

Webinar Report

Linking Blue and Green Infrastructure in the Danube-Carpathian Region: Prioritising Rivers, Wetlands, and Landscapes: An Integrated Connectivity Approach

Date: 11 November 2025, 9:30-12:30 CET

Organisers: BOKU University, Vienna, Austria, with the support of WWF-CEE, Austria, EUROPARC Federation, Germany, and IIASA, Austria

Participants: Approx. 50 participants from across the Danube-Carpathian Region and beyond. These included representatives of and observers to the International Commission for the Protection of the Danube River (ICPDR) and the Carpathian Convention, governmental administrations or authorities, followed by NGOs and research institutions, and other stakeholders from the private or sub-national level. This webinar helped refine the DCR case-study outputs before the final steps.

Objectives

- **Introduce the NaturaConnect case-study methodology** to map an ecological network of green & blue infrastructure in the Danube–Carpathian Region (DCR).
- **Invite participants to share feedback** on the methodology, usability, and next steps.
- Support EU biodiversity and restoration targets **through coordinated, cross-border planning approaches**.
- **Raise awareness & inspire action in the DCR** on integrated restoration and connectivity conservation.

Agenda Overview

- Welcome and introduction
- Opening remarks from ICPDR and Carpathian Convention Secretariats
- Overview of Natura Connect by IIASA
- Methodology presentation by BOKU University
- Deep dives and breakout sessions for feedback on:
 - Longitudinal connectivity
 - Lateral and hinterland connectivity
 - Integration and prioritisation
- Open discussion in the plenum
- Summary and evaluation



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1. Welcome & Introduction

- Purpose of the webinar and technical guidance.
- Explanation of the recording for internal reporting purposes only.
- Use of Mentimeter for interactive input.



Figure 1 Why is ecological connectivity important for you? Results of a Mentimeter question to all participants.

2. Opening Remarks

ICPDR Secretary (Birgit Vogel): Highlighted the importance of longitudinal connectivity, which was included in the Danube River Basin Management Plan (DRBMP) in 2009, and lateral connectivity to be added for the new DRBMP in 2027. NaturaConnect supports tangible links between river basin management, nature conservation, and spatial planning, aligned with the EU Green Deal and Nature Restoration Regulation.

Carpathian Convention Secretariat (Harald Egerer): Emphasised NaturaConnect as a flagship project for biodiversity and transnational cooperation. It strengthens the implementation of the Carpathian Biodiversity Framework and aligns with EU policies.

3. Project Overview (Piero Visconti, IIASA)

- Natura Connect aims to develop operational frameworks for ecological connectivity and support EU Biodiversity Strategy targets (30% protection).
- Provides tools for spatial planning and prioritisation of restoration.
- The consortium includes 22 organisations and six case studies, including the Danube-Carpathian region.
- Activities include species distribution modelling, ecosystem service mapping, connectivity guidelines, governance and financing reviews, and capacity-building tools.

4. Overview of the Methodology

Rafaela Schinegger & Carina Seliger, BOKU University

- **Europe's ecosystems are in crisis:**
 - o Overexploited, polluted, fragmented, and often destroyed.
 - o Habitat loss is driven by land-use change, invasive species, energy production, and climate change.
 - o These complex challenges demand comprehensive solutions, yet Europe still lacks integrated strategic planning to address them.
- **The EU Nature Restoration Regulation** is both a challenge and an opportunity. In the DCR, this is particularly relevant given the dense transboundary river network and the high pressure on riparian systems.
- Nature conservation planning requires **inter- and transdisciplinary cooperation to achieve successful and accepted approaches and solutions.**
- **Ecological prioritisation in the Danube River Basin Management Plan (DRBMP)** uses a new approach that includes not only longitudinal, but also lateral connectivity.
- **Data limitations** for Ukraine and Moldova.
- **Building on these challenges, the selected methodology is multi-dimensional and combines three scales:** longitudinal (river), lateral (riparian zone) and hinterland (sub-catchment) connectivity.

5. Deep Dives & Breakout Groups

DEEP DIVE 1

Longitudinal Connectivity Approach

Johannes Kowal, BOKU University

The proposed method for evaluating longitudinal connectivity uses a network (graph) approach to develop connectivity indices tailored to the perspective of migratory fish species. These indices serve as tools to identify and prioritise river reaches for conservation or restoration efforts, as well as barriers for removal or the installation of fish migration aids.

In his presentation, Johannes Kowal explained how longitudinal habitat connectivity can be assessed. Among others, the input parameters can include habitat availability/suitability, **restoration** relevance, as well as the position and passability of barriers. He discussed dispersal distances (**3,000 km, 300 km, and 30 km**) and barrier passability (with/without a fish pass in the up- and downstream directions) for long-, medium-, and short-distance migratory fish species. Finally, he presented the preliminary results of the longitudinal connectivity assessment and potential approaches for prioritising river reaches and barriers for restoration/conservation. This approach can support the provision of a transparent basis for identifying measures relevant under the **Nature Restoration Regulation** Article 9 (free-flowing rivers).

DEEP DIVE 1 Key Points of the Breakout Group Discussions

Group 1: Passability (Johannes Kowal, Georg Gruber)

Question 1: *How do you rate the suggested barrier passability values for SDM/MDM/ (short/medium-distance) migratory fish species? Please confirm or adjust these values via Mentimeter.*

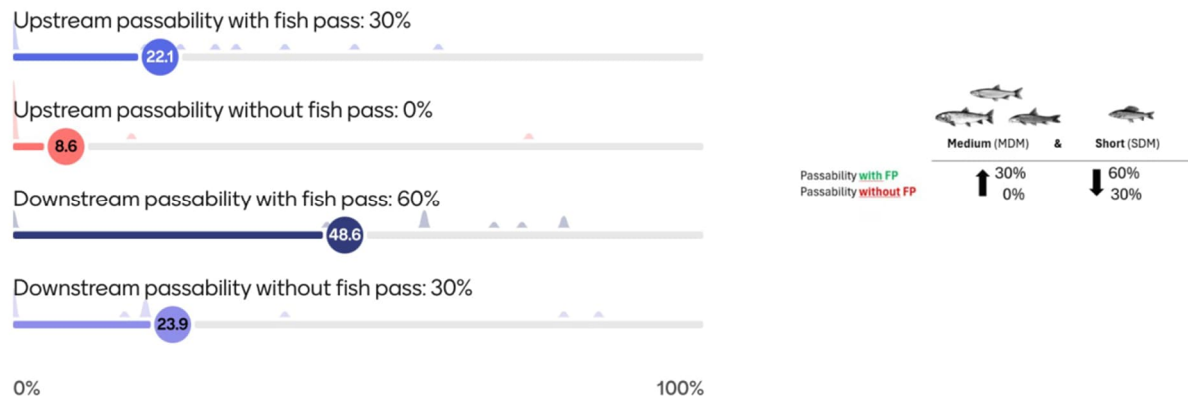


Figure 2 Mentimeter results of Deep Dive 1, Group 1, Question 1. © Johannes Kowal, BOKU IHG.

Question 2: *How do you rate LDM fish passability values, given that most fish passes are designed for MDM species? Confirm or adjust via Mentimeter.*

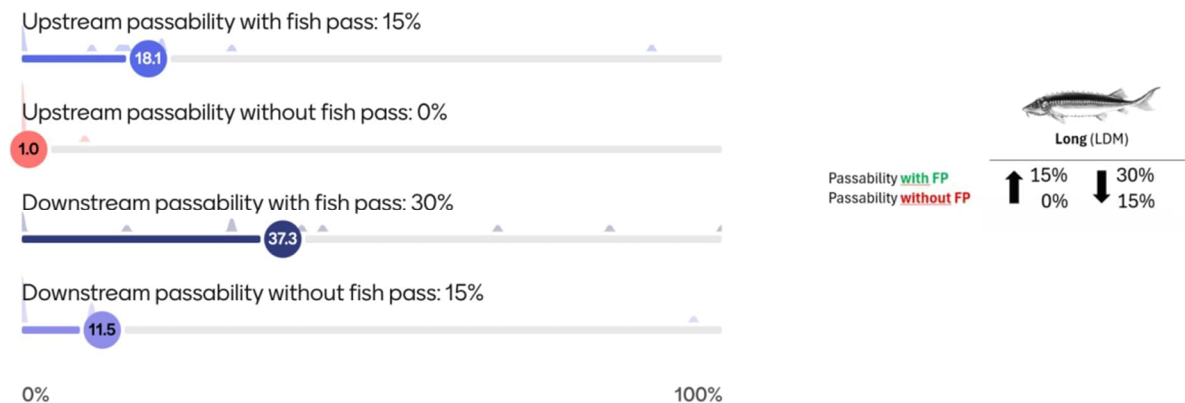


Figure 3 Mentimeter results of Deep Dive, Group 1, Question 2. © Johannes Kowal, BOKU IHG.

Question 3: *Is it urgent to address passability differences due to barrier type/height? If so, what strategies work considering limited data on barriers?*

- In principle, participants agreed that addressing passability differences due to barriers is urgent.
- The challenge of assessing the passability of dams was emphasised due to the considerable number of barriers and limited data. The recommendation was toward a pragmatic approach using national data and extrapolation. You may extrapolate from barriers with valuable information, data, or pilot investigations.

- The strategies require differentiation by type and height to prioritise mitigation efforts by fish species.
- In Slovakia, stakeholders engage in the terrain survey and propose standard solutions for barriers and species.
- Additional field assessments, including an evaluation of functional control, would be needed, especially concerning passing solutions for varied species. Barriers are 'individuals' and need to be assessed case by case.
- Hydromorphology and sediment data should be considered in the study, noting that fish passes alone do not guarantee healthy ecosystems. The suggestion was to integrate ecological status as weights, but it raises concerns about data availability and harmonisation. Further discussion is needed regarding how these datasets could be integrated across countries.

Group 2: Dispersal (Carina Seliger, Florian Borgwardt)

Question 1: *Are the currently used migration distances appropriate for long-distance migratory species?*

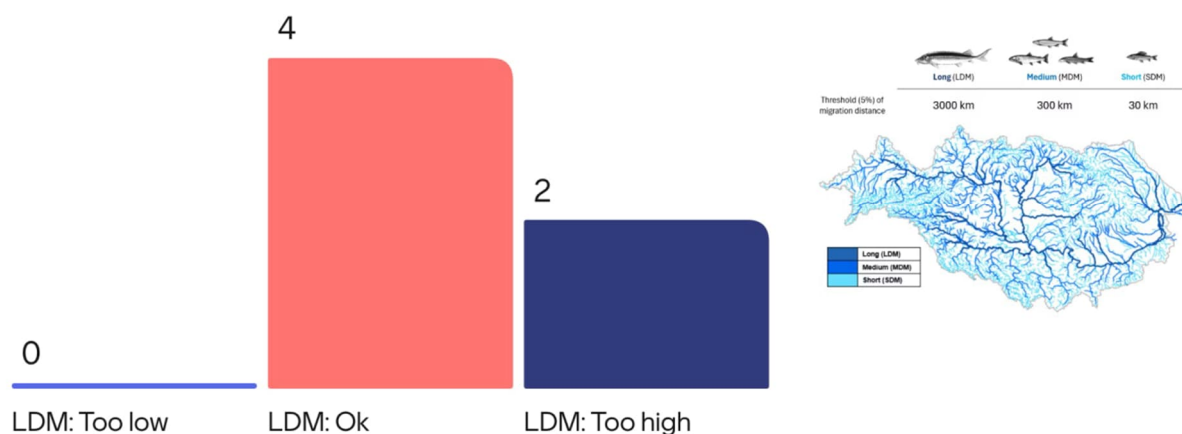


Figure 4 Mentimeter results of Deep Dive 1, Group 2, Question 1. © Johannes Kowal, BOKU IHG.

Question 2: *Are the currently used migration distances appropriate for medium-distance migratory species?*

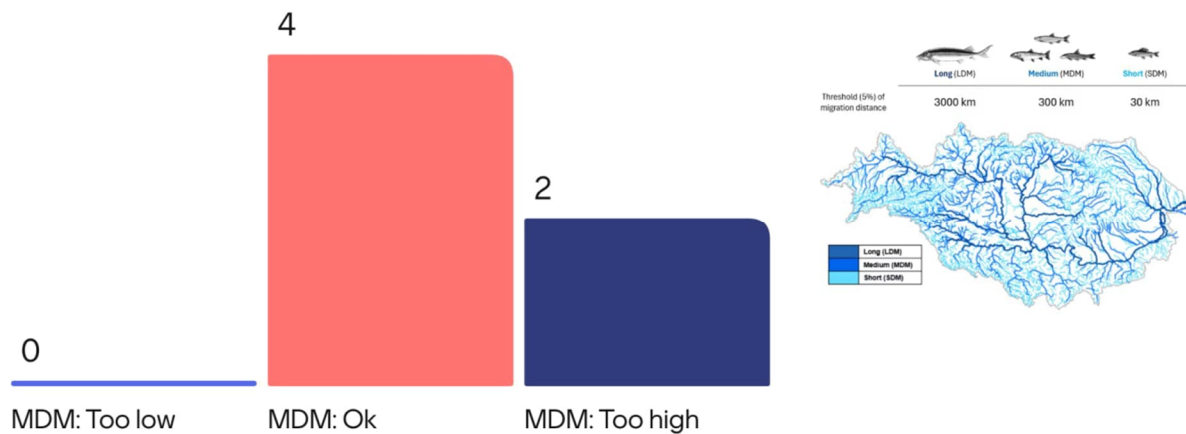


Figure 5 Mentimeter results of Deep Dive 1, Group 2, Question 2. © Johannes Kowal, BOKU IHG.

Question 3: *Are the currently used migration distances appropriate for short-distance migratory species (SDM)?*

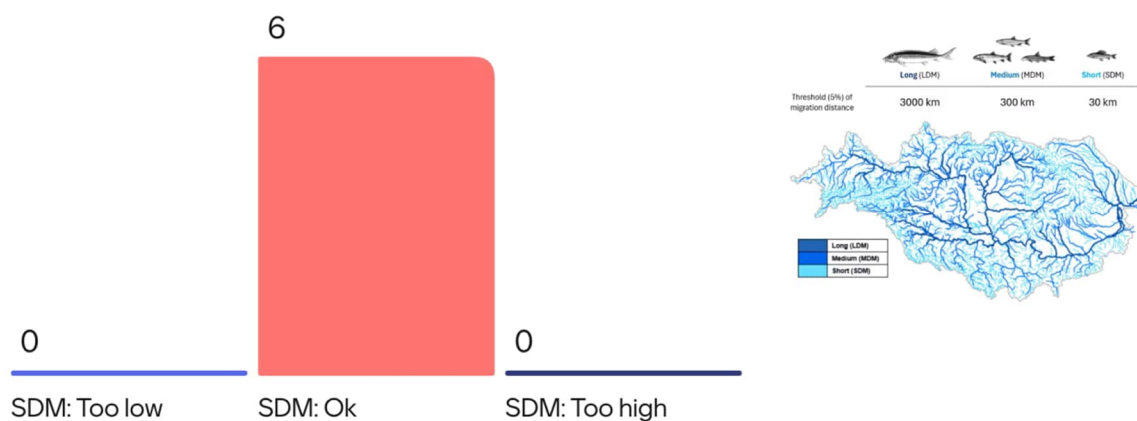


Figure 6 Mentimeter results of Deep Dive 1, Group 2, Question 3. © Johannes Kowal, BOKU IHG.

Participants' comments on the migration distances for LDM, MDM and SDM:

- 300 km seems very high - depends on habitats in the corridor; species can have intact populations with shorter stretches.
- Highest importance for near segments - threshold at 300 km considers only 5%.
- What are the changes in the map with shorter distances?
 - Shorter distances would shift the weighting toward nearby reaches, potentially changing local prioritisation patterns.

Question 4: *Currently, the LDM habitat receives the most attention since it is included in all three RCIs. In your opinion, is this indirect weighting approach legitimate?*

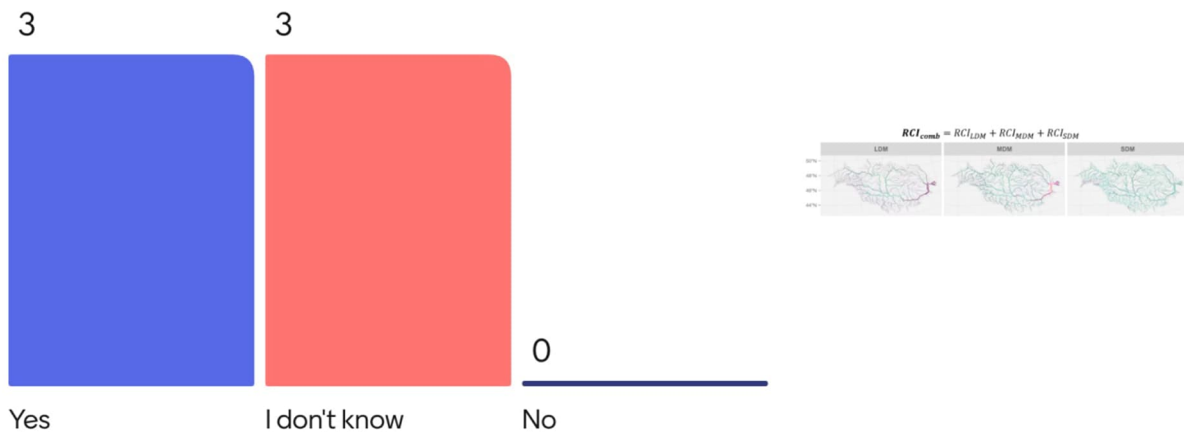


Figure 7 Mentimeter results of Deep Dive 1, Group 2, Question 4. © Johannes Kowal, BOKU IHG.

Group 3: Limitations (Rafaela Schinegger, Anna Huber)

Question 1: *In your opinion, what are the main strengths or limitations of the proposed approach?*

- Strengths: Very advanced and helpful, integration of additional information on fish movement capacities and needs; weighing, fish connectivity is strong.
- Limitations: Data availability; less focus on other species and river-based habitats, limited knowledge of barrier effects and locations in the Lower Danube and its tributaries.
- Other: What are the conventional methodologies for comparison? Have you been collaborating with governmental stakeholders?
 - Response: Yes, we have been collaborating with governmental stakeholders via ICPDR working groups. Conventional methodologies cover a wide range from simple rating approaches to more complex optimisation models.
- A problem with assessing the potential benefit of barrier removal was mentioned. To evaluate whether making a barrier passable, you need to know the actual benefit. But if we use current distribution data, you're already working with biased data. So, how do you face this problem?
 - Response: The distribution modelled (HSM) will be considered in the habitat index, presented in the previous presentation by Johannes Kowal.
- There are prioritisation barriers in Germany <https://www.wwf.de/fileadmin/fm-wwf/Publikationen-PDF/Deutschland/Fachgutachten-Oekologische-Priorisierung-zum-Rueckbau-von-Querbauwerken.pdf> There are more barriers available for the Balkan and the Danube River Basin.

Question 2: *Do you think it is legitimate that mainly large barriers are considered due to the lack of spatially unbiased information on smaller barriers?*

- Suggestion of trying the hypothesis on small barriers based on the limited available data to add the degree of uncertainty.
 - You work with the best available dataset, but it would be good to evaluate the uncertainty.
 - It is a common limitation and should not stop the analysis. These are the barriers that will have the most substantial impact at the large scale with the highest certainty in the level of impact.
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DEEP DIVE 2

Lateral & hinterland connectivity approaches

Georg Gruber, BOKU University

The lateral and hinterland connectivity approach is a river catchment-level analysis that integrates assessments of riparian zones and floodplains using structural and semi-functional approaches (e.g. species-based modelling, habitat connectivity), multiple human stressors on the landscape, and ecosystem services.

Riparian zones link ecosystems and combine green and blue infrastructure. These river-floodplain ecosystems are essential for sustaining high biodiversity in the landscape, but they are under threat from factors such as agriculture, urbanisation, channelisation, climate change, etc.

The analysis of the riparian zone connectivity includes two approaches: structural connectivity of natural habitats (areas in a natural state that are well connected to the river) and semi-functional connectivity based on species' habitat preferences. For both approaches, Copernicus Land Monitoring Service datasets were used. A resistance matrix was applied to analyse structural connectivity, and connectivity for two representative species groups was modelled to represent different ecological groups with different habitat preferences and home ranges, among the 137 animal species of freshwater and wetland ecosystems listed in the EU Habitats Directive identified by Schinegger et al. (2024). Based on this analysis and other NaturaConnect products, areas for connectivity restoration could be identified. Georg Gruber presented an example of the area between Vienna and Bratislava. With this example he showed how priority areas can be identified in detail and highlighted the importance of connectivity restoration and conservation.

DEEP DIVE 2 Key Points of the Breakout Groups Discussions

Group 1: Conservation (Georg Gruber, Johannes Kowal)

Question 1: *When you think about riparian connectivity conservation, what comes into your mind? How would you define riparian zone connectivity?*

place for natural flooding
 no barriers green riparian zone
 biodiversity tributaries
 active riverine landscape
 floodplain connection day
 floodplains areas shallow water
 more lateral than long
 resilience to disturbance

Figure 8 Mentimeter results of Deep Dive 2, Group 1, Question 1.

Question 2: *Based on your definition of riparian zone connectivity, please rate the resistance of the following landcover classes from 0 (good) to 100 (bad).*

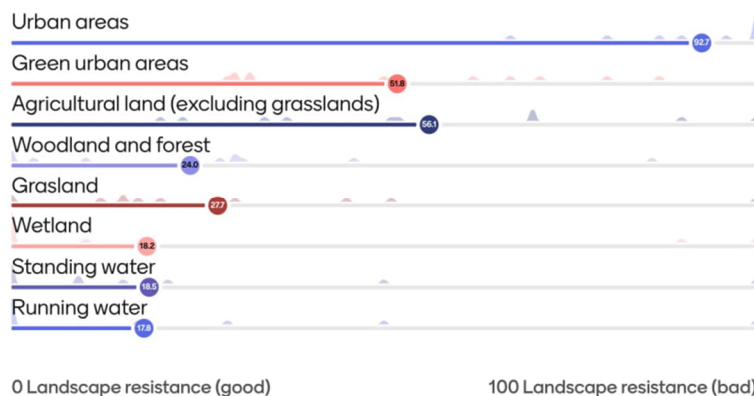


Figure 9 Mentimeter results of Deep Dive 2, Group 1, Question 1. © Carina Seliger, BOKU IHG.

Question 3: *How do you think these connectivity maps could help identify and prioritise areas for conservation efforts?*

- These maps could be used as background documents in climate strategies for various stakeholders, including the Nature Restoration Regulation (NRR), e.g. Article 9, etc.
- Maps are beneficial for implementing the Nature Restoration Regulation. Maps could be used to identify key areas and help get the public/landowners on board.
- Hotspots are nicely illustrated by the connectivity maps. Maps could help allocate funding to relevant areas efficiently.

- Maps are very helpful during transnational planning areas (border river stretches)

Participants' comments:

- One participant liked the landscape approach, but mentioned that the results seem questionable, e.g. the Tullnerfeld has the same score as the Danube National Park. Much more information on hydromorphology and flooding must be included, and habitats must be described in more detail. The participant wanted to see the EU datasets giving sufficient resolution.
 - o Response: Data on hydromorphology are rather heterogeneous within the ICPDR and are not comprehensively available for the entire study region. For the final step of integrating all 3 scales, additional information (e.g. protected areas) will be added to the overall prioritisation approach.

Group 2: Restoration (Carina Seliger, Florian Borgwardt)

Question 1: *From your background/experience, in which areas should lateral connectivity restoration be prioritised in terms of surrounding land-use/human uses, etc.?*

- Agricultural land
- Vicinity to protected areas
- Floodplain grasslands
- River tributaries
- Inland marches
- Biodiversity
- Programmatic approach: based on building a joint vision with the surrounding communities. Historic floodings open a window of opportunity. Around cities, there is usually a better chance to start.

Question 2: *Which benefits arise with restoration in terms of ecosystem services & multifunctionality?*

- Flood retention/prevention was most prominently mentioned.
- Nutrient retention
- Climate adaptation/shadowing
- Recreation potential, recreational fishing
- Habitat for specific species/biodiversity

Participants' comments:

- Communication of benefits is essential, e.g. flood retention.

- Is there any consideration of restoring hydraulic connectivity (lateral), and (semi)natural sediment flux and inputs?
 - Response: Related data are currently not available on the DCR-scale. Still, they are the focus of other projects, focusing on the Danube and its larger tributaries (e.g. using data from the Joint Danube Surveys (JDS)).
 - From a hydromorphological perspective, it is hard to think of restoring sediment connectivity.

Group 3: Hinterland (Rafaela Schinegger, Anna Huber)

Question 1: *Which stressors that are spatially available should be considered in multi-stressor maps?*

nutrient pollution
 wildfires energy infrastructure dev
 lateral barriers deforestation roads
 river drying agriculture land cover
 climate change
 human population roadkills
 land cover change
 water quality

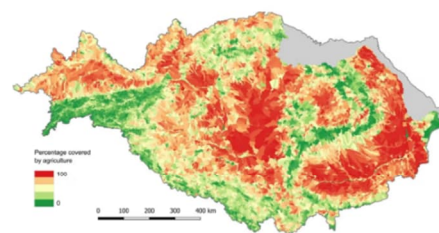


Figure 10 Mentimeter results of Deep Dive 2, Group 3, Question 1. © Georg Gruber, BOKU ILEN.

Participants' comments:

- Road kills might be a sign of an unidentified ecological corridor. Data should be obtained from the national authority responsible for road administration, police and related matters. Harmonising these data sources remains challenging, but stakeholders agreed that even partial datasets can reveal important spatial pattern.
- A case study from Bulgaria found river drying and an 80% decrease in water discharge in tributaries, which is caused by climate change, not by hydrological modification. They have good, comprehensive long-term data on fish populations, but these have to be evaluated.
 - o Response: It is mainly caused by climate change.

Question 2: *Which ecosystem services are most relevant for your work or region and why?*

natural and cultural heri
water retention
 carbon storage
 flood regulation pollination
 nutrient cycling



Figure 11 Mentimeter results of Deep Dive 2, Group 3, Question 2. © PBL, WUR, CICES 2024 in Koetse et al., 2018.

Question 3: *Which national or international policy frameworks could your hinterland-based configurations contribute to?*

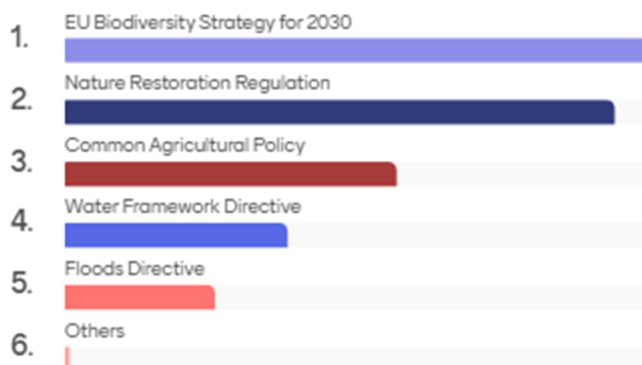


Figure 12 Mentimeter results of Deep Dive 2, Group 3, Question 3. Friberg et al., 2017.

Participants' comment:

- Connectivity issues must be clearly presented in the national directives/policies, which should also be well-connected with the EU Biodiversity Strategy.

DEEP DIVE 3:

The integration and prioritisation of approaches.

Carina Seliger and Rafaela Schinegger, BOKU University

Finally, Carina Seliger presented how the approaches to longitudinal, lateral and hinterland scales discussed earlier can be used to prioritise conservation and restoration areas. She

mentioned that datasets are incomplete, particularly for countries outside the European Union. Especially in Western Balkans and Eastern Partnership countries, further collaboration with national agencies will be crucial. She emphasised the importance of involving relevant stakeholders early in the conservation planning process, as well as the importance of scientifically sound results and scenarios in decision-making. BOKU University can support the process by visualising potential conservation and restoration areas on maps but asks for input on specific applications of the generated data.

Rafaela Schinegger then opened the final discussion by asking five Mentimeter questions and discussing their results.

Mentimeter Questions for the Panel

Question 1: *Are planning authorities using biodiversity and natural resource data from studies covering multiple neighbouring countries & conservation priorities?*

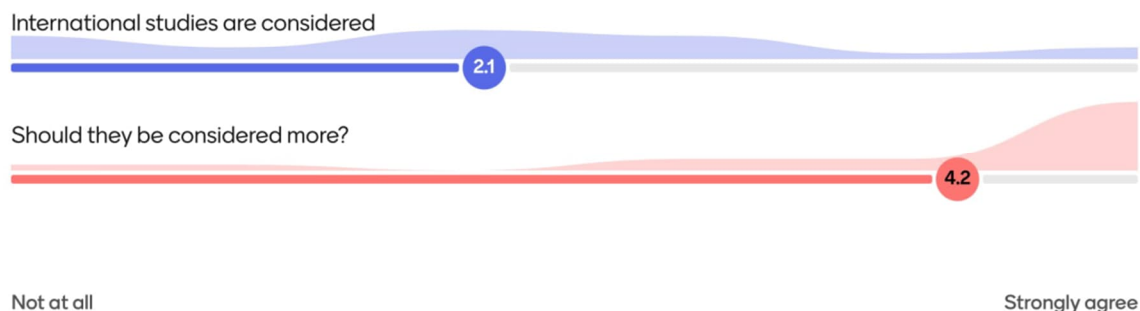


Figure 13 Mentimeter results of the Panel Survey, Question 1.

Question 2: *Rank from low to high the relative importance of the following species or habitats for the 30% protection.*

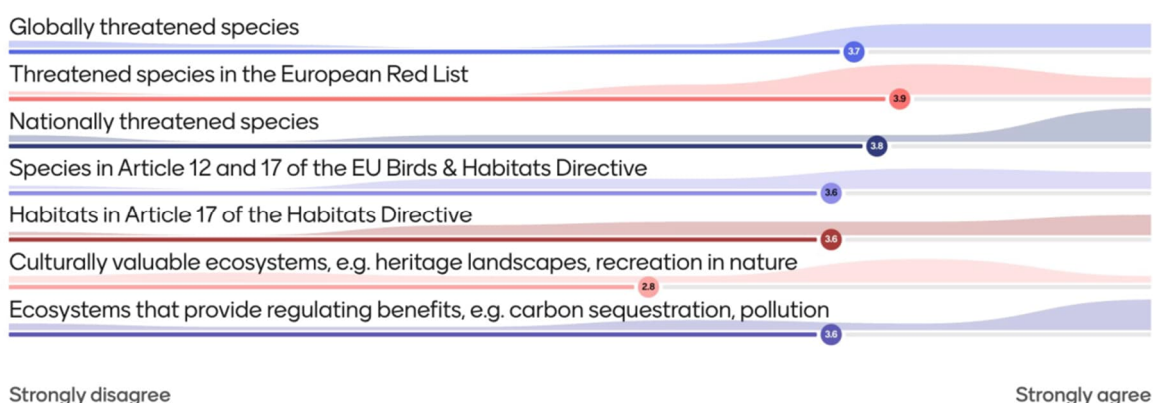


Figure 14 Mentimeter results of the Panel Survey, Question 2.

Question 3: *Which landscape settings offer the greatest opportunity for cross-realm (blue green) restoration in your context? (Rank least 1 to 5 most important)*

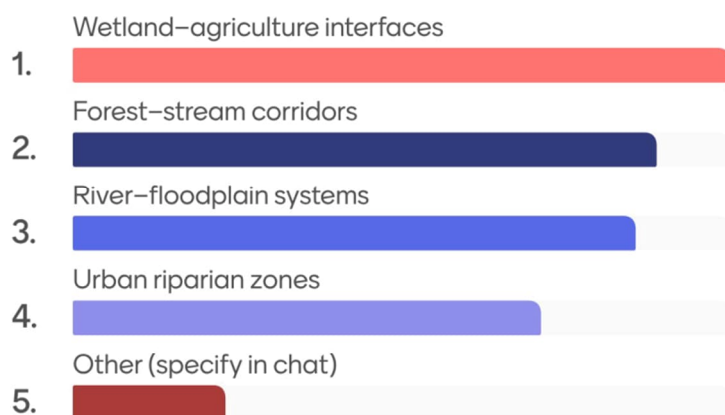


Figure 15 Mentimeter results of the Panel Survey, Question 3. © Goran Safarek.

Question 4: *Can you think of any scenarios where available data are particularly useful in your field? If yes, how and for what purpose?*

- Infrastructure planning
- Roads
- Landscape planning
- Urban planning for residential zones
- Species recovery planning
- Restoration planning and democratic discussion
- For planning and discussion. For searching for compromising solutions – Floods vs. Habitats Directive.
- Development of urban areas (landscape planning) versus keeping areas for protection, for flooding prevention.
- Hydropower planning shall keep the longitudinal connectivity.
- Public participation in integrated planning processes
- Danube River Basin Management Plan and beyond

Question 5: *Should river reach & riparian scales be combined? Is the integration of hinterland/sub-catchment relevant for your work/ addressing policies?*

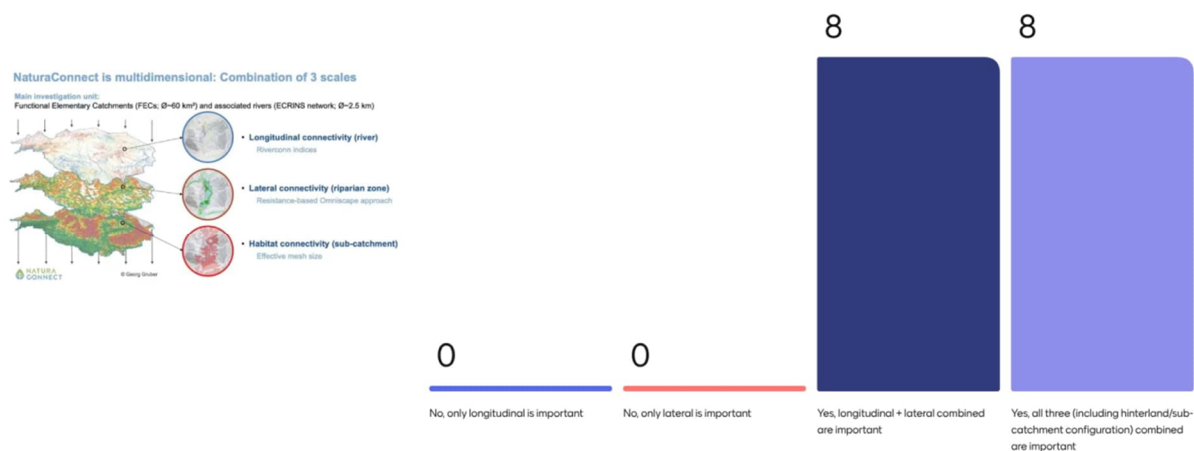


Figure 16 Mentimeter results of the Panel Survey, Question 5. © Georg Gruber, BOKU ILEN.

Participants' comments:

- Culturally valuable ecosystem services appeared less prominent in the poll. Still, participants highlighted that recreation is often key for public acceptance of connectivity measures - an aspect relevant for the NRR implementation and regional planning.
- Question for Johannes: Potential benefit of removing barriers — was this done by removing individual barriers or groups of barriers? The effect of individual barriers might not be significant, but when grouped, the overall effect could be much bigger.
- The group will consider this issue and revisit it later. How about selecting barriers adjacent to reaches with high connectivity and removing them in bulk?

6. Conclusion

The discussions demonstrated how novel, integrated policies, such as the EU Nature Restoration Regulation, can facilitate a genuine transformation — shifting from fragmented, localised initiatives to comprehensive, cross-border planning.

The Danube–Carpathian Region is a prime example of where science, policy and practice can converge to create a connected landscape.

Integrating blue and green infrastructure is crucial for biodiversity, climate resilience, and regional cooperation.

We must continue to strengthen collaboration between sectors, countries and disciplines so that restoration in this region becomes a shared European success story. Thank you to the ICDPDR and the CC for providing good platforms for collaboration!

Stay connected with NaturaConnect! More webinars will be offered until June 2026.