

# **Ensemble simulations extreme discharges (low flows and high flows): Applying the ESSENCE results in Fews-Grade and its consequences for policy makers**

by Albrecht Weerts

## **Introduction:**

ESSENCE (Ensemble SimulationS of Extreme weather events under Nonlinear Climate change) is a DEISA (Distributed European Infrastructure for Supercomputing Applications) project that has been conducted by CKO (Centrum voor Klimaatonderzoek) to explore the changing climate and its variability. A large-member ensemble of runs with a state-of-the-art climate model is performed to investigate the range of possible future climate change. Possible climate change will also affect extreme discharge (low flows and high flows) of the Rhine and the Meuse.

## **Aim:**

The aim of the project is to determine what the effect of the possible climate change is on the extreme discharges of the Rhine and the Meuse using the ESSENCE results. Therefore, we will use the ESSENCE results (daily rainfall, temperature and evaporation) to simulate the past discharge and the future discharge using Fews Grade. The discharge simulations for the period 1950-2000 will be used to validate the approach. These simulations will also provide insight into how good the climate models are for predicting extreme discharges. Using this validation the results for the period 2000-2100 can be evaluated. With the results of this study, it might be possible to say something about when climate change can be detected in the discharge measurements of the Rhine and the Meuse.

## **Data:**

Results of the daily (or hourly) rainfall, temperature and potential evaporation of the ensemble runs (17?) in netCDF format will be provided by the KNMI.

## **Things to Do (2007):**

A: The results of the Essence project are stored in netCDF files. These files have to be imported in the FewsNL/FewsGRADE system. A netCDF writer already exists in Delft-FEWS. However, the netCDF reader needs to be build and tested.

B: Configuration activities (calculate daily P, T, and E) and other etc

C: Running the HBV-96 model for the Rhine and the Meuse 17 times for the period 1950-2100.

D: Analysing the results and reporting

E: Review

F: Presentation results/discussion with KNMI/RIZA

G: Reports and travel

Set up of a ESSENCE like project using a Regional Climate Model is the probably the next step. A substantial amount for such an investigation is necessary (AIO/OIO project). Effect of the results for policy makers, the comparison with the delta approach etc are things that need investigation (2008). For this latter activities an amount of 75000 kEuro/year needs to be allocated.

#### **Costs (ex BTW) 2007:**

<b>Things to Do</b>	<b>R&amp;D</b>	<b>Ext.</b>
<b>A</b>	3200	3440
<b>B</b>	1600	1720
<b>C</b>	800	860
<b>D</b>	4000	4300
<b>E</b>	1190	1280
<b>F</b>	1990	2150
<b>G:</b>	750	750
<b>Total</b>	13530	14500

#### **Cost: 2007-2011**

<b>Year</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>
<b>Costs</b>	<b>14500</b>	<b>75000</b>	<b>75000</b>	<b>75000</b>	<b>75000</b>

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