A regional assessment of land-based carbon mitigation potentials: bioenergy, BECCS, reforestation, and forest management

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Managing forests in the 21st century
Motivation

• Land-based solutions play a prominent role in climate mitigations scenarios
• These scenarios are typically developed at global scale but in practice mitigation projects have to be realized regionally or locally
• What is the carbon mitigation potential of different land management options in Bavaria?

Smith et al. 2016
LPJ-GUESS ecosystem model

climate, CO₂, nitrogen, land use

Animation by P. Papastefanou
Forcing climate (EURO-CORDEX, RCP4.5)

Krause et al. 2020
Present-day land cover

Krause et al. 2020
Alternative management scenarios

Energy and material substitution, wood products

Energy substitution, carbon capture and storage

Krause et al. 2020
Carbon mitigation via alternative management

Krause et al. 2020
Carbon mitigation via alternative management

Krause et al. 2020
Summary

• Without the carbon capture and storage technology, reforestation offers similar carbon mitigation potential as the cultivation of bioenergy crops

• If bioenergy crops are combined with CCS the mitigation potential is ~2x larger

• In the forestry sector carbon mitigation potential is limited

• Land-based carbon mitigation can not substitute rapid fossil fuel emission reductions
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Kohlentoffespeicherung in Ökosystemen im Klima- und Landnutzungswandel

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