



SUSTAINABLE LAND MANAGEMENT

LAND USE IN TRANSITION





Farming in the Heckengäu.

- **Land in Germany is already used intensively and now it shall also be used to cushion the impacts of climate change. Researchers want to demonstrate how this can be successful in an inter- and transdisciplinary project: They are working on a nationwide strategy for intelligent land management practices.**

The differences could not be more evident: the Altmark in the east of Germany – sparsely populated, very little urbanisation or infrastructure and more than 60 percent of the land used for agriculture – in contrast to the Rhein-Sieg District and the Rheinisch-Bergisch District (Rhine) in the west with ten times the population density, considerably more urban areas and a lot less agricultural land. The various agricultural and forestry land uses in the two model regions are typical for many of the approximately 300 districts in Germany and yet they are still somehow unique and therefore interesting for scientific research. »In the two regions we want to examine how land use strategies can be implemented to adapt to climate change,« says Rosemarie Siebert, Ph.D. The sociologist is conducting research at the Leibniz Centre for Agricultural Landscape Research (ZALF) in Müncheberg in the state of Brandenburg. With the results from their sub-project »Regional participation process«, Dr. Siebert, together with colleague Wibke Crewett, will make an important contribution to the overall project CC-LandStraD. The abbreviation CC-LandStraD



Increasing timber prices increase forestry demands.

stands for »Climate Change – Land Use Strategies in Germany«. The project aims to investigate the interactions between different land use forms and climate change with the goal of developing sustainable strategies for land use in Germany. These strategies are not only to reduce carbon dioxide emissions and thus contribute to climate protection, but also to meet societal needs. The Federal Ministry of Education and Research will fund the project, which includes 25 scientists from six different research establishments, with approximately 3.5 million Euros until 2015.

Strong competition for land areas

For Germany, the research approach to develop new, all encompassing land use strategies spanning various sectors is a rather ambitious venture, given the fact that land is already being used intensively. Land currently supplies food and timber, and is used for settlements, roads or industrial premises as well as for recreational areas. According to statistics from the Federal Statistics Office in 2009, 52 percent of Germany's land is used for agriculture, whereas 30 percent is used for forests and about 14 percent is used for settlements, roads and recreation. Now land is required for another task, namely to cushion the impacts of climate change. Land should fix more carbon dioxide in plants and the soil, and farmers should cultivate maize and rapeseed and opt for short rotation coppices to replace fossil fuels such as oil and coal currently used for energy, as well as nuclear energy.



Motorways in Germany: land requirements for infrastructure are on the rise.

For Dr. Horst Goemann, who together with Dr. Johanna Fick, is one of the two scientific co-ordinators running the CC-LandStraD project from the Thünen Institute (Federal Research Institute for Rural Areas, Forests and Fisheries) in Braunschweig, climate protection is a »new social requirement for sustainable land use«. Accomplishing this will not be that simple, because there has been strong competition for land here since the federal government started growing what were traditionally agricultural crops, such as maize or rapeseed, as energy crops as part of its energy turnaround. This has its consequences: in certain areas of Germany, for example, it is being heatedly debated whether the cultivation of maize

»Measures should not only be economically viable, but also socially sustainable.«

for biogas plants is ruining the landscape and taking away agricultural land valuable for the cultivation of food crops. It is therefore important that »measures, such as new forms of land management or innovative technologies not only be economically viable, but also socially sustainable«, says Goemann.

Regional differences

To find out something about the level of acceptance among inhabitants, Siebert and Crewett conducted 40 interviews with local experts from agriculture, forestry, nature protection, and tourism in the two



Different land uses on the Danube Plain near Ulm.

model regions as well as with experts from the urban planning and infrastructure sectors. Among other things they wanted to find out how people perceive climate change and land use change. There are noticeable differences: People in the Rhine region regard climate change more as an opportunity than a threat in contrast to the perceptions of people from the Altmark. »Some of the stakeholders there regarded climate change as positive, because it extended the vegetation period, thus increasing crop yields«, says Siebert.

In the Altmark region, where low water storage capacity results in lower soil quality, increasing aridity would have a much more negative effect. What unites both regions is the fact that changes in land use are registered very attentively. These include, for instance, more intensive land use for agriculture and forestry, the rise in land prices or increasing conflicts about whether food or energy crops should be cultivated on agricultural land. Meanwhile, as a result of various interviews and numerous workshops, the sociologists now know how farmers, forest owners or town and country planners intend to contribute to protecting the climate.

The project team CC-LandStraD is assessing just how realistically these ideas can be implemented. The goal is rather complex: »A measures catalogue will be developed from the demands, bringing together the interests of the users«, says Siebert. The ZALF-researcher realises that this will not be an easy task: »It will stir up a lot of emotions, but at



[Source: J. Fick]

Short rotation coppices like this one in Brandenburg are on the rise.

least it shows that we are taking the local stakeholders and their demands seriously.«

Complex modelling

Indeed there are numerous research projects today that strive to achieve practice-related results. This project is quite remarkable for the amount of time being invested by the sociologists in interviews, workshops, and dialogues with many end users on a regional level and professional representatives on the federal level. The process is important however, because: »We are bringing such an abstract topic as climate change into everyday reality«, says Dr. Annett Steinführer, who is coordinating the subproject »National participation process« in the joint research project. »Because we have involved end users in the project from the very outset, it should also increase the chances that the results will be implemented locally in the end. This forms a good basis of trust between users and researchers«, says Steinführer. The strong social participation is therefore considered to be something of a trademark for the CC-LandStraD project.

»This is not only an important dialogue between science and practice, we will also gain important insights into coping with climate change on a regional level«, says Professor Dr. Peter Weingarten, speaker of the joint research project and head of the Thünen Institute of Rural Studies. The catalogue of measures from the regional participation process will form the basis for complex modelling. These tasks will keep the computers at the Thünen



[Source: A. Künzelmann/UFZ]

Land use for urbanisation and infrastructure.

Institute, at the Potsdam Institute for Climate Impact Research and at the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR) busy for the next few years. The scenarios are supposed to show which measures are not only viable for climate protection and accepted by the

»The CC-LandStraD project is an important dialogue for science and practice.«

respective group of users, but also socially desirable. Possible examples: What will the resulting changes for agriculture and forestry be, if Germany relies more on bio-energy to reduce its greenhouse gas emissions? What will the consequences in terms of greenhouse gas emissions be, if due to a rise in the international prices for maize, farmers decide to intensify cultivation? How will land for urban areas and infrastructure develop if Germany wants to achieve certain goals for the climate in the future?

The researchers of the joint project do not want to answer these and other questions purely theoretically, but to discuss them with regional and national partners in practice. A large amount of nationwide data is required to calculate the various scenarios, i. e., on soils, biomass, the climate, the water regime or on greenhouse gas emissions. These are also available, for example, in the form of statistics on agriculture, soil and land use maps, forest inventories



People enjoying recreation with the view of a diverse landscape.

or the national climate reports. To the disappointment of researchers, however, they are not always in a suitable form for analysis: They often have to be adapted to the interdisciplinary model approach or are not small-scale enough. Scientists want to be as precise as possible with their land forecasts, and Dr. Roland Goetzke from the BBSR supports this stipulation. With his colleagues in the subproject »Land use scenarios« he is simulating the development trends of land for settlement areas in Germany up to the year 2030. Goetzke already has some preliminary results: The trend that has been observed in the recent past showing large spatial differences of land for settlement areas will continue into the future.

»Major West German cities show a higher demand for settlement areas than is seen in rural areas.«

It is mainly in the major West German cities and their suburbs that the increase in demand for settlement areas is proportionally higher than in rural areas. In many districts we are, however, experiencing another development: Here a clearly decreasing population density is being accompanied at the same time with a slight increase in land for settlements«, says Goetzke. This situation affects many East German districts and structurally weak districts in West Germany.



Protected areas are important landscape areas that can provide essential balance and recovery functions.

Land use in 2030

Together with partners, the BBSR scientists have modelled trends for the development of settlements on the district level, for which they have used data on the development of the price of land, population dynamics or economic indicators. This very rough yardstick is, however, still not sufficient. »We need more accurate statements«, says Goetzke. The simulation model LandUseScanner, which is based on a geographical information system, aims to make this possible. With this model the development of different land use classes can be calculated on a small spatial scale, such as, for example, residential areas or agricultural and forestry land uses. Thus it can be demonstrated how land use could change until 2030.

The model thereby distributes the demand for land use that has been allocated beforehand to the land most suitable for those purposes. Linking the land use models implemented by Goetzke with socioeconomic and biological-physical model approaches from other subprojects into a model group is a major challenge, according to CC-LandStraD coordinator Goemann. The model group allows regionally specific analyses to be conducted nationwide.

The goal is clear according to Goemann: »The project aims to give some scientific foundations to the emotional discourse in terms of what land use can achieve for climate protection«. In an ideal case, measures could be defined agreeable to all



The Rhine-Main region: agricultural production in the urban agglomeration

groups of users. The results of the joint research project should be used in policy-making, irrespective of whether this is at a national level, the federal

»The project aims to provide the emotional debates with some scientific foundations.«

state level or the municipality level or even internationally. »It is there«, says spokesman Weingarten, »that there is a great need for authoritative data on how climate change will influence land use and which costs will be associated with which measures for climate protection.«



Production systems investigated in the region are: Agricultural systems, forest systems, settlements

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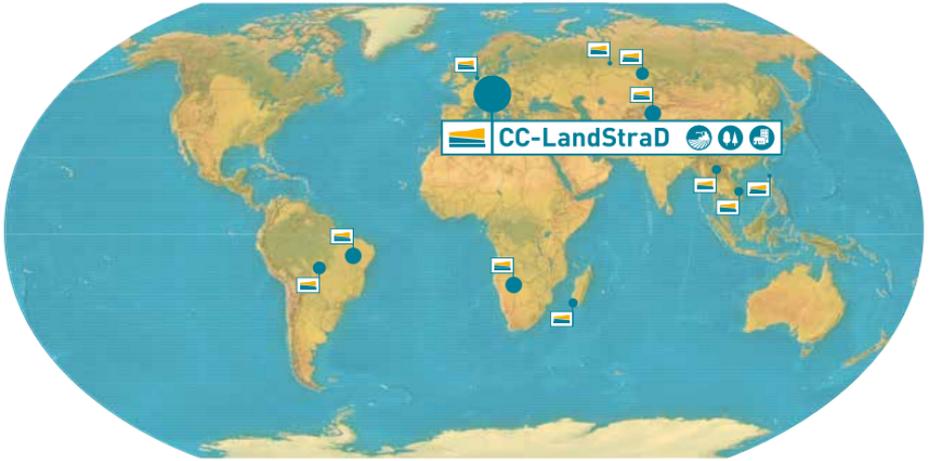
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In addition to the Thünen Institute as leading institute also participating in the project are:

The Federal Institute for Research on Building, Urban Affairs and Spatial Development; the Institute for Ecological Economy Research; the Potsdam Institute for Climate Impact Research; the Westphalia Wilhelms-University of Münster, and the Leibniz Centre for Agricultural Landscape Research.

The Thünen Institutes of Rural Studies, Climate-Smart Agriculture, Forest Economics and Biodiversity are involved in the project.



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