Aspects of hydromorphology of the Danube

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Content

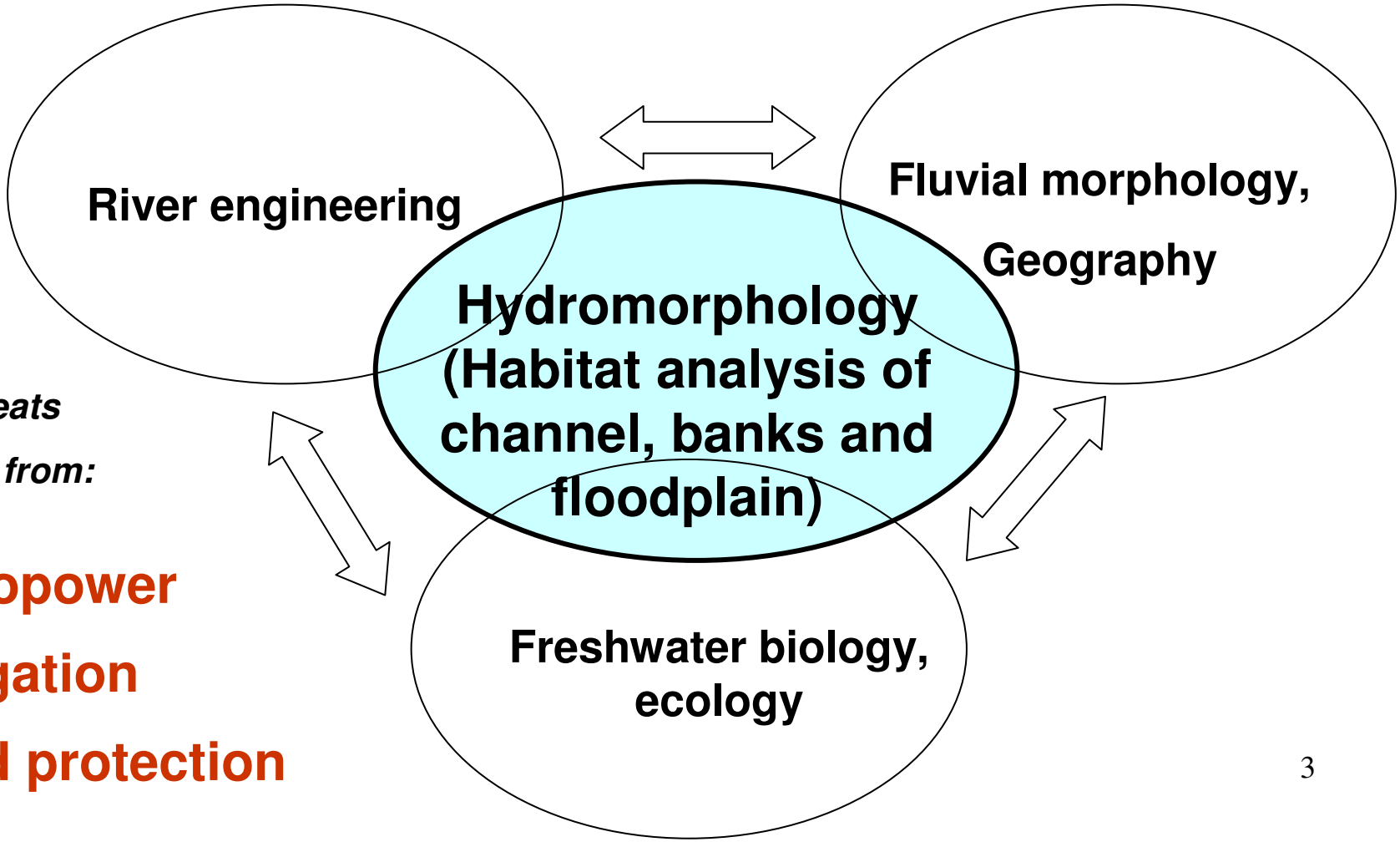
1. Introduction

2. Hydromorphological Inventories: Methodology, CEN Standards

3. Case studies for Drava and Danube ICPDR Joint Danube Survey2

4. Outlook, implications for the Danube

Introduction



Key threats coming from:

Hydropower

Navigation

Flood protection

Methodological framework

- CEN Framework Standard 2004
- RHS (River Habitat Survey, GB), SEQ Physique (FR), LAWA/BafG/Kern (DE), Werth et al. (AT)
- WFD requirements: Quantity and dynamics of water flow, connection to ground water bodies, river continuity, river depth and width variation, structure and substrate of the river bed, structure of the riparian zone

Chapter 2

Methodological framework (CEN)

1. Water quality: Methods of biological sampling for all WFD relevant biological quality elements

2. Biological classification of rivers, lakes and marine ecosystems

3. Hydromorphological features of rivers and lakes, and degree of modification of river hydromorphology

4. Assuring the quality of biological and ecological assessments

Main paramters based on the CEN Standard

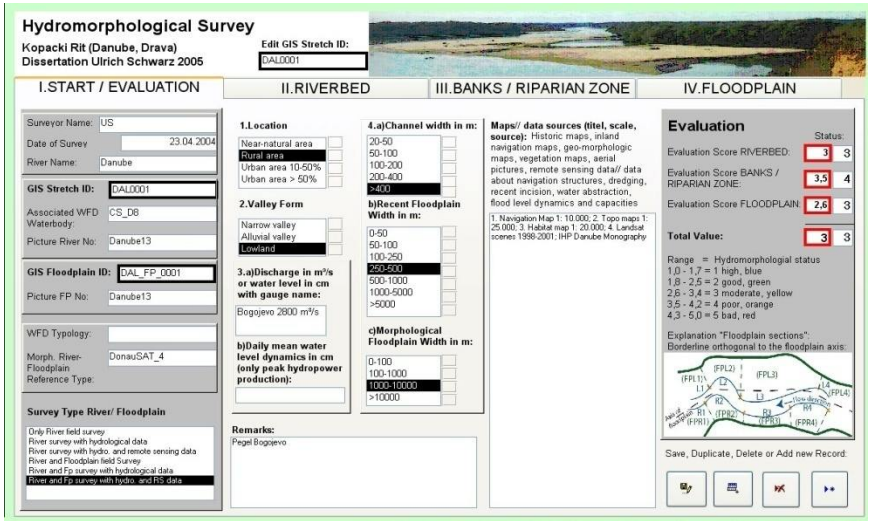
Case study 1 Drava: Detailed hymo inventory

Inventory for large rivers (regarding CEN standards and WFD requirements), developed for the IAD based on German approaches for large rivers (KERN, BfG, NRW/RPF)

Main parameter groups:

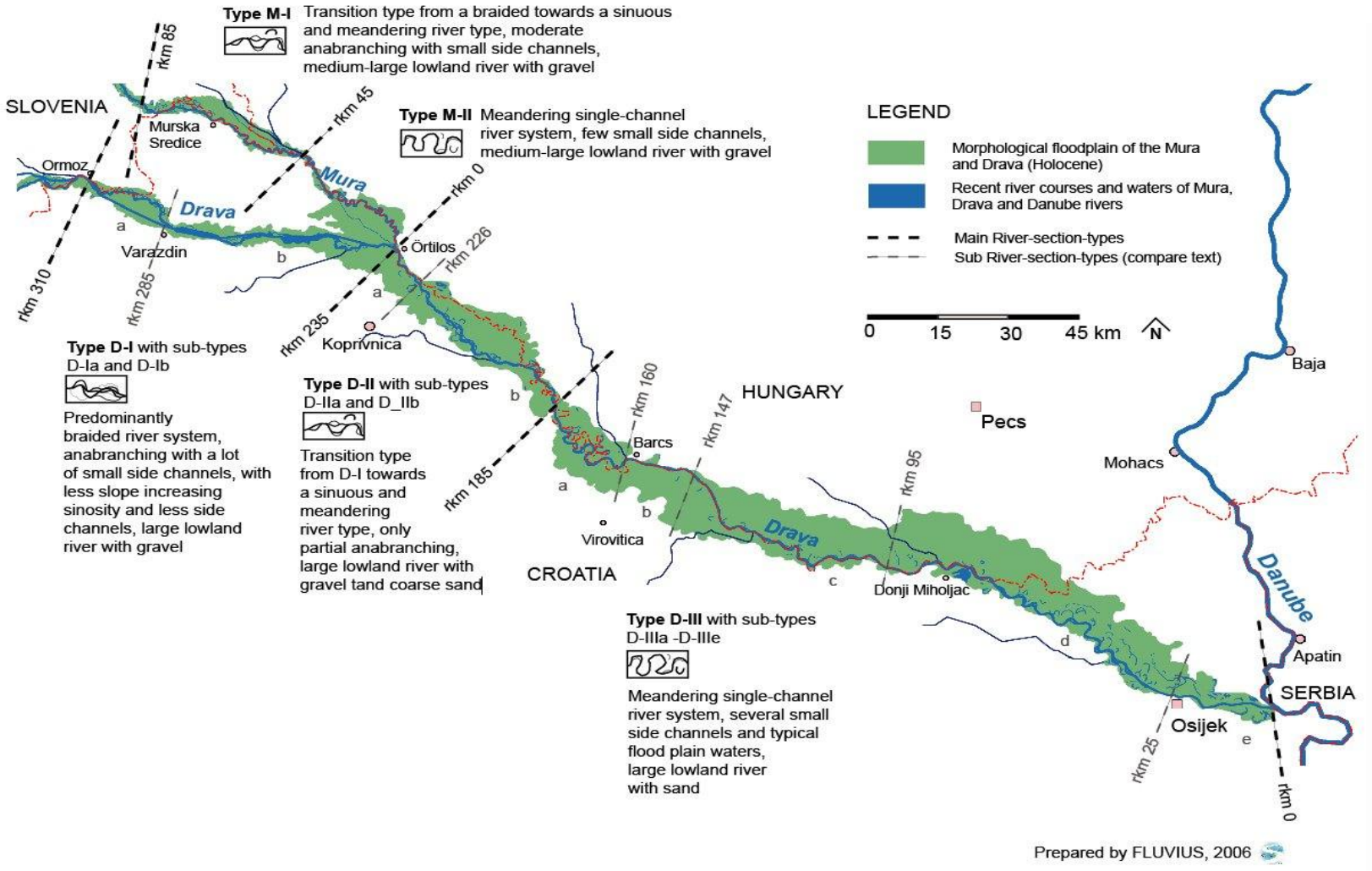
1. River channel
2. Banks and riparian zone
3. Floodplain

Five classes evaluation, colour-ribbon map (scale 1:25.000), data generalisation for overview proposes



Chapter 3

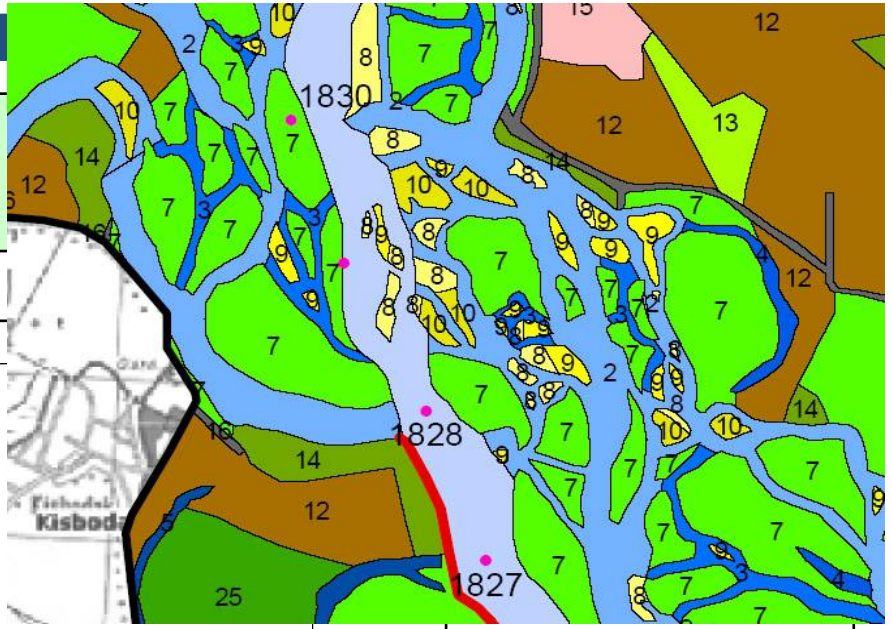
Drava: Hymo reference conditions and typology

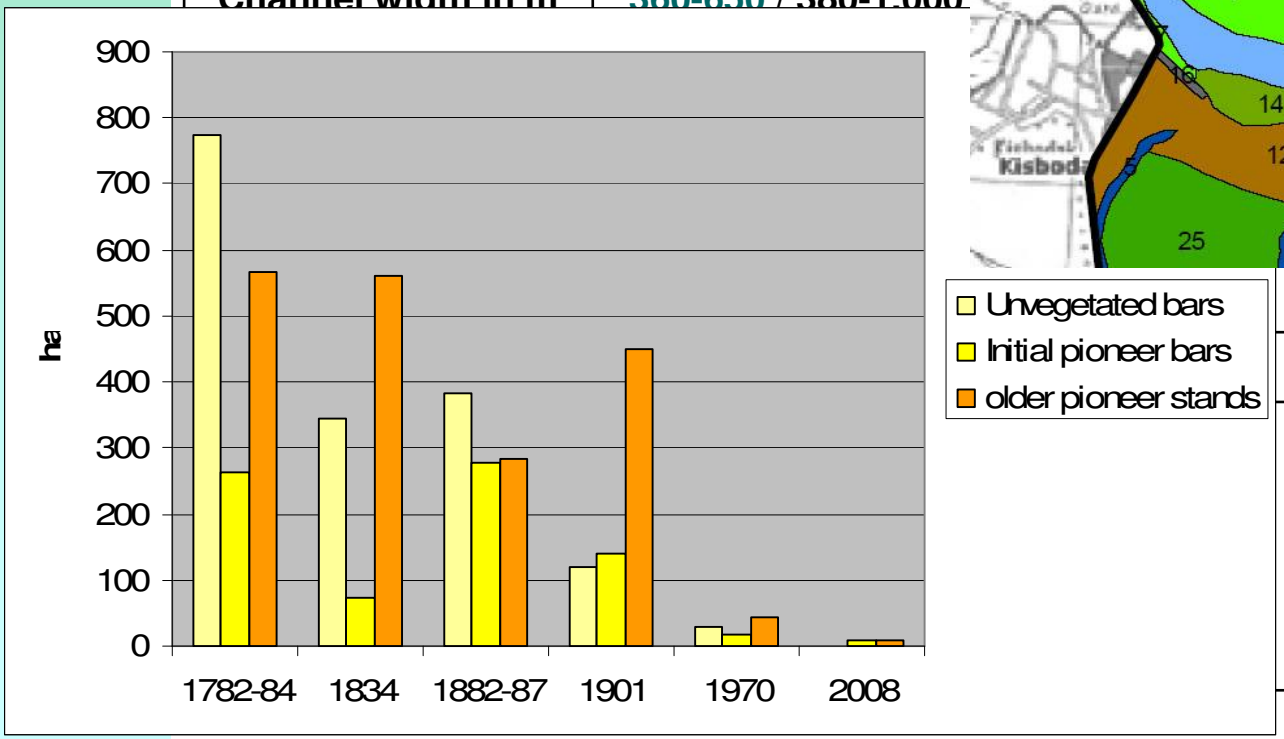


Chapter 3

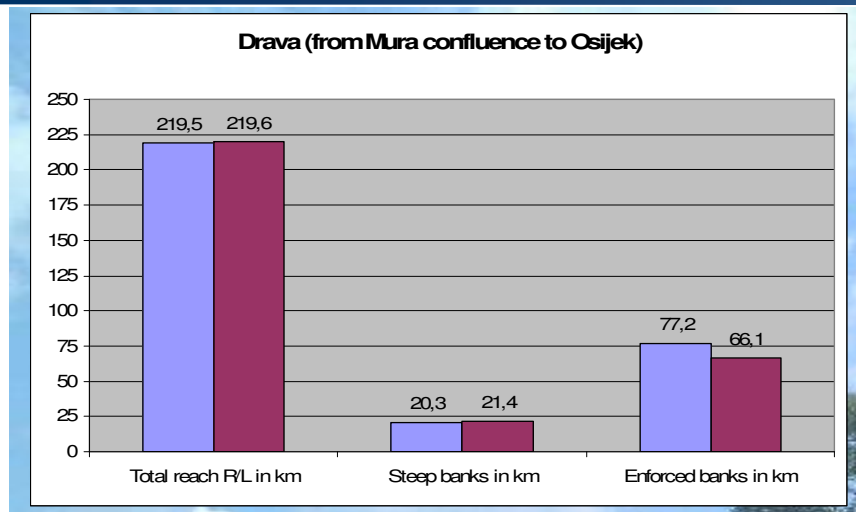
Fluvial morphological parameters

Parameter	Danube from Bezdan to Apatin (reference / recent)
Reach in km	43 / 24
Channel width in m	360-650 / 380-1.000
	2,5 / 1
	9 / 1
	II (10%) III (25%) IV (45%) V (20%) / I (50%) II (50%)





Drava: Evaluation example Lower Drava and Mura



Hydromorphological Status of the Drava and Mura Rivers

Drava 23

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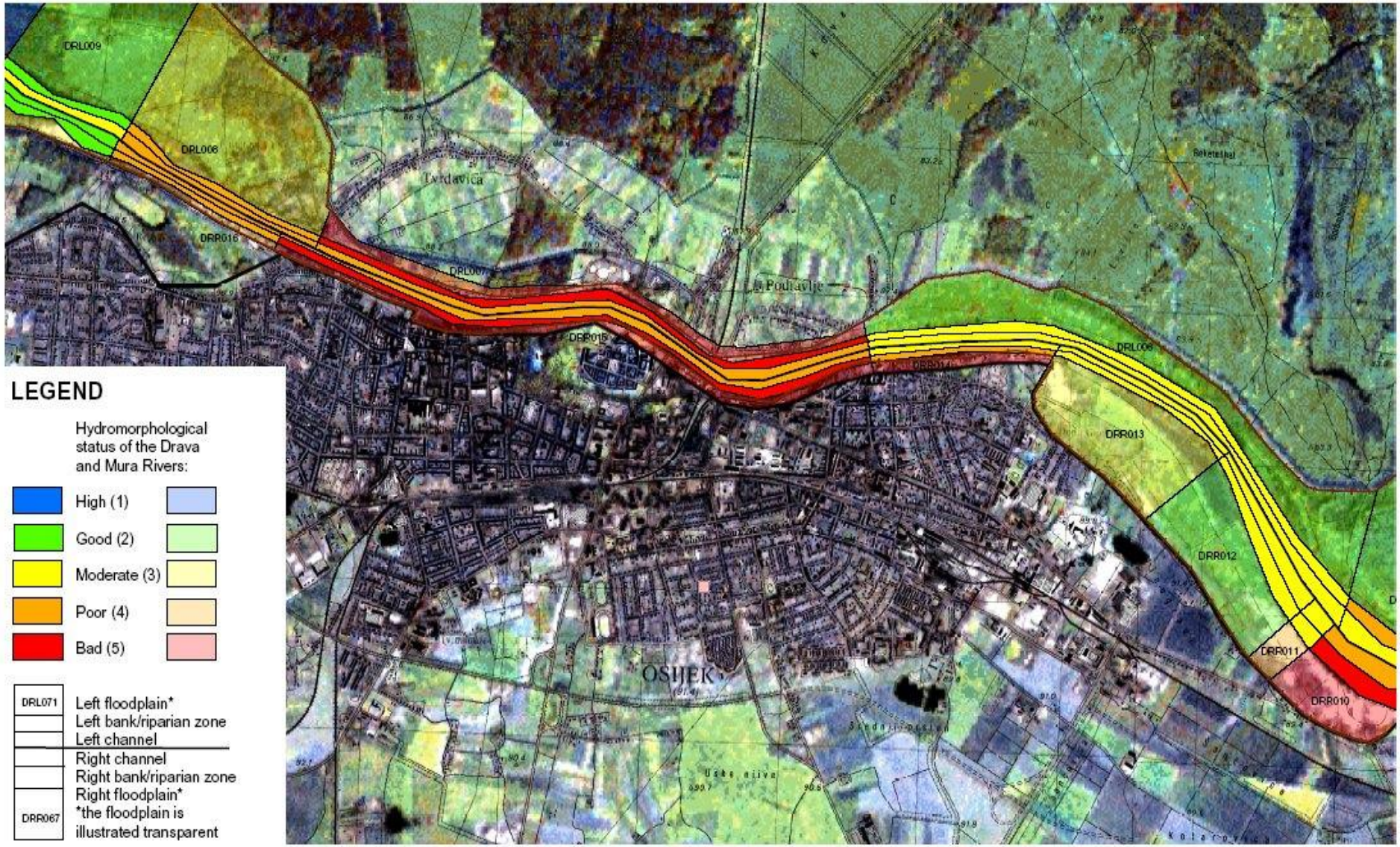


LEGEND

Hydromorphological status of the Drava and Mura Rivers:

- High (1)
- Good (2)
- Moderate (3)
- Poor (4)
- Bad (5)

DRL071
- Left floodplain*
- Left bank/riparian zone
- Left channel
- Right channel
- Right bank/riparian zone

DRR067
- Right floodplain*

*the floodplain is illustrated transparent

- Borders
- Morphological floodplain margin
- Flood protection dikes

0 0,5 1 2 3 Kilometers

N

Scale: 1 : 25,000
(in A3 landscape paper format)

Prepared by FLUVIUS, Vienna, August 2006

Chapter 3

Drava: Overall assessment

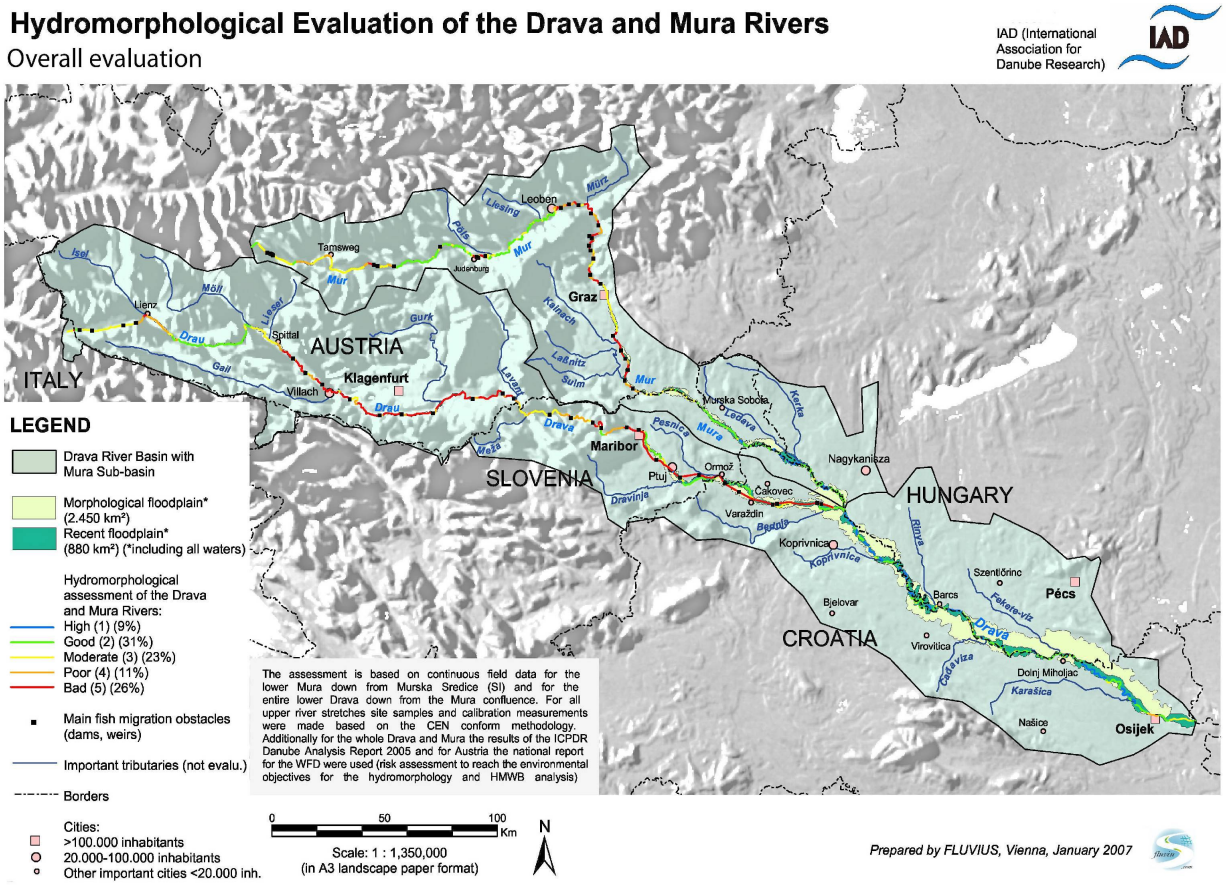
- **Main „drivers“ for the Drava: 1. Hydropower, 2. Flood defence, 3. Sediment extraction, 4. Navigation (Mura without navigation)**

- **Overall floodplain loss for the entire Drava and Mura: -75%**

- **Over 50 large dams**

- **Overall hydromorphological evaluation:**

40% have class two or better (mostly along the lower stretches in Hungary and Croatia), 60% contributes to the classes 3-5 (over 26% are completely modified).



Case Study 2 Danube: JDS2, longitudinal survey, site survey

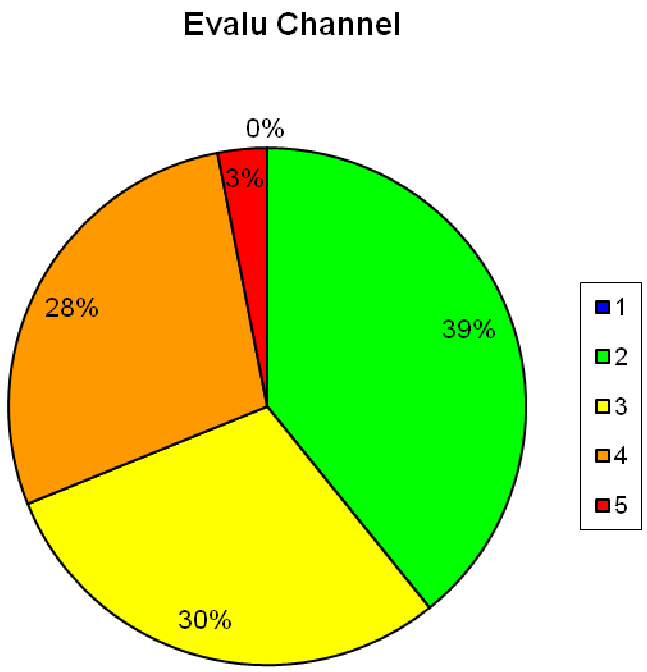
- Longitudinal survey: Homogenous stretches of about 50 km along a five class evaluation system according to SOP
- Site survey: Detailed JDS site characteristic according to SOP table without evaluation
- Inventory of dams, hydrological situation during the survey
- Additionally to the site survey fact sheets for all stations incl. tributaries were prepared
- Access database development and GIS integration (site coordinates, rkm and assessment stretches)

Danube: Longitudinal survey (focus)

- A total of 62 homogenous stretches along the Danube including the three delta branches (in total 2,584 rkm) were prepared.
- The mean length of each evaluation stretch is about 42 rkm, the smallest is 8rkm (strongly altered town stretch) and by far the longest 225 rkm (between Calafat and Svistov at the lower Danube).
- In general the length of homogenous segments increase for the lower Danube.

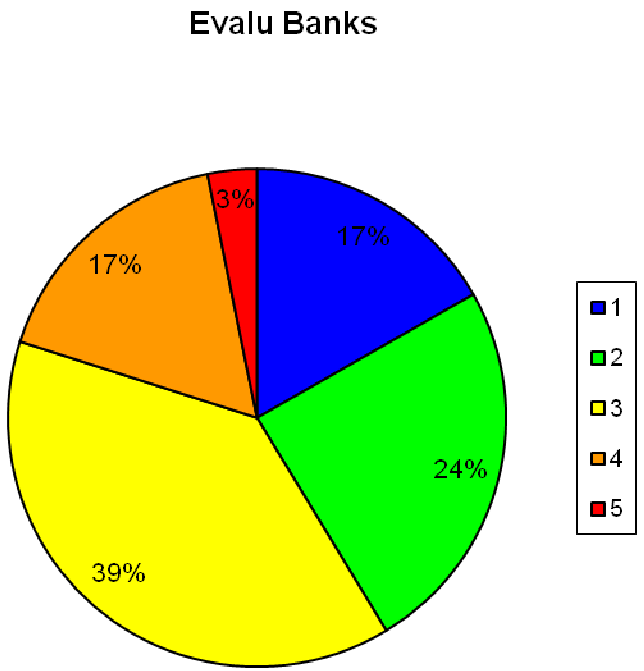
Danube: Classification channel

- class 1: Channel nearly natural
- class 2: slightly modified
- class 3: moderately modified
- class 4: severely modified
- class 5: totally modified



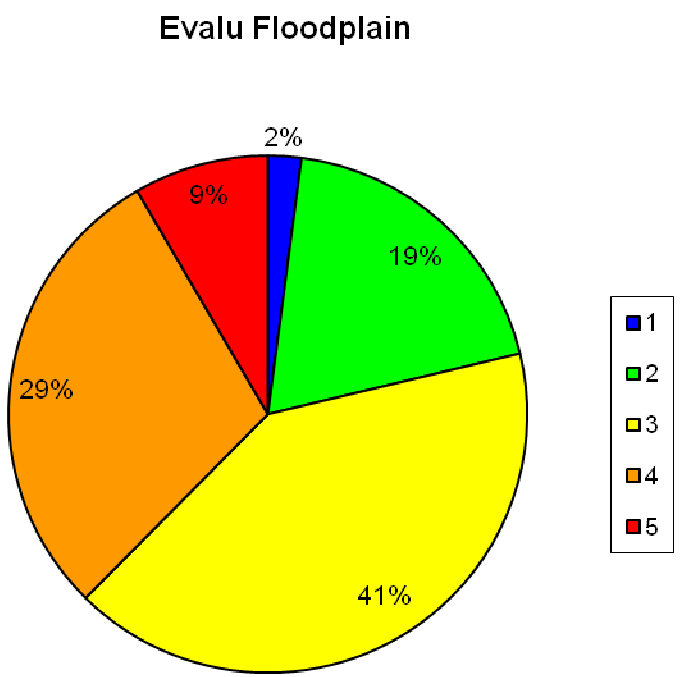
Danube Classification banks

- class 1: nearly natural banks
- class 2: reinforcement in small sections
- class 3: reinforcement in large sections
- class 4: continuous bank reinforcements
- class 5: totally modified banks



Danube: Classification floodplain

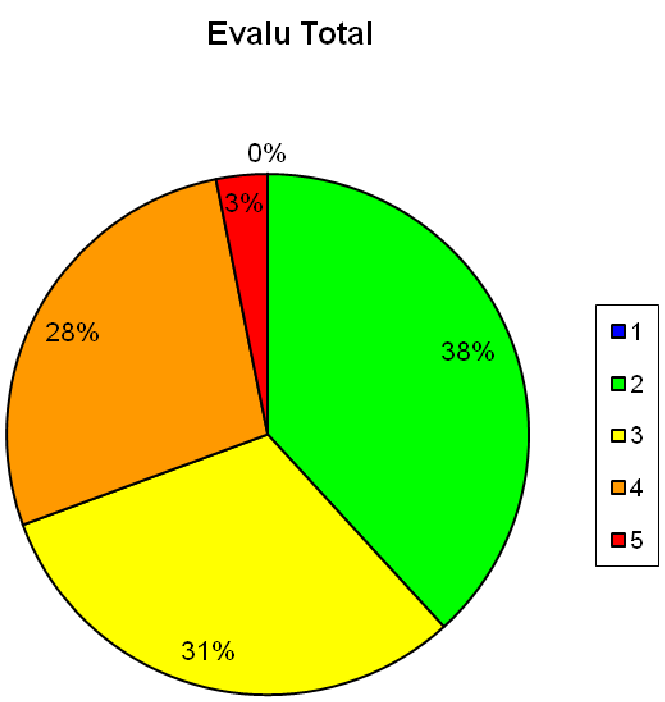
- class 1: Very high ecological value
- class 2: high ecological value
- class 3: moderate ecological value
- class 4: Low ecological value
- class 5: floodplain totally modified



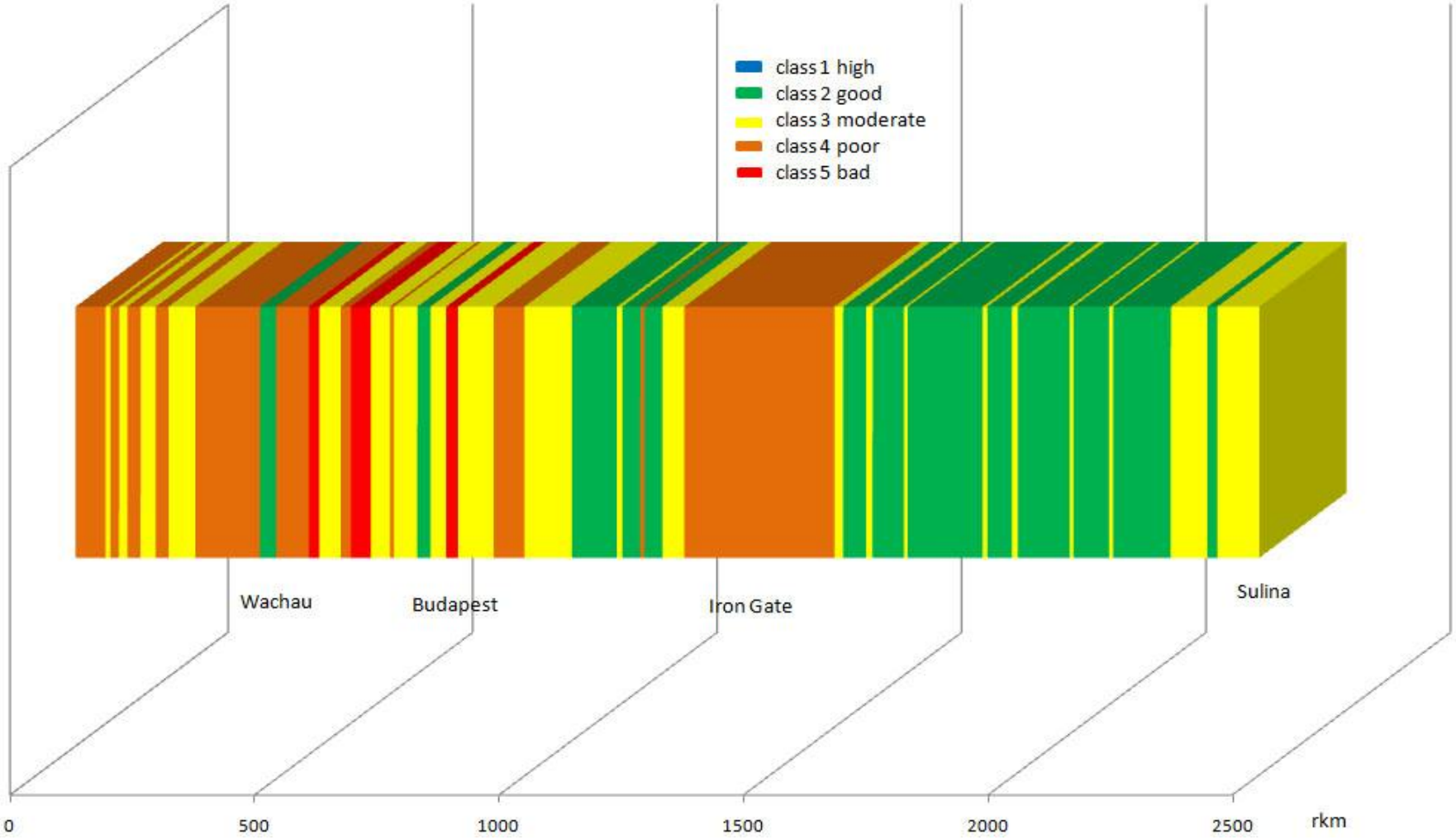
Danube: Total evaluation

Assessment according to WFD/CEN classes:

- class 1: High
- class 2: Good
- class 3: Moderate
- class 4: Poor
- class 5: Bad



Danube: Total evaluation



Outlook, implications for the Danube

- Harmonized approaches based on CEN standard are necessary
- Assessment of screening methods versus full inventories
- Morphological reference conditions should be more considered
- Hymo inventories would strongly support and post-validates the typological units and the water body delineation
- Would enable a transparent HMWB designation based on quantitative and qualitative hydromorphological data
- Would allows a precise development of tools for measures
- Ongoing projects involved: IAD Hymo study Mures, SEA Szigetköz (historical riparian landscape analysis)