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Changes expected in the hydrological regime of the Dovinė river after removal of sluice-gates

Arvydas Povilaitis [1]*,

Erik Querner [2]

[1] *Water Management Department,*
Lithuanian University of Agriculture,
LT-53361 Kaunas,
Lithuania
E-mail: arvis@hidro.lzuu.lt

[2] *Alterra, P.O. Box 47, 6700 AA*
Wageningen,
the Netherlands
E-mail: erik.querner@wur.nl

Lake Žuvintas located in southern Lithuania in the basin of the Dovinė river, is one of the biggest lakes and oldest nature reserves of the country. However, changes in the hydrology of the Dovinė river basin, caused by a large-scale melioration and water management works carried out in the 20th century, have resulted in a significant decrease of the biodiversity of Lake Žuvintas and the surrounding wetlands. To prevent the ongoing deterioration of Lake Žuvintas and adjacent wetlands, solutions have to be found at the basin level. Therefore, two scenarios to evaluate the impact of the removal of sluice-gates built on the Dovinė and Amalvė rivers have been analysed to get an insight into the impact of water regime changes in the Žuvintas, Simnas, Dusia and Amalvas lakes and adjacent wetlands. For such scenarios, the method of mathematical modeling employing the SIMGRO model was used.

The results have shown that the entire restoration of water dynamics and flow pattern of the Dovinė river to its original state is impossible. The Dovinė river has been modified to such a degree that the changes are hardly reversible. When striving for at least partial flow naturalization, reconstruction of the existing sluice-gates is necessary.

Key words: the Dovinė river, Lake Žuvintas, SIMGRO model, hydrological regime, wetlands

INTRODUCTION

The objectives of the EU Water Policy as described in the Water Framework Directive (2000/60/EC) identify a need for a greater integration among the factors such as water quantity, quality, water use and environmental protection. The Directive is to be implemented using river basins as the basic unit. One implication with respect to water management is that there should be an objective to maintain flow regimes as close to natural as feasible. Wetlands, due to their influence on controlling peak flows and droughts as well as on removing pollutants and recycling nutrients and accumulating sediment, can play an important role in governing the processes in terrestrial and aquatic environments (Bragg et al., 2003). Therefore, naturalization of the flow regime as well as restoration of wetlands have received increased attention in river basin management in recent years (Dunn, Ferrier, 1999; Zhang, Mitsch, 2005; Mitsch, Day, 2006; Mitsch et al., 2002; White, Fennessy, 2004; Adrian et al., 2006).

Spatially distributed hydrological models have become useful tools to support the design and evaluation of river basin management. The dynamics of flow between unconfined aquifer systems and interconnected streams are explored using coupled stream–aquifer interaction models that are capable of accounting for the interdependence of groundwater and surface water functioning (Bradley, 2002; Thompson et al., 2004).

The Dovinė river basin has been an exclusive area because it holds one of the most important and meanwhile most threatened lakes of Lithuania, the Žuvintas. The lake is one of the biggest lakes and oldest nature reserves of Lithuania. In geo-morphological terms, the lake is unique and there is no other lake of this kind in Lithuania. Next to Lake Žuvintas, also other areas located in the Dovinė river basin are proposed to be designated as Natura 2000 sites, either under the Birds Directive or under the Habitats Directive.

The basic impediment to find a solution for the ongoing deterioration of Lake Žuvintas and adjacent wetlands has been the lack of regarding the lake as an integrated part of the Dovinė river basin and to acknowledge that solutions for Lake Žuvintas have to be found at the basin level. Therefore, the general objective of the research was to evaluate the impact of the removal of sluice-gates constructed in the early 80s of the last century, on the water regime in the Dovinė river. The paper is mainly focused on simulation scenarios using the SIMGRO model. The model is physically based and therefore suitable to be used in situations with changing hydrological conditions (Querner et al., 2004).

SITE DESCRIPTION

The Dovinė river basin covers an area of 588.7 km^2 and is located in the southern part of Lithuania (Fig. 1). The basin is the right tributary of the Šešupė river and consists of a network of rivers and water bodies formed by five big

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* Corresponding author.

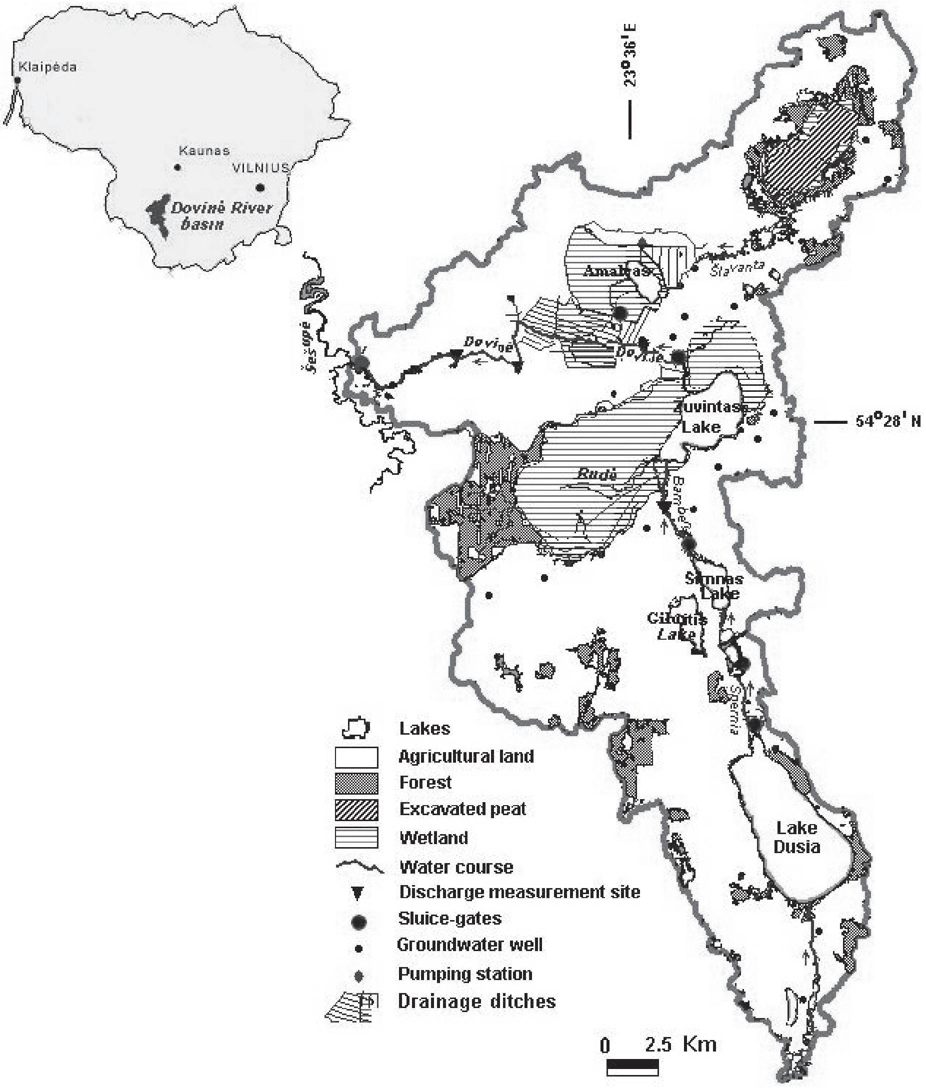

Fig. 1. Location of the Dovinė river basin

lakes (Dusia 23.3 km^2, Žuvintas 9.3 km^2, Simnas 2.4 km^2, Giluitis 2.4 km^2 and Amalvas 1.9 km^2) and a number of rivulets and small ponds. All the lakes, except Giluitis, are through-flowing lakes. Most of the areas in the basin are productive agricultural lands. The forest cover is scarce, i. e. approximately 9% of the area. About 16% is taken by pasture and meadows, 46% is arable, 14% is natural wetlands (including sparse forest) and 3% is urbanized area. All areas in the Dovinė river basin are hydrologically linked, and measures taken in one part of the basin impact the situation in its other parts.

The relief of the northern part of the Dovinė river basin is rather flat (80–100 m a. m. s. l.) and holds various glacial lakes. In the southern direction it changes into low glacial hilly landscape (100–190 m a. m. s. l.). The dominant soils are Haplic Luvisols covering one third of the basin, while Gleyic Luvisols cover more than 20% of the territory. The soils are mainly developed on sandy loam (27.9%), peat (26.5%) and on sandy clay loam (20.7%). Sandy loam soils prevail in the hilly southern part of the basin, while light clay loam and peat soils dominate within the Žuvintas Biosphere Reserve.

The predominantly fertile soils in the Dovinė river basin stimulated the extension of agriculture. In the second half of the 20th century, the water regime of the river and its basin was significantly altered. Sluice-gates were built at the outlets of the Dusia, Simnas, Amalvas and Žuvintas lakes to accumulate spring runoff. After the arrangement of sluices the average water level in the lakes increased by 0.43, 0.83, 0.20 and 0.31 m, respectively. Fishing ponds along with a dam in the area between the Dusia and Simnas lakes were established and a small hydro-power station was built in the lower reaches of the basin. At the same time large-scale amelioration activity was executed: the northern and southern parts of the Amalvas wetland were drained and long sections of the Dovinė watercourse were canalized. The Amalvas winter polder was arranged in the north-eastern and northern outskirts of the Amalvas wetland. Due to intensive drainage activity, about 36% of the Lake Žuvintas basin area was ameliorated.

DATA AND METHODS

Modelling methodology

Such a complex system as the Dovinė river basin requires the use of a combined groundwater and surface water model to predict the effect of measures. Therefore, the SIMGRO model was used. SIMGRO (SIMulation of GROundwater and surface water levels) is a distributed

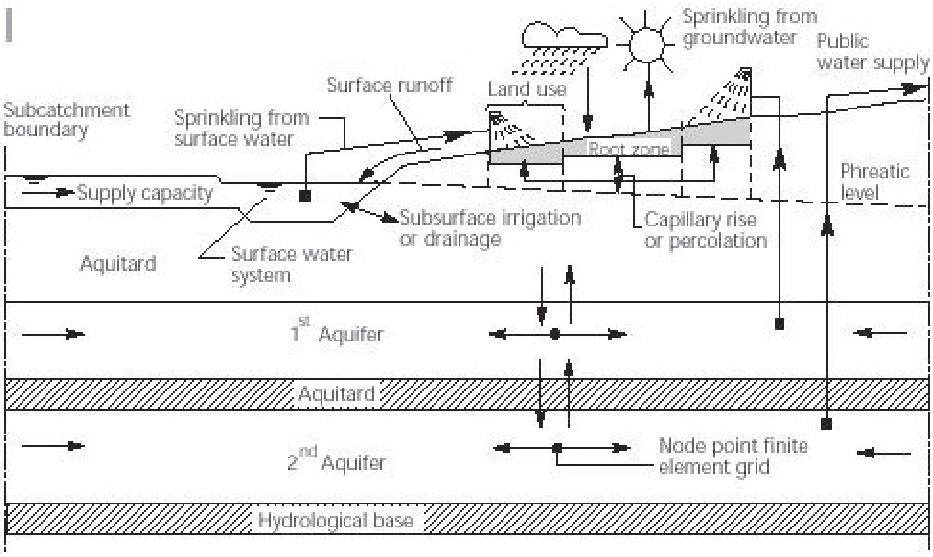

Fig. 2. Schematization of water flow in SIMGRO model

parameter model that simulates regional transient saturated groundwater flow, unsaturated flow, actual evapotranspiration, sprinkler irrigation, stream flow, groundwater and surface water levels as a response to rainfall, reference evapotranspiration, and groundwater abstraction (Kupper et al., 2002; van Walsum et al., 2004).

To model a regional groundwater flow in SIMGRO, the system has to be schematized geographically, both horizontally and vertically (Fig. 2). The horizontal schematization allows assessing the input of different land uses and soils per subregion in order to model spatial differences in evapotranspiration and moisture content in the unsaturated zone. The finite element procedure is applied to approach the flow equation which describes transient groundwater flow in the saturated zone. A transmissivity is allocated to each nodal point to account for the regional hydrogeology. A number of nodal points make up a subregion. The unsaturated zone is represented by two reservoirs, the other for the root zone and one for the underlying soil. Evapotranspiration is a function of the crop and moisture content in the root zone. The measured values for net precipitation, potential evapotranspiration for a reference crop (grass) and woodland are input data for the model. The potential evapotranspiration for other crop or vegetation types is derived in the model from the values for the reference crop by converting with known crop factors.

In the SIMGRO model, the surface water system is a network of reservoirs. The inflow of one reservoir may be the discharge of the various watercourses and ditches. The outflow from one reservoir is the inflow to the next reservoir. For each reservoir, input data are required on a 'stage versus storage' relation and a 'stage versus discharge' relation.

In the model, four drainage subsystems are used to simulate the drainage. It is assumed that three of the subsystems – ditches, tertiary watercourses and secondary watercourses – are distributed evenly over a finite element or a subregion. These three subsystems are primarily involved in the interaction between surface water and groundwater. The interaction between surface and groundwater is calculated for each drainage subsystem using data on drainage resistance and the difference between the groundwater and surface water levels.

Input data and schematization

A SIMGRO model application scheme was built for the entire Dovinė river basin with a size of approx. 600 km^2. The groundwater system was schematized by means of a finite element network. The network comprised 4370 nodes spaced about 400 m apart. The peat layer of the Amalvas and Žuvintas bogs was considered as an aquitard ranging in thickness within 2–4 m. The resistance of this peat layer is in the order of 400 days. The aquifer below is 40–80 m thick and its transmissivity is about 20–65 m^2 day^{-1}. For modelling the surface water, the basin was subdivided into 460 sub-basins. The schematization of the surface water further included sluice-gates and the pumping station for the Amalvas polder. For the modelling of spatially distributed features in the Dovinė river basin, the available digital data on topography (scale 1 : 10000) along with the boundaries of the river basin and sub-basins, land use, soil type, geological layers and hydro-geological parameters, hydrographic network and positions of hydraulic structures were used.

Daily data on surface water level in the Dusia and Žuvintas lakes were available for the period 1945–2005 and 1967–2005, respectively. Unfortunately, no measurements of temporal variability of groundwater level at any site in the basin were available. Only 38 wells, measured in August and September 2004, provided useful information on the spatial distribution of groundwater tables. Data on daily precipitation and average daily air temperature were taken from the Lazdijai meteorological station situated 10 km south-west from Lake Dusia. The maximum and minimum values of daily air temperature and the data on average wind velocity for the calculation of potential evapotranspiration were additionally collected. It was assumed that the daily amount of precipitation and air temperatures are distributed evenly over the entire basin.

Continuous daily discharges in the Bambena river were measured at the Ąžuoliniai measurement station installed 1.6 km upstream Lake Žuvintas for the period January–December 2005; 22 single extra measurements of discharges were also carried out in August 2004 to verify the model (Kilkus, 2004).

Model calibration and verification

The SIMGRO model was calibrated with the available meteorological information and water levels measured in the Dusia and Žuvintas lakes for the period 1996–2002. Analysis of residual errors was used to evaluate the model's performance by characterizing systematic under- and over-predictions.

Model verification was performed using information collected for the period 2003 through 2005. The groundwater levels as well as surface water level dynamics in the lakes during the period were statistically analysed afterwards. The verification also included analysis of simulated and measured daily discharge patterns in the Bambena river for the year 2005.

A comparison of measured and simulated discharges, groundwater levels and lake water levels revealed that there were differences. However, in spite of some inaccuracies that could be also related to the errors in the measured data, the SIMGRO model showed to be a useful tool to predict groundwater movement and its interactions with surface water in the Dovinė river basin. More detailed results of evaluation of the model performance under calibration and verification procedures are presented by Povilaitis and Querner (2006).

Simulation scenarios

The anticipated water management measures concern the entire Dovinė basin, the lakes and the Amalvas and Žuvintas wetland complexes. The Dovinė river runoff regime should be made more natural.

Therefore, two scenarios (Table 1) have been analysed to get an insight into the impact of changes of the river regime on the water levels in the Žuvintas, Amalvas, Simnas and Dusia lakes and adjacent wetlands. Simulations with the model were carried out on a daily time step for the period 1994–2005, thus simulating the surface and groundwater levels according to the changing meteorological conditions. Depending on what changes may occur due to certain pressures on the environment, the chosen scenarios simulated a "what if…" situation.

RESULTS

Present situation (scenario 0)

This scenario reflects the present water management practices in the Dovinė river basin as well as their impact on surface water and groundwater characteristics. Scenario 0 was the reference for the other scenarios. It gave the possibility to assess the impact of different water management practices on water regime in the Dovinė river basin.

Table. **Scenarios simulated with the SIMGRO model**

Scenario	Description (main features)
0	Present situation used as reference
1	Removal of sluice-gates
2	Restoration of the outflow through the old Bambena river meander

Simulation results have shown that under the present conditions the average groundwater level in summer occurs 0.10 m to more than 10.0 m below the ground surface. In winter, the average highest water level at different sites within the basin fluctuates from 0 to more than 7.0 m. Groundwater level in the complex of the Žuvintas and Amalvas wetlands is much higher than in the surrounding areas.

Removal of sluice-gates (scenario 1)

This scenario reflects changes in the hydrological regime of the Dovinė river basin after the removal of sluice-gates. The removal of sluices means free water release through the gates.

Results of this scenario revealed that the removal of sluice-gates could significantly decrease water level in the lakes (Fig. 3) – on the average by 50 cm in Lake Dusia, by 140 cm in Simnas Lake, by 120 cm in Amalvas Lake and by 112 cm in Lake Žuvintas. The water level in Lake Žuvintas would drop down below its critical level – 86.32 m a. m. s. l. The critical water level was based upon the attitude of outcropped mire areas in the lake during the highest subsidence. The most sensitive part of Lake Žuvintas, from this standpoint, appeared to be in the south-western edge near the outlets of the Bambena and the Rudė rivers.

Consequently, the area of surfacing shallow in Lake Žuvintas would increase. Besides, the groundwater level can decrease by 2–80 cm in the complex of wetlands surrounding the lake (Fig. 4). The removal of sluice-gates can negatively influence Lake Amalvas as well. The south-western part of this lake would dry up significantly. The groundwater level in the wetlands surrounding Lake Amalvas can decrease by 50 cm on average compared to the reference scenario.

The removal of sluice-gates would be followed by a 4% reduction in water storage capacity in Lake Dusia and by 30–35% in lakes Amalvas, Žuvintas and Simnas. This would shorten water residence time by one year in Lake Dusia and by 22 days in the other lakes. Consequently, the lakes would benefit from the reduced sediment retention capacity and increased processes of sediment flushout. Furthermore, changes in water level regime in the lakes would occur. 2.4 times higher fluctuations of water level (according to the coefficient of variation) in Lake Amalvas are expected. Water level fluctuations in lakes Žuvintas, Simnas, and Dusia would increase by 30, 55 and 22%, respectively (Fig. 3). The post-damming would condition the changed river flow pattern. By 10–30% higher daily peak outflows from Lake Dusia can be observed. The average outflow during the driest 30-day period would increase twice. Therefore, this would increase the inflow to the downstream located lakes Simnas and Žuvintas. The average daily inflow to Žuvintas is expected to increase by 12%, while the peak ones by 30% in comparison to the dammed conditions. The same tendencies as for inflows would appear also in the dynamics of outflows.

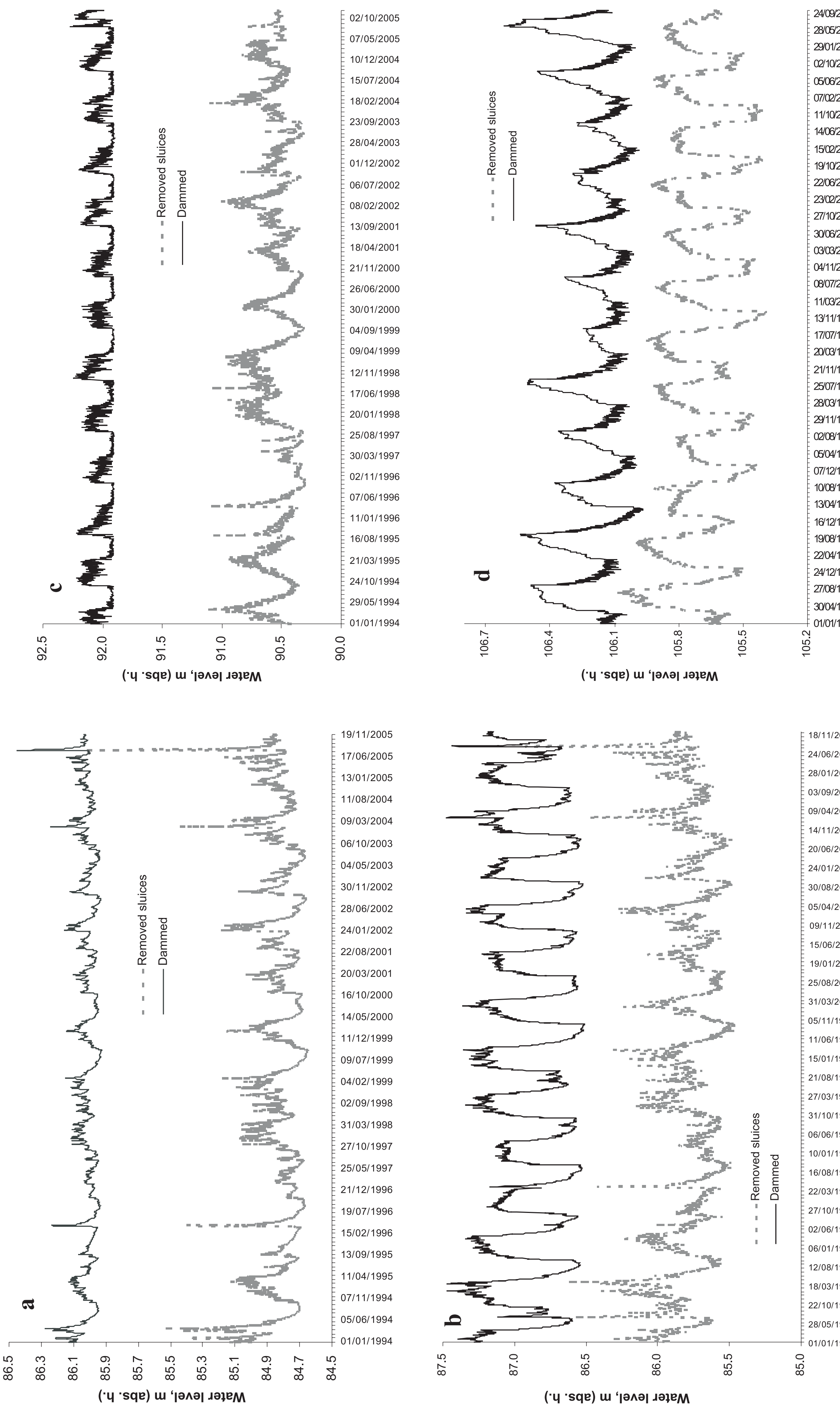

Fig. 3. Changes in water level dynamics in lakes Amalvas (*a*), Žuvintas (*b*), Simnas (*c*) and Dusia (*d*) after the removal of sluice-gates

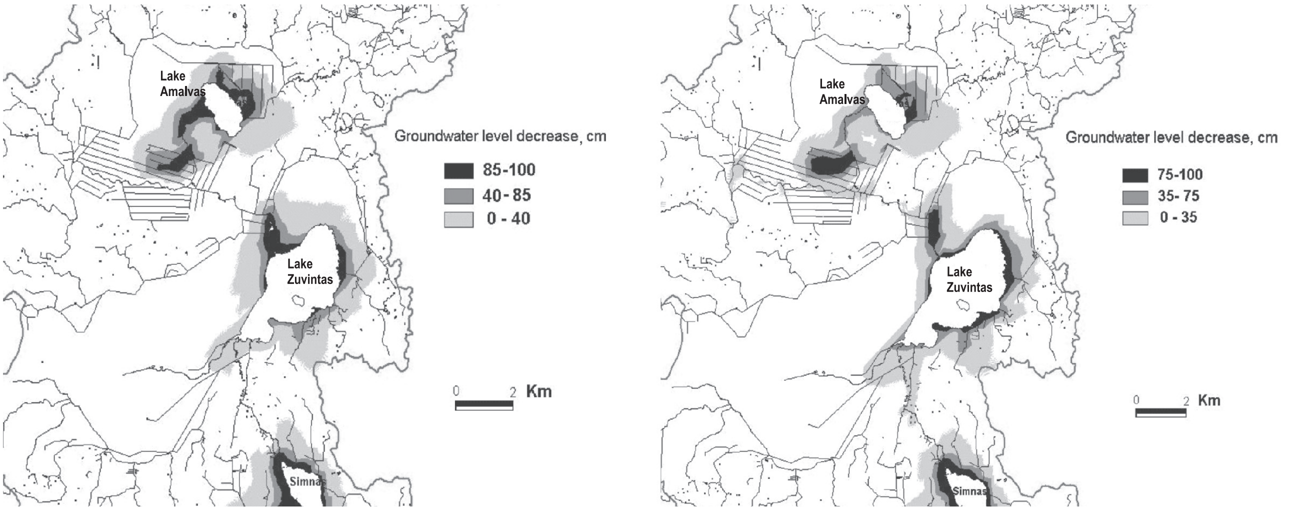

Fig. 4. Average decrease in groundwater level in Žuvintas and Amalvas wetlands in summer (*a*) and winter (*b*) seasons after the removal of sluice-gates

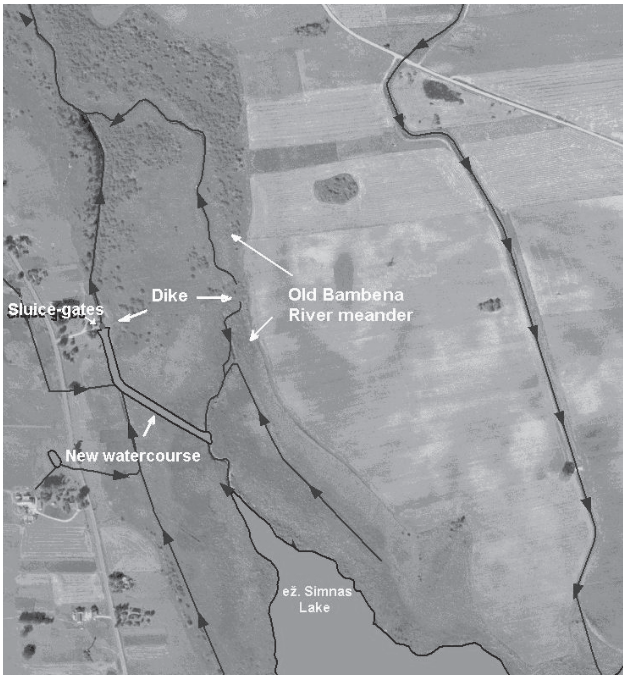

Fig. 5. The network of watercourses downstream Lake Simnas

Restoration of the outflow through the old Bambena river meander (scenario 2)

According to the water management project implemented in 1972, the hydrological regime in Lake Simnas was changed while installing sluice-gates and a dike at the outlet. Outflow from the lake was diverted to an artificial 700 m long new watercourse (Fig. 5). Consequently, a natural 890 m long strip of the Bambena river was abandoned.

While analysing the possibilities to reinstate the outflow from Lake Simnas through the old Bambena river meander, a similar simulation procedure as in scenario 1 was used. The main point of this numerical experiment was that according to the longitudinal profile and cross-sections of the old Bambena river meander, which were defined before the construction of the sluice-gates (Žuvinto rezervatas, 1961), the outflow conditions and the change of water levels in the lake were "restored". Consequently, the outflow from Lake Simnas proceeded only through the old Bambena meander. Short-term data on water level fluctuations in pre-dammed Lake Simnas, measured for the period from June 1960 to April 1961, were used to calibrate the model.

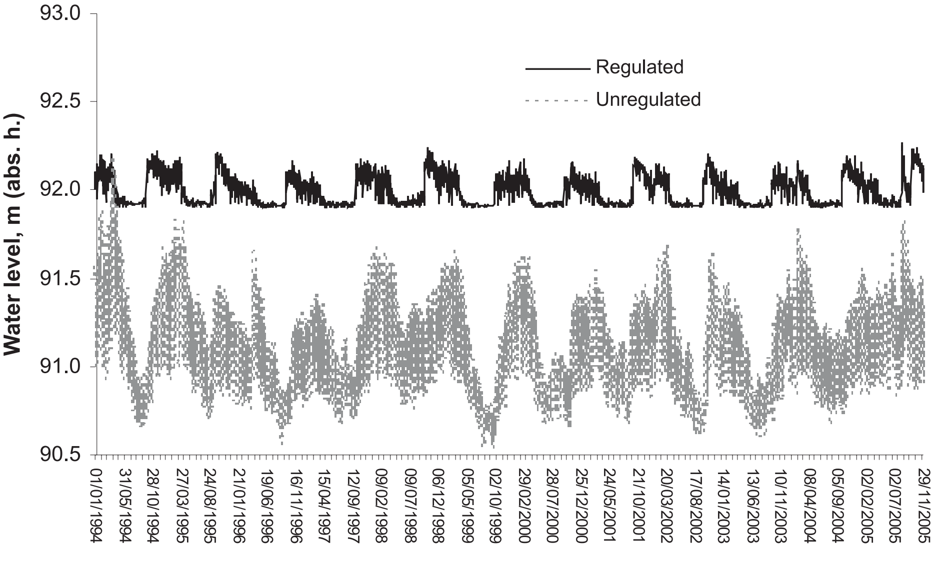

Fig. 6. Water level dynamics in Lake Simnas under regulated and unregulated outflow scenarios

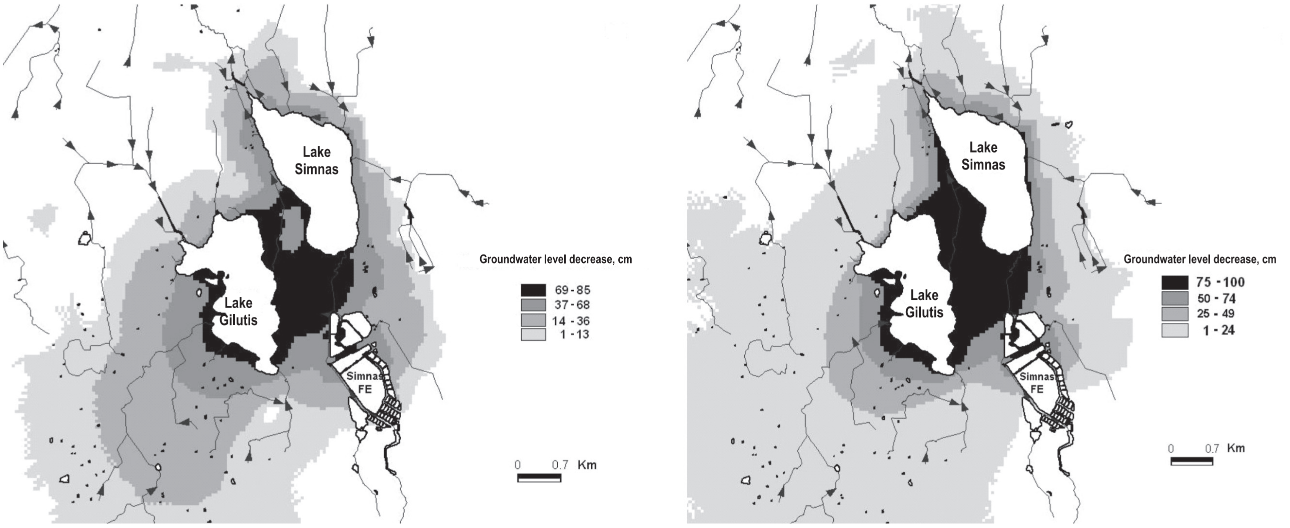

Fig. 7. Average decrease in groundwater level around Lake Simnas in winter (*a*) and summer (*b*) seasons (comparison between "regulated" and "restored" outflow scenarios)

The simulation results have shown that after the restoration of the outflow through the old Bambena river meander, water level in Lake Simnas would lower by 0.77 m on average (Fig. 6). The restoration would be followed by a threefold increase in water level fluctuations. Changes in surface water dynamics would induce changes of groundwater level in the surrounding areas as well. The decrease of groundwater level around Lake Simnas under "restored outflow" conditions is shown in Fig. 7.

During wet periods, the groundwater level would decline mostly in the areas situated to the south-west from Lake Simnas. There the decrease (in comparison with the present situation) would make 60–80 cm (Fig. 7a). In the eastern part of the shores of Lake Simnas groundwater table would decline by 15–30 cm. Such decline would impact the areas situated at a distance of 300 m from the lake. During dry periods, the groundwater level can decline most (by 80 to 100 cm) in the area between lakes Simnas and Giluitis (Fig. 7b).

DISCUSSION AND CONCLUSIONS

Dams exert major impacts on river hydrology, primarily through changes in the timing, magnitude, and frequency of low and high flows, ultimately producing a hydrologic regime differing from the pre-impoundment natural flow regime (Magilligan, Nislow, 2005). Restoration of an unregulated flow regime has been cited as a necessary, and often sufficient, condition for restoration of the ecosystem (Bednarek, 2001). However, many of the physical changes are irreversible and have to be taken for granted when assessing the quality status of the river (Doyle et al., 2005). This necessitates the use of combined groundwater and surface water models to evaluate the effect of the changes.

Simulations by the SIMGRO model revealed that for the case of the Dovinė river basin the removal of sluice-gates would be followed by 1.2–2.4 times higher fluctuations of water level in the lakes in comparison with dammed conditions. The removal would result in a reduced sediment retention capacity followed by a shortened water residence time. The deepening and widening of pre-damming outlets while installing sluice-gates changed the outflow conditions. Therefore, the flow pattern in the river would change significantly during spring floods and drought periods. Daily maximum outflows from the lakes higher by 10–30% can be expected. At the same time, the average outflow during the driest 30-day period would increase twice. However, restoring the water dynamics and flow pattern of the Dovinė river to its original state by removing sluice-gates appeared to be hardly possible. The removal of sluices would result in an undesirable water level decrease in the lakes. Consequently, the entire naturalization of the hydrological regime in Lake Žuvintas is impossible. Such measure would destroy the lake.

Some measures to improve the hydrological situation along the Dovinė river, however, are possible. Reinstatement of historical outflow conditions through the old Bambena river meander downstream Lake Simnas could be an effective measure when trying to achieve entire naturalization of water level regime in the lake. This measure would activate the retention of biogenic substances (phosphorus in particular) and sediment in the floodplain. The restoration would increase threefold water level fluctuations in Lake Simnas, consequently, the outflow discharges would assume features characteristic of natural rivers. However, water level in the lake would decline by 77 cm on the average. This would lead to a decrease of groundwater level in the surrounding areas (within the radius of 500 m) by 0.15 to 1.0 m. Such a decrease can significantly worsen the ecological conditions in and around Lake Simnas.

Therefore, the damming in the lakes remains necessary in order to prevent the drying out of the lakes and to avoid the undesirable lowering of the groundwater table in adjacent wetlands. This indicates that the Dovinė river has been modified to such a degree that the changes are hardly reversible. When striving for at least a partial flow naturalization, reconstruction of the sluice-gates is necessary. As an effective measure, replacement of the sluice-gates by overflow type spill-weirs of a complex shape can be considered.

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References

1. Adrian D., Werner A. D., Gallagher M. R., Weeks S. W. 2006. Regional-scale, fully coupled modelling of stream–aquifer interaction in a tropical catchment. *J. Hydrol.* Vol. 328. P. 497–510.
2. Bednarek A. T. 2001. Undamming rivers: a review of the ecological impacts of dam removal. *Environmental Management.* Vol. 27(6). P. 803–814.
3. Bradley C. 2002. Simulation of the annual water table dynamics of a floodplain wetland, Narborough bog, UK. *J. Hydrol.* Vol. 261. P. 150–172.
4. Bragg O., Lindsay R., Risager M., Silvius M., Zingstra, H. 2003. Strategy and action plan for mire and peatland conservation in Central Europe. *Wetlands International Publication*. Vol. 18. Information Press Ltd., Oxford.
5. Doyle M. W., Stanley T. E. H., Orr C. H., Selle A. R., Sethi S. A., Harbor, J. M. 2005. Stream ecosystem response to small dam removal: lessons from the Heartland. *Geomorphology.* Vol. 71. P. 227–244.
6. Dunn S.M., Ferrier, R. C. 1999. Natural flow in managed catchments: a case study of modeling approach. *Water Research.* Vol. 33(3). P. 621–630.
7. Kilkus K. 2004. Minimalaus nuotėkio, pilnos vagos debitus atitinkančių skerspjūvių ir hidrofizinių-hidrocheminių rodiklių erdvinis pasiskirstymas Dovinės upės baseine (palyginamoji analizė). PIN-Matra projektas Nr. 2003/040 (galutinė ataskaita).
8. Kupper E., Querner E. P., Morábito J. A., Menenti, M. 2002. Using the SIMGRO regional hydrological model to evaluate salinity control measures in an irrigation area. *Agricultural Water Management.* Vol. 56(1). P. 1–15.
9. Magilligan F. J., Nislow K. H. 2005. Changes in hydrologic regime by dams. *Geomorphology.* Vol. 71. P. 61–78.
10. Mitsch W. J., Day J. W. 2006. Restoration of wetlands in the Mississippi–Ohio–Missouri (MOM) River Basin: experience and needed research. *Ecological Engineering.* Vol. 26(1). P. 55–69.
11. Mitsch W. J., Lefeuvre J. C., Bouchard, V. 2002. Ecological engineering applied to river and wetland restoration. *Ecological Engineering.* Vol. 18(5). P. 529–541.
12. Povilaitis A., Querner E. P. 2006. Analysis of water management measures in the Dovinė river basin, Lithuania. *Alterra Rapport. 1370.* Wageningen. 67 p.
13. Querner E. P., van Lanen H. A. J. 2001. Impact assessment of drought mitigation measures in two adjacent Duch basins using simulation modeling. *J. Hydrol.* Vol. 253. P. 51–64.
14. Querner E., Ślesicka A., Mioduszewski W. 2004. Ecohydrological system analysis of the Lower Biebrza Basin. *J. Ecohydrology & Hydrobiology.* Vol. 4(3). P. 307–313.
15. Thompson J. R, Sørenson H. R., Gavin H., Refsgaard A. 2004. Application of the coupled MIKE SHE/MIKE 11 modelling system to a lowland wet grassland in southeast England. *J. Hydrol.* Vol. 293. P. 151–179.
16. White D., Fennessy S. 2005. Modeling the suitability of wetland restoration potential at the watershed scale. *Ecological Engineering.* Vol. 24(4). P. 359–377.
17. Zalidis G.C., Takavakoglou V., Panoras A., Bilas G., Katsavouni S. 2004. Re-establishing a sustainable wetland at former Lake Karla, Greece, using Ramsar restoration guidelines. *Environmental Management.* Vol. 34(6). P. 875–886.
18. Zhang L., Mitsch, W. J. 2005. Modelling hydrological processes in created freshwater wetlands: an integrated system approach. *Environmental Modeling and Software.* Vol. 20(7). P. 935–946.
19. Walsum P. E. V. van, Veldhuizen A. A., Bakel P. J. T. van, Bolt F. J. E., van der, Dik P. E., Groenendijk P., Querner E. P., Smit, M. F. R. 2004. SIMGRO 5.0.1: theory and model implementation. *Alterra Rapport. 913.1*. Wageningen.
20. Žuvinto rezervatas. 1961. *Detalių tyrinėjimų techninė ataskaita*. Pramoninės statybos projektavimo institutas.

Arvydas Povilaitis, Erik Querner

GALIMI HIDROLOGINIO REŽIMO POKYČIAI DOVINĖS UPĖJE PAŠALINUS ŠLIUZUS-REGULIATORIUS

Santrauka

Dovinės upės hidrologinis režimas pagal 1972–1974 m. įgyvendintą projektą tiesiogiai reguliuojamas šešiose vietose. Tam tikruose upės ruožuose pastatyti skirtingo dydžio ir vandens pralaidumo šliuzai-reguliatoriai, sudarantys patvanką Dusios, Simno, Žuvinto ir Amalvo ežeruose. Darbe analizuojami galimi hidrologinio režimo pokyčiai Dovinės upėje panaikinus šliuzus-reguliatorius. Tam tikslui panaudotas matematinio modeliavimo metodas pritaikant SIMGRO modelį.

Tyrimo rezultatai parodė, kad dėl šliuzų-reguliatorių panaikinimo ženkliai pažemėtų vandens lygiai ežeruose. Tokia priemonė sunaikintų Žuvinto ežerą ir neigiamai paveiktų vandens režimą Žuvinto–Amalvo pelkių komplekse.

Ištakos Bambenos upės senvage žemiau Simno ežero atkūrimas būtų efektyvi priemonė siekiant natūralizuoti vandens lygių režimą Simno ežere ir biogeninių medžiagų sulaikymą paežerės salpoje. Deja, ši priemonė sąlygotų požeminio vandens lygio pažemėjimą iki 1 m aplinkinėse teritorijose.

Gauti rezultatai rodo, kad vandens režimas Dovinės upėje yra labai pakeistas. Vien šliuzų-reguliatorių panaikinimu jo visiškai natūralizuoti negalima. Siekiant bent dalinio vandens režimo natūralizavimo būtina rekonstruoti šliuzus-reguliatorius.

Raktažodžiai: Dovinės upė, Žuvinto ežeras, SIMGRO modelis, hidrologinis režimas, pelkės