CC-LandStraD
Climate Change — Land Use Strategies

Interdependencies between Land Use and Climate Change

Scenarios for Sustainable Land Management in Germany

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Introduction

How can we counteract climate change and contribute to climate mitigation with a responsible use of land?

This often triggers conflicts because of differing social demands. Opinions vary on how much land should be used for the production of food, energy and wood, for settlement and for transport. Additionally, the type and intensity of land use significantly affect the environment and the landscape, and thus the recreational value of particular regions.

Research questions

- How can land use contribute to mitigate GHG-emissions?
- How can the various demands on land use be balanced?

Results – Mitigation of GHG-emissions in agriculture

	Development compared with reference situation in 2030		Refe-rence	Climate mitigation
	Indicators		Mio.	%
Agricultural sector	Income inclusive mitigation payment	EUR	26,000	-11.0
	Food production	t GE	296	-3.0
	Bioenergy production	MJ	49078	-14.8
	Net GHG emission	t $CO_{2\text{-equ.}}$	72	-12.2
	Mitigation effect	t $CO_{2\text{-equ.}}$	9	53.2
	Total nitrogen balance	t N	1	-4.5

	Development compared with reference situation in 2030		Refe-rence	Climate mitigation
	Indicators		Mio.	%
Agric.	Net GHG emission	t $CO_{2\text{-equ.}}$	72	-12.2
	Income inclusive mitigation payment	EUR	26,000	-11.0
Indus-try	Net GHG emission inclusive savings from reduced mineral fertilizer production	t $CO_{2\text{-equ.}}$	72	-13.0
Fores-try	+ carbon storage from afforestation	t $CO_{2\text{-equ.}}$	72	*-22.0
	+ iLUC (estimated values after**)	t $CO_{2\text{-equ.}}$	72	-18.8
	Income agric. sector adjusted***	EUR	26,000	-14.5
	Income agric. sector adjusted incl. forestry	EUR	26,000	-14.8

*C storage from afforestation on UAA: Mean value of the first 16 years, **Osterburg B, Kätsch S, Wolff A 2013 Szenarioanalysen zur Minderung von Treibhausgasemissionen der deutschen Landwirtschaft im Jahr 2050, ***adjusted for mitigation payment and additional EEG apportionment

Further reading

Henseler, M et al. 2015 Mitigation potential and cost efficiency of abatement based subsidies for production of short rotation coppices in Germany. Biomass and Bioenergy 81:592ff.

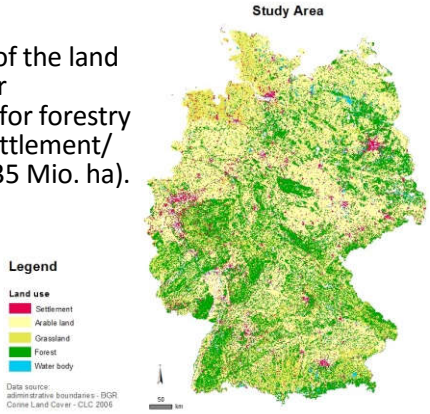
Hoymann, J, Goetzke, R. 2016 Simulation and evaluation of urban growth for Germany including climate change mitigation and adaptation measures. ISPRS International Journal Of Geo-Information, 5(7)

Methodology

- Cross-sectoral area consistency
- Scenario-based research (e. g. climate mitigation)
- Inter- and transdisciplinary research approach
- Integration of climate, bio-physical and socio-economic models to a model network which works comprehensive, cross-sectoral and regional differenciated

Study area: Germany

Currently, about half of the land in Germany is used for agriculture, one third for forestry and about 14 % for settlement/ transportation (total 35 Mio. ha).



Assumptions for scenario climate mitigation (agriculture)

- Measure ‚afforestation': order of afforestation by +10 %
- Measure ‚rewetting of organic soils': mitigation payment for max. 30 % of peatland 100 €/t $CO_{2\text{-equ.}}$
- Measure ‚reduction of land use intensity': nitrogen tax on mineral fertilizer +40 % on reference price in 2030

Results - Cross-sectoral area consistency in 2030

Sectoral area in 2030 / in 2010 in Mio ha	Settlement/ transportation	Agriculture (agriculturally used land)	Forestry
References	5.1 / 4.7	16.5 / 16.7	11.1 / 10.7
Climate mitigation	4.9	16.0	12.1

Conclusion

- Agricultural land use can mitigate 12 % Net GHG emission
- Research on climate mitigation by land use has to consider cross-sectoral and sectoral effects, e.g. production, income and environment
- Agriculture can contribute to climate mitigation with positive effects e.g. environment and negative effects, e.g. food production → societal preferences required

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