River runoff response to climate changes in Poland (East-Central Europe)

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An increasing freshwater discharge into the Arctic Ocean is a result of increasing river runoff in high latitudes of the Northern Hemisphere. However relatively little research has been done on rivers in Poland. The aim of the paper is to survey the present day research on river runoff response to climate change in Poland.

Mean annual flows of two main rivers crossing the country (Vistula and Odra) observed in the period 1901-2008 reveal an occurrence of series of wet and dry years. This periodicity is caused by different types of the atmospheric circulation and no statistical trends were stated (Stachy 2010). More detailed study was done by Jokiel & Bartnik (2010): maximum discharges for 462 water gauges were analyzed in the period 1951-2006. According to their “high water level index” (2007), it can be stated, that during the last 20-30 years neither the number, nor the relative magnitude of maximum river discharges in Poland has increased. They are even slightly smaller than in 1951-1980. However, increase of low flows days was observed on small rivers in central Poland in the period 1981-2000 in compare with two previous decades (Jokiel 2010).

Trends detection for high annual, winter and summer discharges in the central part of the Carpathian Mts. (South of the country) were studied by Kasina, Pociask-Karteczka & Nieckarz (2006-2007) for 20 water gauges in the period 1984-2003. For the considerable part of analyzed series, trends are not significant even at very high values of a significance level. Hydrological maxima extreme events and 10-days averages of river discharge with respect to the North Atlantic Oscillation impact were also studied for these rivers by Pociask-Karteczka & Nieckarz (2010). There is no clear relationship between high number of hydrological maxima extreme events in the Carpathian Mts. and the winter NAO index; some statistical significant correlations between decadal values of river discharges and the NAO indexes was found; they may be used for the river flow forecasting in particular decades.

The above review do not correspond with research results obtained for rivers in Europe. It might means, that climate change expressing in warming and decreasing precipitation in Poland does not lead to change tendencies in river discharges. It is also possible, that in this part of Europe, climate change express not in increasing or decreasing runoff but in intra-year dynamic of runoff, which might cause changes in annual water balance structure. It should be undertaken in future research.