WEAP for Effective Water Resources Management

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Abstract: - Water resources planning needs multi-disciplinary approach for sustainable development. Allocation of water resources for the optimisation of water uses at the users' end is one of the major challenges to the policymakers and stakeholders. WEAP Version 21 - Water Evaluation and Planning Model - developed by Stockholm Environmental Institute with its advanced feature of priority-preference based simulations can be used as a powerful IWRM tool for modelling future water demand and supplies under various scenarios like population growth, changing water use rates, climate change etc to analyse the demand pattern in simple to complex watershed systems. The present paper provides review on WEAP21 applications as a decision-making tool for water allocation problems and water resources planning in different aspects including water quality analysis, groundwater modelling and climate change simulations.

WEAP with its various inbuilt hydrologic modules has been successfully applied in hydrological simulations to various catchments. Worldwide, it has been used to model future water supply and demand under climatic change scenarios integrating various climatic models e.g. water supply assessment, streamflow simulations. For groundwater modelling, WEAP-MODFLOW linkage has been used to assess fluctuations in groundwater level under various pumping-based scenarios. WEAP-QUAL2K link has been used for water quality modelling to simulate various water quality parameters across major river basins. It has been used to simulate DO and temperature along with changing waste water treatment plant capacity for assessing water pollution related scenarios. For efficient irrigation management, it has been used to assess water stress under various types of irrigation supply system for effective irrigation scheduling.

In this study, WEAP has been used to model future water demand and supply for a rainfed milli-watershed(1000-10000ha) of 6600 ha with an approximate annual rainfall of 1100mm in Dist. Kanker, Chhattisgarh which is also recognised as IWMP-XIV under Integrated Watershed Management Programme for sustainable water resources planning. The model was run with input variables as the population and livestock demand data, climatic data such as precipitation and reference evapotranspiration (ET) and supply sources data such as streamflow and other sources. In order to analyse the demand pattern, WEAP was formulated with the different scenarios namely, reference scenario with the current practices, population growth rate, changing water use rate and changing climatic conditions by water year method. The results showed considerable decrease in demand satisfaction with the changing demographic and climate data as compared to reference scenario suggesting the need for alternate supply sources in the coming time period. The model has been validated with the observed and simulated value of precipitation with high value of Pearson coefficient indicating satisfactory model performance. The study shows that WEAP can be used as a effective tool for sustainable water resources planning and management.

Keywords: WEAP, Water allocation, Sustainable water resources management