



Editorial



Climate Change and Water Resources

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The data of the World Meteorological Organization show that the significant climate change has already started. The average annual temperature has increased about 0.6 - 0.9 °C compared to that of the end of the 19th to the end of the 20th centuries. The average temperature of winter and spring has increased at middle altitudes. The global sea-level has risen about 10-25 cm during the last 100 years. The increased average temperature causes changes in hydrological cycles.

Lithuanian climate fluctuation also depends on the processes of atmosphere circulation. Lithuanian scientists have seen into these tendencies and have estimated that deep cyclones more often move to Lithuania in winter starting with the 30th of the last century. Consequently, winters have become warmer, long-lasting frosts have decreased, and the contrast between seasons has almost disappeared. In the last decades of the last century the phenomena of abnormal heats and the amount of precipitation in winter have appeared in Lithuania.

Among the evidence for climate change is ice phenology observations of lakes and rivers (observations of annual periodically recurring seasonal ice phenomena, recording of ice freeze-up date and duration). Ice phenology researches seasonal meteorological and hydrological phenomena. Long-term observation data collected by the Nemunas at Smalininkai water measurement station show that in the 20th century the ice cover formed on an average 13 days later than in the 19th century and remained unbroken on average 30 days less.

Changes in the climate terms (temperature and precipitation) influence directly the conditions of river runoff formation. In the second half of the 20th century, the tendencies of river runoff variation were observed in many countries of the world. Depending upon the region the river runoff changes differed greatly. Nowadays the contrast between the seasons in the runoff of Lithuanian rivers is disappearing, i.e. spring floods are decreasing and a runoff of winter season is increasing.

Knowledge of possible changes in water resources in the 21th century is of great importance to planning the activities of hydropower stations.

There is a long tradition of co-operation between Nordic hydrologists in the field of hydrological modelling for the hydropower sector and of studies of global warming impact on water resources. The Nordic Climate and Energy Project addresses the impact of global warming on renewable energy production in the Nordic area including the Baltic countries.

The use of renewable energy sources in Lithuania as well as in the EU countries would make it possible to reduce negative effects (for instance, the greenhouse effect) of the climate change. One of the most usable sources of renewable energy is the river hydropower resources which directly depend on the river runoff parameters. Following the global warming, changing river water resources may directly affect the hydropower production under extreme nature conditions.

Statistical analysis of the climate and Lithuanian river runoff in the 20th century and the forecast of the change parameters in the 21th century indicate that their change tendencies are the same. Redistribution of river runoff in different seasons occurs due to the temperature increase and the precipitation amount change. The analysis of temperature, precipitation and river runoff shows that the strongest relation between them is in the winter season. The runoff decrease will have a great impact on Kaunas Hydro Power Plant energy production in our century. The analysis of seasonal runoff distribution indicates that energy amounts remain increased in winter; but they decrease in spring, summer and autumn. Decrease in the average energy production is forecast from 7 to 26 % in 2001-2100 in comparison with the baseline period.