

Reviving Europe's rivers: **Seven challenges and opportunities to improve river connectivity and biodiversity**

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Free Flow 2024– Groningen, The Netherlands

15 April 2024

Restoring river connectivity: How to achieve 25.000 km free-flowing rivers in the EU?

Received: 1 August 2023 | Revised: 20 December 2023 | Accepted: 2 January 2024

DOI: 10.1002/wat2.1717

WIREs WATER WILEY

PERSPECTIVE

Reviving Europe's rivers: Seven challenges in the implementation of the Nature Restoration Law to restore free-flowing rivers

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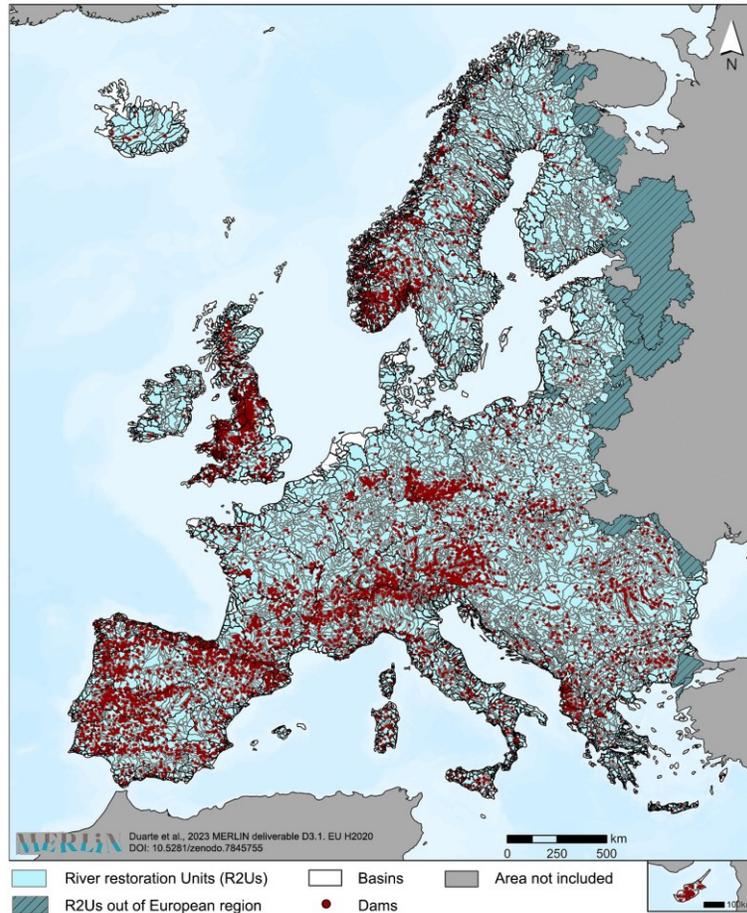


Deltares



Restoring river connectivity: How to achieve 25.000 km free-flowing rivers in the EU and restore river biodiversity?

Dams within European river basins



Stoffers et al., (2024). WIREs Water

The EU Nature Restoration Law

Article 7

Restoration of the natural connectivity of rivers and natural functions of the related floodplains

1. Member States shall make an inventory of **artificial** barriers to **connectivity of surface waters** and, **taking into account their socio-economic functions**, identify the barriers that need to be removed to contribute to the achievement of the restoration targets set out in Article 4 of this Regulation and of the objective of restoring at least 25 000 km of rivers into free-flowing rivers in the Union by 2030, without prejudice to Directive 2000/60/EC, in particular Articles 4(3), 4(5) and 4(7) thereof, and Regulation 1315/2013, in particular Article 15 thereof.
2. Member States shall **remove the artificial barriers to connectivity of surface waters based on the inventory** under paragraph 1 of this Article, in accordance with the plan for their removal referred to in Article 12(2), **points (e) and (f)**. When removing barriers, Member States shall primarily address obsolete barriers, which are those that are no longer needed for renewable energy generation, inland navigation, water supply, **flood protection**, or other uses.
3. Member States shall **complement the removal of the barriers referred to in paragraph 2, by the measures necessary to improve the natural functions of the related floodplains**
4. **Member States shall ensure that natural connectivity of rivers and natural functions of the related floodplains restored in accordance with paragraphs 2 and 3 are maintained.**

The much-needed Nature Restoration Law...

Extension of the current nature conservation directives: **WFD** and **Birds and Habitats Directives**

Contributes to enhancing river restoration efforts by:

Setting **quantitative restoration targets** for rivers and floodplains with specific timetables

Focusing on **large-scale biodiversity assessments**

Expanding restoration needs beyond the Natura 2000 network

But also:

- Re-establishing missing habitat
- Sustainable functioning of river-floodplain ecosystems
- Descriptions and definitions of all restoration actions

The much-needed Nature Restoration Law...

But, the NRL leaves several aspects open for interpretation

1. Would restoring 25,000 km be enough? **Estimated length of European rivers is 600,000 -1.6 million km**
2. It lacks clarity. **E.g., “free-flowing rivers”, or “Taking into account socio-economic functions...” (Art. 7.1)**
3. Potential conflicts not explicitly addressed, between:
 - Restoration measures
 - Existing infrastructure
 - Land-use practices

The implementation process should effectively address these 3 aspects to have an impact on declining river ecosystems and biodiversity

Seven challenges in the implementation of the NRL to restore free-flowing rivers and river biodiversity?

1 Develop a clear definition of free-flowing rivers, barriers, and reference areas



3 Incorporate meta-ecosystem thinking in restoration planning for larger spatial scales



5 Enhance awareness, stakeholder participation and citizen engagement



7 Establish methods for identifying integrated connectivity across river networks



2 Consider the network structure of rivers and their connectivity dimensions



4 Prioritise actions to obtain sufficient quantity/quality of free-flowing river networks



6 Consider conflict areas with other legislative frameworks

Stoffers et al., (2024). WIREs Water

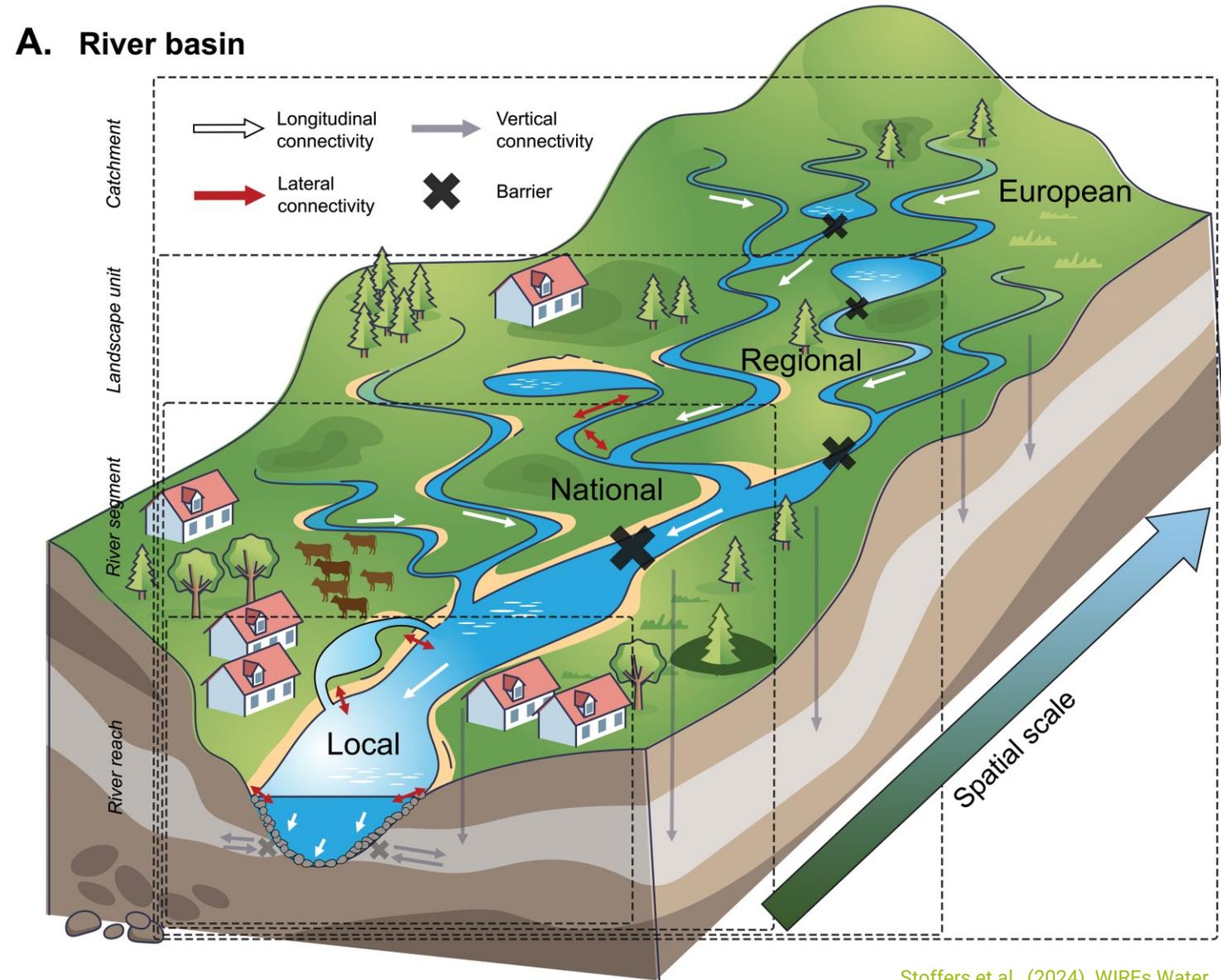
Challenge 1: Develop a clear definition of free-flowing rivers, barriers, and reference areas

- Define and prioritise barrier removal for **lateral**, **vertical**, and **temporal** connectivity
- Use **ecological criteria** and **free-flowing river conditions**
- Include **minimal free-flowing river section lengths** in restoration targets
- **No height threshold** for identifying barriers
- No measures that target **one organism group**



Challenge 2: Consider the network structure of rivers and their connectivity dimensions

- Consider **4-dimensionality**
- Member States should **collaborate on restoration plans**
- Include **minimum river section length** as a restoration target for free-flowing rivers to ensure efficiency in protection of biodiversity and functioning
- Prioritise **critical management zones** in rivers



Stoffers et al., (2024). WIREs Water

Challenge 4: Prioritise actions to maximize quantity and quality of free-flowing river networks

- ...And focus on **important rivers for freshwater biota**
- Implement a **prioritisation approach using ecological outcomes**
- Halt all **activities in near-natural** or **pristine** rivers



"Restoring an additional 25,000 km of free-flowing rivers by 2030 will not suffice to halt the decline of freshwater biodiversity, let alone reverse it. Due to the relatively small number of rivers to be restored, the implementation should focus on areas where restoration efforts will result in the most substantial improvements to ecological conditions, freshwater resources, and ecosystem services. In fact, it makes little sense to prioritise restoring degraded systems while still degrading near-natural or pristine systems at the same time".

Professor Sonja Jähnig

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CORRESPONDENCE | 19 March 2024

'Global swimways' on free-flowing rivers will protect key migratory fish species

By [Twan Stoffers](#), [Catherine A. Sayer](#), [Adela Baratech](#) & [Fengzhi He](#)



Stoffers et al., (2024) Nature



Migratory fish need global swimways

A report by the Convention on the Conservation of Migratory Species of Wild Animals makes for grim reading on migratory fishes (see go.nature.com/3v8pdv2). Among the 37 species with sufficient data, populations have declined by an average of 90% since 1970. Migratory fishes have key ecological roles, and their decline undermines Indigenous cultures, food security and biodiversity conservation.

No more than 37% of rivers longer than 1,000 kilometres remain free-flowing over their entire length (G. Grill *et al.* *Nature* **569**, 215–221; 2019). Obstructing more migration routes will condemn important species to complete destruction. Governments must act now by designating 'global swimways' (T. A. Worthington *et al.* *Front. Ecol. Environ.* **20**, 573–580; 2022).

Many rivers cross national boundaries, so protecting and restoring swimways will require regional collaborations. This will be key to achieving future targets to reduce freshwater biodiversity loss, combat climate change and improve food and water security. Global swimways are essential for both river ecosystems and those who depend on them.

Challenge 5: Enhance awareness, stakeholder participation and citizen engagement

- Include **all stakeholders** in river protection and restoration efforts
- Share **scientific discoveries** and implement **good practices**
- Stimulate **citizen engagement** to improve support



BIG WIN in Serbia:

Key Area Serbia



breach). However, Latvia already (since the 80s) cooperating to enable se country. Get to know all

Klamath Basin tribes and allies stage a rally in 2006 at a meeting of the international hydropower industry. The tribes called for the removal of PacifiCorp's four Klamath River dams to help restore salmon runs. The dam removal project is now expected to be completed in 2024. (Patrick McCully, Flickr, CC by 2.0)

BioAgora project: developing a Science Service for Biodiversity

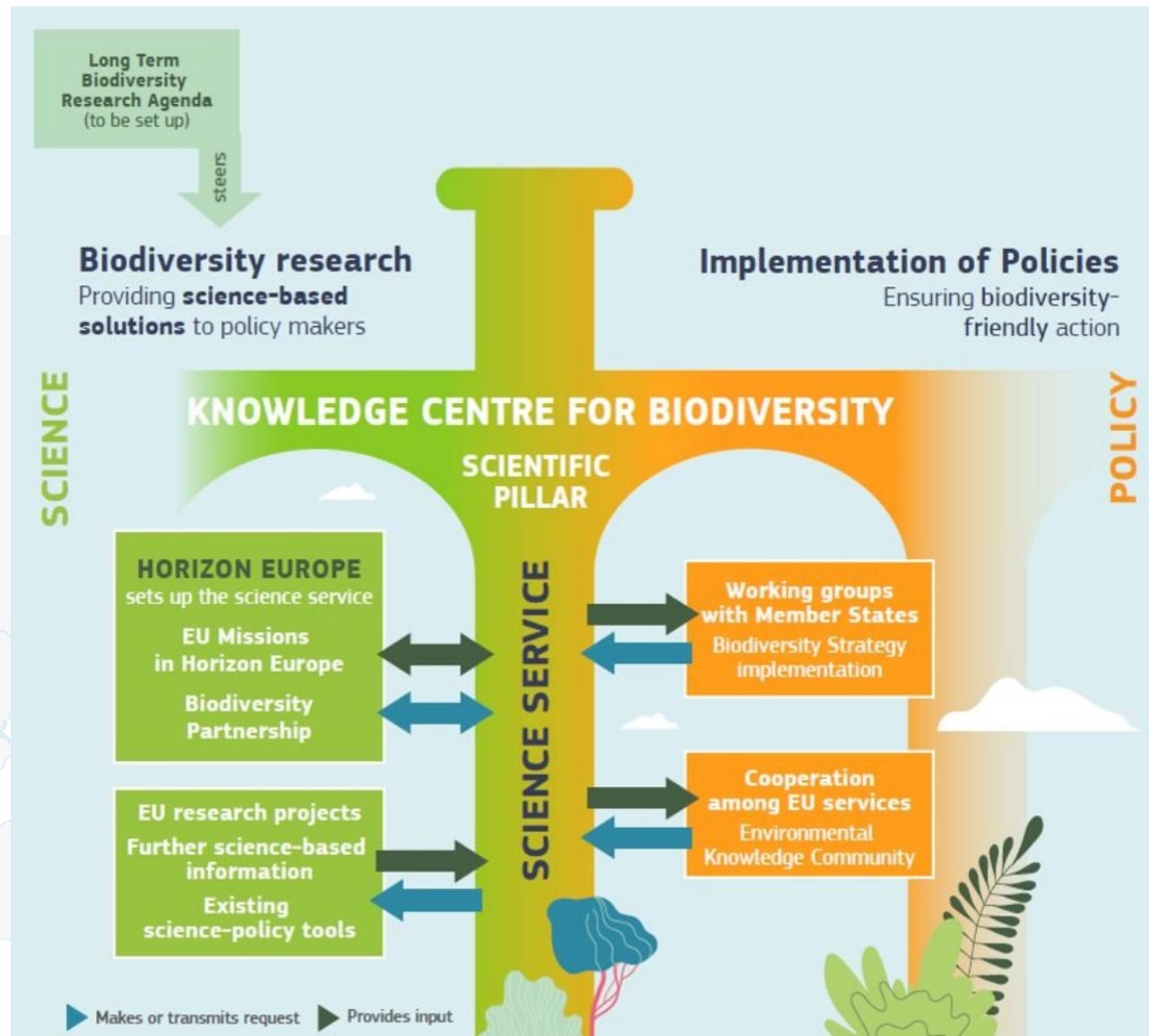
“Connecting knowledge and decision-making”

Freshwater demonstration case

The EU Biodiversity Strategy 2030 goal of restoring 25,000 km of free-flowing rivers, floodplains, and wetlands is central to the freshwater demonstration case

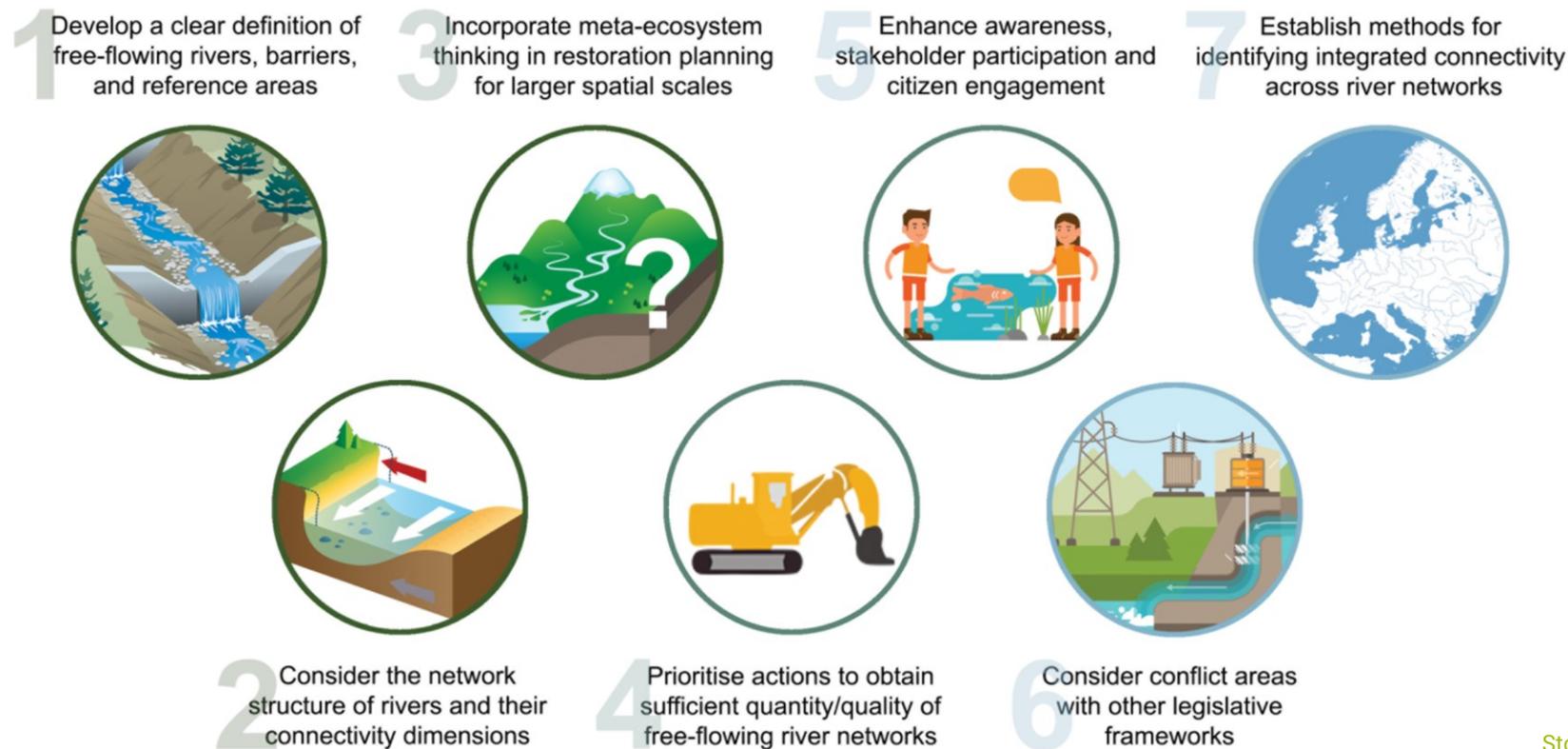


Funded by the European Union



Collaboration for restoration

- **The Nature Restoration Law is important** for reviving rivers and conserving biodiversity
- Challenge is the **lack of political will and commitment** to allocate resources and funding
- **Preserve the remaining natural rivers**



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What type of research is needed often depends on who you ask!

Research priorities developed by **natural scientists** and **social scientists** tend to be very different, potentially resulting in a disconnect between these priorities and legislative development.

Join our BioAgora workshop tomorrow 10:40-12:00!



Please join our effort to restore free-flowing rivers and fill out this 5-min questionnaire!



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Thank you very much for your attention!

If you have any questions, please contact:

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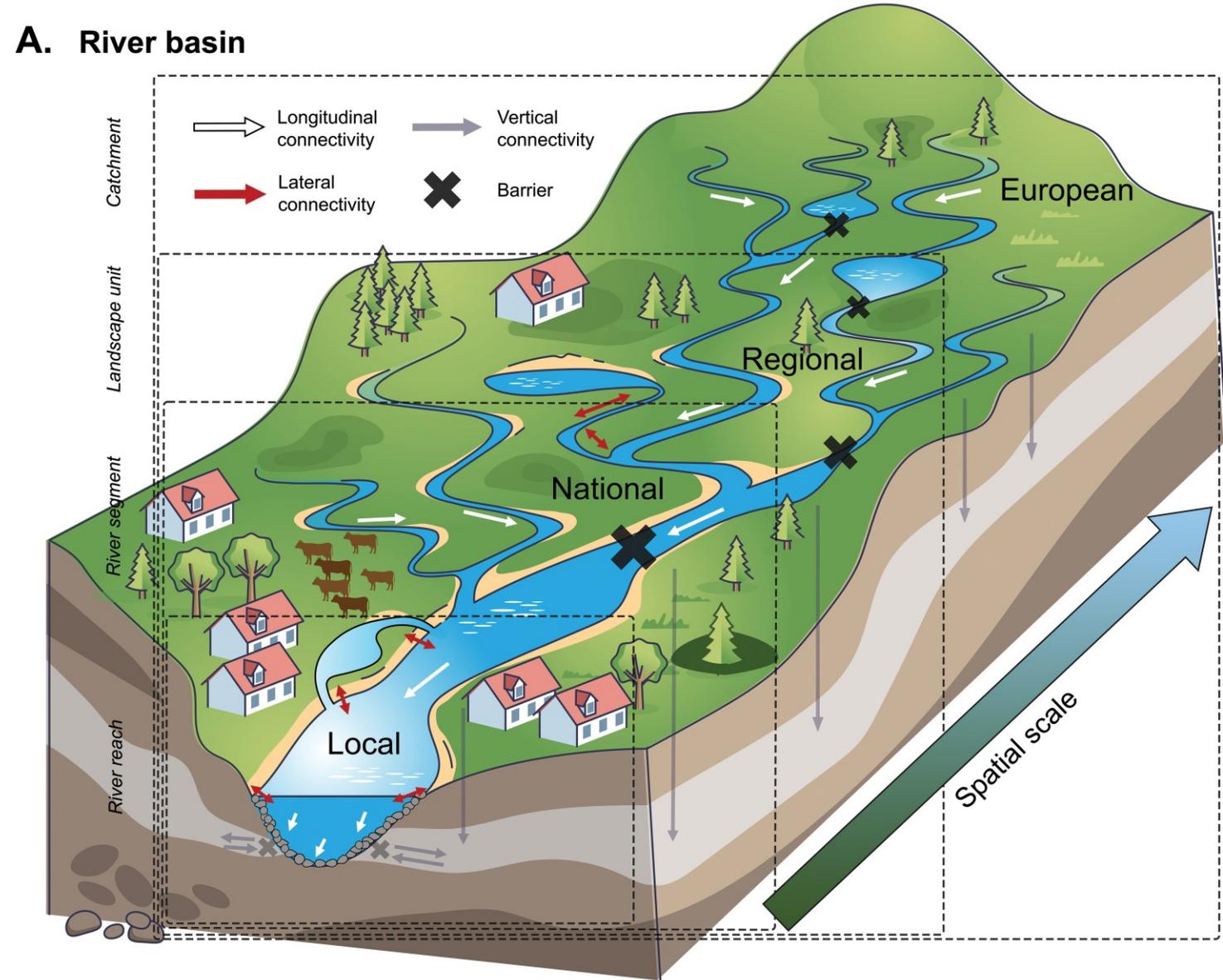
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Challenge 3: Incorporate meta-ecosystem thinking in restoration planning

- Consider **interactions** of aquatic systems **with riparian and terrestrial matrices**
- Member States should **collaborate on restoration plans**
- Prioritise **critical management zones** in rivers



Challenge 6: Consider conflict areas with other legislative frameworks

- **Resolve conflicts** and find **territorial compromises** using negotiation processes similar to those in water-scarce regions for barrier removal activities



Challenge 7: Establish methods for identifying integrated connectivity across river networks

- Adopt **biodiversity-centred monitoring** focusing on metacommunity processes
- Develop and implement an **integrated monitoring framework**
- Establish a **system for continuous updating** and validation of **barriers** to river network connectivity

