## Forest

**Ecological and societal adaptation strategies for forested landscapes to climate change**

As a result of climate change, forest ecosystems and forested landscapes are exposed to environmental factors which differ fundamentally from the past. Changes in climate such as temperature increases, changes in the intensity and distribution of precipitation, increase in extreme weather events, as well as changes in the chemical climate will greatly change the ecological and economic framework for production in the forest industry, but also the function of forests in the agricultural landscapes.
The objective of the interdisciplinary research area 'Forest' is to develop adaptation strategies to climate change for the forested landscapes of Lower Saxony differing in sensitivity, using the Harz Mountains and Lueneburger Heath as examples. Focus will be placed on the central ecosystem services of wood production, regulation of hydrology, conservation and tourism which will be considered in ecological, economic and social contexts within 9 sub-projects. To realise this project a wide research approach has been chosen, which covers areas ranging from the fundamental aspects of genetics and molecular biology to forest utilization under consideration of conservation and tourism. By including stakeholders in the project, the needs of the forestry industry are considered from the onset.

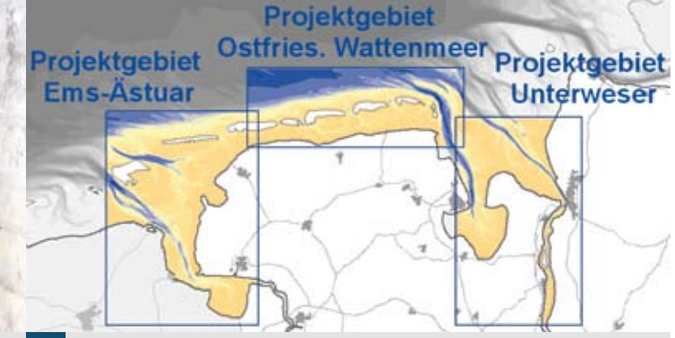
Ecopedology of temperate zones, University of Göttingen
**Speaker:** Prof. Dr. Friedrich O. Beese

## Surface Water

**Effect of climate change on water supply, flood risk and water pollution in Lower Saxony 'KLIFWA'**

Global climate change can have major consequences for regional water resources with subsequent effects on water supply, agriculture and conservation. The frequency of extremes like floods and low water levels in rivers during dry spells may change in future. This may impact the efficiency of existing water policies as well as the state of Ecosystems and biodiversity.
In 13 sub-projects, 'KLIFWA' investigates the regional and local effects of climate change on water resources using the Aller-Leine river catchment, which has an area of 15000 km$^2$, as a model region. An integrated analysis covering water supply, flood risk and water pollution will be carried out.
The influence of different regional climate projections on the hydrologic system will be estimated using simulation and statistical models. A great challenge is the uncertainty of future climate developments, and thus the uncertainty of the future hydrological balance. Emphasis has been laid on showing the range of the changes that may occur based on the current state of research knowledge and uncertainty analyses. Using these findings exemplary adaptation strategies will be developed.

Institute for Water Resources Management, Hydrology and Agricultural Hydraulic Engineering, Leibniz University Hanover
**Speaker:** Prof. Dr. Uwe Haberlandt




## Coasts

**Changes in the coastal climate - evaluation of alternative strategies in coastal protection - 'A-KÜST'**

The consequences of predicted future climate change in coastal areas are manifold: accelerating sea-level rise, stronger storms creating both higher set-ups of storm surges, higher and longer waves. Higher set-ups of storm surges as well as a delayed adaption of tidal flat levels result in larger water depths in front of coastal protection structures enabling their attack by higher and longer waves. At the Lower Saxon coast with the large estuaries of Ems, Weser and Elbe lowlands with an areal extension of approximately 6600 km$^2$ and a population of 1.2 million people depend on protection against flooding during storm surges.
In 7 sub-projects, the research area 'A- KÜST' will investigate at a realistic scale, both the loads on conventional coastal protection structures for two climate change scenarios and comparatively alternative strategies for the time points 2030, 2070 and 2100. Primary aim of the project is creating an inevitably necessary regional database for the hydrodynamical loads due to climate change in order to deliver a sound basis for future coastal protection being beneficial for adaptation of coastal protection to climate change beyond the lifetime of the project. Stakeholder interests are considered by accompanying socio-economic studies.

Coastal Research Station, Lower Saxony Water Management, Coastal Defence and Nature Conservation Agency, Norderney/East Frisia
**Speaker:** Dipl.-Ing. Hanz D. Niemeyer

KLIFF

# Klimafolgenforschung in Niedersachsen

Climate impact and adaptation research in Lower Saxony

Climate change is not a problem of the future; it is already measurable, and will strengthen based on current knowledge. The aim of the research co-operation KLIFF, is to increase the knowledge base of the consequences of climate change at regional and local scales, in order to develop sustainable adaptation strategies. The Aller-Leine river catchment, the Harz Mountains, the Lueneburger Heath and the North Sea coast will serve as model regions which may have differing sensitivity to climate change. This complex problem is being investigated in 7 research areas, and is addressed by scientists from 21 universities and research facilities.

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## Climate

**Regional Climate Projections**

A standardized climate database is a prerequisite for the success of the applied research areas within KLIFF. Regional climate projections are considered to be ‘predictions based on assumptions’, and the assumptions involve the projected greenhouse gas emissions in both the medium (up to 2030) and long (up to 2100) term. The KLIFF focus is on the greenhouse gas emission scenario A1B, which assumes rapid economic development and quick spread of efficient technologies. This and other scenarios are used to drive climate models that cover the whole planet, including the oceans and atmosphere. The outputs of the global model ECHAM5 are in turn used to drive regional climate models, such as REMO and CLM, which have a higher spatial resolution. For Lower Saxony, the important climate variables that will be predicted at a regional scale include temperature and precipitation. The five subprojects of the research area ‘Climate’ have the objective to provide the KLIFF partners with the best possible projections as a basis for further work. This includes the analysis of both temporal and spatial accuracies by means of statistical approaches to obtain robust uncertainty estimates. An important aspect of the work is the dissemination of these uncertainties to both the public and policy makers.

Alfred Wegener Institute for Polar and Marine Research, Bremerhaven
**Speaker:** Prof. Dr. Gerrit Lohmann

## Spatial Planning

**Implementation of results from KLIFF in spatial planning in Lower Saxony ‘IMPLAN’**

The impacts of climate change have consequences for spatial planning. Timely local and regional level adaptation to climate change can lessen the risks and reduce the damage potential, and thereby decrease the costs of climate change to both humanity and the environment.
‘IMPLAN‘ is primarily provided as a service for planning practitioners, especially at the regional scale, and is thus concerned with transfer and application. The aim is to facilitate the effective transfer of results from KLIFF into planning practice, and thereby promote the implementation of adaptation strategies. This includes suggestions for action and instigations of realisation processes in model regions, and through the development of a networking platform between research and practice.
By evaluation of the possible consequences of climate change and establishment of an inventory of available instruments for spatial planning, a risk assessment is being carried out. Thereafter the ‘IMPLAN‘ working network will be built up with a central and interdisciplinary dialog platform, which links KLIFF experts with planning practitioners from different disciplines. The development of adaptation measures is achieved through knowledge transfer and exchange with the planning practitioners.

Academy for Spatial Research and Planning, Hanover
**Speaker:** Prof. Dr. Dietmar Scholich

## Crop Production

**Climate change and production of healthy crops - processes and adaptation strategies**

Agriculture and horticulture are important economic sectors in Lower Saxony. Plant protection is a key factor in the cultivation of crops. Weather and climate have major influences on both biotic and abiotic factors that can damage crops. However, little is known about the potential effects of expected climate change on future occurrence and distribution of plant pests. Based on medium (2001-2030) and long term (2071-2100) regional climate scenarios, 26 sub-projects will investigate the potential effects of climate change on insects, nematodes, pathogens, and weeds, as well as the associated plant damage, both theoretically and experimentally. Using these results, potential risks will be assessed and appropriate adaptation strategies for wheat, maize, oilseed rape and sugar beet will be developed. Additionally, insect attack and abiotic damage will be investigated in selected fruit and vegetable crops. Potential climate change effects on soil characteristics conferring to crop health will also be studied. Furthermore, economic analyses and scenarios will add to these biological questions, in order to evaluate the necessary structural adaptations of agriculture to climate change, both on-farm and at sector level. In summary, the results of the area ‘Crop Production‘ will provide decision support for stakeholders in agriculture.

Division of Plant Pathology and Crop Protection, University of Göttingen
**Speaker:** Prof. Dr. Andreas von Tiedemann

## Animal Production

**Consequences and adaptation to climate change for milk and beef production at a regional scale in Lower Saxony**

Cattle husbandry and milk production are of high economic importance in Lower Saxony. About half of the farms in Lower Saxony keep cattle, and produce about 20% of the total German milk. Beef and milk production systems are directly affected by climate change. Therefore estimations of possible effects of climate change and the development of adaptation strategies are indispensable for this area.
The genetic potential of animals as well as maintenance of animal health can only be fully realised when the production environment is optimally adjusted to the needs of the animals. Particularly high performance milk cows are sensitive to environmental factors, with regard to feeding, husbandry and other aspects of management.
The aim of the 9 sub-projects in ‘Animal Production’ is to analyse the effects of climate change on the health and fertility of cattle. Emphasis is laid on the areas of epidemiology and therapy against important pathogens, nutrient contents and composition of pasture plants, the effects of different feeds on cattle, physiological effects on the rumen, as well as socio-economic parameters. Based on this adaptation strategies and intervention concepts will be developed.

Research Centre Agriculture and Environment, University of Göttingen
**Speaker:** Prof. Dr. Dr. Matthias Gauly