



Knowledge
for Climate



Vision

What is a good adaptation strategy and how can we design it? What tools can be used to support the process of planning adaptation strategies? What is the optimal timing of adaptation measures? How can we keep options open and at the same time avoid catastrophic events?

Aims

It is these questions decision makers are struggling with. The Knowledge for Climate consortium 'Decision Support Tools' aims to assist policy makers in answering questions of how to adapt, when to adapt and how to deal with uncertainties. It does so by improving tools for defining adaptation challenges and for identifying effective adaptation strategies, and by improving the evaluation tools to further optimize adaptation options and to select the best solutions.

Key research questions

1. How can targets be identified for adaptation in various sectors and regions of the Netherlands and when should these be scheduled? One of the main challenges is that planning of adaptation to climate change takes place in a dynamic context with the uncertainties related to climate change and socio-economic developments.
2. How can a consistent adaptation strategy, and alternative and innovative adaptation options be generated in order to cope with climate change and to climate proof the Netherlands?
3. How can assessment and evaluation tools for adaptation be developed and how can they be applied in various policy domains and regions?

Insights

Assessment of climate change impacts

Future impacts of climate change need to be known in order to identify targets for adaptation. This is not an easy task due to uncertainties in socio-economic and climatic developments. We develop and improve scenarios to form an idea how these developments may affect our surroundings.

Our scenarios for regional economics and spatial development have become more advanced. In Hotspot Haaglanden (the Hague and surroundings), we assessed the prospects of the urban heat island effect. Combining scenarios for climate change and economic development, we found that both factors contribute to the urban heat island. It shows that adaptation is required to avoid a further increase of the urban heat island effect and to reduce the negative impacts. Similarly detailed projections are made of the potential impact of flooding. This was done by applying a detailed 3-dimensional model (3Di Water Management).

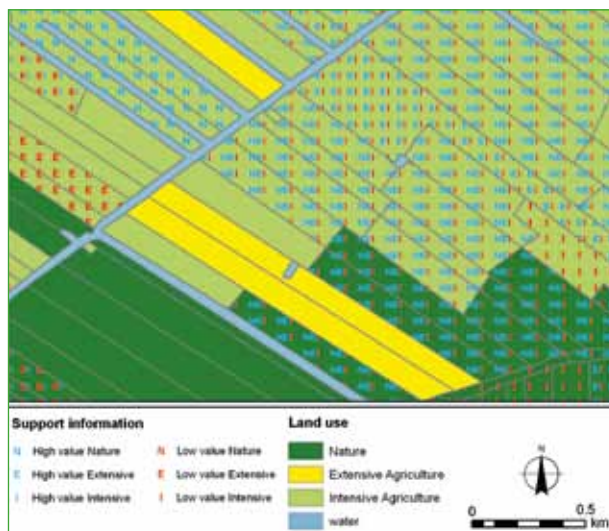
Design of adaptation options

Adapting to climate change generally involves representatives from many disciplines, such as water engineers, city planners and architects. They all have to participate in the designing process. How can this process be facilitated? How can people be assisted in discussing possible options? We are working on techniques and instruments to visualize the effects of climate change and adaptation interventions. The climate effect atlas, for example, includes maps with the expected future effects of climate change for many regions in the Netherlands and how that impacts safety against flooding, agriculture and nature. This atlas is used together with design principles visualized into guiding models. These help people to design strategies. The touch table is a practical instrument to support dialogue between various groups of people. It uses detailed digital maps, specially designed for the negotiating process. In the research we improve the tools by looking at how users react to the options offered by the tool.

Evaluation of adaptation options

Adaptation strategies and options can be evaluated with a variety of tools. This programme focuses on tools for the monitoring and evaluation of adaptation strategies and options. In one of our projects we developed and assessed a monitoring and evaluation framework. This framework contains indicators, and norms and procedures for the evaluation process, like who does the evaluation and who takes decisions on what is evaluated. The national adaptation strategies of England, Scotland, Germany, Finland and France were assessed using the framework.

In addition, we develop tools to select the best adaptation options and the best moment for implementing them. For example tools that can help to make decisions about avoiding urban inundations: is it more effective to improve water storage capacity in surface water, to improve water retention by green roofs or to increase the water pumping capacity? These kind of assessments are being done by means of cost-benefit and cost-effectiveness analysis. Other methods we use are complex dynamic optimization, general equilibrium models, dynamic programming for decision making under uncertainty.



Developing tools together

3Di Water Management

One of our research projects in Hotspot Haaglanden is '3Di Water Management'. In this project we develop simulation and visualization tools to explore possible scenarios of flooding. These tools can support decision makers in water management. The 3Di system can simulate and visualize on 3D maps how the flooding process develops in time when a dike breach occurs. The 3D maps show how high the water will rise at any time after the breach, for example near a hospital or around a farm.

Research prototypes of the system are currently extended for practical application by stakeholders. The software system is suitable for large-screen stereo projection to increase the visual impact and improve insight into spatial effects of flooding. The first results of static flooding scenarios have been frequently demonstrated to stakeholders. Already in November 2010, a first evaluation of the system was performed in an emergency exercise with the Water Board of Delfland, Delft and local emergency services. Several other case studies have been applied with this system since.

Working with the touch table for regional adaptation strategies

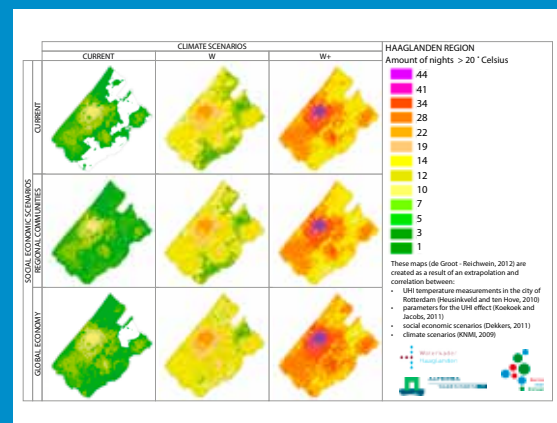
Farmers, nature conservationists and civil servants from the province and Water Board of Friesland are collectively studying the effects of raising the water table in one of the Frysian peat meadow areas. The touch table shows how some plots would be immersed and others not. This starts a dialogue about what measures to take and where, so that both farmers, nature conservationists and water managers can agree. Because the touch table not only shows the differences in water table in the plots, but also soil and water quality and value of nature. All information needed for a decision is visible on the maps.

The researchers observe the negotiations and how the participants use the touch table. They pose questions such as: do people understand the presentations? How do people interact and how can we possibly change the group dynamics by changing the technique? How do people relate with the information they get? Based on observations and interviews with the participants they improve the maps, techniques and interventions to facilitate the dialogue.

The knowledge that is required to develop and improve our decision support tools is spread over various universities, knowledge institutions, consultancy firms and end users. Several knowledge institutions pool their knowledge and experience, and design new instruments and tools together. The tools are used and tested in the field from the start. Feedback from stakeholders is constantly solicited for and used to improve the tools.

Case studies

- Regional adaptation strategy development of Hotspot Haaglanden.
- Urban heat island assessment in Hotspot Haaglanden.
- Optimal dike heightening of Dike Ring 15, Lopikerwaard: What is the best increment and when should the dikes be made higher?
- Waalblok polder: What is the best method from an economic perspective to reduce flood risk?
- 3Di Water Management in the City of Delft: How will inundation take place and how can this be visualised in 3 dimensions?
- Evaluating and monitoring adaptation at the local scale in Hotspot Haaglanden: What questions should the monitoring system answer to suit users' needs?
- Green roofs in the City of Rotterdam: What questions should the monitoring system answer to suit users' needs?
- Computable general equilibrium (CGE) modelling for the Rhine and Meuse international river basin (France, Germany, Belgium and the Netherlands): Simulating the economic effects of a structural decrease in water availability due to climate change in the region.



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Working with Hotspots / Stakeholders

- Hotspot Haaglanden region
- Hotspot Major rivers
- Hotspot Dry rural areas
- Hotspot Shallow waters and peat meadow areas
- Provinces
- Municipalities
- Delta Programme
- Stakeholders at the regional level
- Insurance companies, such as Aon Re
- Water Boards
- Agricultural sector
- Nature conservation agencies

Consortium partners

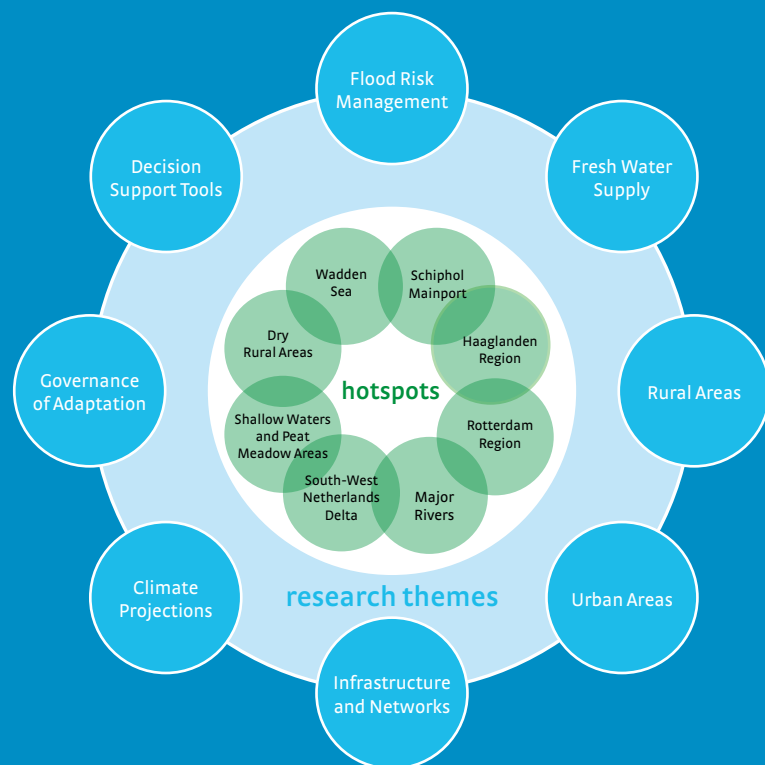


Knowledge
for Climate

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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