Geophysical Research Abstracts
Vol. 20, EGU2018-18065, 2018
EGU General Assembly 2018

Understanding human and natural drivers of seasonal urban water demand: a panel-data analysis in a set of touristic towns

Elena Toth, Mattia Neri, and Cristiana Bragalli
University of Bologna, DICAM, Bologna, Italy (elena.toth@unibo.it)

In order to understand future water scarcity scenarios it is necessary to analyse the possible consequences of the expected anthropogenic and natural changes not only on the supply side but also on the demand side.
The demand for water in cities is projected to grow by 50 percent within the next three decades (according to the World Bank Water Scarce Cities Initiative) and increasing water stress conditions are expected for residential users all over the world.
Urban water demand is guided by complex interactions between human and natural system variables at multiple spatial and temporal scales and understanding the dominant drivers is a necessary prerequisite for improving the demand models. It is crucial capturing not only the yearly-based, but also the infra-annual expected variations in the demand. In particular, in seaside touristic regions, the strain on the available resources may become unsustainable during the dry season when exacerbated by the peak of tourists' presence. The present work studies the combined impacts of rainfall, temperature and touristic fluxes on the seasonal urban water consumption for a set of seaside resort towns in Italy.
The correlation analysis carried out for all the study cities between the water demand in the summer months and the seasonally-varying predictors, in order to understand their influence, shows that the consumption indeed increases very much with the number of tourists. Furthermore, differently from non-touristic areas analysed in the literature, in seaside cities, where residents do not leave the city in the hot summer months, an increase in temperature always implies a significant growth in the demanded water volumes. The rainfall occurrence (number of rainy days) has an highly significant negative correlation for all the municipalities, while the total rainfall depth does not always exert an equally strong significant effect on the demand.
A panel data modelling approach was carried out combining the time series for all the cities. The outcomes of the panel-data water demand models demonstrate the importance of the inclusion of the seasonal determinants analysed in the study. When comparing the modelling approaches, the non-linear model (based on an artificial neural network architecture) outperforms the linear regression indicating that the influence of the identified predictors appears to be better captured by non-linear causal relationships.
The results of the study are promising and indicate that in a number of increasingly water-scarce and touristically exploited regions, additional research is necessary on the role of tourism as well as meteorological variables as determinants of water consumption, and it is important to carry out such analyses at an appropriate temporal and spatial scale.