SDI capacity building by enviroGRIDS in the Black Sea catchment: progresses, highlights and next priorities

The enviroGRIDS project in the Black Sea catchment is bringing together several emerging information technologies that are revolutionizing the way we are able to observe our planet. EnviroGRIDS is building a data-driven view of Black Sea catchment that feeds into models and scenarios to explore its past, present and future. The outputs of the projects will provide spatially explicit data and knowledge to nourish and promote the Global Earth Observation System of Systems (GEOSS) and the European INSPIRE directive.

As the principal aim of the enviroGRIDS project is to build capacity in new Earth Observation Systems, a specific strategy was developed, operating at three levels: human, institutional and infrastructure. At the human level, the main objectives are to inform policy and decision makers about GEOSS and INSPIRE capacities, to teach scientists how to install SDI nodes, and to teach the project partners to become trainers themselves. At the institutional level, we are targeting the needs of our main end users: BSC PS and ICPDR, and preparing the base for many others by demonstrating good practices. At the infrastructure level, we are supporting the development of SDI nodes among our partners that will serve as the base for the BSC OS. We are also developing new ways of integrating SDI with Grid computing infrastructures.

The first environmental datasets created by EnviroGRIDS are based on environmental scenarios for the Black Sea Catchment using an integrated modelling framework called METRONAMICA, which was developed by the RIKS firm in 2005. It is a spatially-dynamic land use model that is able to analyze the effects of alternative policy scenarios on the quality of the socio-economic and physical environment in cities, regions or countries. The system creates dynamic year-by-year land use maps as well as spatially explicit socio-economic and environmental indicators represented at high spatial resolution.

The second main data output of the project comes from the Soil Water Assessment Tool. SWAT is a hydrologic program developed to quantify the impact of land management practices on water, sediment and agricultural chemical yields in large complex watersheds with varying soils, land uses and management conditions over long periods of time. This watershed-scale program performs simulations that integrate various processes such as hydrology, climate, nutrient cycling, soil temperature, sediment movement, crop growth, agricultural management and pesticide dynamics. In order to allow the calibration of very large catchment, the Gridification of the Soil and Water Assessment Tool (SWAT) application has been achieved, and the gridified SWAT tool is currently being tested on the Grid Infrastructure with large-scale models.

The calibrated model will be used to estimate all components of water resources at the sub-basin level on a monthly time step as well as quantifying the impact of land use and climate change of the hydrological cycle. We will explicitly quantify river discharge, water quality, deep aquifer recharge, soil moisture, and actual and potential evapotranspiration. To bring the outputs of this model closer to the needs of water resources objectives we will calculate blue water flow (river discharge plus deep aquifer discharge), green water flow (evapotranspiration), and green water storage (soil moisture).

The results of this project will provide useful information of current and future status of water in Black Sea Catchment to support the Black Sea Commission and the International Commission for the Protection of the Danube River to meet the challenges posed by eutrophication, water scarcity and climate change across the region. So far, the main concern in the project has been the difficulty of accessing raw data from weather and hydrological stations to calibrate the hydrological model. We therefore prepared a policy brief to help convincing data holders to release their data and metadata for the project and beyond. However, we are confident that satisfactory outcomes for the hydrological models are ensured even with the data currently at hand within the consortium.

Both METRONAMICA scenarios and SWAT outputs will be distributed through the enviroGRIDS geoportal (URM), and shared through web services registered into GEOSS. The Unified Resource Management (URM) geoportal has been setup and is accessible at: http://www.envirogrids.cz. This portal is to become the main entry point to discover and access data and metadata shared by the different partners of the project.
While the enviroGRIDS project is particularly targeting the needs of GEOSS, the importance of addressing as well the specific requirements of the European directive INSPIRE is becoming more and more an evidence as most of the countries belonging to the Black Sea catchment are now required to fulfil their obligations to share spatial information.

GEOSS and INSPIRE are clearly focusing on data sharing. EnviroGRIDS is already looking ahead by exploring how the increasing amount and quality of data being made available can be processed in an efficient manner. The main avenues being explored by the project are parallel computing on the largest scientific GRID infrastructure, and the development of web processing services that should allow us to process data on-the-fly in order to bring up-to-date information to targeted end-users.

Another challenge of the project will be to communicate the outcomes of the project to the general public. We are presently testing the use of social networks such as LinkedIn and Tweeter.