Climate Adaptation for Rural Areas

Vision

Rural areas play an important role with respect to climate change. On the one hand climate change will impact rural areas, as droughts, heat waves, torrential rainfall and subsequent floods are likely to become more frequent. On the other hand, rural areas have the potential to provide services that can relieve the pressure of climate change, such as water buffering, carbon storage and facilitating a northward migration of species. In order to do so, rural areas have to adapt to the changing environment, so as to mitigate pressures and capitalize on opportunities.

Aims

Climate Adaptation for Rural arEas (CARE) aims to assess the effects of climate change and autonomous adaptive strategies (i.e. adaptation strategies undertaken by autonomous actors such as farmers and nature organizations) on a multitude of land-use functions in the rural landscape of the Netherlands. The research programme acknowledges the important role of human perception of, and response to, climate change and its consequences in the development and implementation of adaptation strategies. An agent-based model is developed as a tool to understand these human dimensions of adaptation. The results of CARE will provide spatial planners and policy makers with information about the impact of climate change and adaptation strategies on multifunctional land use. Local and regional stakeholders are involved in all stages of the research.

CARE addresses the following research questions

- What are adaptive measures for water management, nature and agriculture?
- What are promising adaptation strategies for farmers?
- What are the cross-sectoral effects of adaptation?
- Which adaptation strategies have the highest potential to serve society, agriculture, nature and water management in multifunctional landscapes in an effective manner?

Insights

Building adaptive capacity

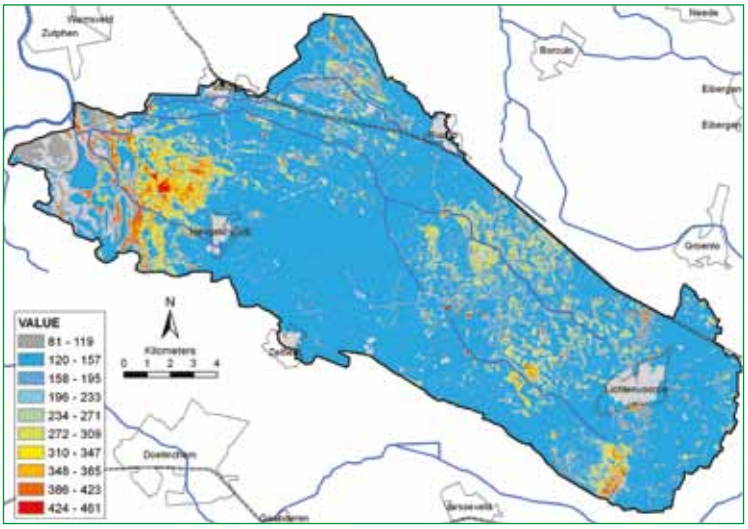
The on-the-ground implementation of adaptation measures is still hampered because adaptation plans are insufficiently suitable for application in local planning processes with multiple stakeholders. Most literature on local adaptation planning considers adaptive capacity as a characteristic of the human community only. This limitation overlooks the fact that the functioning of the physical landscape is influenced by climate change and - as a result - the provisioning of landscape services is impacted by climate change. We developed a method that assists local communities with their diagnosis whether climate change will affect the adaptive capacity of their landscape to the extent that intervention is required. In addition, we developed measures that strengthen the adaptive capacity of the physical landscape to cope with the impacts of climate change. Three generic spatial characteristics were identified that can be used as key principles to determine and enhance the adaptive capacity of the physical landscape: 1) *Size*, where the mere size enables (eco)systems to absorb change or recover from disturbances; 2) *Heterogeneity* causing a buffering capacity for disturbances; and 3) *Connectivity* to link processes at multiple scales, facilitating change or recovery.

Water and biodiversity in a future climate

Policy makers and spatial planners need information about the impacts of climate change on ecosystems. To fulfil this need, CARE studies how climate change will affect the evaporation demand of natural vegetation, and how climate change will affect the functioning and biodiversity of ecosystems. To this end, a process-based and climate robust ecosystem model (PROBE) is used to simulate the spatial distribution of ecosystem types and their associated conservation values. Using this information as input, CARE then computes how plants and animals migrate across the rural landscape. Thus, the consequences for nature of climate change, of adaptive measures and of ecological networks can be assessed.

Drivers and consequences of adaptation by farmers

Farmers are important actors when it comes to shaping the future rural area. An important constraint to the performance of the National Ecological Network (EHS) is the rate at which agricultural land becomes available for nature organizations. Although many farmers quit farming and sell their land, there are still quite a few farmers left who are interested in buying this land, therewith competing with the nature organizations. We simulate these dynamics in the land market, so as to identify the feasibility of establishing the EHS. In doing so, we take into account the dynamics within the agricultural sector, brought about by market changes, climate change, and policy change. First results indicate that it will be difficult for nature organizations to prevent a fragmentation of new nature land. CARE will explore to what extent this will actually hinder the targets set for improving biodiversity.



Potential conservation value, simulated with PROBE. This map is used to design an ecological infrastructure for the dispersal of plants and animals.

Working with stakeholders

Stakeholders fulfil an important role in the transfer of area-specific information to the CARE researchers. They provide information about socio-economic, political and spatial contexts and the way these contexts influence the behaviour of farmers and nature managers. In regional workshops stakeholders discuss the preliminary results of the individual research projects within CARE, learn about the principles of agent-based modelling, and suggest aspects or data to include or not include. They also help the researchers to gain better insight in the various ways possible adaptation measures might be implemented against the background of the historical context and sentiments in the region. In "design workshops" stakeholders creatively explore the added values of climate-conscious long-term landscape interventions and transformations. These workshops aim to result in a shared vision on adaptation strategies.

Sharing knowledge between scientists, policy makers and farmers is not always easy. The scientists have a lot of explaining to do when it comes to the models. Stakeholders press the researchers to show the relevance of their models to them. It helps focusing the researchers on practical applications of their work.

Baakse Beek

Jurjen Moorman (Water Board Rijn en IJssel) explains the water system in the Baakse Beek area, stakeholder meeting November 2011.

The Baakse Beek catchment consists of a rather flat sand-covered landscape with shallow groundwater levels and brooks, dominated by pasture, maize fields and small nature reserves. The CARE research in this area aims to develop regional integrated adaptation options, as part of on-going regional development. Participants of the regional development process take part in the participative workshops of CARE. Future human behaviour is simulated in order to understand how land managers (farmers, nature organizations) make decisions about landscapes. As a result of knowledge co-creation, several measures have been taken and planned to prepare the area to climate change. For instance, rewetting measures are planned, to be combined with the creation of 35 hectares of wetlands, re-meandering of brooks and fish ladders.

Case studies

Baakse Beek catchment

Effects of climate change and adaptive measures on the hydrology, the conservation value and the future of agriculture in a multifunctional rural landscape, and the development of regional integrated adaptation options.

Tungelroyse Beek catchment

Spatial arrangements of landscape elements in stream valleys to optimize biodiversity under various scenarios of water storage and climate change, and the development of regional integrated adaptation options.

Blauwe Bron

Effects of climate change on the groundwater recharge and the influence on drinking water abstraction and nature conservation and restoration.

Klimaatcorridor Veenweiden

Future spatial configurations of nature areas under conditions of climate change.

Isle of Texel

Interactive workshop with farmers about the consequences of climate change for the quality of fresh water for agriculture.

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Working with Hotspots / Stakeholders

- Hotspot Dry rural areas
- Hotspot Shallow waters and peat meadow areas
- Province of Gelderland
- Province of Noord-Brabant
- Province of Zuid-Holland
- Water Board Aa en Maas
- Water Board Rijn en IJssel
- Water Board Veluwe
- Water Board Peel en Maasvallei
- Brabant Water
- Vitens

Consortium partners

Wageningen UR For quality of life
Deltares Enabling Delta Life
VU University Amsterdam
The University of Edinburgh
Universiteit Utrecht
KWR Watercycle Research Institute

Knowledge for Climate

To develop the scientific and applied knowledge required for climate proofing the Netherlands and to create a sustainable knowledge infrastructure for managing climate change

Knowledge for Climate is a research programme (2008-2014) that develops knowledge and services needed to make the Netherlands climate proof. Governmental organisations (national government, provinces, municipalities and water boards) and businesses actively participate in the research programme. Knowledge for Climate focuses on eight areas, called hotspots: Mainport Schiphol, Haaglanden Region, Rotterdam Region, Major Rivers, South-West Netherlands Delta, Shallow waters and Peat Meadow Areas, Dry Rural Areas and the Wadden Sea Region. The scientific research is carried out in eight themes by consortia.

- Climate Proof Flood Risk Management
- Climate Proof Fresh Water Supply
- Climate Adaptation for Rural Areas
- Climate Proof Cities
- Infrastructure and Networks
- High-quality Climate Projections
- Governance of Adaptation
- Decision Support Tools

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