, many uncertainties remain—both socio-economically/technologically and on part of the climate science.



Kraxner et al., 2015

Policymakers will need a more complete picture of the NE option within the socio-institutional, techno-economic and Earth system context likely to prevail within and beyond their decision-making horizon. Implications for governance and the required behavioral transformation need to be better understood. The main goal of MaGNET is thus to *develop consistent narratives of NE management trying to reduce uncertainty within the socio-institutional, techno-economic and Earth system dimensions.*

Steering Board

- Sabine Fuss, MCC, Germany (Co-lead)
- Detlef van Vuuren, PBL, The Netherlands (Co-lead)
- Pep Canadell, GCP Canberra International Office, Australia
- Rob Jackson, Stanford University, USA
- Chris Jones, Met Office, UK
- Florian Kraxner, IIASA, Austria
- José Moreira, University of Sao Paulo, Brazil
- Nebojsa Nakicenovic, IIASA, Austria
- Glen Peters, CICERO, Norway
- Yoshiki Yamagata, NIES, Japan

Related Events

- Workshop on negative emissions: Bridging societal and mitigation needs
  September 2-5 2015, Hokkaido University, Japan
- "Negative emissions for climate change stabilization & the role of CO_2 geological storage", Session in "Our Common Future Under Climate Change", International Scientific Conference
  July 7-10 2015, Paris, France
- Workshop on Sustainable Negative Emissions: A Climate Risk Management Option?
  December 6–7 2013, Tokyo, Japan
- Negative Emission and the Carbon Cycle Workshop
  April 17–19 2013, Laxenburg, Austria

References

- Canadell, Josep G., and E. Detlef Schulze. "Global potential of biospheric carbon management for climate mitigation." Nature communications 5 (2014).
- Fuss, Sabine, et al. "Betting on negative emissions." Nature Climate Change4.10 (2014).
- Kraxner, Florian, et al. (2015). The role of bioenergy with carbon capture and storage (BECCS) for climate policy. In J. Yan (Ed.), The Handbook of Clean Energy Systems (Vol. 3, pp. 1466-1483): John Wiley & Sons, Ltd.

Further Information

http://www.globalcarbonproject.org/
http://www.cger.nies.go.jp/gcp/

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GLOBAL CARBON project

つくば国際オフィス

Tsukuba International Office

Managing Global Negative Emission Technologies (MaGNET)

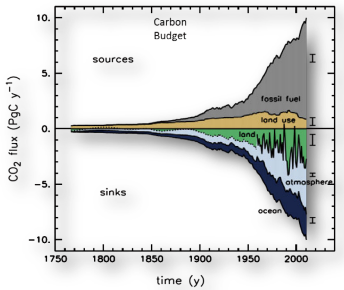
About GCP

The Global Carbon Project (GCP) was established in 2001 in recognition of the large scientific challenges and critical nature of the carbon cycle for Earth's sustainability. The scientific goal of the Global Carbon Project is to develop a complete picture of the global carbon cycle, including both its biophysical and human dimensions together with the interactions and feedbacks between them. Research is organized in three major areas:

- Patterns and Variability
- Processes and Interactions
- Carbon Management

Diagnostics: Patterns & Vulnerability

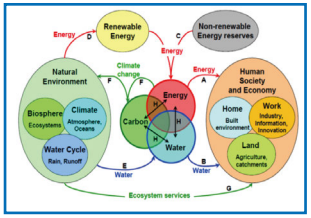
- Carbon Budget
- Methane Budget
- REgional Carbon Cycle Assessment and Processes
- Component Assessments: forests, grasslands



Global Carbon Project 2013; Le Quéré et al. 2013, ESSD

Vulnerability: Processes & Feedbacks

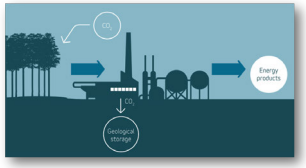
- Carbon pools size and vulnerability (permafrost, methane hydrates, global pools assessment)
- Socio-economic drivers of emissions



Raupach, 2010

Low Carbon: Carbon Manag. & Policy

- Future carbon budgets (permissible emissions)
- Urban development
- Energy-carbon-water
- Negative emissions

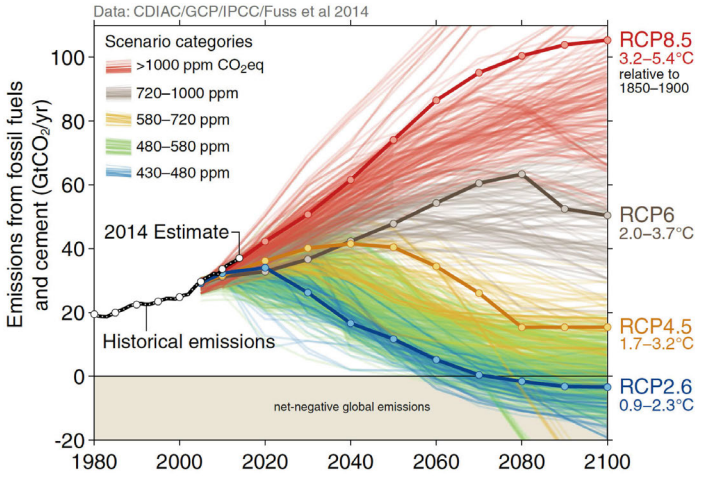


Canadell and Schulze, 2014

Research Agenda

Major BECCS Uncertainties

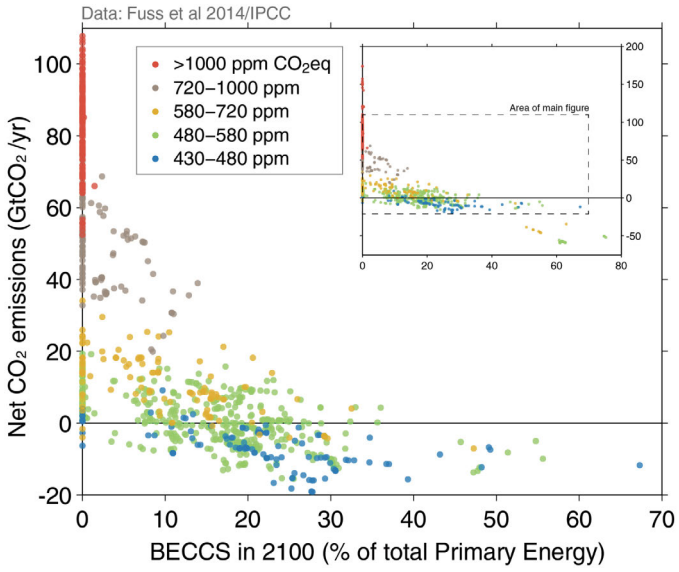
- Physical constraints on BECCS, including sustainability of large-scale deployment relative to other land and biomass needs, such as food security and biodiversity conservation, and the presence of safe, long-term storage capacity for carbon
- Response of natural land and ocean carbon sinks to negative emissions
- Costs and financing of an untested technology
- Socio-institutional barriers such as public acceptance of new technologies and the related deployment policies



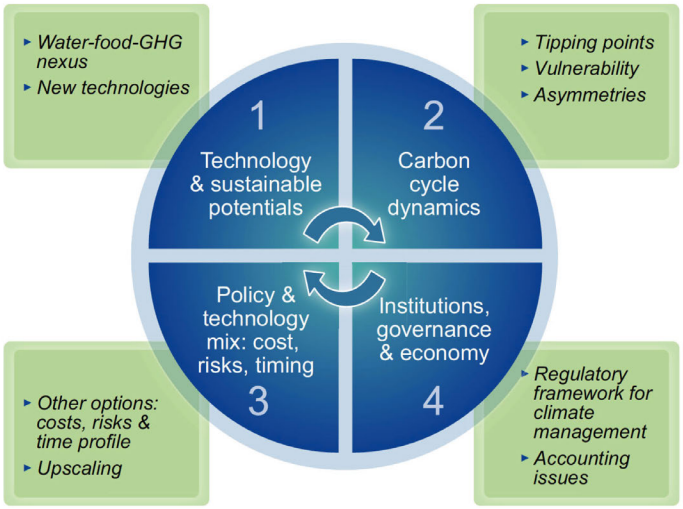
Fuss et al., 2014

Current research agenda:

- Limits to land and other resources
- Interaction with other land-based mitigation options and alternatives
- Assumptions behind BECCS pathways
- Implications for other policy objectives
- Reaction of sinks to large-scale CDR



Fuss et al., 2014



Fuss et al., 2014