Climate Proof Fresh Water Supply

Knowledge for Climate

Vision and goals

Climate change will affect the supply of fresh water to the population and to economic sectors in many deltas around the world. Also the Netherlands will have to adapt to a growing mismatch between water demand and supply. This mismatch can be bridged in the present and the future by creating a more robust system that not relies solely on external water supply but on a broader mix of sources and buffers on a local to national level.

The ambition of the consortium Climate Proof Fresh Water Supply is to provide knowledge that can be used to assess the available local to regional measures for improving fresh water supply, and compare these to options on a national scale within the Delta Programme.

Aims

The programme focuses on three types of solutions: based on improvement of water management, improvement of land use and improvement of water technology. For the stakeholders in the Knowledge for Climate Hotspots we aim at providing practical and applicable knowledge by working together on pilot projects. We see a difference between policy, practice and science in how problems and potential solutions for fresh water supply are being perceived. Therefore, we aim to add nuances to the national discussion by providing more in depth insight.

Key research questions

- What is the potential of measures to either increase water availability or decrease water demand?
- How can effective regional adaptation strategies be built from these and other measures?
- To what extent do these strategies contribute to a national solution for a climate proof freshwater supply?

The research scope is limited to ‘Laag-Nederland’; the lower western parts of the Netherlands (mostly below sea level).

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Insights

Salinisation of regional water ways

The loading of surface water in polders by upward salt seepage is scattered due to very localized boils. We developed a methodology to assess the contribution of boils to salt seepage and estimated this contribution to be up to 60% of total salt seepage. Measured data for the Haarlemmermeer polder indicate an even higher percentage of salt load caused by boil seepage.

Dynamics of rain water lenses

The dynamics of rain water lenses in coastal areas appear to be mainly determined by seasonal net rainfall fluctuations. We developed quite robust estimation methods to predict the thickness of these lenses, also under climate change. For the shallow freshwater lenses, we constructed a vulnerability map. The robustness of rain water lenses can be improved on the small to medium scale by adapting the drainage in parcels and restoration of ancient creeks in combination with active injection of fresh water.

Salt tolerance standards

The currently used salt tolerances in the Netherlands seem out dated. Knowledge about mechanisms in the root zone and plant is incomplete and the climatological variability in the Netherlands is insufficiently taken into account. We developed a new stochastic methodology to quantify the hazard of salinity due to changes in time of rainfall and soil water replenishment from groundwater. This was done for Dutch and other situations, enabling a risk assessment accounting for temporal changes. First research results show that improvements are possible and lead to more realistic estimates of salinisation effects on crops. Less rigorous and more realistic salt standards for crops could reduce the need for water for flushing and the amount of compensation for damages. This leads to a better basis to account for regional differences and will probably lead to a better acceptance among stakeholders.

Salt tolerance crops

Irrigation of salt tolerant crops with brackish and salt water leads to a reduction of the fresh water need of these areas. It offers the opportunity to redevelop areas that are deemed too saline for regular agriculture production. Knowledge about the physiological aspects of salt tolerance is gained by studying salt tolerant crops and is used to improve existing models or to breed salt resistant crops with a good market potential. Research has already led to good examples as the salt potato.

Based upon the above-mentioned intermediate insights it can be concluded that the robustness of the regional system in 'Laag Nederland' could be higher than assumed until now. Moreover, by smarter distribution of the available water in combination with smarter spatial planning, the sensitivity to higher chlorine of the whole system could be reduced.

Official opening of the pilot facility for ASR in the Westland region by van Haersma Buma, Chair Water Board Delfland.

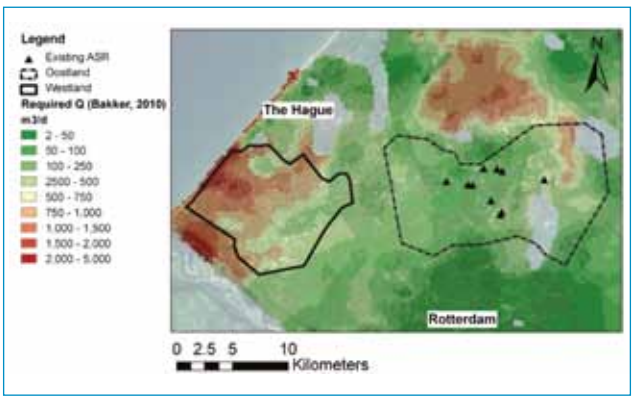
Working with stakeholders

All research projects have a connection to one or more case studies. This means that all researchers in the programme interact with stakeholders on a regular basis, for instance during meetings in which adaptation options for the Hotspots are discussed or in which field measurements are compared to modelling results. There are 3 main case study areas:

1. The Haaglanden region, where the potential for technological solutions is investigated.
2. The South-West Delta where a.o. the rain water lenses, water optimalisations at farm level and risk behaviour of farmers is investigated.
3. The 'Groene Hart' where the interaction between salinisation and ecology (e.g. water frame work directory) but also the local hydrology in the Haarlemmermeer polder is investigated.

Regional ASR suitability mapping in the Haaglanden region

Aquifer Storage and Retrieval (ASR) is a promising water technology for providing regional self-sufficiency in fresh water supply that is being investigated in the programme. With this technique fresh surface water is stored in the subsurface by deep well injection. In the case study Haaglanden the performance of ASR was mapped using high-resolution geological and hydrochemical data, an ASR screening tool and a Geographical Information System (GIS). This way, we identified promising and unfavorable ASR sites. Clearly, successful small-scale ASR application is extremely site-specific in the coastal area.



Required daily injection rate in winter to recover at least 60% in the following summer, indicating ASR suitability.

Case studies

Innovative ASR-systems have been installed at several locations in Nootdorp and Westland. The Westland case is especially interesting since water is injected in a brackish layer. Researchers are modelling and monitoring the recovery efficiency and the chemical quality of the water. The research is carried out in cooperation with the horticulture firm and people from the municipality and Water Board of Delfland.

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Working with Hotspots / Stakeholders

- Ministry of Infrastructure and the Environment
- STOWA (Applied Water Research)
- Ministry of Agriculture, Nature and Food Quality
- Hotspot Rotterdam region
- Hotspot South-West Netherlands Delta
- Hotspot Haaglanden region

Consortium partners

Wageningen UR · Acacia Water · VU University Amsterdam · TU Delft · Deltares · TNO · KWR Watercycle Research Institute · University of Twente. · Alterra Wageningen UR · Universiteit Utrecht

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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