

Summary

This program aims to provide high quality information on regional climate in The Netherlands, now and in the future, for developing national and regional adaptation strategies. We do so by:

- ▽ Performing/analyzing regional and global climate model simulations (WP1 and WP2)
- ▽ Providing show cases of high impact future weather situations at very high resolution (WP1)
- ▽ Providing coherent time series, and estimates of extremes and uncertainty ranges (WP2)
- ▽ Applying climate projections to various sectors, including dealing with uncertainty (WP3)
- ▽ Communicating climate change and climate change impact to users (WP4)

We will focus on those meteorological phenomena that have the largest impact on Dutch society, which are: extreme periods of precipitation and drought, mean and extremes in wind conditions and the pace of sea level rise. This generates a big challenge as these phenomena involve processes at a wide range of time and spatial scales.

The fact that climate changes are uncertain poses a challenge when developing adaptation strategies with a long time horizon. Therefore, we will study methods to quantify uncertainty, and develop, where possible, methods to assign a probability to a specific climate projection. Furthermore, various methods will be investigated to obtain information at small spatial/temporal scales, and on regional differences within the Netherlands, for example due to land characteristics (cities) and the influence of the North Sea.

We will assess the impact of regional climate change to various sectors: hydrology, agriculture, ecosystems, spatial planning and air quality. Jointly with the users, we will explore the effectiveness of different methods for providing the information on climate change, its effects and uncertainties to the adaptation community.

We will provide the knowledge from the other WP's (and also links to other relevant international databases) through technical services, web-portals and expert services that involve tailoring information and support by experts on the interpretation and use of the information.

Overview of main research questions on three levels

The KfC program aims to provide scientifically sound information to enable those responsible for adaptation measures to make robust decisions. In 2006, KNMI published a set of climate change scenarios that serves as a standard for supporting adaptation policies and climate impact research in the Netherlands. A new generation of scenarios will be presented in 2012/13. Until now, the climate models used for generating climate scenarios had a relatively coarse spatial resolution. Climate change impacts mainly occur at the local and regional scales. The KfC program will contribute to embedding national climate scenarios consistently in climate adaptation research and decision making.

Summary

The basis for our estimates of possible future climate are climate models. Currently, we are not able to assign convincingly a probability to any climate projections made with climate models, although conditional probabilities can be obtained (conditional on a model and emission scenario). This introduces uncertainty in the process of making climate projections. Our estimates of future variability and probabilities are intrinsically uncertain. In this project we aim to find ways to quantify these uncertainties and offer guidelines to cope with the climate projection uncertainties.

Besides data from a range of climate models, data from observations and the understanding of the physical processes contribute to knowledge of regional climate change. This implies that the information needed to estimate climate impacts involves a large number of issues. For example, in the Rhine-Meuse delta the most serious consequences of climate change can be expected from changes in extreme weather conditions. They may result in storm damages, flooding from the sea, river flooding due to excessive rainfall as well as damages due to prolonged dry conditions. Design of measures and strategies to mitigate the most serious consequences of extreme conditions are based on risk assessments where the probability of occurrence plays a key role.

It is challenging to combine different information sources in quantified estimates of climate change at the regional scale. In practice this often leads to a loss of information (neglecting information sources) or a loss of consistency (between different variables, or in time and space). Obviously, within this project we cannot fully solve the above challenges. We will focus on those questions that are most important for the Dutch society, and for which we feel that significant progress can be made. The relevant questions at programme level that need to be addressed are:

1. How to estimate and quantify climate change at the regional scale, including extremes?
2. How to provide scenarios that guarantee optimal consistency between different variables, both in time and in space?
3. How to use the information obtained in 1-2 to assess climate impacts?
4. How to use information on climate change impact to design adaptation measures?
5. How to integrate information for various user groups such that it becomes a comprehensive set that is valuable to a range of decision makers?

More specifically, we address these questions in the following 4 work packages:

WP1: Climate scenario development: mechanisms of local climate change in the Netherlands: How do the sea surface temperature, the land surface, and small-scale atmospheric dynamical processes impact on our future climate at the local scale? And what is the uncertainty about these processes?

WP2: Climate scenario development: time series, extremes and probabilities: How can uncertainty of future climate change predictions and projections be represented in time series and scenarios of future climate changes?

Summary

WP3 Scenario development for climate change impact: How to couple consistently climate projections to impact assessment models and how can uncertainty in the impact assessment be incorporated in such a way that it can effectively be used by the climate adaptation community?

WP4: Climate services: How to improve the 2-way data and information exchange in the chain of climate research, to impact/adaptation research, to policy making?

For the questions on the project level, we refer to the project descriptions in Appendices 2.