

Establishing the scientific knowledge base in the TBR MDD



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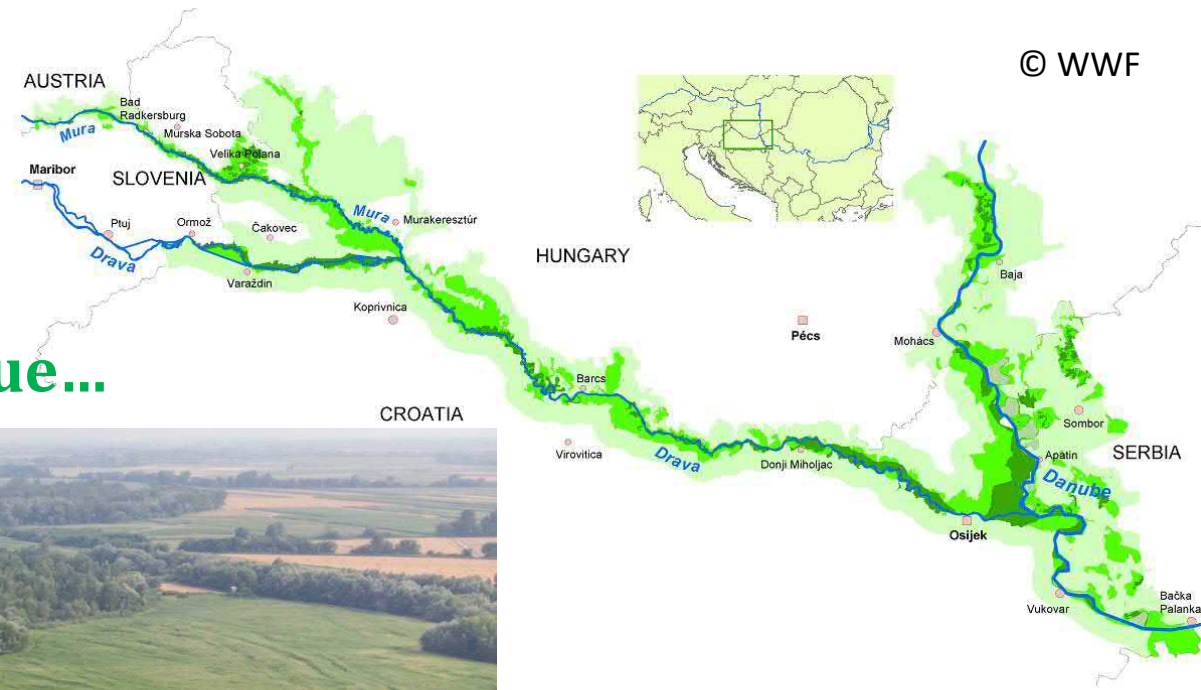
lifelineMDD final conference,
September 6th and 7th, 2022

Content

- Introduction
- Abiotics
- Biotics
- Overlay map
- Metadatabase
- Synthesis and conclusions for river restoration strategy

Introduction

700km of free flowing river corridor, unique...



Introduction

...but under pressure!

Channelization



Bank protection



Transversal structures upstream



Unclear effects
of climate
change



Introduction

Establishing a scientific knowledge base via:

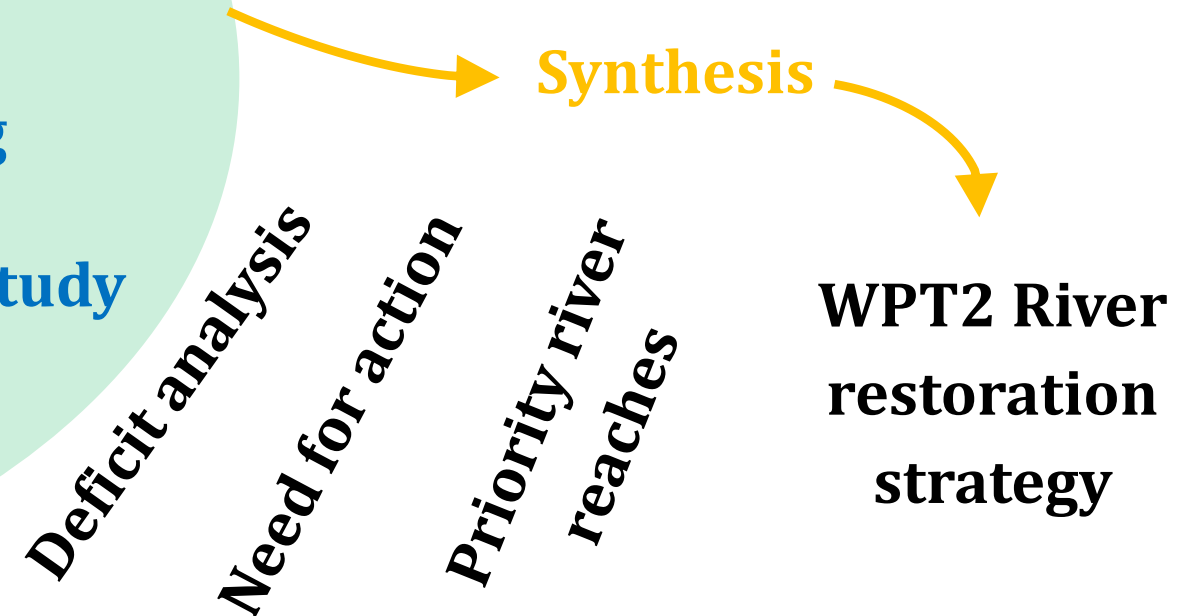
Interacting studies

Biotic:

- **Assessment of fish population status**
- **River birds breeding study**

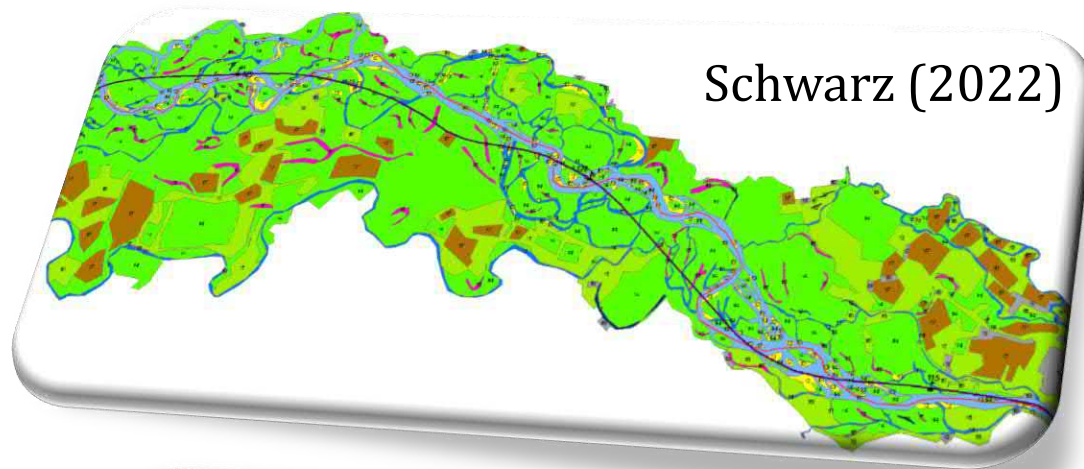
Abiotic:

- **River training structures mapping**
- **Sediment mobilisation study**
- **Sediment balance and transport study**
- **Climate change study**



Abiotics

Historic mapping



Results for entire TBR MDD

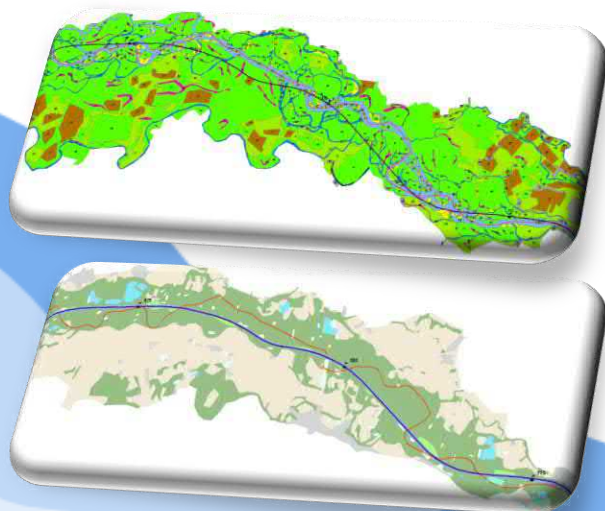
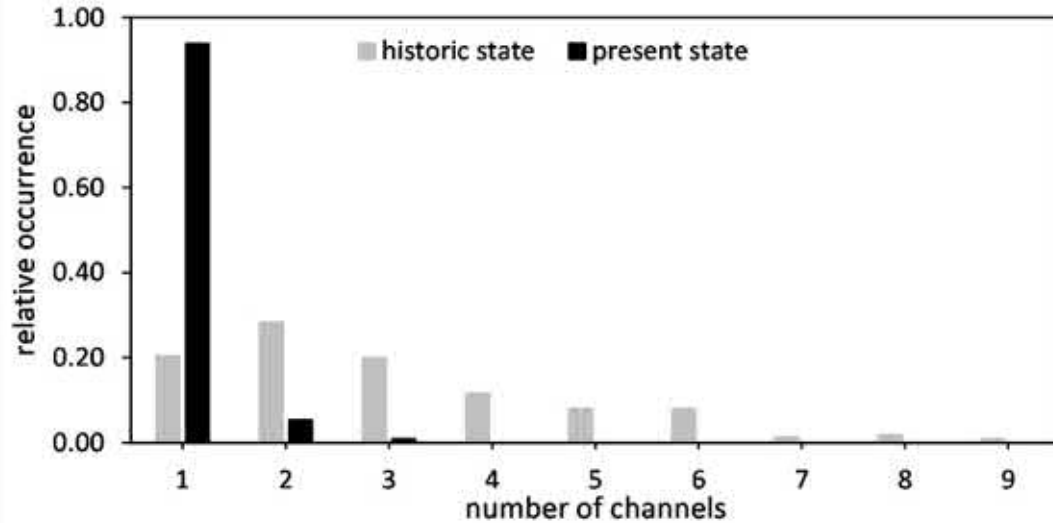
Area of gravel/sand bars	-84%
Number of islands	-83%

Schwarz (2022)

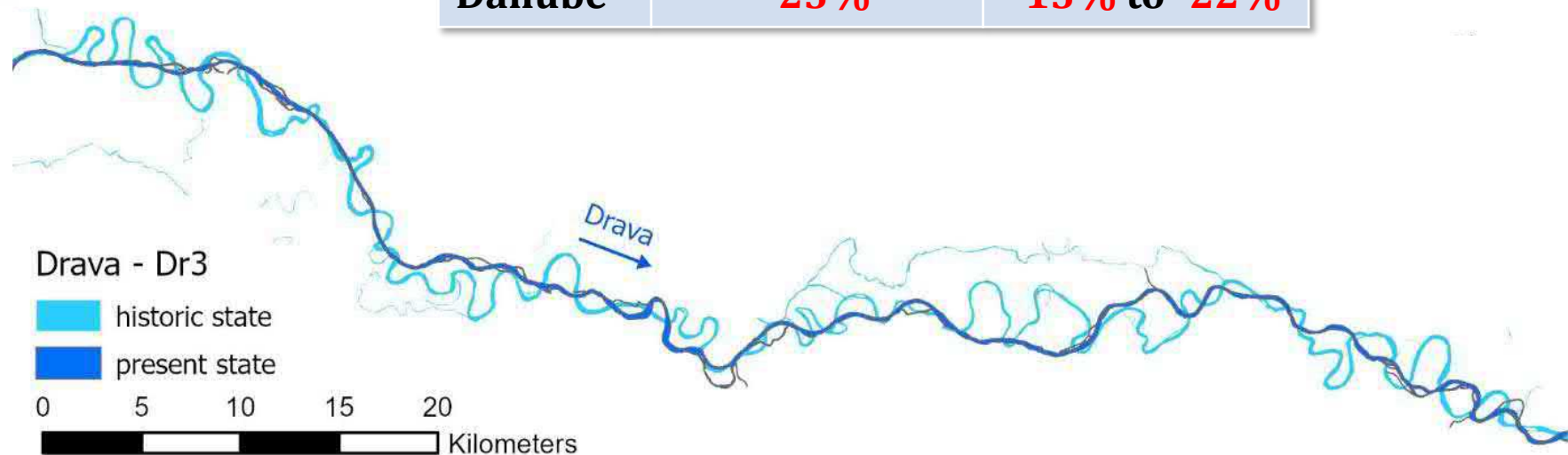


Abiotics

Narrowing and Straightening



Changes:	Flow length	Wetted width
Mura	-9%	-56% to -61%
Drava	-35%	-14% to -78%
Danube	-23%	-15% to -22%



Abiotics

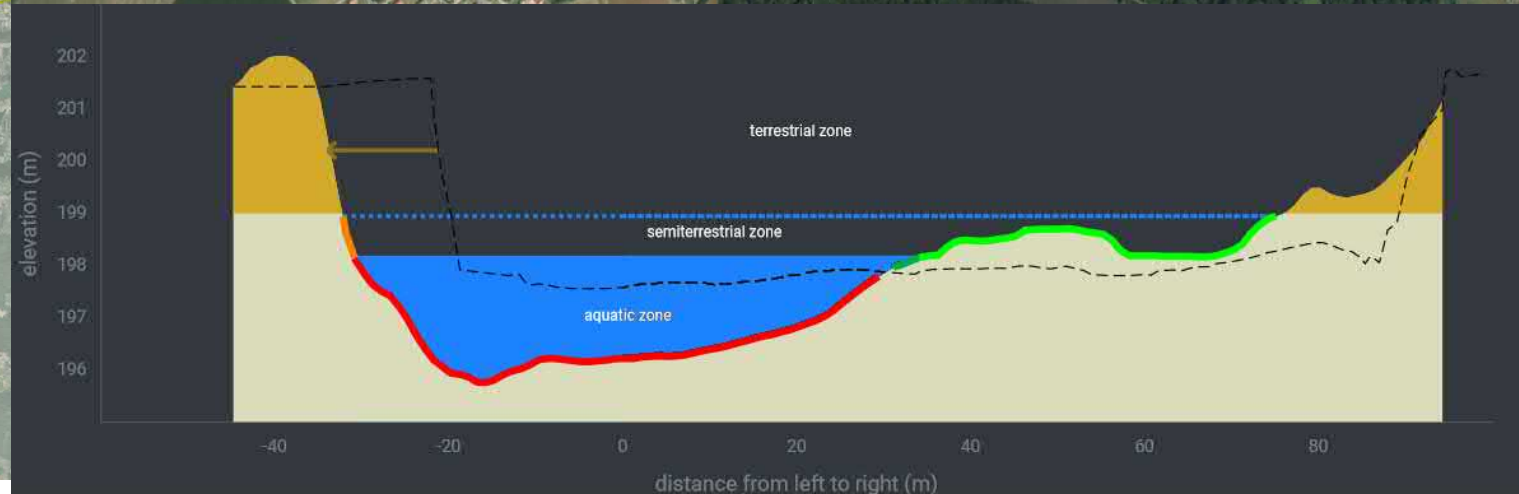
River training structures prohibiting lateral dynamics



Bank erosion needed for morphodynamics and related habitat provision!

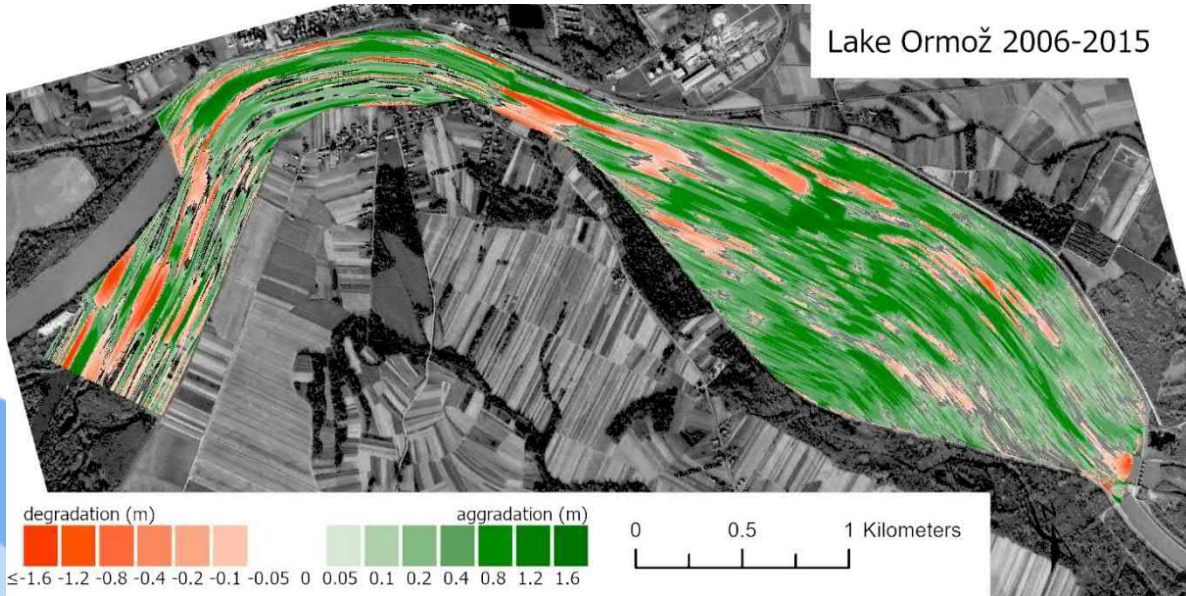


© Mohl

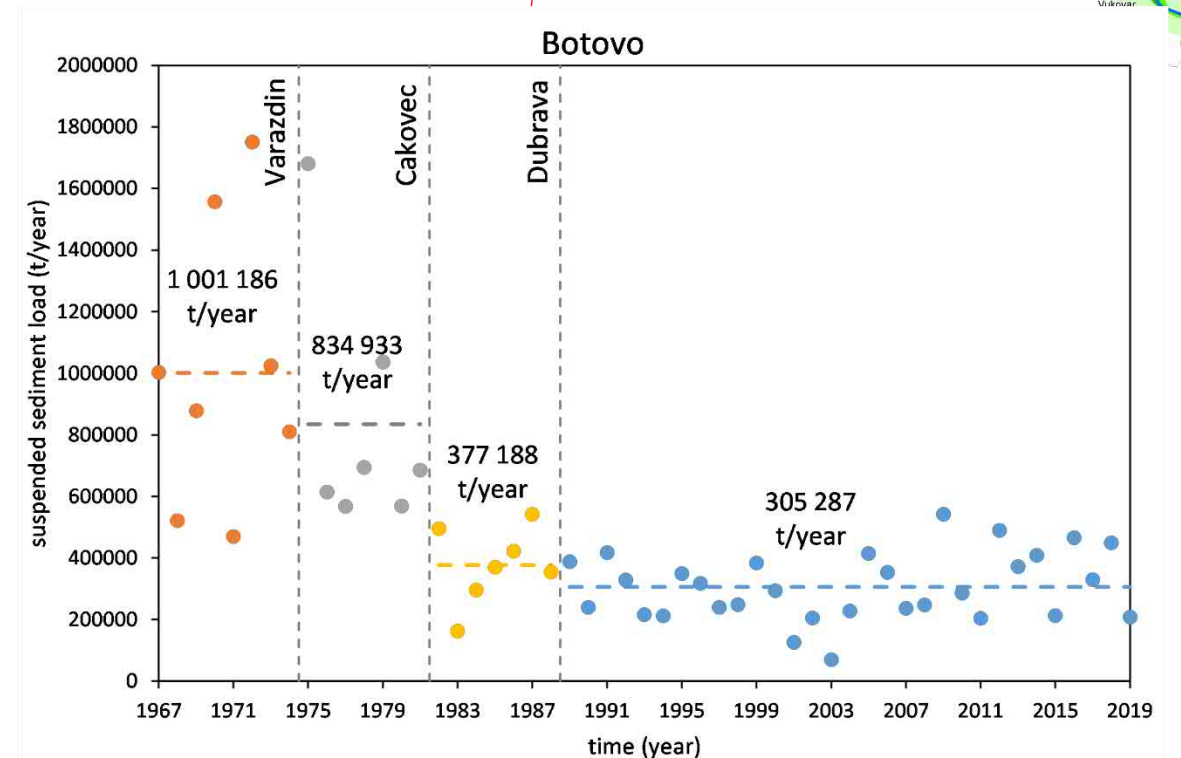


Abiotics

Sediment retention and deficits



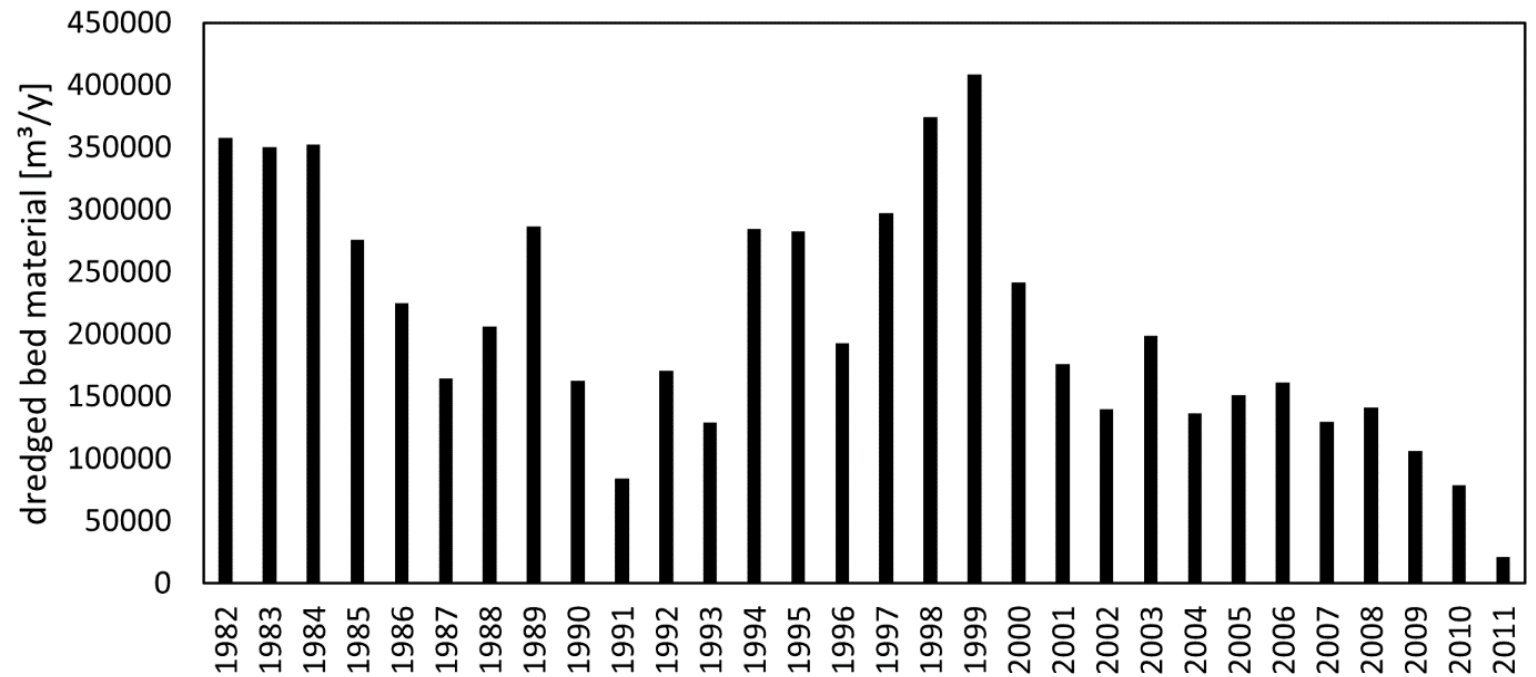
Data provided by Croatian Waters



Continued from Bonacci and Oskorus (2009), Data provided by Croatian Waters

Abiotics

Dredging

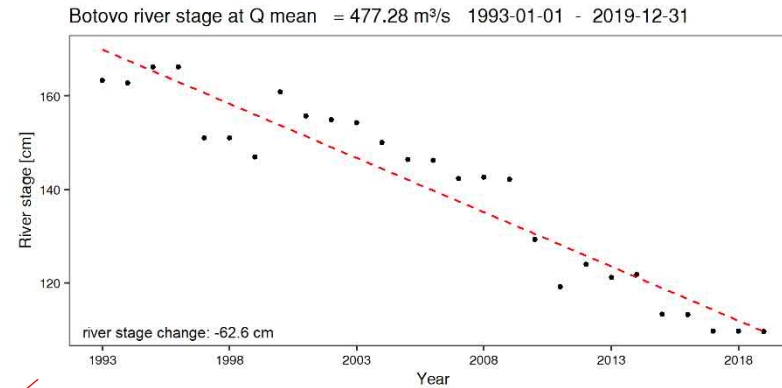


(data source: Vituki, 2003; Baranya et al., 2020 and EJF)

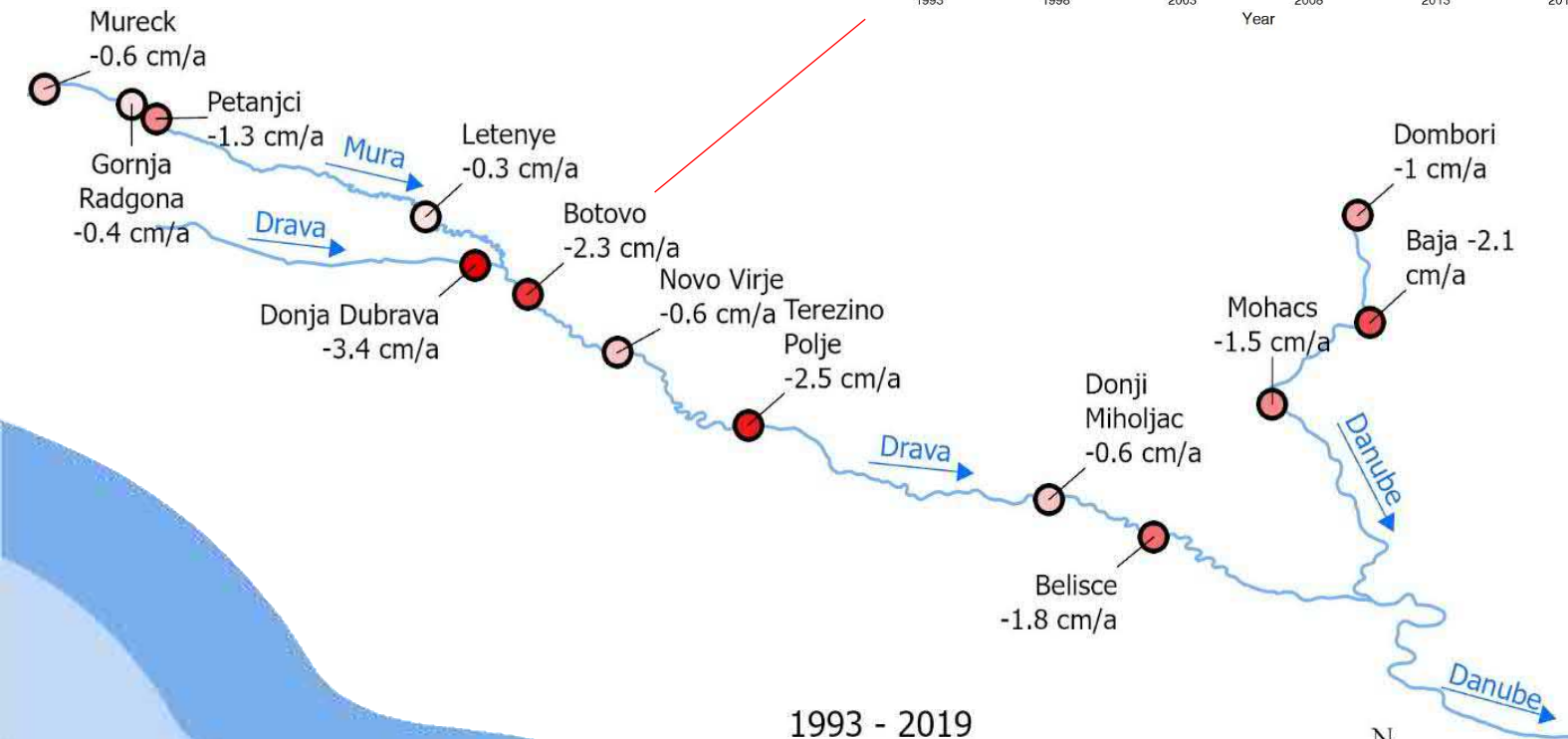
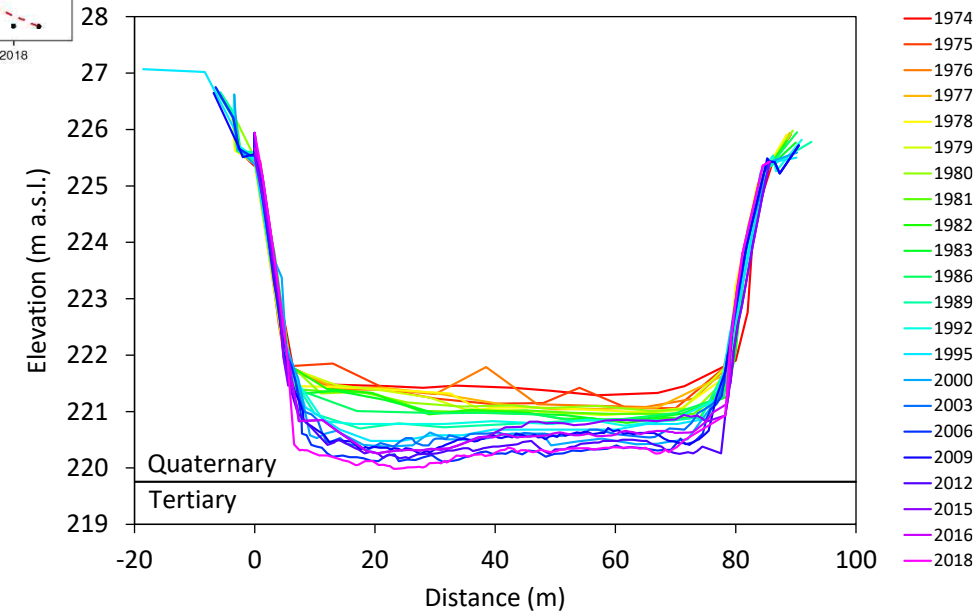
Abiotics

Resulting channel incision

Incision at Botovo



Mura in SI-AT border section



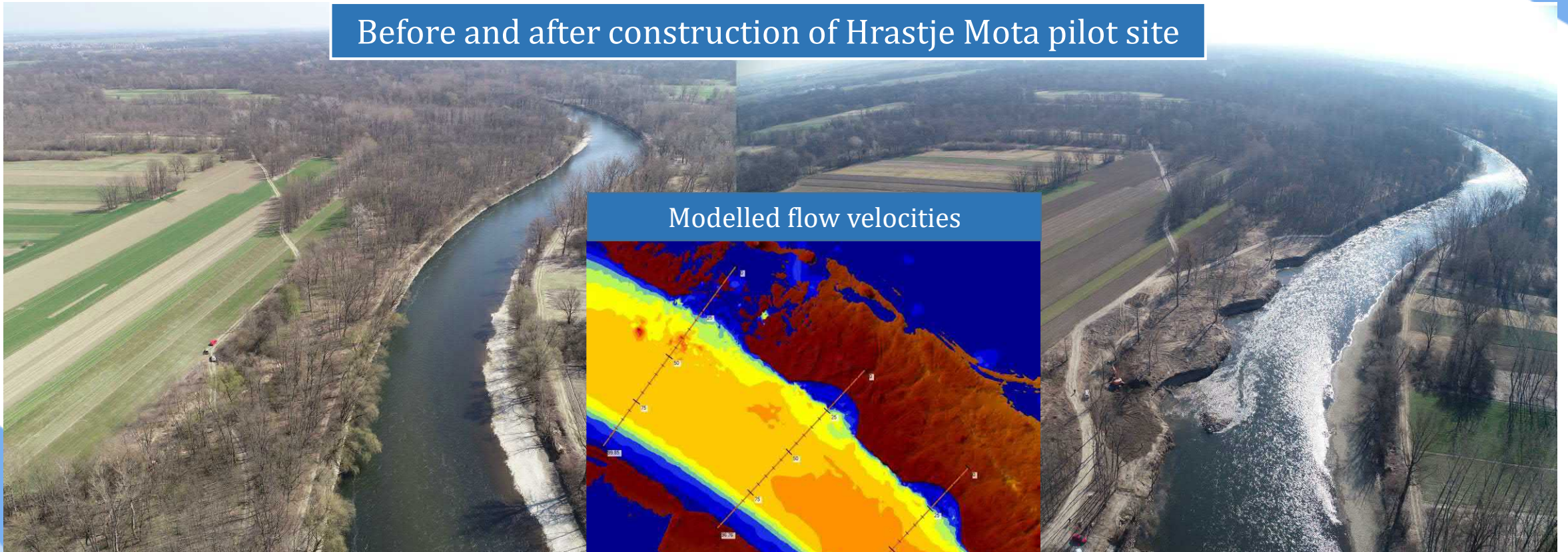
1993 - 2019



Abiotics

Model-based optimization of sediment remobilisation

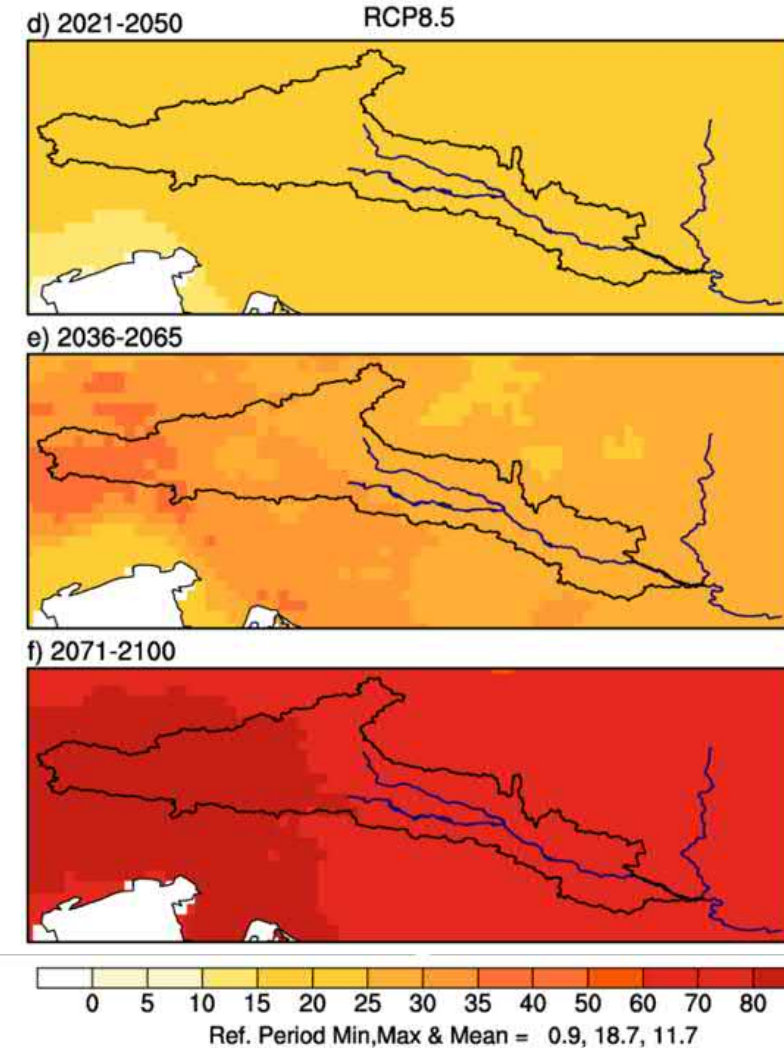
Before and after construction of Hrastje Mota pilot site



Abiotics

Effects of Climate change

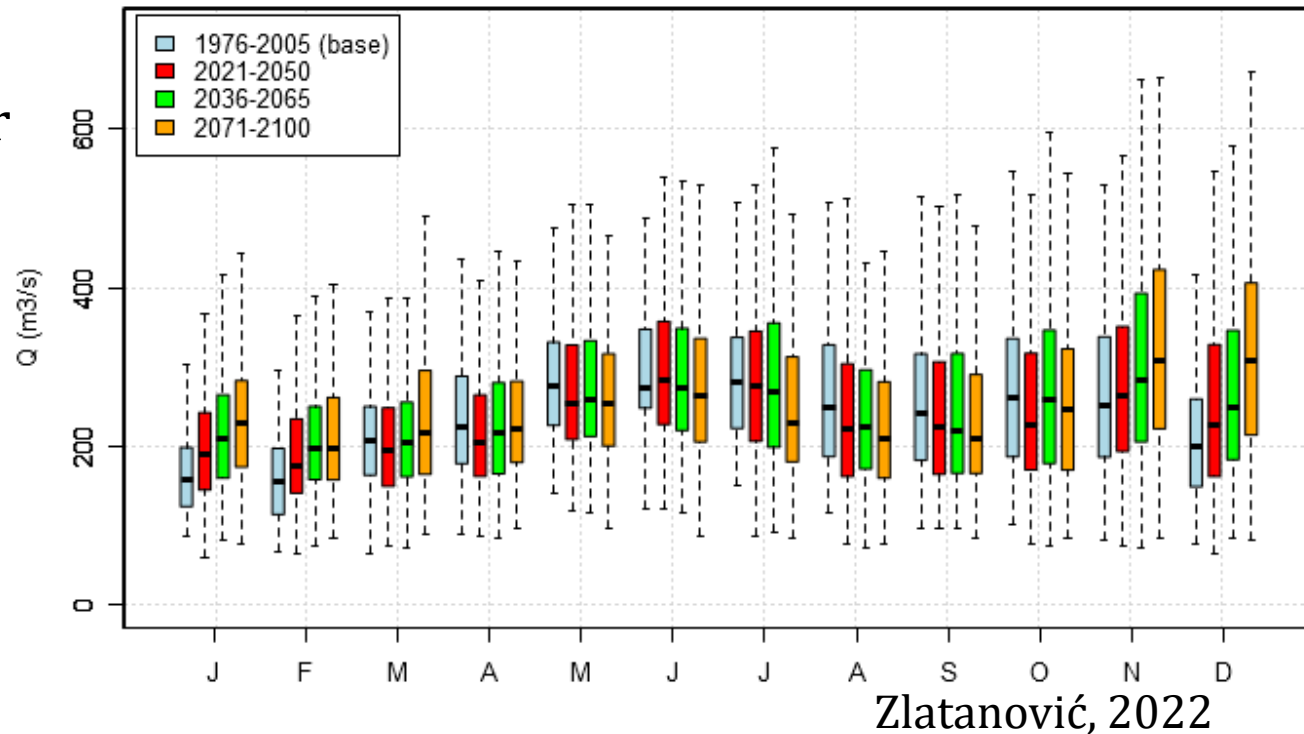
- increase in both minimum and maximum temperature
- more intense and longer heat waves in future time periods
- reduced availability of snow in winter
- early snowmelt in spring
- increased water stress later in summer months
- increase in water demand for agriculture and forestry
- shifts of some aquatic and terrestrial flora and fauna
- affects the whole ecosystems and biodiversity



Abiotics

Hydrologic Effects of Climate change, Land use change and increased water demand

- Decreasing snow storage
- Substantially decreasing runoff in summer
- Increases runoff in winter
- Aggravation of existing low flow periods
- Degradation of water quality



- using riparian vegetation for shading to buffer warming effects
- Ensure habitat connectivity for species to access their thermal niche

Biotics - Fish

First assessment of the fish population for sections within the entire TBR MDD at one point in time!

Methods:

- **Electrofishing:**

Mura: 3 sections

Drava: 6 sections

Danube: 2 backwaters

- **eDNA:** 10 sites in Mura and Drava



Biotics - Fish

Example results

- **54 fish species detected**
- **At least 66 species are considered present in the TBR MDD**
- **TBR MDD allows migration!**



Migrating nase

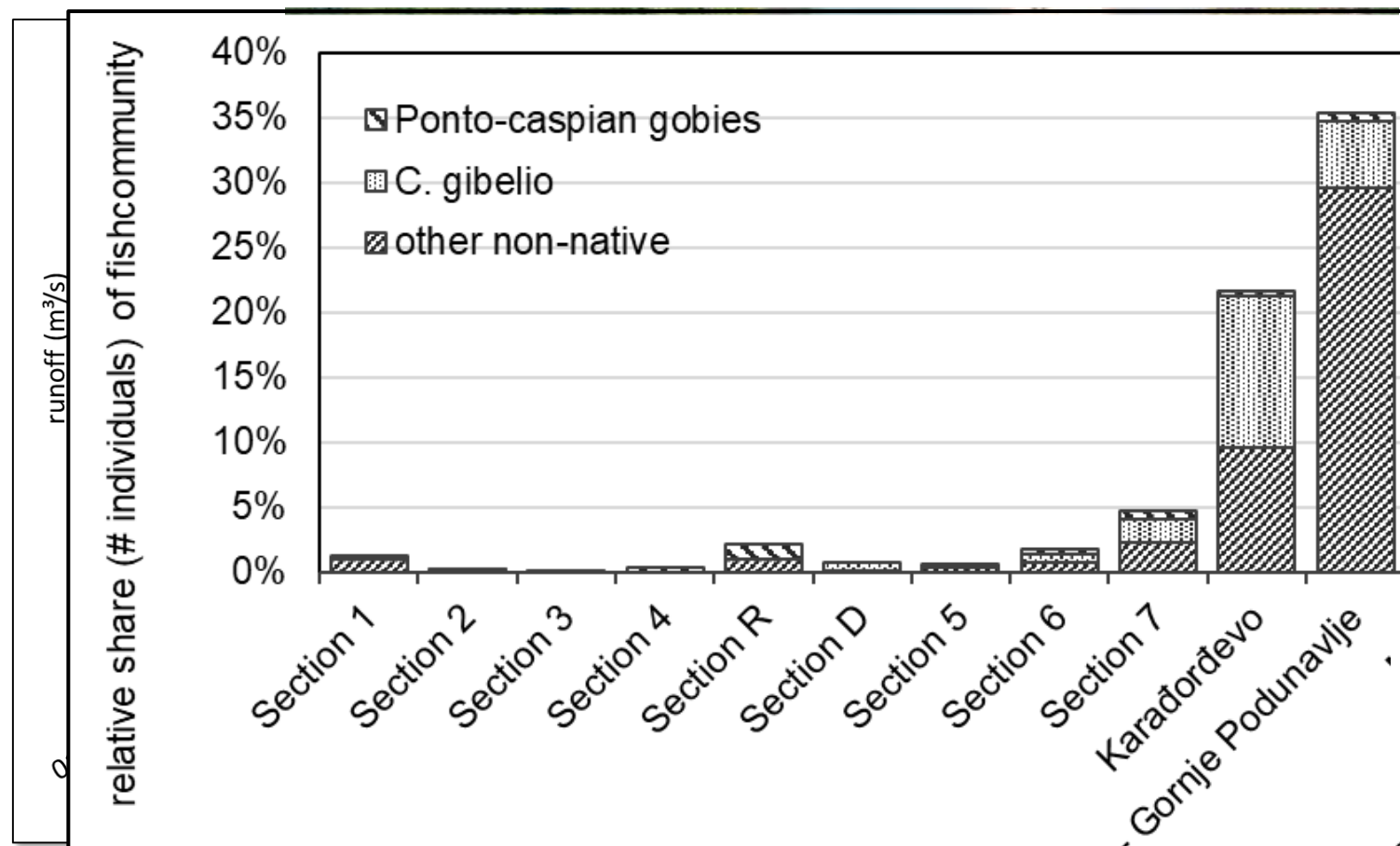


*Pictures by
Boku IHG*

Biotics - Fish

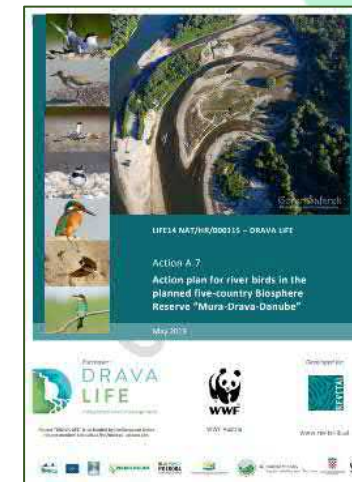
Threats

- Hydromorphological alterations (river training, embankments, hydropower plants) affect longitudinal and lateral connectivity and thereby alter the fish community.
- Hydropeaking in the Drava
- Water pollution/water quality issues
- Spreading of invasive fish species
- Few adult predatory fish



Biotics - Birds

- Before lifelineMDD:
 - Action plan for river birds in the planned 5-country BR “Mura-Drava-Danube” (Revital 2019, Gattermayr & all, project DRAVA LIFE)
 - Extent of existing data in 5 countries is very different: HR-MDD - 15 years monitoring, SI-Mura – censuses in some years, RS-Danube: census of 2 species
- lifelineMDD: Prepared unique methodology (a big challenge)



1st joint river bird mapping of the 550 km Mura-Drava-Danube in spring 2021-2022

142 km Mura River

273 km Drava River

135 km Danube River

(by IRSNC, WWF Adria, INCVP & experts: DOPPS (SI), D. Grlica (HR) & D. Radišić (RS))



Little tern (*Sternula albifrons*)



Common tern (*Sterna hirundo*)



Little ringed plover (*Charadrius dubius*)



Common sandpiper (*Actitis hypoleucos*)



Kingfisher (*Alcedo atthis*)



Sand martin (*Riparia riparia*)

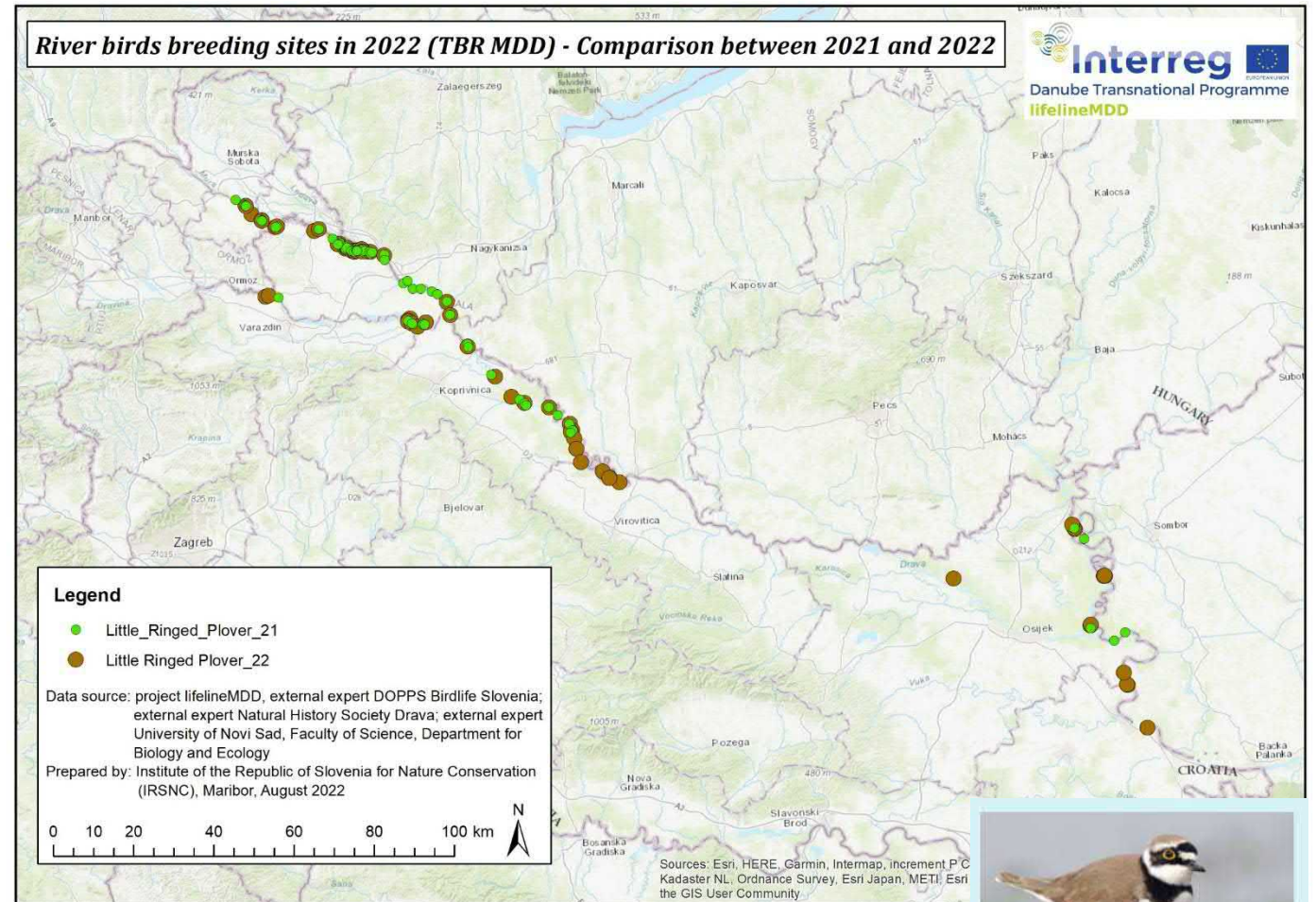


Bee-eater (*Merops apiaster*)

Biotics - Birds

New in TBR MDD:

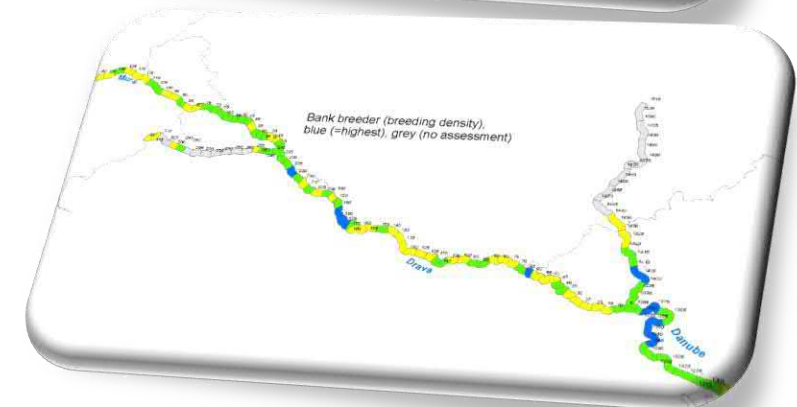
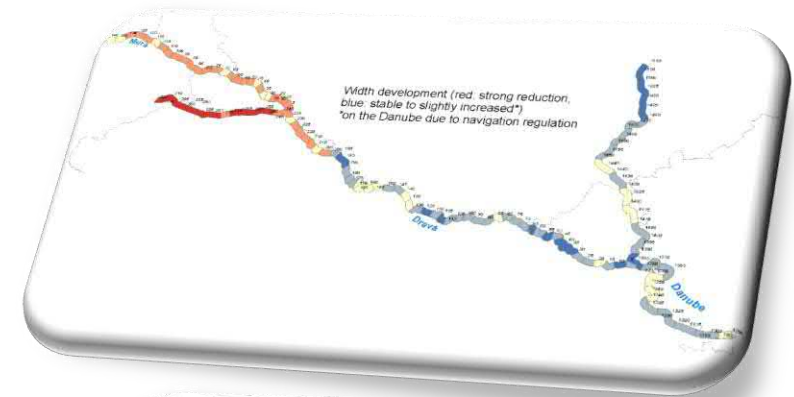
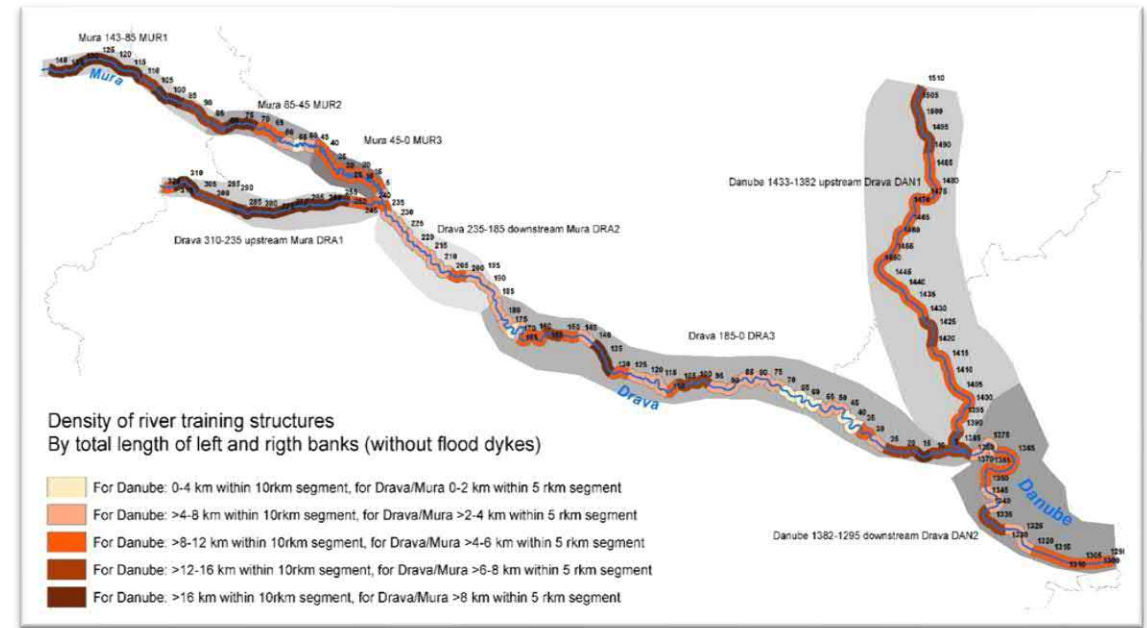
1. In total, ca. 1000 new river bird breeding data (pairs) for 2021 & 2022 in TBR MDD, purchase of ca. 1900 existing data Mura (Slovenia)
2. Reliable recent status: spatial distribution of breeding sites and number of breeding pairs for 7 key river birds species
3. Estimation of the breeding population size (species/river)
4. Analysis of breeding sites per 5(10) km segments



Little ringed plover (*Charadrius dubius*)

Overlay map

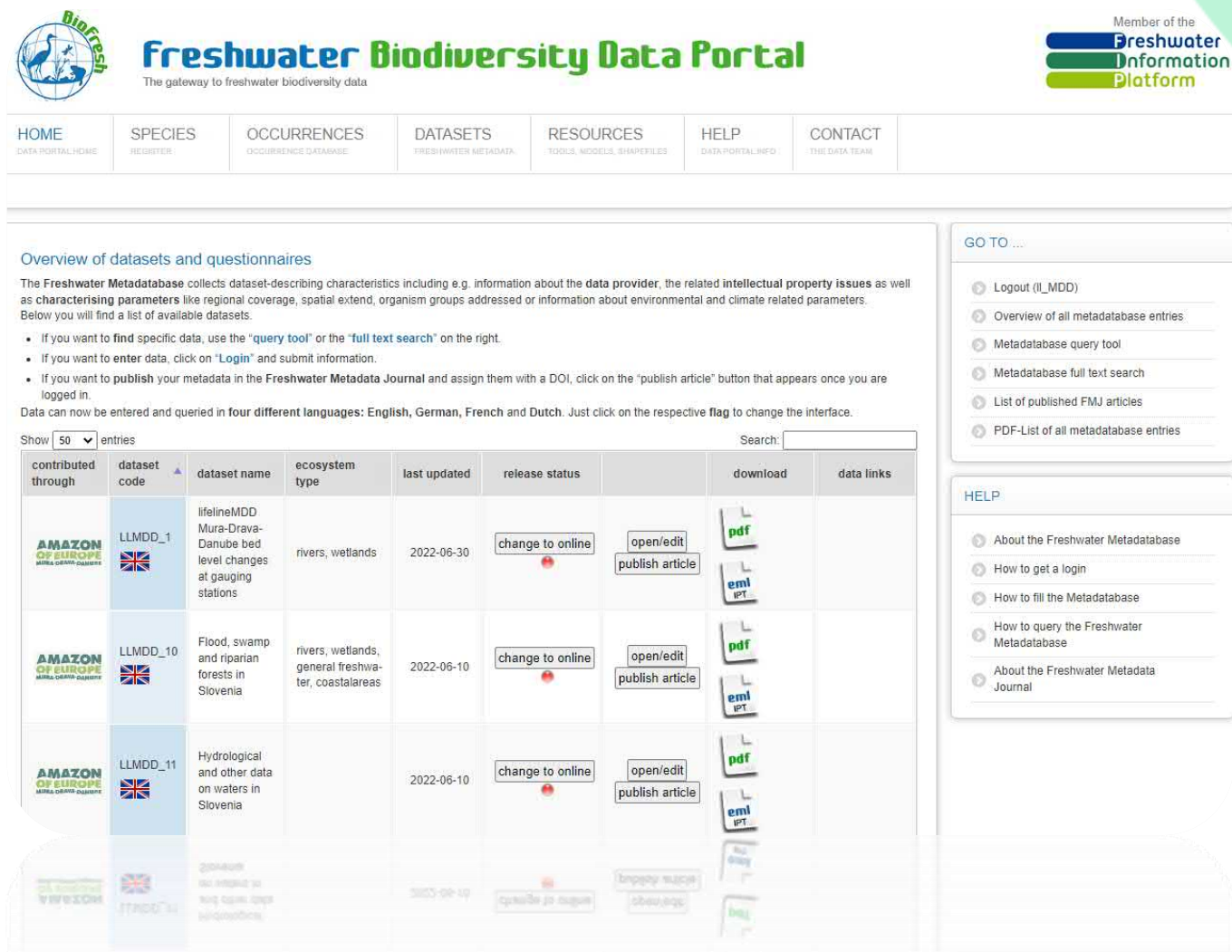
- ▶ Visualisation for river section types and 5 rkm(Mura/Drava)/ 10 rkm (Danube) segments
- ▶ Overlay of maps with river training structures, morphological parameters and bird distribution.
- ▶ To find river stretches with less and most alterations and to support the preparation of a restoration strategy.



Data exchange tool

for biotic and abiotic data – a metadatabase

- First shared metadatabase is being established by IRSNC & BOKU, as a pilot tool for intensified data exchange
- It will serve as a central scientific knowledge base for a specific kind of data
- Smooth partners cooperation
- To avoid loss of resources and double work



Member of the **Freshwater Information Platform**

freshwater Biodiversity Data Portal
 The gateway to freshwater biodiversity data




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Overview of datasets and questionnaires
 The Freshwater Metadatabase collects dataset-describing characteristics including e.g. information about the data provider, the related intellectual property issues as well as characterising parameters like regional coverage, spatial extend, organism groups addressed or information about environmental and climate related parameters. Below you will find a list of available datasets.

- If you want to find specific data, use the "query tool" or the "full text search" on the right.
- If you want to enter data, click on "Login" and submit information.
- If you want to publish your metadata in the Freshwater Metadata Journal and assign them with a DOI, click on the "publish article" button that appears once you are logged in.

Data can now be entered and queried in four different languages: English, German, French and Dutch. Just click on the respective flag to change the interface.

Show 50 entries

contributed through	dataset code	dataset name	ecosystem type	last updated	release status	download	data links
	LLMDD_1	lifelineMDD Mura-Drava-Danube bed level changes at gauging stations	rivers, wetlands	2022-06-30	change to online	pdf, eml IPT, publish article	
	LLMDD_10	Flood, swamp and riparian forests in Slovenia	rivers, wetlands, general freshwater, coastalareas	2022-06-10	change to online	pdf, eml IPT, publish article	
	LLMDD_11	Hydrological and other data on waters in Slovenia		2022-06-10	change to online	pdf, eml IPT, publish article	

GO TO ...
 Logout (IL_MDD)
 Overview of all metadatabase entries
 Metadatabase query tool
 Metadatabase full text search
 List of published FMJ articles
 PDF-List of all metadatabase entries

HELP
 About the Freshwater Metadatabase
 How to get a login
 How to fill the Metadatabase
 How to query the Freshwater Metadatabase
 About the Freshwater Metadata Journal



dataset entry ID: LLMDD_1

name of the dataset:

full name of the dataset:

lifelineMDD Mura-Drava-Danube bed level changes at gauging stations

full name of the dataset (original/national language):

lifelineMDD Mura-Drava-Danube bed level changes at gauging stations

dataset short name:

lifelineMDD bed level changes at gauging stations

type of dataset ([more information](#)):

data evaluation database ("results" database)

specify: analysis of discharge-river stage curves

data type: point data/observation data vector data (shape files) raster data (e.g. GeoTIFF) descriptive data

short description of the dataset/summary:

The discharge-stage curves, which are repeatedly assessed by Hydrographic Services, were analysed to derive eventual bed level changes in the cross sections of the gauging station. The shift of the curves allows conclusions on bed level changes, however, eventual cross section changes (especially eventual changes of width) need to be considered.

- Ca. 50 collected datasets

Action recommendations (1)

See the synthesis – examples:

- Care for this unique river system should be a collective goal!
- Multiple threats require action – need for preservation and restoration
- Provide/remobilise sediment → establish a sediment management concept for the whole Danube, Drava and Mura basins
- Reduce sediment transport capacity (increase width and sinuosity) → define parameters and needed measures in an overall restoration concept
- Remove bank protections/set back levees and provide a corridor for lateral dynamics – provide the needed dimensions for more sustainable river restoration
- Develop a restoration master plan in the Biosphere Reserve including minimum criteria of size and needed sediment flux
- Draw attention to the hydropeaking operation

Action recommendations (2)

See the synthesis – examples:

- Restore to increase resilience against floods and droughts --> derive a climate change adaptation roadmap to reduce flood and drought risks
- Reduce reservoir sedimentation, optimise operation
- Connect stakeholders for concerted action → joint development of a sediment management plan, river restoration plan including the strategic work on restoration land reclamation

Thank you!