Summary

This research programme is designed to generate the fundamental knowledge that is necessary to design and evaluate adaptation strategies to cope with the impacts of climate change on rural areas in the Netherlands. It focuses on two contrasting climate scenarios and on four case study areas measuring a few tens to hundreds of square kilometres. In addition to these exogenous scenarios, the feasibility and effectiveness of adaptation strategies will be studied. This will be done in a case-study specific setting and in close cooperation with the stake-holders.

The necessary knowledge will be developed in three work packages. The first one is meant to coordinate and integrate the research of the ten projects within the programme. This will be done in discussion with the stakeholders and with the help of a technique named agent based modelling, to optimize the spatial configuration of farm types and nature targets. In the second work package the impacts of climate change on water balance components, vegetation composition and ecological networks for plant- and animal species are studied and adaptation strategies are developed (with a strategy being a set of concrete adaptation measures). To this end, the spatial and habitat requirements are quantified and attitudes of nature managers towards adaptation options are explored. In the third work package the driving factors behind adaptation strategies for different farm types are analyzed. In order to find the best adaptive strategies, the results of last two work packages feedback to the first one. Thus, optimal strategies are designed via a procedure of successive approximation.

Innovative of this programme is the way in which the overall functionality of the landscape, in terms of water management, biodiversity, agriculture, drinking water and recreation is optimized. Moreover, innovative aspects are fully present in the development of methods to assess the biophysical effects of climate change on water, biodiversity and agriculture.

Overview of main research questions on three levels

Programme level

▽ Which adaptive measures in water management, nature and agriculture are feasible options to help eliminate potential climate change threats and create opportunities for nature restoration? Where and how should the National Ecological Network be strengthened? Do nature targets have to be adjusted, and how? What is the attitude of resource managers towards these options?

▽ How are different types of farms and farmers distributed over the rural area, currently and in the future, and what is their attitude towards different adaptation strategies? What are promising adaptation strategies, what are their effects, and what will be the trade-offs with other functions?

▽ What are the cross-sectoral effects of adaptation? How do adaptation strategies within the agricultural sector and the drinking water sector affect ecosystem functioning and water management, and how does adaptation of ecosystems and water management affect agriculture? Can the exploitation of new ecosystem services attenuate the possible detrimental impacts of one sector's adaptation on another sector?

Summary

▽　Which adaptation strategies have the highest potential to serve society, agriculture, nature and water management in multifunctional landscapes in an effective manner? What is their viability in terms of support from local decision makers?

Work package level

WP1:

▽　How can climate adaptation strategies for water management, nature conservation and agricultural management be integrated in the case study areas?
▽　What are the various decision-making strategies of farmers and nature managers?
▽　How should landscape planning, design and management be organized in order to be effective, efficient and sustainable?
▽　Which adaptation strategies (ecosystem services) are available to land resource managers and policy makers and which seem most beneficial for rural areas?

WP 2:

▽　What are the effects of climate change on the water cycle, on vegetation biodiversity, and on the ecological networks of plants and animals?
▽　What are the future effects of inundations on the vegetation of stream valleys?
▽　Which adaptive measures in policy, nature and water management are feasible options to help eliminate potential climate change threats and create opportunities for nature development?
▽　What are the perceptions of nature managers of nature conservation, what are their goals, and how do they intend to achieve these goals?

WP 3:

▽　How do climate and global change affect the viability of agriculture? Which farm types will survive and which not?
▽　What are feasible and effective adaptation strategies for different farm types and which services can farmers provide?
▽　What are the effects of food production and other services provided by farmers on nature conservation?
▽　What are the success and failure factors for synergies between agriculture and nature at field, farm and regional level?

Project level

Projects in WP 1:

∇   What are the various decision-making strategies of farmers and nature managers?

∇   How will farmers and land managers adapt to climate change in the future?

∇   What is the meaning of 'integration' and which criteria may be used to understand the integrative aspects of the landscape?

∇   How can these criteria be applied in the development of design options for integrated multifunctional adaptation strategies in the case study areas?

∇   What options are available to land resource managers in adapting to climate change?

∇   Which adaptation strategies would most benefit rural areas?

Projects in WP 2:

∇   How do solar radiation, temperature and soil water availability relate to the cover fractions of plant functional types (PFTs) such as bare soil, mosses, lichens, grasses and shrubs?

∇   What are the effects of climate change and adaptive measures on vegetation biodiversity?

∇   How can correlations between biodiversity and abiotic conditions be adapted to predict the effects of water storage and climate change on biodiversity?

∇   What is the impact of extreme weather events and expected additional population fluctuations on the survival of species in ecological networks?

∇   How can we enhance the adaptive capacity of natural ecosystems by strengthening the functional relationships between nature areas and the surrounding multifunctional landscape?

∇   What are the different perspectives of actors responsible for nature policy/management toward nature conservation within the context of different scenarios and policy options?

Projects in WP 3:

∇   What are the main drivers of adaptation strategies of different types of farms?

∇   What are the impacts of agricultural adaptation strategies on (socio-)economic and environmental indicators for different farm types?

∇   How can ecosystem services provided by farmers contribute to adaptation strategies for nature?

∇   What are the socio-economic consequences of these ecosystem services and to what extent are they compatible with different farm types?