Journal of Water and Soil
Vol. 29, No. 5, Nov.-Dec. 2015, p. 1158-1172

نشریه آب و خاک (علوم و صنایع کشاورزی)
جلد ۲۹، شماره ۵، آذر – دی ۱۳۹۴، ص. ۱۱۷۲-۱۱۵۸

Title:Evaluation of Optimal Water Allocation Scenarios for Bar River of NeishabourUsing WEAP Model Under A2 Climatic Changes Scenario

Gh. Ghandhari[1] – J. Soltani[2*] – M. Hamidian Pour[3]

Received:25-02-2013
Accepted:07-06-2015

Introduction: The rapid population growth in Iran and the corresponding increases in water demands, including drinking water, industry, agriculture and urban development and existing constraints necessitate optimal scheduling necessity in use of this crucial source. Furthermore, the phenomenon of climate change as a major challenge for humanity can be considered in future periods. Climate change is caused by human activity have also been identified as significant causes of recent climate change, referred to as "global warming". Climate change indicates an unusual change in the Earth's atmosphere and climate consequences of the different parts of planet Earth. Climate change may refer to a change in average weather conditions, or in the time variation of weather around longer-term average conditions. A Warmer climate exacerbates the hydrologic cycle, altering precipitation, magnitude and timing of runoff. The purpose of this study was to evaluate the effect of climate change on water consumption and demand in Bar river basin of Neighbor. Climate change affects precipitation and temperature patterns and hence, may alter on water requirements and demand at three sectors; agriculture, industry and urban water.

Materials and Methods: At present, Global coupled atmosphere-ocean general circulation models (AOGCMs) are the most frequently used models for projection of different climatic change scenarios. AOGCMs models represent the pinnacle of complexity in climate models and internalize as many processes as possible. These models are based on physical laws that are provided by mathematical relations. AOGCMs models used for climate studies and climate forecast are run at coarse spatial resolution and are unable to resolve important sub-grid scale features such as clouds and topography. As a result AOGCMs output cannot be used for local impact studies. Therefore, downscaling methods were developed to obtain local-scale weather and climate, particularly at the surface level, from regional-scale atmospheric variables that are provided by AOGCMs. Four different downscaling methods exist: regression methods, weather pattern-based approaches, stochastic weather generators, which are all statistical downscaling methods, and limited-area modeling. For this research, HadCM3 and statistical downscaling model (SDSM), precipitation and temperature variations were simulated under A2 scenario. Then the impacts of these variations on Bar River discharge were analyzed, i.e. water resources at three sectors of agriculture, industrial and potable water under climate change during 2011-2040 using WEAP. Results at first part of simulation showed that temperature is increasing and precipitation is decreasing resulted in decreasing of Bar discharge. According to the decreasing on Bar discharge, water allocation was simulated under these conditions of agricultural and industrial development and increasing of population with WEAP. Simulation showed that watershed will face increasing of water demand for all three sectors; agriculture, industry and drinking water, so the highest water shortage would be in agricultural demand and then industry and drinking water respectively. IWRM is the basic managerial need to rest the demands especially for drought periods. Current allocation process is based on steady state conditions while allocation pattern would be done under climate change conditions so we need to be reinvestigat the last allocations for all three sectors. Another challenge for this watershed refers to the gardens and steel factory of Khorasan that they need to use new technologies for reduction of their water needs.

Results Discussion: In this study, the outputs of General Circulation Models (HadCM3) and statistical downscaling model (SDSM) have been used to investigate the changes of rainfall and temperature under A2 scenario in Bar river basin of Neishaboor and assess the impacts of this changes on the Bar river's discharge. Finally, using WEAP model under climate change conditions for the period of 2011-2040, the status of basin water resources was evaluated for the three sectors (agricultural, domestic and industrial). The results indicated increased temperature in the Arie station amounting to 16 percent and rainfall reduction in the Arie and Taghan stations amounting to 3.9 and 8.75 percent respectively. Under these conditions, according to the increasing

1- MSc Graduated, Department of Water Engineering, College Soil and Water, University of Zabol
2- Assistant Professor, Department of Water Engineering, University College of Abureyhan, University of Tehran
(*-Corresponding Author Email: jsoltani@ut.ac.ir)
3-Assistant Professor, Faculty of Geography and Enviromental Planning, University of Sistan and Baluchestan, Zahedan, IRAN

water demands of agricultural and industrial sectors in the future, there will be a shortage of water supply resources in the region. So the agricultural sector with 12 percent will have the highest percentage of water shortage and water scarcity and of the industrial sector will be 2%. However, the drinking water or domestic demand will not face a shortage of supplies.

Conclusion: Therefore given that the most part of agriculture sector's share of basin is allocated to orchards and on the other hand the most shortages are related to agriculture, then while creating an integrated management of water resources, development and use of modern methods of irrigation during the period of 2011 - 2040 would seem to be necessary.

Keywords: Climate Change, Downscaling, General Circulation Model (GCM), Population Growth, water shortage