Conclusions

The survey is still in progress and the data obtained from the remaining sites is needed to provide a full insight into the status quo regarding the level of faecal contamination of water bodies in Serbia. Based on the samples processed so far, the seriousness of the situation is more than evident. In further research, the origin of faecal pollution at impacted sites will be traced using quantitative PCR - based assays for the analysis of general-, human- or animal-associated genetic Bacteroidetes faecal markers.

References

Byamukama D, Mach RL, Kansiime F, Manafi M, Farnleitner AH (2005): Discrimination efficacy of faecal pollution detection in different aquatic habitats of a high-altitude tropical country, using presumptive coliforms, Escherichia coli, and Clostridium perfringens spores. Applied and Environmental Microbiology 71, 65–71.

European Commission (2000): Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy. J. Eur. Commun 22.

European Commission (1991a): Council Directive of 21. May 1991 concerning urban waste water treatment (91/271/EEC). J Eur Commun 34–40.

European Commission (1991b): Directive of the Council of December 12, 1991 Concerning the Protection of Waters Against Pollution Caused by Nitrates from Agricultural Sources (91/676/EEC). J Eur Commun 1–8.

European Commission (1998): Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption. J Eur Commun 32–54.

Kirschner AK, Kavka G, Reischer GH, Sommer R, Blaschke AP, Stevenso M, Vierheilig J, Mach RL, Farnleitner AH (2014): Microbiological Water Quality of the Danube River: Status Quo and Future Perspectives, in Liska, I. (Ed), The Danube River Basin. Springer Berlin Heidelberg, Berlin, 439–468.

Kirschner AK, Kavka G, Velimirov B, Mach RL, Sommer R, Farnleitner AH (2009): Microbiological water quality along the Danube River: Integrating data from two whole-river surveys and a transnational monitoring network. Water Res 43, 3673–3684.

Serbian Environmental Protection Agency (2018): Status of surface water of the Republic of Serbia – development of monitoring within river basin management plans. ISBN 978-86-87159-19-8

Water Law of the Republic of Serbia (2010):. Official Gazette of the Republic of Serbia 30/10.

Improving water quality for nature, humans and the Black Sea – the launch of the IDES project funded by the Danube Transnational Programme

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25 partners of ten countries along the Danube (Germany, Austria, Romania, Hungary, Slovenia, Slovakia, Bulgaria, Serbia, Croatia and Moldavia) join forces in the EU-funded project IDES to improve water quality in the Danube River and its tributaries by integrative floodplain management based on Ecosystem Services. Synergies instead of trade-offs, identified by an impartial evaluation tool, will foster the implementation of water quality management for a better environment both for nature and humans.

Background

National governments have committed themselves to the aim of reducing the nutrient loads transported by the Danube in order to ensure and enhance the ecological status of the Danube. The challenge of reducing the eutrophication of the Danube and its tributaries, and thus of the Black Sea, can only be met by transnational basin-wide cooperation. Diffuse pathways clearly dominate overall emissions, with rural emissions as major source. Emissions differ extremely between regions, but every region is affected: e.g. Germany and Slovenia produce the highest area-specific N emissions in the basin, Serbia generates the highest area-specific P emission rates (ICPDR 2015). Near-natural floodplains or buffer strips have high potential to reduce nutrient pollution, small but specific areas of them may even contribute significantly to reducing the nutrient inputs and to increasing the nutrient retention rates (Gericke et al. 2020). However, floodplains are subject to multiple human uses which strongly affect the water quality of rivers. Water quality management faces immense competition with other interests in floodplains (e.g. land use, fishery, navigation, flood retention), thus leading to very slow progress in implementation. So far, these uses have been managed sectorally (e.g. water management, nature conservation, agriculture), rarely regarding water quality or interactions between sectors. The ongoing project Danube Floodplain (Rîndasu-Beuran 2019) links attempts to improve flood retention and restoration, while water quality is not yet in focus. IDES project aims to add water quality targets to this effort and improve water quality by developing integrative floodplain management based on ecosystem services.

Ecosystems offer many services to human well-being (MA 2005). Along rivers and floodplains, nature provides manifold services, for instance flood protection, nutrient retention, drinking water, food and fibre production, habitats for biodiversity and possibilities for recreation, heritage or education (Grizetti et al. 2015). Degraded floodplains, in contrast, are not able to offer these goods or only in strongly reduced amounts. Taking into account all relevant ecosystem services, a multi-functional and sustainable water

and floodplain management can be established. Implementation and awareness of the ecosystem service approach varies widely in the Danube region (Badura et al. 2018), but so far it has not been used pro-actively anywhere for spatial planning or as an official part of planning or permission procedures. The use of a River Ecosystem Service Index in Germany has shown that water management significantly improves when synergies between various ecosystem services, which reflect the various sectoral interests and targets, were identified (Pusch et al. 2018, Stammel et al. 2020).

The IDES Project

Against this background, a consortium of 11 project partners from seven countries (Germany, Austria, Slovenia, Hungary, Serbia, Romania, Bulgaria) and 14 associated strategic partners (additional countries: Slovakia, Croatia, Moldava and three international associations) started the project IDES – Improving water quality in the Danube river and its tributaries by integrative floodplain management based on Ecosystem Services in July 2020. After an application phase of almost two years, there are now 30 months of intensive cooperation for this task. Financial support is provided by the ERDF fund and the IPA fund in the Danube Transnational Programme.

The IDES project aims to develop and implement a transnational integrative ecosystem service approach to improve water quality management and thus to generate win-win-situations for multifunctional floodplains instead of trade-offs. In the future, the new IDES evaluation tool should enable the national key actors in water quality management to identify the most sustainable measures without neglecting the needs of other sectors and thus reduce target conflicts among different interests. The application of the innovative IDES tool in five pilot areas in Austria, Slovenia, Hungary, Serbia and Romania (fig. 2) will provide best practice examples and water quality management concepts co-created with local, regional and national stakeholders. On the transnational level, a joint strategy on how to employ this homogenous approach in water management will accelerate integrative management and thus the development of multi-functional green infrastructure in the Danube region.

Three workpackages, one single aim: development of the IDES tool

During the two-and-a-half-year implementation timeline, the actions of three technical work packages will focus on the following:

In work package 1 one focus is on the analysis of the actual situation of water quality and its pressures (mainly via the geographical explicit model MONERIS, Venohr et al. 2011) and of ecosystem services in the whole Danube region by GIS analysis and literature review. Based on these

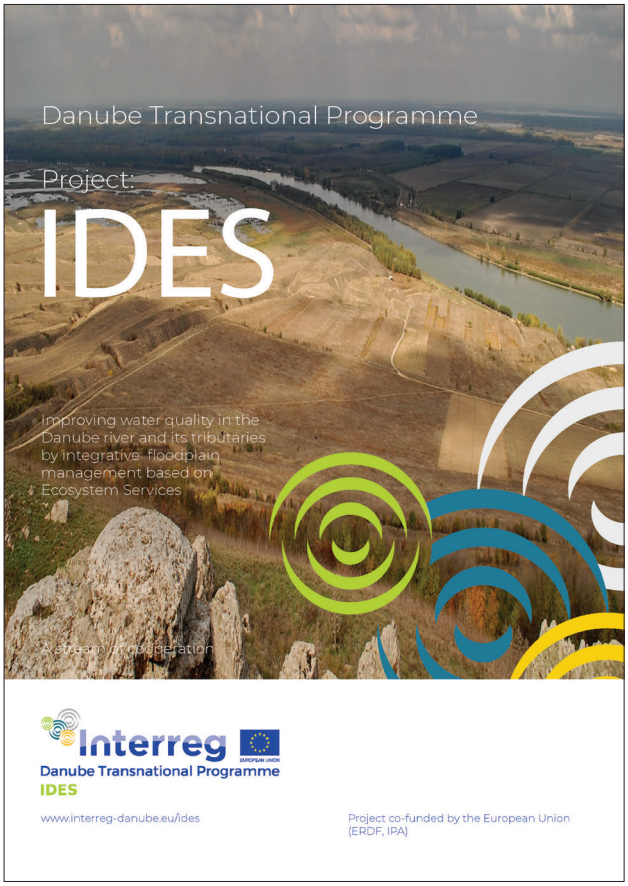

Figure 1: Official poster of the IDES project

enquiries, harmonization of already existing evaluation approaches and a joint framework of the new IDES evaluation tool will be developed. The tool will support planners in assessing all relevant ecosystem services, either provisioning, regulating or cultural services, homogenous in the same range and for the same spatial relation. The tool will enable spatially explicit assessment of the status quo and characteristic discharge situations (e.g. extreme flood events), but also of predicted water quality management options.

In work package 2 sustainable water quality management actions will be identified in five pilot areas reflecting different territorial and practical challenges. At two stakeholder workshops, innovative water quality management concepts will be jointly discussed and elaborated. Different scenarios will be assessed by the newly developed IDES tool leading to a smooth graphical visualization of the results and a more objective decision making. The results and the experience from the pilot actions will be summarized in the IDES manual and passed on to key actors of the participating countries during national training courses conducted by work package 1.

Work package 3 will subsequently develop a joint strategy to ensure the implementation of the IDES approach at political and administrative level. Both national action plans and a transnational strategy will provide the operational pathway to integrate the ecosystem service approach

in future water quality planning processes. Based on the findings of work package 1, all partners will agree on areas of high priority for water quality management actions alongside transnationally relevant rivers. They will be identified by combining the spatial evaluation on nutrient emission and water quality-related ecosystem services. Based on experiences of work package 2, recommendations on applicable water quality management actions will be described. By bringing both packages together, the most effective and promising water quality management actions (both in terms of areas and measures) will be prioritized in spatially explicit national action plans to support the tasks and mandatory evaluations (e.g. EU WFD) of water management authorities. As an important step, feedback from a transnational stakeholder workshop will be included helping to fine-tune the IDES tool and strategy in the final phase and to foster its implementation.

At the end of the IDES project in December 2022, the project will have produced eight outputs:

1. IDES tool: a method to evaluate ecosystem services homogenously as a basis for integrative floodplain management
2. Stakeholder workshops in five pilot areas focusing on water quality and ecosystem services
3. Water quality management concepts in five pilot areas
4. Implementation of the IDES tool in five pilot areas
5. IDES manual, including best practice examples and recommendations
6. National training courses for key actors in the water sector on the application of the IDES tool
7. Transnational stakeholder workshop in September 2022 in Budapest
8. Transnational strategy for implementing the IDES approach including national action plans

Virtual kick-off

The IDES project started in July 2020, just before the summer break. The kick-off event in September took place in the castle of Grünau near Neuburg/Danube in Germany, where the Lead Partner, the Aueninstitut Neuburg is based. But, like most events in this COVID-19 affected year 2020, it was held virtually. The kick-off event brought together key stakeholders and international project partners, a to tal of 99 participants from ministries, authorities, agencies, NGOs and universities, and from different disciplines (water management, environmental science, planners, foresters etc.). A mid-term conference will be held back-to-back with the postponed 43rd IAD conference in the second week of June 2021, hopefully as a real meeting in Neuburg or, if the pandemic still determines our everyday lives, again as a virtual event.

For more information about the project co-funded by the European Union (ERDF, IPA) visit the website www.interreg-danube.eu/ides. If you are interested in regular information, please subscribe to the newsletter http://www.interreg-danube.eu/approved-projects/ides/campaigns.

Figure 2: *Pilot Area "Braila Island" in the south-east of Romania along the heavily modified Danube with both wetlands and agricultural land providing many ecosystem services (source: RCSES; Tudor Racoviceanu)*

References

Badura M, Schmidleitner A, Tupikin O (2018): Ecosystem Services in the Danube - A report on the status quo of assessment, best practice examples and recommendations on how to consider ecosystem services within decision making. Report for Bavarian State Ministry for the Environment and Consumer Protection, European Strategy for the Danube Region (EUSDR), Priority Area Coordinator (PAC) 06. https://nature.danube-region.eu/?mdocs-file=565

Gericke A, Nguyen HH, Fischer P, Kail J, Venohr M (2020): Deriving a Bayesian Network to Assess the Retention Efficacy of Riparian Buffer Zones. Water 2020, 12, 617. https://doi.org/10.3390/w12030617

Grizzetti B, Lanzanova D, Liquete C, Reynaud A, Rankinen K, Hellsten S, ..., Cardoso AC (2015): Cook-book for water ecosystem service assessment and valuation. JRC Science and policy Report. European Commission Luxembourg.

ICPDR (International Commission for the Protection of the Danube River) (2015): Danube River Basin District Management Plan – Part A Basin-wide overview, Update 2015. https://www.icpdr.org/flowpaper/app/#page=1

MA (2005): Millenium Ecosystem Assessment. Ecosystems and Human Well-being: Synthesis. Island Press, Washington, DC.

Pusch MT, Podschun SA, Costea G, Gelhaus M, Stammel B (2018): With RESI towards a more integrative management of large rivers and floodplains. Danube News 38, 6-10.

Rîndasu-Beuran IS, Ciurea A, Mazilu P (2019): Danube countries review their options on flood risk management and include green infrastructures besides traditional measures in planning for a sustainable Danube. Danube News 39, 4-8.

Stammel B, Fischer C, Cyffka B, Albert C, Damm C, Dehnhardt A, Fischer H, Foeckler F, Gerstner L, Hoffmann T, Iwanowski J, Kasperidus H, Linnemann K, Mehl D, Podschun S, Rayanov M, Ritz S, Rumm A, Scholz M, Schulz-Zunkel C, Thiele J, Venohr M, von Haaren C, Pusch M, Gelhaus M (2020): Assessing land use and flood management impacts on ecosystem services in a river landscape (Upper Danube, Germany). River research and applications. http://dx.doi.org/10.1002/rra.3669

Venohr M, Hirt U, Hofmann J, Opitz D, Gericke A, Wetzig A, Natho S, Neumann S, Hürdler J, Matranga M, Mahnkopf J, Gadegast M, Behrendt H (2011): Modelling of Nutrient Emissions in River Systems – MONERIS – Methods and Background. International Review of Hydrobiology 96(5), 435–483.

How "*We Pass*" is Opening the Iron Gates to Danube Migratory Fish Species

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A recent report (Deinet et al. 2020) found populations of migratory freshwater fish species to have declined on a global scale by 76% since 1970 – and the highest of those drops has been experienced in Europe. In order for migratory fish such as shad, barbel, and others to reproduce, they have to travel further upstream in rivers such as the Danube – the only such paths to their ancient spawning grounds. However, this important aspect of their life-cycle has been and continues to be hindered across the world. While dams along the Danube River certainly provide vital infrastructure and renewable energy sources for the region and citizens, their establishment presents a major blockage to the migratory routes of many Danube fish species. Sturgeons – the flagship fish species for the Danube – are also one such species of migratory fish, already long endangered before Danube dams blocked essential migration routes due to overfishing.

The We Pass project is an initiative aiming to facilitate fish migration in the Danube River Basin, set up in 2019 by the ICPDR, Jaroslav Černi Institute, DDNI, CDM SMITH | OAK Consultants, and the Norwegian Institute for Nature Research. The focus is on the preservation of habitat and reestablishment of migration routes for fish at the Iron Gates stretching over the river between Serbia and Romania. While sturgeons are by no means the only fish species impacted – though they are considered to be among the most endangered groups globally according to the IUCN Red List of Threatened Species – they are also a flagship species for the ICPDR. With concerted study and efforts such as We Pass though, these iconic fish can not only be saved from completely disappearing, but can have their numbers brought back up to healthy levels all along the Danube.

Efforts to raise awareness were highlighted at the We Pass kick-off event held on 9 April 2019 in Kladovo (Serbia) and included a site visit at the Iron Gates I Đerdap Hydroelectric Power Station. In attendance were project partners, stakeholders, representatives of the Đerdap Hydroelectric Power Station, and members of the public.

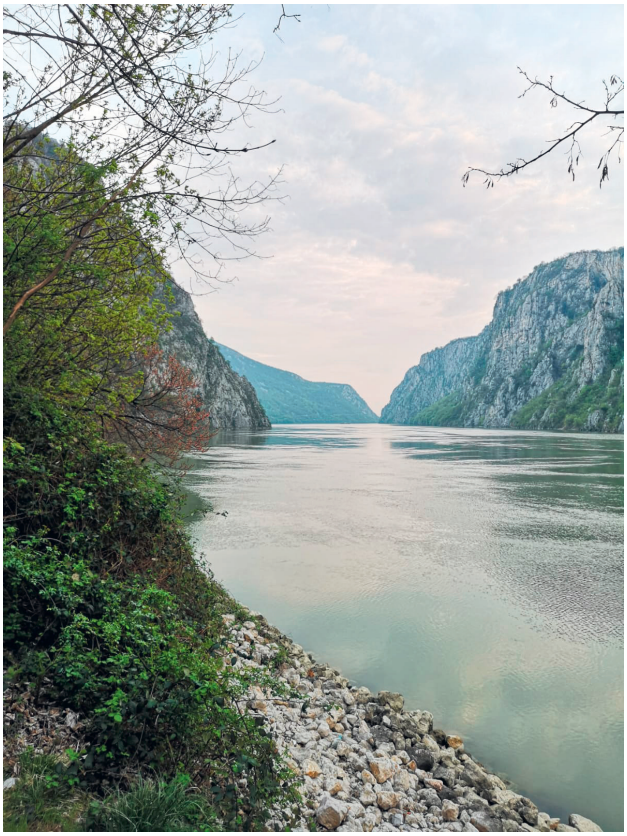

Figure 1: *View of the Iron Gates gorge, Serbia-Romania border*