

## Integrated assessment of mitigation and carbon dioxide removal technologies

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The integrated assessment of mitigation pathways to limit global warming to 2 degrees has shown the potentially important role of carbon dioxide removal (CDR) technologies (Clarke et al., 2014, Chapter 6: Transformation Pathways, IPCC Fifth Assessment Report of Working Group III). The admissible amount of future cumulative emissions (the so-called carbon budget) has become so small that negative emissions may be needed to offset excess emissions in the past or residual emissions in sectors such as agriculture and transport (Kriegler et al., 2013, Climatic Change 118: 45-57). So far, integrated assessments have mainly considered bioenergy combined with carbon capture and storage (BECCS) as the only CDR option to produce negative emissions. Land use trade-offs have given rise to concerns about the sustainability of large-scale BECCS deployment (Fuss et al., 2014, Nature Climate Change 4: 850-853). BECCS is, however, not the only option for removing CO<sub>2</sub> from the atmosphere.

This presentation will put the debate about the role of CDR for achieving ambitious climate targets into a broader context by considering a larger set of CDR options such as BECCS, afforestation and enhanced weathering. The presentation will review the existing literature on the use of BECCS in 2°C mitigation scenarios, and how it may be altered if afforestation or enhanced weathering are added to the portfolio of technology options. To this end, the trade-offs between BECCS and afforestation (based on the results of Humpenöder et al., 2014, Environmental Research Letters 9, 64029), and between BECCS and enhanced weathering, in mitigation scenarios will be investigated. Furthermore, the total deployment of CDR options as well as the trade-offs and synergies between CDR and other mitigation options will be analysed, and put into the broader context of the debate to what extent CDR options can be an effective, sustainable and ethically defensible strategy to reach ambitious climate targets.