

The Morava River Restoration: Plan of Measures Prepared in Agreement with EC Water and Nature Protection Directives - MoRe

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creating the future

Programm zur grenzüberschreitenden Zusammenarbeit SLOWAKEI – ÖSTERREICH 2007-2013
Program cezhraničnej spolupráce SLOVENSKA REPUBLIKA – RAKÚSKO 2007-2013

Project objectives:

... preparation of the detail plan of restoration measures (RM) for the Morava river (km 53 – km 69) based on the restoration strategy (BGM II project (2007))

Key approach:

Re-introducing of flow dynamics and sediment transport that is recognized as the most vital step for sustainable restoration at lowland meandering river with active sediment transport

WP2 Feasibility study, WP4 Abiotic and biotic monitoring, WP3 Detail planning of restoration measures

Project partners: **AT:** via donau

umweltbundesamt

viadonau/

umweltbundesamt[®]

SK: Výskumný ústav vodného hospodárstva

Slovenský vodohospodársky podnik, š. p.

ŠOP SR, Chránená krajinná oblasť – Záhorie

Inštitút ekozológie, SAV



SLOVENSKÝ
VODOHOSPODÁRSKY
PODNIK, š.p.



Co-financing:

Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft, Abt. II/4

Ministerstvo pôdohospodárstva a rozvoja vidieka Slovenskej republiky (MPRV SR)

Morava river - Where we are?

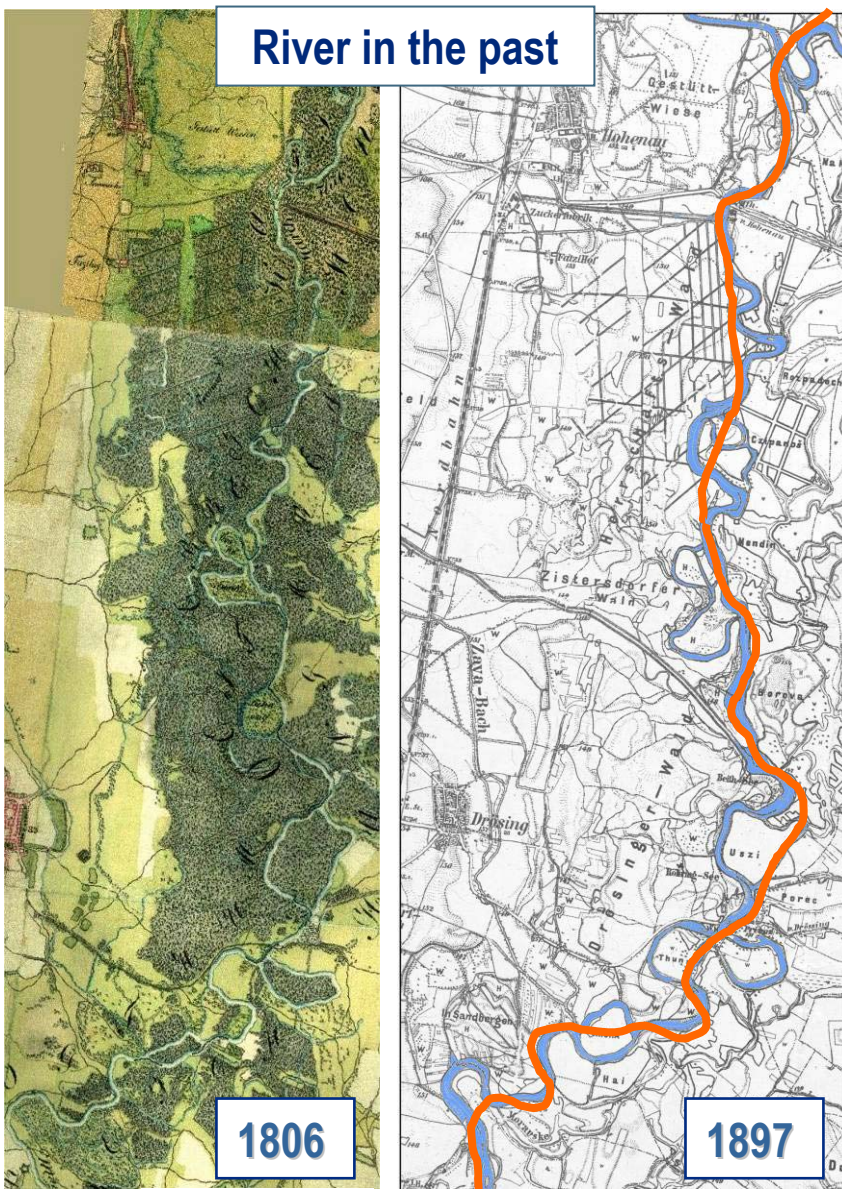


Project area: Slovak-Austrian border section (km 53 – km 69)

- slowly flowing meandering river
- with fine bed material and active sediment transport
- crates the unique wetland ecosystem, including areas **Natura 2000 and Ramsar sites**



River in the past



1806

1897

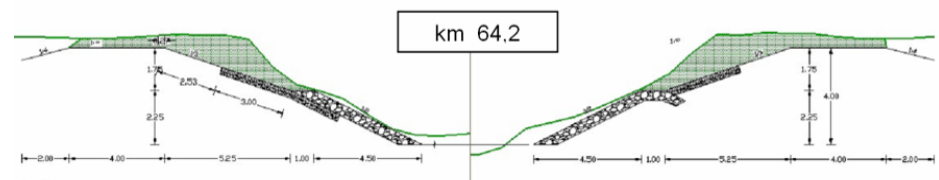
...after regulation:



cut-off meander



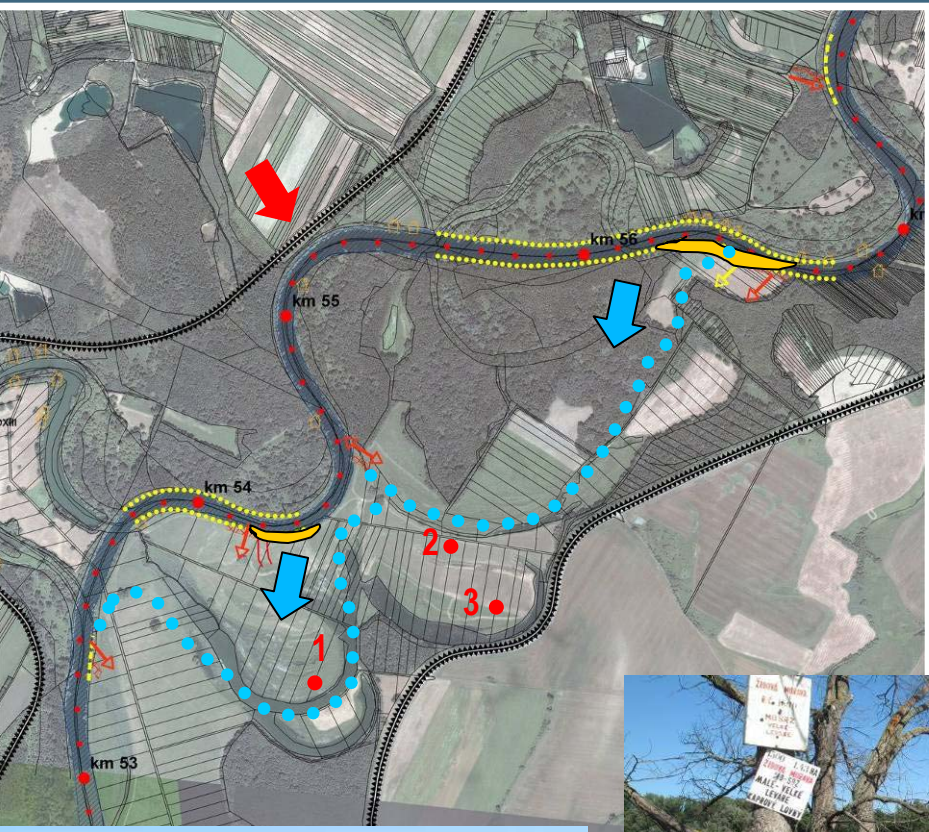
river channel



- uniform channel - poor habitat diversity
- no lateral movement
- limited hydrological connectivity
- changes in flow dynamics and sediment transport
- incised river bed and floodplain deposition
- separation of the river and floodplain processes



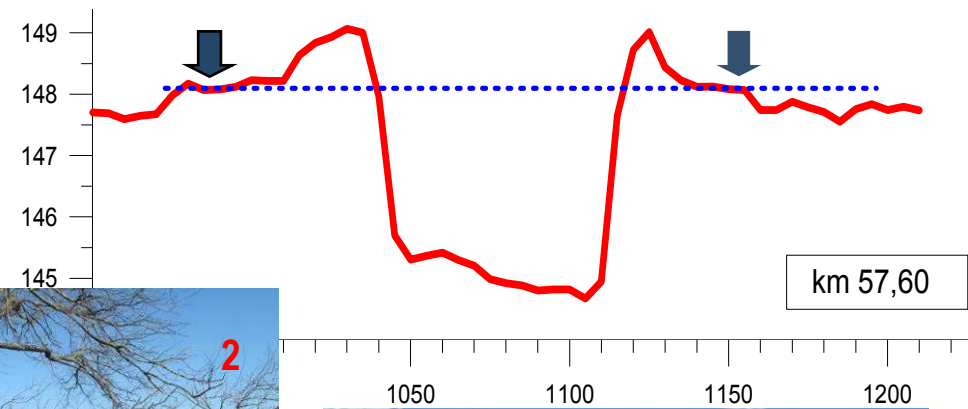
Successive abiotic and biotic degradation

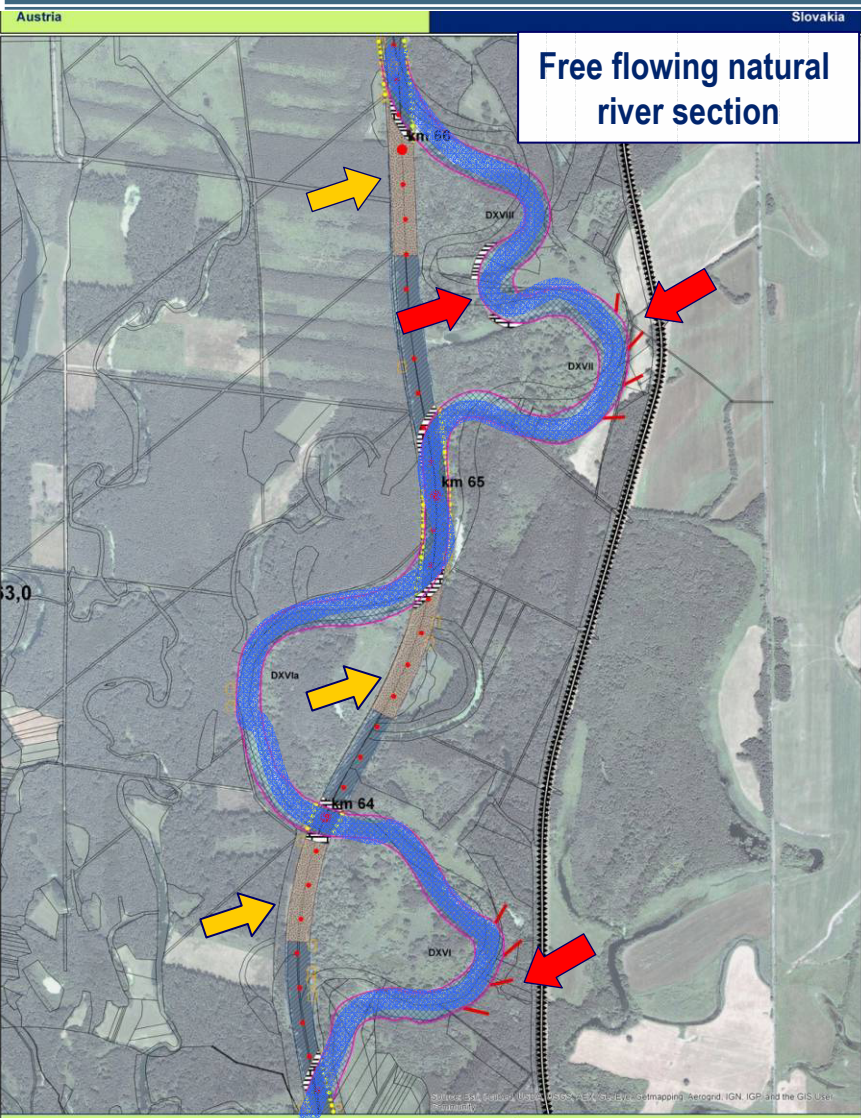


Bgm II – basis for detail plan of measures

1) Smaller size measures:

- Bank pavement removal to trigger natural bank erosion & initiate lateral development
- Lowering of the natural levee (locally) to increase frequency and duration of mean floods





2) Big size measures:

- integration cut-off meanders into the river system to restore original morphodynamics

MIKE11, CCHE2D, km 69-km 53 - flow pattern, sediment transport, river bed morphology

Physical model: km 64- km 66 - reconnection variants - flow pattern, river bed morphology

OPTIMIZATION

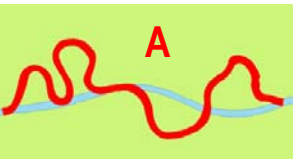
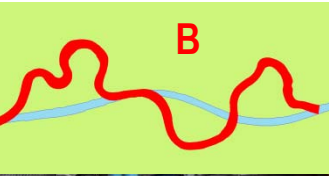


Types, combinations and dimensions of restoration measures ensuring dynamic equilibrium

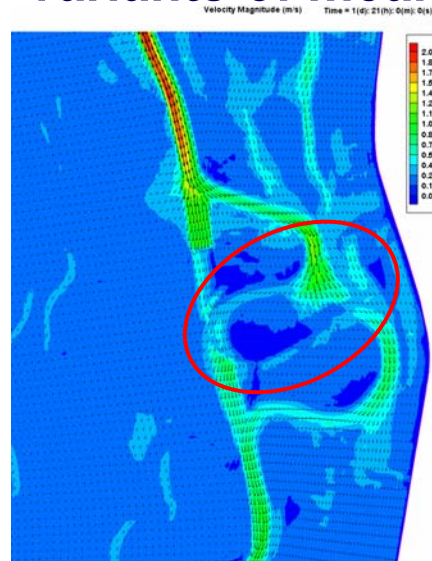
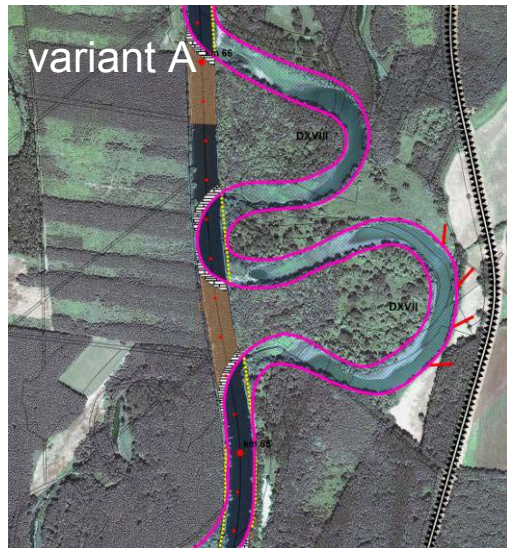
Optimal restoration scheme

- flood protection - Q_{100} water level
- ice regime
- habitat diversity of the restored channel

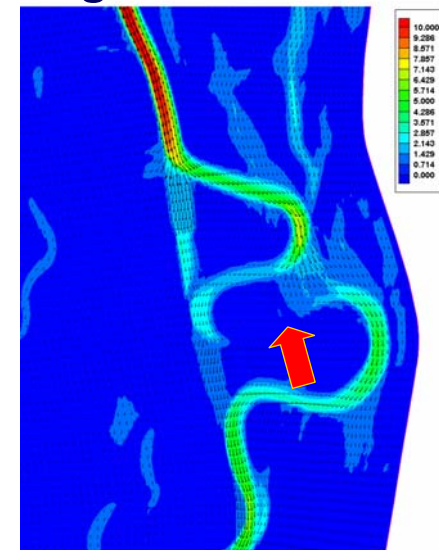
Physical model with mobile river bed



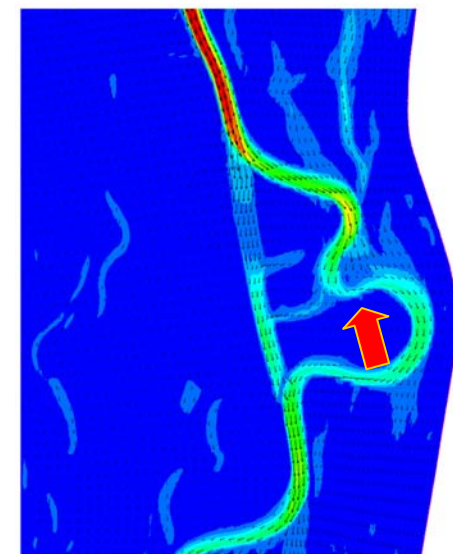
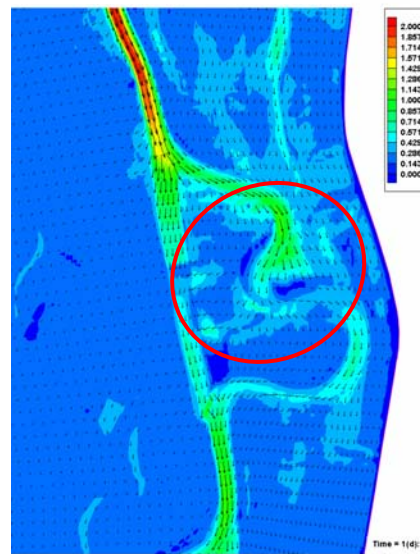
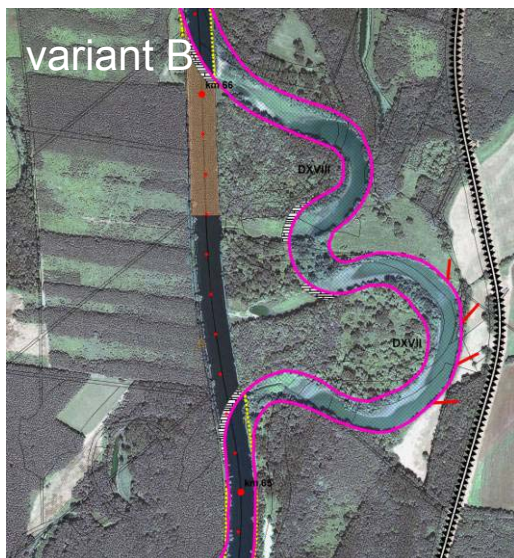
Flow pattern - variants of meanders integration



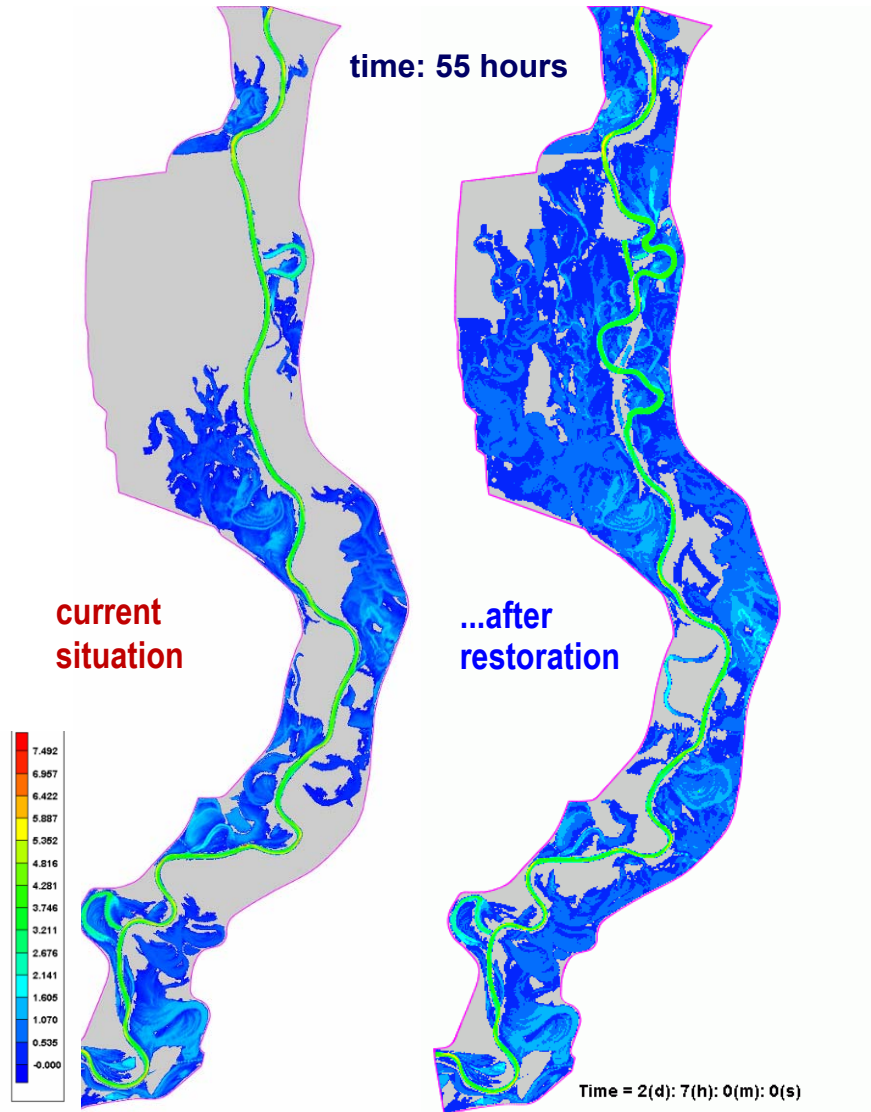
velocity distribution



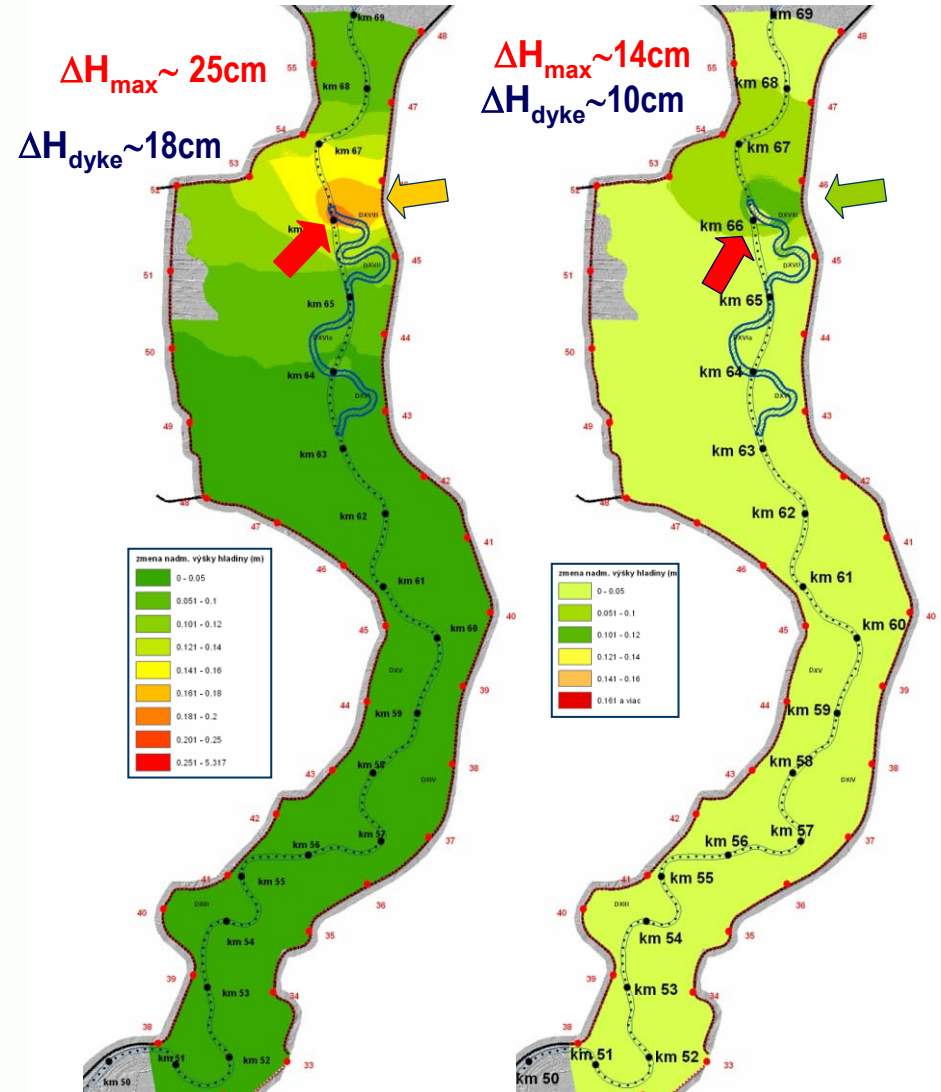
specific discharge



Bank levee & water regime in floodplain



Flood protection & meanders integration

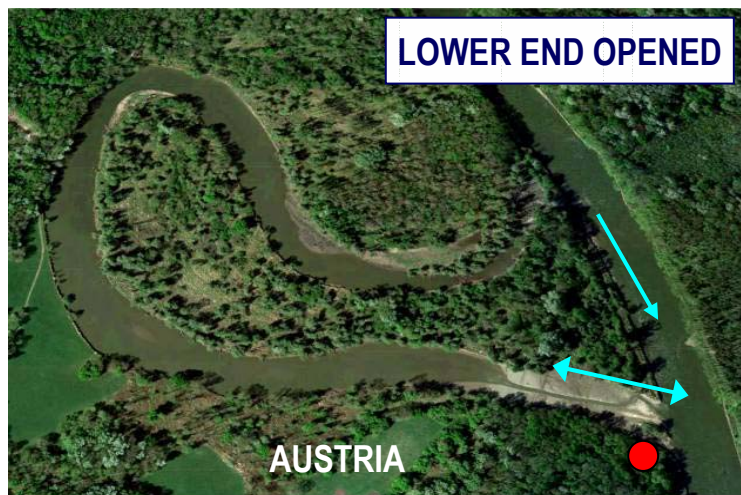
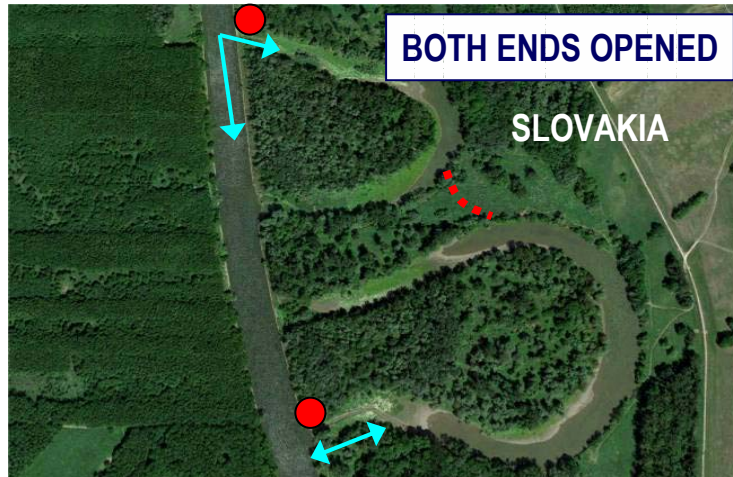




ICE REGIME video

Lessons learned

- Any flow distribution between the main river and oxbow arms can lead to rapid depositions in the case of lowland meandering river with active sediment transport ☹️



- **Implementation of large scale RM that are not based on physical processes are often ineffective and too costly (particularly on large rivers)** 😞
- **Local measures usually have limited effectiveness - restoration strategy should be developed for longer river stretch** 😞
- **Numerical and physical models in combination with field data are effective tools for optimizing the flow dynamics and sediment transport to achieve effective restoration scheme** 😊
- **Morphodynamic equilibrium is essential for sustainable restoration** 😊

... final remark

Respecting the river behavior in restoration scheme enables to recreate hydromorphological conditions, which allow the river to create channel morphology itself, which can be very close to the natural state. This approach provides sustainable restoration with maximized ecological benefit 😊 😊 😊

Dynamic natural section of the Morava river (Osypané brehy) Strážnice – Czech Republic





Thank you ...

