

Designing Specific Habitats as a Measure to Reduce the Impacts on River

Concevoir des habitats spécifiques comme mesure pour réduire les impacts sur la rivière.

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RÉSUMÉ

Selon certaines données, 95 % des rivières en Europe occidentale sont plus ou moins dégradées. La restauration des rivières et la réhabilitation des écosystèmes fluviaux seront donc un processus long mais nécessaire. Ce faisant, nous devons nous poser la question : que protégeons-nous, ou que créons-nous ? Les formes géomorphologiques et les habitats protégés sont-ils quelque chose créé par la nature, ou quelque chose créé par l'homme que la nature a ensuite repris ? Lors de la gestion des rivières modernes, pouvons-nous vraiment tracer une ligne claire entre ce que la nature a créé et ce qui a été influencé par l'humain ?

Nous avons été confrontés à de telles dilemmes lors de l'intégration de la centrale hydroélectrique de Brežice dans l'environnement, car nous protégions des valeurs naturelles qui avaient en réalité été créées par l'homme dans le passé. Les changements dans le régime fluvial et le changement climatique, qui ont modifié les besoins en eau actuels, menaçaient ces valeurs. La solution pour les protéger et répondre à ces changements a été de créer des habitats spécifiques, conçus comme des zones protégées destinées à certaines espèces.

Une approche multidisciplinaire était essentielle pour concevoir ces solutions, mais cela ne suffisait pas – une vision large était également nécessaire. En regardant vers le passé, nous avons pu concevoir un avenir où la nature et l'homme coexistent et partagent la rivière.

ABSTRACT

According to some data, 95% of rivers in Western Europe are more or less degraded. Restoring rivers and re-establishing river ecosystems will therefore be a long but necessary process. In doing so, we must ask ourselves: what are we protecting, or what are we creating? Are the protected geomorphological forms and habitats something created by nature, or something created by humans that nature has taken over? When managing modern rivers, can we draw a clear line between what nature has created and what has been influenced by humans?

We faced such dilemmas when integrating the Brežice Hydroelectric Power Plant into the environment, as we were protecting natural values that were actually created by humans in the past. Changes in the river regime and climate change, which have altered today's water needs, posed threats to these values. The way to protect and respond to these changes was to create specific habitats, designed as protected areas for specific organisms.

A multidisciplinary approach was essential in designing these solutions, but it wasn't enough – a broad perspective was also required. By looking into the past, we could design a future in which nature and humans coexist and share the river.

KEYWORDS

Environment protection dilemmas, Environmental value, Impact of hydropower plants, Maintenance with added value, Reduction of the impacts of energy facilities

Dilemmes de protection de l'environnement, Valeur environnementale, Impact des centrales hydroélectriques, Entretien avec valeur ajoutée, Réduction des impacts des installations énergétiques.

1 EXTENDED ABSTRACT

The only constant is change. Nature is constantly evolving, and climate change is creating new conditions for both humans and the environment. At the same time, the Sava River is an example of a watercourse where changes are now being observed, which have been caused by water management measures implemented several decades, even centuries ago. Static structures, such as hydropower plants, need to adapt to this dynamism through new measures that do not oppose nature but rather embrace new natural conditions and build upon the advantages that run-of-the-river reservoirs has to offer.

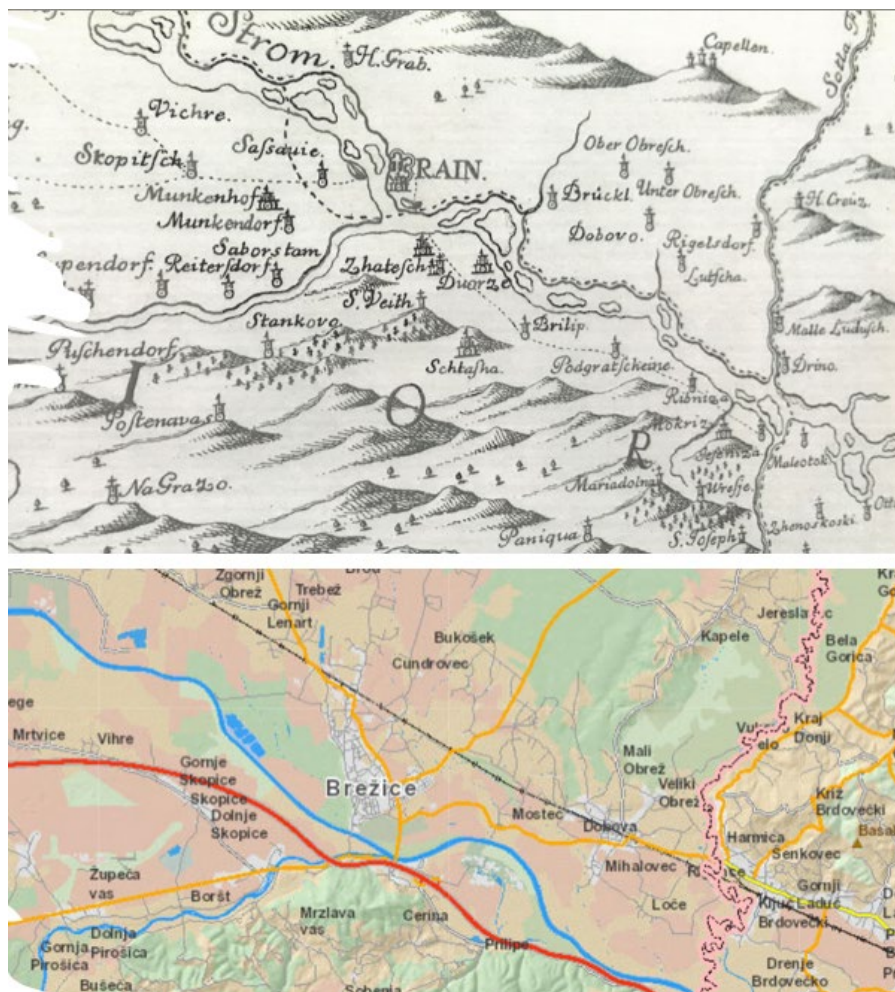


Figure 1: River Sava in the 19th (above) and 21st century (below) – there is no free space for the river to return to an ecologically stable form as it was in 19th century.

And exactly the reservoirs of every hydropower plant have significant impact, causing the most substantial spatial changes and environmental influences during its operation. Modern approaches to locating reservoirs demand a comprehensive and multidisciplinary approach involving various stakeholders. Involving a broad range of experts from different fields opens up numerous questions but also enables actions that reduce the impact during the facility's establishment and operation.

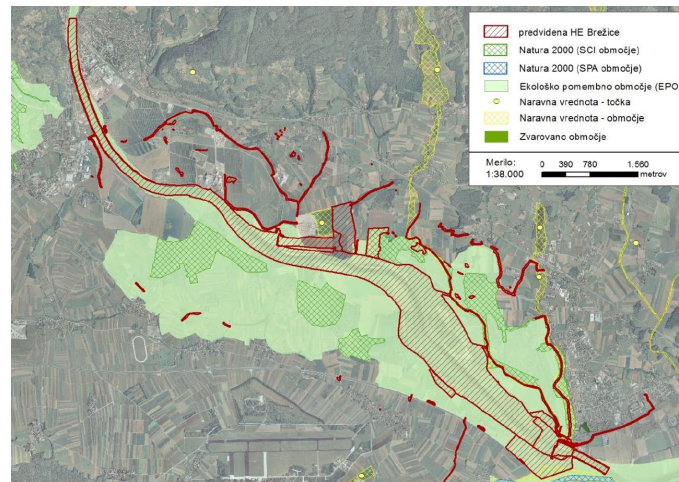


Figure 2: Protected areas (green) and depiction of infrastructure of the Brežice Hydropower Plant (red).

A practical example is the reservoir of HP Brežice on the lower Sava River, where several specific habitats were designed. The starting point was defining the elements of protected nature, which were thoroughly analysed. Key question was “what impacts the construction of the hydropower plant would have on them and how these impacts could be mitigated”. For those organisms for which the construction of the hydropower plant meant a loss of habitat, specific habitats were designed to simulate a particular living environment. The placement of these habitats, in many cases, exceeded the boundaries of the hydropower plant construction and required collaboration with other stakeholders. It also necessitated the use of land outside the strict area occupied by the hydropower plant, taking into account existing activities in the area (such as agriculture, various economic infrastructures, flood control measures, etc.).



Figure 3: Specific Habitat designated for the European pond turtle, approximately 2 years after construction. The originally bare gravel surfaces are gradually becoming overgrown. On the right, fallen trees are visible, where beaver activity is present. Is this an example of successful environment measure or failed project?

Now, during operation, data is collected through monitoring and collaboration with experts in ecology, biology, and other natural sciences. This information are used to plan new habitats or adapt existing ones.

Maintaining hydropower plants should generally be a routine activity. However, new findings about organism migrations (e.g., fish), the arrival of new species in the area (e.g., beaver), the spread of new invasive species (e.g., zebra mussel), changes in the river's hydrological regime (e.g., transition of the Sava River from snow-rain to rain regime), and climate change require continuous development and adaptation. All new measures must

now adhere to the principles of a circular economy, while considering the carbon footprint, which becomes increasingly important for activities related to sediments. Within HESS (Slovenian hydroelectric power company), a dual system is in place: On one side a monitoring the condition of reservoirs is organised. And on the other side is formulating a set of desired measures to increase environmental and social value. This dual system allows for the comparison of both aspects and enables actions that result in added value during each remediation or modification. Numerous examples of such actions exist on the lower Sava River, with the Kompolje embankment project on reservoir of the Boštanj hydropower plant currently in the implementation phase.

And last but not least, while we try to preserve natural values, a question arises – what exactly are we trying to preserve? Is it a natural condition or something already changed that nature has assimilated?



Figure 4: Nowadays, we are protecting artificial forms, such as gravel pits, in the name of bird nesting.

This paper will present several topics, all based on the experience of building a chain of HPPs on the Lower Sava River. Some natural forms that now hold value were created by humans in the past. This means that what was once a degradation of nature is now worth protecting. Do apocalyptic headlines in the media, suggesting that nature will be destroyed, make sense?

The spatial placement of electro-energy facilities is nowadays a challenging task, and specific habitats provide a solution for conserving nature around both new and existing facilities. Through these reserved areas, we create space for nature to flourish. This demonstrates how human impact and nature conservation can be balanced and sustainable development achieved.

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