ICT TOOLS FOR ENHANCING SUSTAINABLE WATER MANAGEMENT IN RURAL ENVIRONMENTS

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Introduction

Numerical models can be used to support effective application of the Water Framework Directive (WFD, EU 2000). Their major advantage is to enable a full characterization of the flow processes and contaminant transport pathways involved. Thanks to their predictive function, numerical models can help also to facilitate planning and management activities. However, many of the hydrological models developed to date are not able to deal with issues in multi-scale territorial planning (e.g. Bergez *et al*., 2012). FREEWAT (FREE and open source software tools for WATer resource management; Rossetto *et al*., 2015) is an EU HORIZON 2020 project, whose main goal is to simplify the application of EU water-related Directives. It aims to integrate a simulation platform in a Geographic Information System (GIS), coupling the power of GIS geo-processing and post-processing tools in spatial data analysis with that of process-based simulation models. The resulting GIS-integrated FREEWAT platform will provide a modeling environment to simulate multiple hydrological processes, with a focus on the sustainable management of combined use of surface- and ground-water resources in rural environments. The FREEWAT platform is being developed within the QGIS free open source software package and simulates the whole hydrological cycle using open source numerical codes mainly belonging to the USGS MODFLOW family.

Achieved and Expected Results

Stakeholder survey has shown that water management in rural areas is a major priority requiring new software tools to assess the impact of agricultural activities on surface- and ground-water (FREEWAT, 2015). For this reason, within the software development and integration phase, a careful review of the available models to manage combined use of surface- and ground-water was carried out. The Farm Process, embedded within MODFLOW-OWHM (Hanson *et al*., 2014), was selected to simulate combined water use under demand-driven and supply-constrained conditions. This model code was coupled with a radiation-based crop growth module to estimate crop water uptake and crop yield. The FREEWAT platform is currently in the testing phase. During 2016, capacity building activities will introduce FREEWAT capabilities to researchers, technical staff at river basin and water authorities, water utilities or irrigation areas. The full capabilities of the FREEWAT platform will be then demonstrated through 14 case studies. Nine case studies (Fig. 1) will apply the FREEWAT platform to the WFD and Groundwater Directive (8 in EU, 1 in Switzerland), while 5 case studies will address rural water management (3 in EU, 1 in Turkey, and 1 in a large transboundary aquifer shared among Botswana, Namibia and South Africa, through UNESCO involvement).

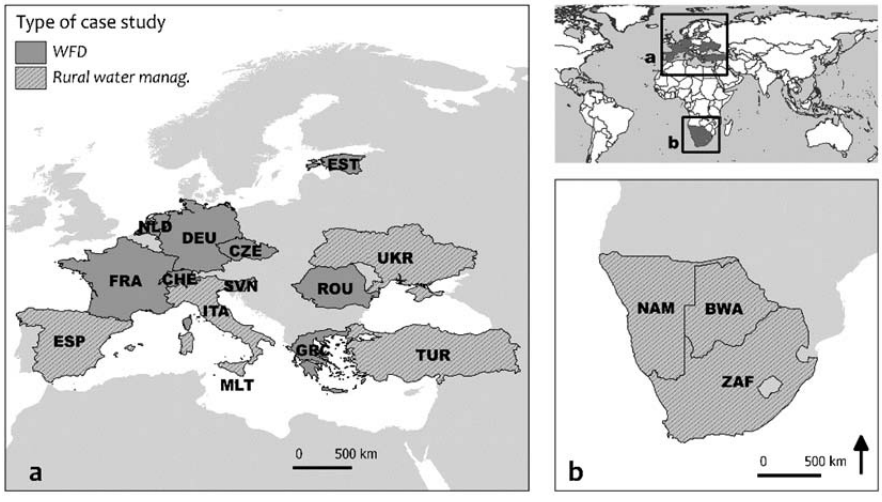

Figure 1. Location of the FREEWAT case studies.

Conclusions

Both the EU regulations and the needs and priorities of FREEWAT partners pointed out that developing watershed models able to simulate water and nutrient transport from agricultural areas to surface- and ground-water is of paramount importance. As the platform being developed by the FREEWAT consortium is free and open, contributions to further development by research institutions, private developers etc. are welcome, in the view of an initiative "ad includendum". The software suite will be complemented by user manuals and training materials.

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