



Pathways to achieve the 1.5 °C target in Europe based on land-based mitigation

Heera Lee (1), Calum Brown (1), Bumsuk Seo (1), Ian Holman (2), Mark Rounsevell (1,3)

(1) Institute of Meteorology and Climate Research, Atmospheric Environmental Research (IMK-IFU), Karlsruhe Institute of Technology (KIT), Garmisch-Partenkirchen, Germany (Heera.lee@kit.edu), (2) School of Water, Energy and Environment, Cranfield University, Cranfield, UK, (3) School of Geosciences, University of Edinburgh, Edinburgh, UK

Limiting average global temperature increases to between 1.5 and 2 °C, as agreed by the 195 signatories to the UN Framework Convention on Climate Change 'Paris Agreement', is a significant challenge. Achieving this aim requires substantial changes in use of land systems. Currently, however, very little is known about the trade-offs and synergies of those land-based mitigation strategies under the 1.5°C target. This study focuses on the impacts of climate change and mitigation strategies in the European land system for the 2050s and the 2080s. Land-based mitigation through bioenergy production and reforestation/afforestation is crucial to achieving the 1.5°C target, but such mitigation options have substantial consequences. These consequences include changes in levels of food production, land management intensity, water usage, ecosystem service provision and biodiversity. We used a regional Integrated modelling framework, the CLIMSAVE Integrated Assessment Platforms (IAPs) for Europe, to identify pathways towards the 1.5°C target. We analysed technological, social (e.g., diet), and economic changes with respect to the various combinations of the scenario options (n = 3780). The results showed that technological change including agricultural intensification led to an increase in forest areas (5-7 %), yet the trade-offs of such intensified agricultural systems should be considered. Even though reduced meat consumption in Europe (social change) contributed to an increase in forest areas, timber production was still not enough to meet demand in Europe. Under the 1.5 °C climate with growing human populations, the demands for food, energy and timber were not met without increases of at least 5% in economic trade. To avoid the harmful displacement effect outside of Europe, a major transformation in all sectors is needed. This study will present possible pathways and spatial distribution of vulnerabilities over the European land system. We hope that this study contributes to building successful pathways in Europe.