ABSTRACT

In developing countries like India, Integrated Water Resources Management (IWRM) at sub-watershed level is a mandate now-a-days. It alleviates water crisis by developing water accessibility, while ensuring environmental sustainability. Decision support systems (DSS) associated with IWRM are an effective tool for water allocation, supply and demand analysis. Here, four sub-watersheds (Kesinga, Kantamal, Salebhata, Tikarapada) in the middle reach of Mahanadi River basin, Odisha, have been chosen as the study area. Water Evaluation and Planning (WEAP) model is used as a DSS tool to evaluate the water resources in the study area and to manage the future unmet demand raised by various sectors due to socioeconomic changes. WEAP model was calibrated and validated using ten years (2000 to 2009) of historical climate data, and further used to predict streamflow for near future (2010 to 2030) using the climatic data projected by four regional climatic model and their ensemble (MME) for two future scenarios (RCP4.5 and RCP8.5). The water demand and supply analysis for historical period (2000-2009) reflected an enormous gap between supply and demand in each sub-watershed, mainly for agriculture sector. Under the Baseline Future Scenario (BLS), the highest annual unmet water demand for agriculture and non-agriculture sectors was found in all sub-watersheds. As compared to BLS Scenario, the average annual unmet water demand for agriculture and non-agriculture sectors for future period decreased by 1-33% under RCP4.5, and 24-51% under RCP8.5,. The socioeconomic changes in the study area increased the unmet water demand by 6.5% to 28.9%. The management adaptation options have played an important role in the mitigation of unmet water demand and the check dam adaptation option under the Demand Supply Management Scenario proved effective in reducing the total unmet water demand of both agriculture and non-agriculture sectors in all sub-watersheds. However, the combination of check dam, traditional ponds and improving irrigation efficiency reduced the unmet water demand to a great extent for all four sub-watersheds. With proper planning and demand supply management, the disparity between water supply and demand may be managed to handle the inevitable socioeconomic changes in the middle reach of Mahanadi River basin.

Keywords: *IWRM, WEAP modeling, adaptation option, middle reach, DSS tool, scenario analysis.*