



# Outlook to new climate change scenarios for the Netherlands

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The KNMI-06 climate change scenarios are being used in response to societal needs for information to assess vulnerability and explore robust adaptation options. Yet, new scientific developments and additional user requests have generated the momentum for a new generation of climate change scenarios, to be launched around 2013 in conjunction with the fifth IPCC report. Responding to user needs, these **KNMInext** scenarios will contain more information on the probability of occurrence for different future climate states, and a set of showcases of how “Future Weather” may look like.

## 1. KNMI '06

The current set of 4 climate change scenarios lists projected changes in key variables (see Figure 1).

Global temperature rise Change in air circulation patterns	G	G+	A	A+
Winter <sup>1</sup>				
average temperature	+0.8°C	+1.3°C	+1.8°C	+2.3°C
coldest winter day per year	+1.0°C	+1.5°C	+2.0°C	+2.5°C
average precipitation amount	-1%	-2%	-3%	-4%
number of wet days (≥ 0.1 mm)	-1%	-2%	-3%	-4%
10 day precipitation sum exceeded once in 10 years	-1%	-2%	-3%	-4%
maximum average daily wind speed per year	0%	+2%	1%	+4%
Summer <sup>2</sup>				
average temperature	+0.8°C	+1.3°C	+1.7°C	+2.2°C
warmed summer day per year	+1.0°C	+1.5°C	+2.0°C	+2.5°C
average precipitation amount	-1%	-2%	-3%	-4%
number of wet days (≥ 0.1 mm)	-1%	-2%	-3%	-4%
daily precipitation sum exceeded once in 10 years	-1%	-2%	-3%	-4%
Sea level				
potential sea level rise	11-31 cm	11-21 cm	20-33 cm	20-33 cm

Figure 1: The KNMI '06 scenarios: change in key variables around 2050 compared to 1990.

## 2. User consultation

Recent user consultation meetings – where experiences with the KNMI '06 scenarios were exchanged – lead to new insights and new desires:

- *New variables* (min/max temperature, more extreme return levels, evaporation and radiation, wind direction)
- *More information on temporal variability* (full annual cycle, variability and persistence within seasons and between years, near-future changes, observed changes since 1990)
- *Links with other scenarios* (consistency with KNMI '06, link with IPCC emission- and land use scenarios).

## 3. New components

### 3.1 Probabilistic scenarios

Although the structure of a number of discrete scenarios will be maintained, probabilities and links with other scenarios are included by estimating a “likelihood of occurrence” given future GHG emissions (Figure 2).

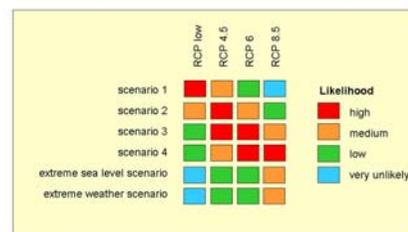


Figure 2: Probability scheme of a range of new **KNMInext** scenarios (left) conditional on the new IPCC Representative Concentration Pathways (RCPs).

### 3.2 Variability at various time scales

Apart from the mean changes listed in Figure 1, many user applications depend on climate variability at multiple time scales (note e.g. the strong variability in Dutch summer conditions in 2006, 2009, 2010, ...). This may be represented by including a wider range of return levels of key weather events and an indicator for interannual variability (Figure 3).



Figure 3: Example of possible representation of different future climate states in **KNMInext**. Both a range of return levels and an estimate of the interannual variability are included. Note: all numbers are for illustration only and are not realistic estimates of true climate change indicators.

### 3.3 Future Weather

To generate realistic time series of a set of related weather variables at multiple locations use is made of a number of global and regional model simulations at a high spatial and temporal resolution. The simulations will be adjusted to conditions that are compatible with the **KNMInext** scenarios (Figure 4).

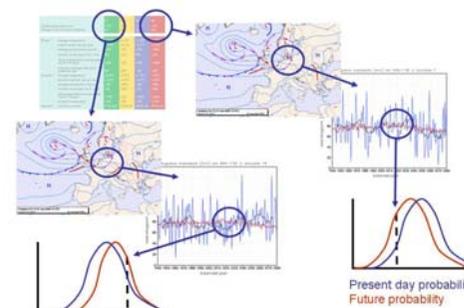


Figure 4: Sketch of the concept of **Future Weather**. From a range of climate model simulations a selection is made that is consistent with the assumptions underlying a given **KNMInext** scenario, which is further downscaled to generate time series at the local scale. The resulting time series is one realization of a wide range of possible weather evolutions.

## 4. Time frame

Global climate model simulations using the new IPCC RCP-scenarios are currently underway. First analysis and definition of new (regional climate) model simulations will take place in early 2011. First versions of **KNMInext** numbers will be generated in 2012. Around 2013 the official release of the new scenarios including documentation, websites, and processing tools is foreseen.

## 5. Conclusion

A new set of KNMI climate change scenarios (**KNMInext**) is under development. The scenarios will take updated user requirements clearly into account, and contain more information on likelihood of occurrence, modes of variability and spatial, temporal and physical consistency of time series resulting from **Future Weather** simulations. Frequent user consultation is part of the development process. See [www.knmi.nl/climate-scenarios](http://www.knmi.nl/climate-scenarios) for further updates.