Times series transformation to assess climate change impacts in water management

F. Keller (1), A. Buishand (1), T. Kroon (2), G. Lenderink (1), B. vd Hurk (1)

(1) Royal Netherlands Meteorological Institute (KNMI), P.O. Box 201, 3730 AE De Bilt, The Netherlands, (2) Institute for Inland Water Management and Waste Water Treatment (RIZA), Smedinghuis, P.O. Box 17, 8200 AA Lelystad, The Netherlands

In many sections of society climate change scenarios on a local scale (10-100 km) are needed, representing the variability of meteorological variables at small scale. Neither Global Circulation Models nor Regional Climate Models are capable to give accurate information at this level. An approach is developed to combine Dutch climate scenarios designed for a national scale with historical time series to obtain local time series of a future climate which can be used in impact assessment applications of water management.

For precipitation the wet day frequency of the time series is modified to match the scenario values, and subsequently the intensity of the modified time series is transformed using a non-linear transformation that reproduces changes in the mean and the 99th percentile at the wet-day precipitation amounts. For temperature a scaling using the 10th, 50th and 90th percentiles of the temperature distribution within a given season is employed.

This approach is applied to generate input data used for modeling the national Dutch water balance terms such as the groundwater levels and the water shortage in the soil on a scale of 500 x 500 m. Precipitation is employed directly and evaporation is calculated from the temperature time series.

The results indicate that the non-linear transformation of the time series better imitates the distribution of the extreme values in the future than as simulated by the models. For instance if a water balance model is fed with this data it better calculates water balance terms in dry seasons as compared to a calculation with linearly modified climate data.