

TRENDS IN PRECIPITATION AND STREAMFLOW IN GEDIZ RIVER BASIN, TURKEY

S. Anac, E. Yesilirmak, Y. Kukul

*Ege University, Faculty of Agriculture, Department of Irrigation and A. Structures, Bornova, Izmir, Turkey
suer.anac@ege.edu.tr*

Current scientific research reveals that climate change will have major effects on hydrologic cycle components, particularly on precipitation, evapotranspiration and runoff. Climate induced changes in the hydrological cycle will likely affect magnitude, frequency, and costs of extreme weather events as well as availability and quality of water resources. An important element of the research on the impacts of climatic change is the analysis of trends in hydrological variables. Trend analysis provides insights into the characteristics and magnitude of global and regional climatic variations. In this study, it was attempted to search the trends in annual precipitation totals and annual mean streamflow records in a basin scale in Turkey. Data used belongs to Gediz basin (1720000 ha) located in Western Turkey, and consists of records of fourteen precipitation gaging stations and four streamflow gaging stations, with a time interval between 1966 and 1998. Streamflow gaging stations used in this study were selected principally among all gaging stations in the basin to secure the condition of homogeneity. In other words, those streamflow gaging stations without upstream regulation, diversion, dam etc. were selected and used. The methods for trend analysis were sequential version of non-parametric Mann-Kendall test and Pettitt test. The results showed a decreasing trends for annual precipitation with the change points in the beginning of 1980's, then, the trends became significant in the beginning of 1990's at the confidence level of 95% in most of precipitation stations. Similar downward trends have been detected for streamflow records. The change points were concentrated around mid 1980's. As in the case of precipitation trends, streamflow trends became significant at beginning of 1990's at the confidence level of 95% in most of streamflow stations. The trend of streamflow pattern in basin could be directly explained by the observed decrease in precipitation over the same period. The trends observed in these hydroclimatic variables were entirely consistent with those identified in recent studies conducted in Turkey and several southern Mediterranean countries. Overall supply of water for domestic, industrial and irrigation consumptions is almost equal to overall demand in the basin. Therefore, the climatic variations particularly impacted water management in irrigation schemes and created severe conflicts between water users. The average irrigation water requirement is 853 mm in the basin. The irrigation water allocated to the irrigation schemes decreased approximately to 440 mm during the water scarce years of the last decade. There are several opportunities for reducing conflicts over supply of future water demands and adapting to climate variability and change. These include establishing incentives for using, conserving and protecting water supplies; providing opportunities for transferring water among competing users; evaluating the reoperation of existing infrastructure in the basin.

In recent years the emphasis in action plans to cope with drought has increasingly shifted from supply side management to effective demand side management for scarce water resources in the basin. Demand side measures include reusing treated wastewaters of Izmir city -182 million cubic meters per year- and incentives on water saving methods in agriculture; reduction of wastages and water pricing measures in urban areas; and recycling water and special tariffs in industry. Integrated Water Resources Management plans at basin scale meeting demands of water users, as well as ecosystem needs while assuring good water resource status according to the European Community Water Framework Directive requirements are also under consideration.

