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Optimising The Available Scarce Water Resources At European Scale In A Modelling Environment: Results And Challenges

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As a next step to European drought monitoring and forecasting, which is covered in the European Drought Observatory (EDO) activity of JRC, a modeling environment has been developed to assess optimum measures to match water availability and water demand, while keeping ecological, water quality and flood risk aspects also into account. A multi-modelling environment has been developed to assess combinations of water retention measures, water savings measures, and nutrient reduction measures for continental Europe. These simulations have been carried out to assess the effects of those measures on several hydro-chemical indicators, such as the Water Exploitation Index, Environmental Flow indicators, low-flow frequency, N and P concentrations in rivers, the 50-year return period river discharge as an indicator for flooding, and economic losses due to water scarcity for the agricultural sector, the industrial sector, and the public sector. Also, potential flood damage of a 100-year return period flood has been used as an indicator.

This modeling environment consists of linking the agricultural CAPRI model, the land use LUMP model, the water quantity LISFLOOD model, the water quality EPIC model, the combined water quantity/quality and hydro-economic LISQUAL model and a multi-criteria optimization routine. A python interface platform (IMO) has been built to link the different models. The work was carried out in the framework of a new European Commission policy document "Blueprint to Safeguard Europe's Water Resources", COM(2012)673), launched in November 2012.

Simulations have been carried out to assess the effects of water retention measures, water savings measures, and nutrient reduction measures on several hydro-chemical indicators, such as the Water Exploitation Index, Environmental Flow indicators, N and P concentrations in rivers, the 50-year return period river discharge as an indicator for flooding, and economic losses due to water scarcity for the agricultural sector, the manufacturing-industry sector, the energy-production sector and the domestic sector. Also, potential flood damage of a 100-year return period flood has been used as an indicator.
The study has shown that technically this modelling software environment can deliver optimum scenario combinations of packages of measures that improve various water quantity and water quality indicators, but that additional work is needed before final conclusions can be made using the tool. Further work is necessary, especially in the economic loss estimations, the water prices and price-elasticity, as well as the implementation and maintenance costs of individual scenarios.

First results and challenges will be presented and discussed.