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Complementary use of the WEAP model to underpin the development of asset water accounts and to facilitate water management under scarcity conditions

Galina Dimova (1), Emil Tzanov (1), Plamen Ninov (2), Irina Ribarova (1), and Maggie Kossida (3)

(1) University of Architecture, Civil Engineering and Geodezy, 1 Hr. Smirnenski blvd, 1046 Sofia, Bulgaria (dimova_fhe@uacg.bg), (2) Bulgarian Academy of Sciences- National Institute of Meteorology and Hydrology (plamen.ninov@gmail.com), (3) National Technical University of Athens, Department of Water Resources and Environmental Engineering, Athens, Greece (mkossida@chi.civil.ntua.gr)

ABSTRACT

The paper presents the outcomes of a study aiming at evaluating and managing the water resources utilization in Vit River Basin, Bulgaria, through a detailed assessment of the water balance integrating hydrological and economic information in a coherent manner. Vit River is a tributary of Danube, covering an area of 3,225 sq.km and a population around 208,000 people. Recently, the region has been suffering from seasonal drinking water shortage. To assess the available water resources and the socio-economic water needs within the basin, two tools have been used in combination: (1) the System of Economic and Environmental Accounts for Water (SEEAW); (2) the Water Evaluation and Planning System (WEAP.

The SEEAW was developed by the United Nations Statistics Division (UNSD) in collaboration with the London Group on Environmental Accounting (United Nations, 2012). with purpose to encourage the countries to launch integrated overall water management approach through establishing operational framework that integrates economic and hydrological information. A key element in the SEEAW concept is setting of tables for physical water supply and use coupling hydrological and economic information. Populating these standard tables, however, requires adoption of additional tools since the existing information is often neither complete, nor detailed enough, while some of the requested parameters cannot be derived through direct measurements.

The WEAP software was developed by Stockholm Environment Institute's U.S. Center as a generic, integrated water resource planning software tool. It provides a system for simulating the hydrological parameters of the water cycle, water demand and water supply, thus enabling the development of mass balance models on a link-node architecture (Stockholm Environment Institute, 2011). Further simulations for a broad range of natural and engineered components, as well as generation of scenarios under various future assumptions make WEAP a robust tool for integrated water management planning.

Hydrological and socio-economic sets of data for the period 2000 till 2011 were used in the methodology. The model has been calibrated for 2009, which represents an average year in terms of water resources availability, while 2011 (which is an year with deficit in drinking water supply) was used for modeling validation and analyses. Simulation results of the calibrated and validated WEAP balance model for Vit basin were used to complement the missing data in the standard SEEAW asset and physical supply and use tables.

The harmonization of the SEEAW methodology with the WEAP modeling platform in the study area has allowed: i) getting confidence about the possibility to combine these tools and to achieve useful results; ii) identifying the vulnerability of the water system to certain socio-economic factors, which in combination with changing natural factors may lead to water shortage for some sectors; iii) outlining concrete measures for overcoming water scarcity in some economic sectors and furthermore evaluating the impact of these measures on the whole water resource utilization at a river basin scale. It has also provided a functional background for setting targets for medium-term integrated water management at river basin scale, considering the current challenge of climate change.

References

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