

Summary

The report was prepared within the framework of fulfillment of the TOR for a scientific research approved by IPO "Ecopartnership".

The scope of work included:

- a basic study of Ivie district rivers;
- an assessment and mapping of climatic conditions changes (air temperature and precipitation), as well as of river flow in Ivie district within the period from 1961 till 2015;
- calculation of the forecasted change in the main rivers runoff within the period till 2035 in Ivie district in the light of anticipated climate change and a corresponding mapping;
- definition of a draft list of rivers section most vulnerable to climate change, taking into account the use of water resources in these rivers (water use, recreation, hydropower);
- development of a draft action plan to mitigate the climate change impacts on the most vulnerable sections of the rivers.

The researchers compiled a list of rivers sections most vulnerable to climate change taking into account the use of the rivers. The key focus was on the river sections used for recreational purposes, as well as on those located close to the buildings in settlements that can be flooded fully or partially due to extreme weather events (spring floods, rain floods etc.), which can result in a land-flood, as well as lowering of the water level and shallowing of rivers during drought periods. It ought to be noted that there is no anticipated direct threat of a negative impact of either the climate change itself or of an associated reduction of surface runoff and of water level lowering in surface water bodies, which could affect the centralized water supply within Ivie district, because water is supplied from underground sources rather than from surface sources. The potential threat is mainly related to water use in rural settlements, which are not connected to centralized water supply, and it is mainly attributed to lowering of the groundwater level (the upper aquifer) and, correspondingly, lowering of the water level in individual shaft wells, which can lead to their short- or long-term drying out. However, this issue needs a further detailed study and is not related to the research.

Reduction of the negative impacts of climate change on the rivers in Ivie district as well as other rivers can be achieved by their artificial watering through placement of water-retaining structures (dams) to maintain the level in the upper poulder and to prevent shoaling of watercourse, as well to regulate the water level at the existing dams. It is recommended to place a small low-head HPPs in the dams if sufficient water head can be ensured with just a minimal flooding of adjacent territories and minimal negative impact on the ecological functioning of watercourse and the adjacent areas. In this case, it is necessary to make a scientific justification and conduct detailed water-energy calculations for each of the proposed HPPs at the stage of feasibility study.

In total 21 actions are proposed to mitigate the possible negative consequences of the climate change impact on the hydrological regime of the rivers. The key proposed actions are as follows:

- placement of a dam with the installation of a mini hydro power station on the river Gavya in the middle reaches near Tsentralnaya village;
- placement of nine water-retaining structures and ponds for recreational purposes to maintain the water content of rivers and reduce the risk of shallowing during dry periods, including on the Volozhinka River (intersection with M6), the Dudlyanka near Dudy village, the Zhizhma near Malye Knyazikovtsy village, the Klev in Matyuki village, the Lyntupka near Dovgyalovshchina village, the Matryona near Subbotinka village, the Olshanka near Barovo village, the Chapunka near Nezhnevichi village, the Chernitsa near Eyegerdy village;
- improvement of the regulation of the level regime in the eight existing ponds, depending on its actual water content;
- timely periodic clearing of the two sites of the amelioration system to ensure its normal functioning;
- provision of the population of Dudy and Gurshchyzna villages with centralized water supply systems because of the risk of wells drying in low-flow periods, especially under changing climate conditions (for example, in 2015 the wells dried up during a period of extremely low water).

Based on the preliminary hydropower calculation in Ivie district, it is possible to install one more hydroelectric power station on the river Gavya in the middle reaches of the river Tsentralnaya with the difference in marks between the upper and lower pounders (water head) of approximately 3 m and the estimated capacity of 209 mW. It is more than 3 times higher than the capacity of the existing hydroelectric power station in the upper reaches of the Gavya river near Zhemyslavl settlement.

The location of HPPs at other rivers is inexpedient because of their natural functioning and the type of use (for example, Isloch is used for canoeing with through routes), and because of insignificant water content of other small rivers.

In order to reduce the possible negative impact on biodiversity it is recommended to monitor ecosystems and water quality, as well as to control implementation of all the necessary environmental management technologies and to prevent the spread of invasive species.

In order to reduce the pollution of soils and groundwater by nutrient pollutants due to the possible increase in the intensity of agricultural production and the possible drop in groundwater levels under climate change, it is expedient to exercise erosion control and to introduce effective technologies in agriculture, including reduction of soil pollution. Further replacement of agricultural species with more productive and sustainable ones, adapted to the new climatic conditions, will also improve the efficiency of agriculture and its potential for adaption to climate change.

In order to improve the hydropower characteristics of the existing hydroelectric power station on the Gavya, it is expedient to evaluate the operation and develop proposals on its modernization (if necessary), including the Operating Rules updating, taking into account the predicted changes in the hydrological regime.

In order to improve water resources management it is recommended to optimize the management of releases from reservoirs and wastewater discharges.

In order to reduce the possible negative consequences of hazardous hydrometeorological phenomena, it is recommended to develop flood and drought risk management plans for the Ivie district, including a preliminary flooding risk assessment and the construction of hazards and flood risk maps of the main watercourses areas, which are most exposed to these risks.

Increasing the use of renewable energy sources and the use of waste to generate energy should also increase the potential for climate change adaptation in Ivie district.

The results of the research can improve the level of awareness among stakeholders, including Unitary Enterprise of Housing and Communal Services of Ivie District, Ivie District Executive Committee, as well as of the public about the climate and river flow change in Ivie district and their forecast until 2035.

The implementation of the proposed action plan on climate change adaptation in the area of water resources management improvement, taking into account possible variations, both of the problematic sections of rivers in low water period of the summer-autumn season, and of the action plan composition, will mitigate the negative impacts of the climate change on water resources and characteristics of their use.

It is planned to publish the results of a research on this topic in scientific and practical journals with an obligatory reference to IPO "Ecopartnership".

Experts Vladimir Korneev and Ivan Bulak took part in the report preparation.

The river Isloch near Darling is on the front-page photo of the report.

The full version of the report is available at IPO "Ecopartnership" office.