

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

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EU Programme of cross border cooperation
Austria –Slovakia 2007-2013



creating the future
Program na transhraničnej spolupráci SLOVAKIE - ÖSTERREICH 2007-2013
Program cezhraničnej spolupráce SLOVENSKÁ REPUBLIKA - RAKÚSKO 2007-2013

Project objectives:

... detail plan of restoration measures for the Morava river

Key approach:

Re-introducing of natural processes - flow dynamics and sediment transport

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

Project partners: **AT:** via donau
umweltbundesamt



SK: Výskumný ústav vodného hospodárstva
Slovenský vodohospodársky podnik, š. p.
ŠOP SR, Chránená krajinná oblasť – Záhorie
Inštitút ekoszológie, SAV



Co-finnancing:

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?

Slovak-Austrian border section
(km 53 – km 69)

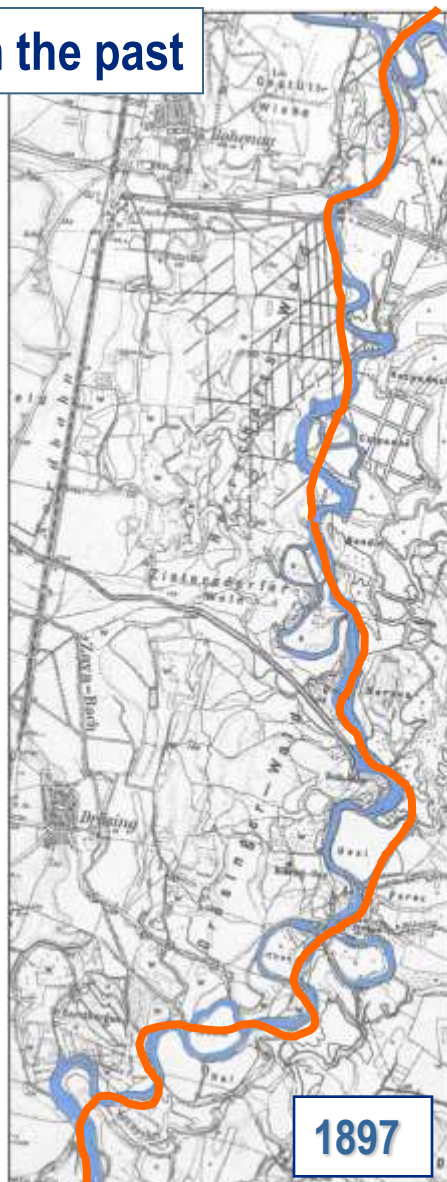
- slowly flowing meandering river
- fine bed material, active sediment transport
- unique wetland ecosystem,
Natura 2000 and Ramsar sites



River in the past



1806



1897

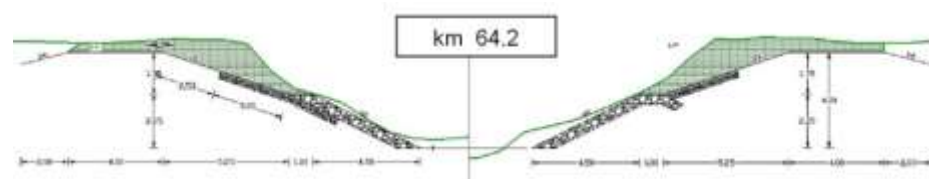
...after regulation:



cut-off meander



river channel

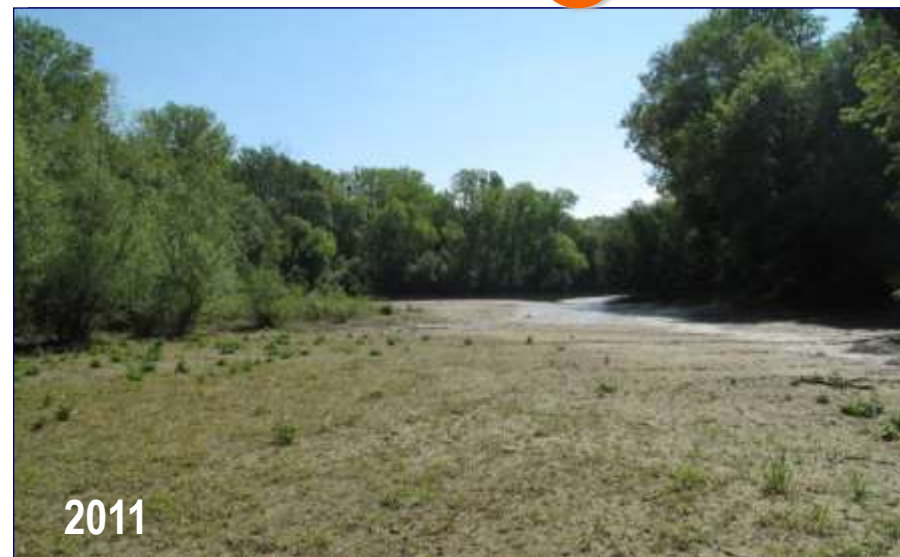
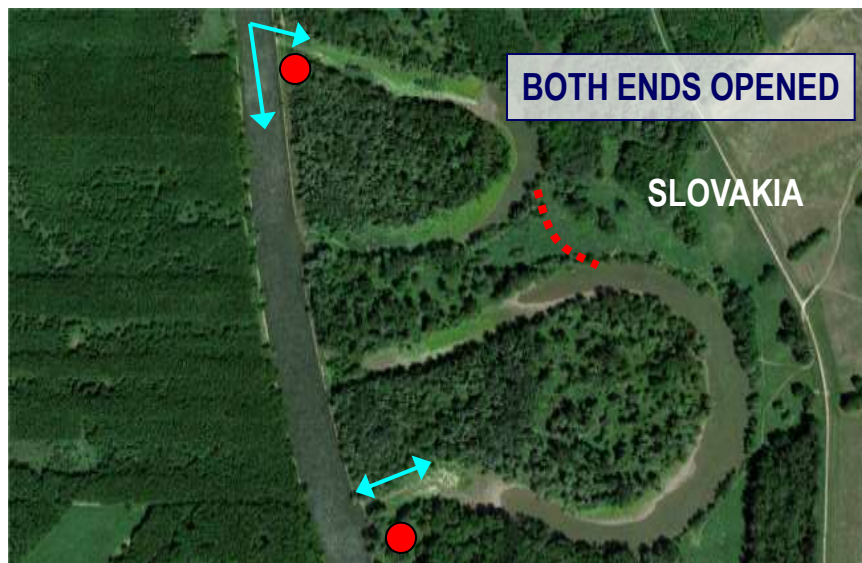


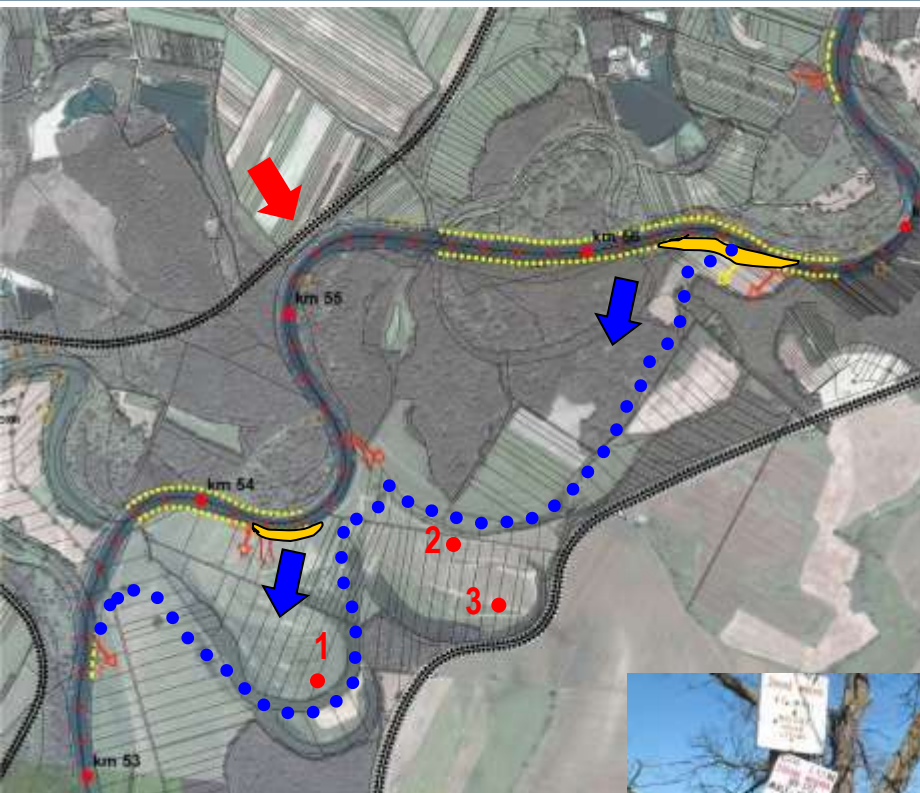
- uniform channel - poor habitat diversity
- no lateral movement
- limited hydrological connectivity
- changes in flow dynamics and sediment transport
- incised river bed and floodplain deposition
- separation of the river and floodplain processes



Successive abiotic and biotic degradation

Attempts to reconnect cut-off meanders ...

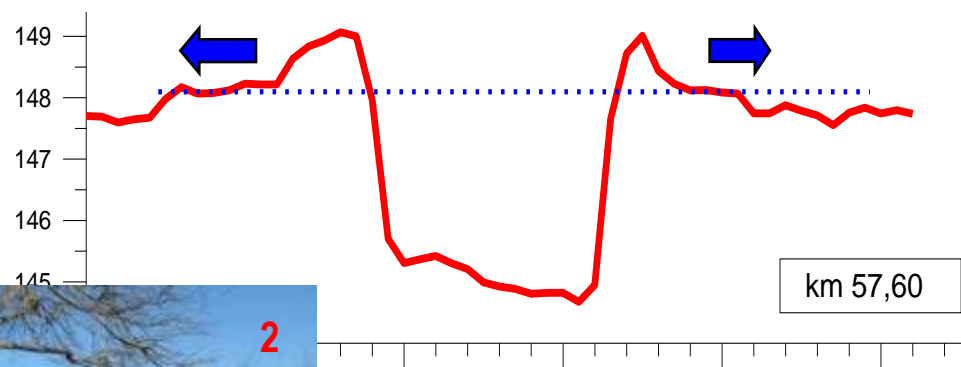


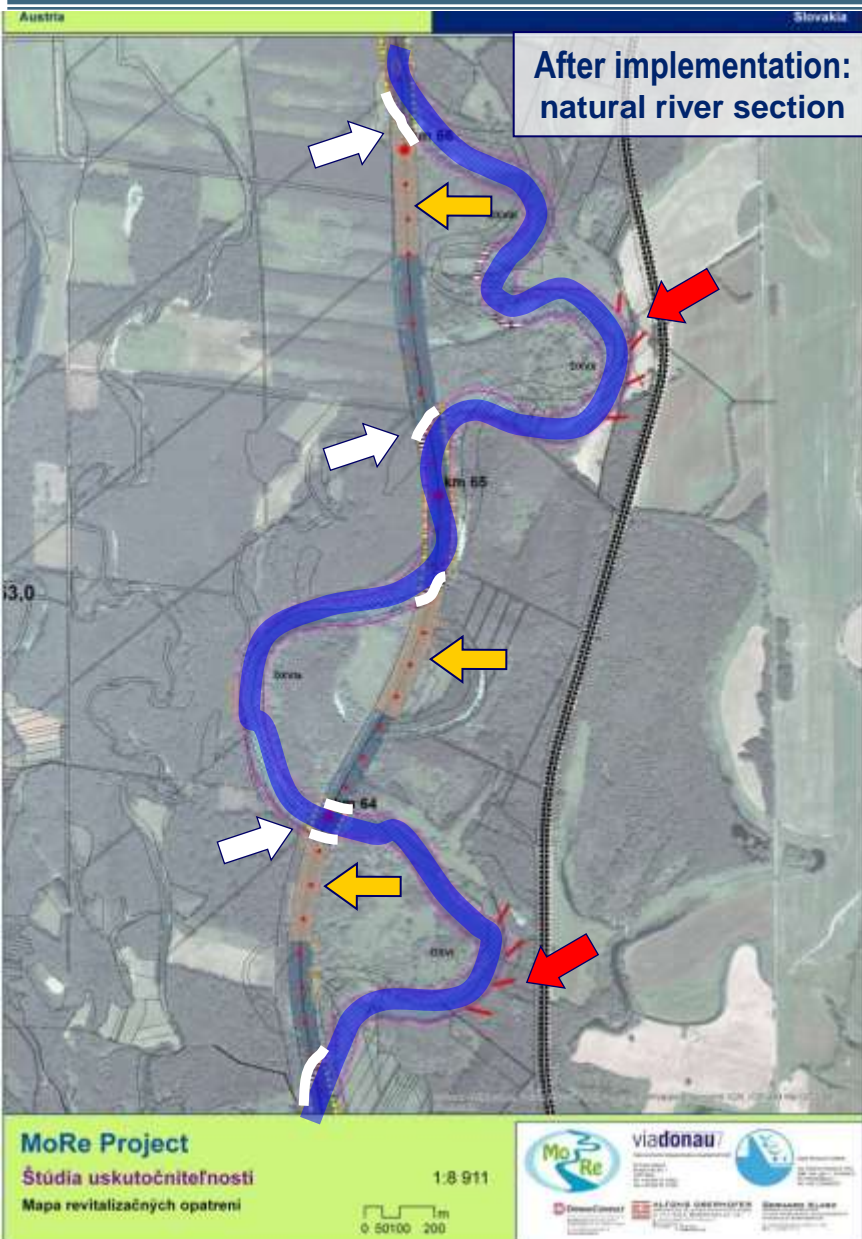


Bgm II (2007) – reintroducing of natural dynamics

1) Smaller size measures:

- Natural levee – lowering
- Bank pavement - removal
- Tributaries - continuity





2) Big size measures:

- cut-off meanders - integration

OPTIMIZATION



Numerical models: MIKE11, CCHE2D
Physical model (mobile bed)
Field survey

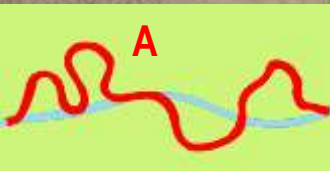
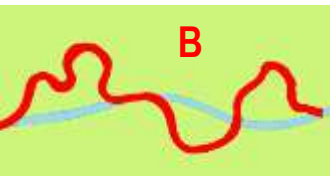


DYNAMIC EQUILIBRIUM

Main constrains:

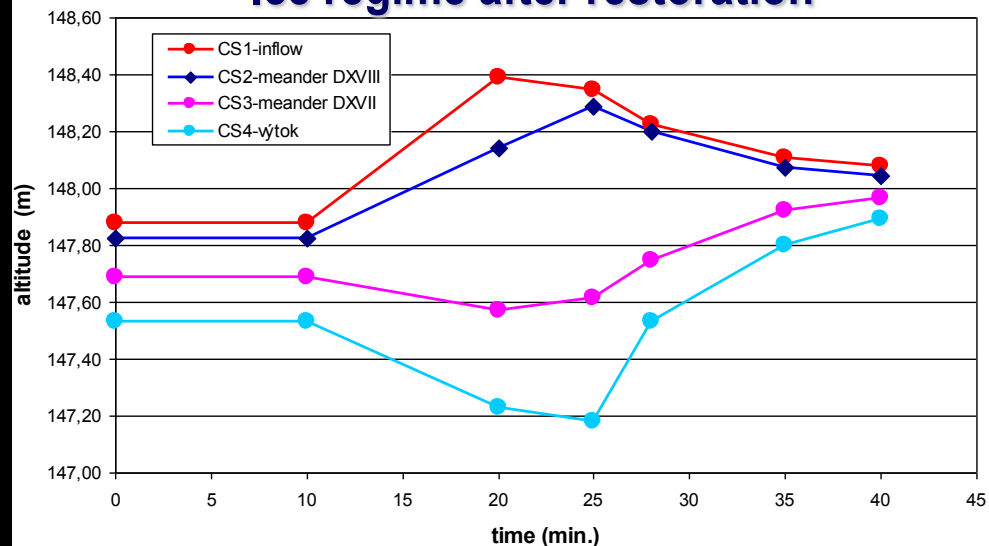
- flood protection - Q_{100} water level
- ice regime

Morphology and flow dynamics



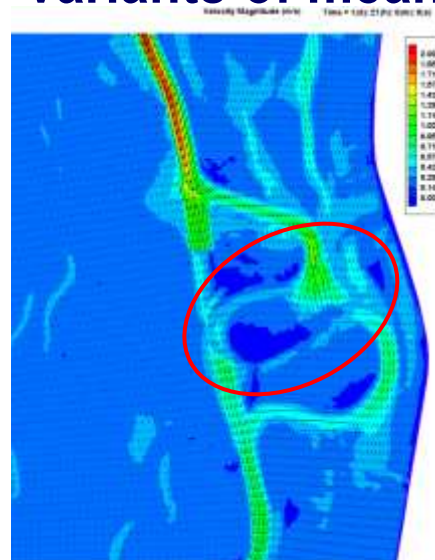
Video Q = 33 m³s⁻¹

Ice regime after restoration

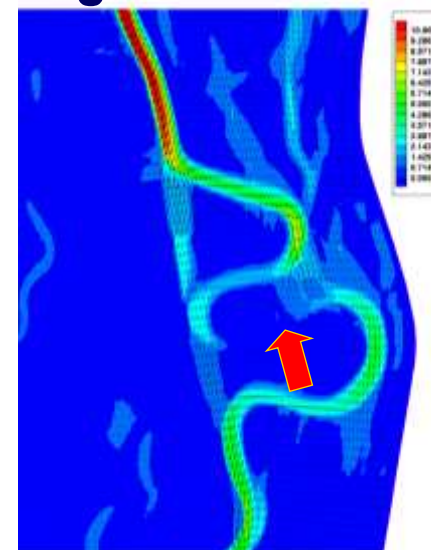


Flow pattern - variants of meanders integration

variant A

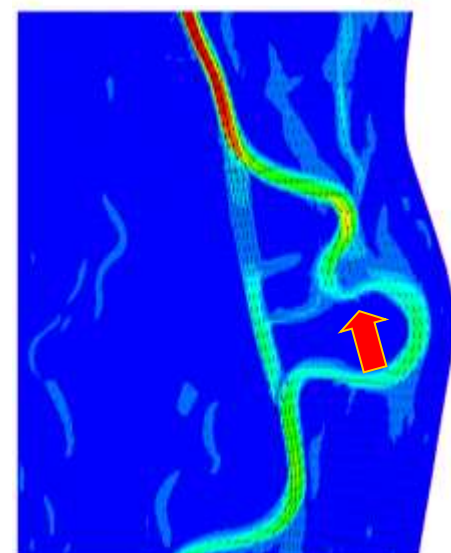
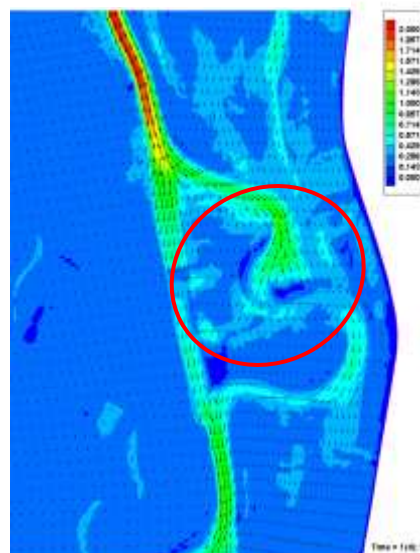
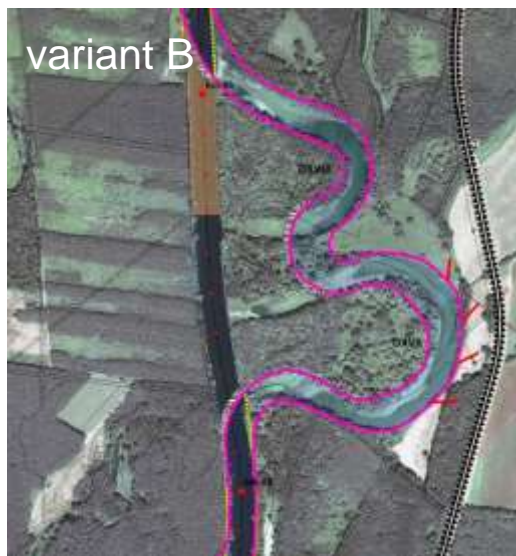


velocity distribution



specific discharge

variant B



Bank levee & water regime in floodplain

$$Q_{\text{bank}} = 300 \text{ m}^3\text{s}^{-1}$$

$$T = 55 \text{ (h)}$$

current
situation

...after
restoration

Time = 2(d): 7(h): 0(m): 0(s)

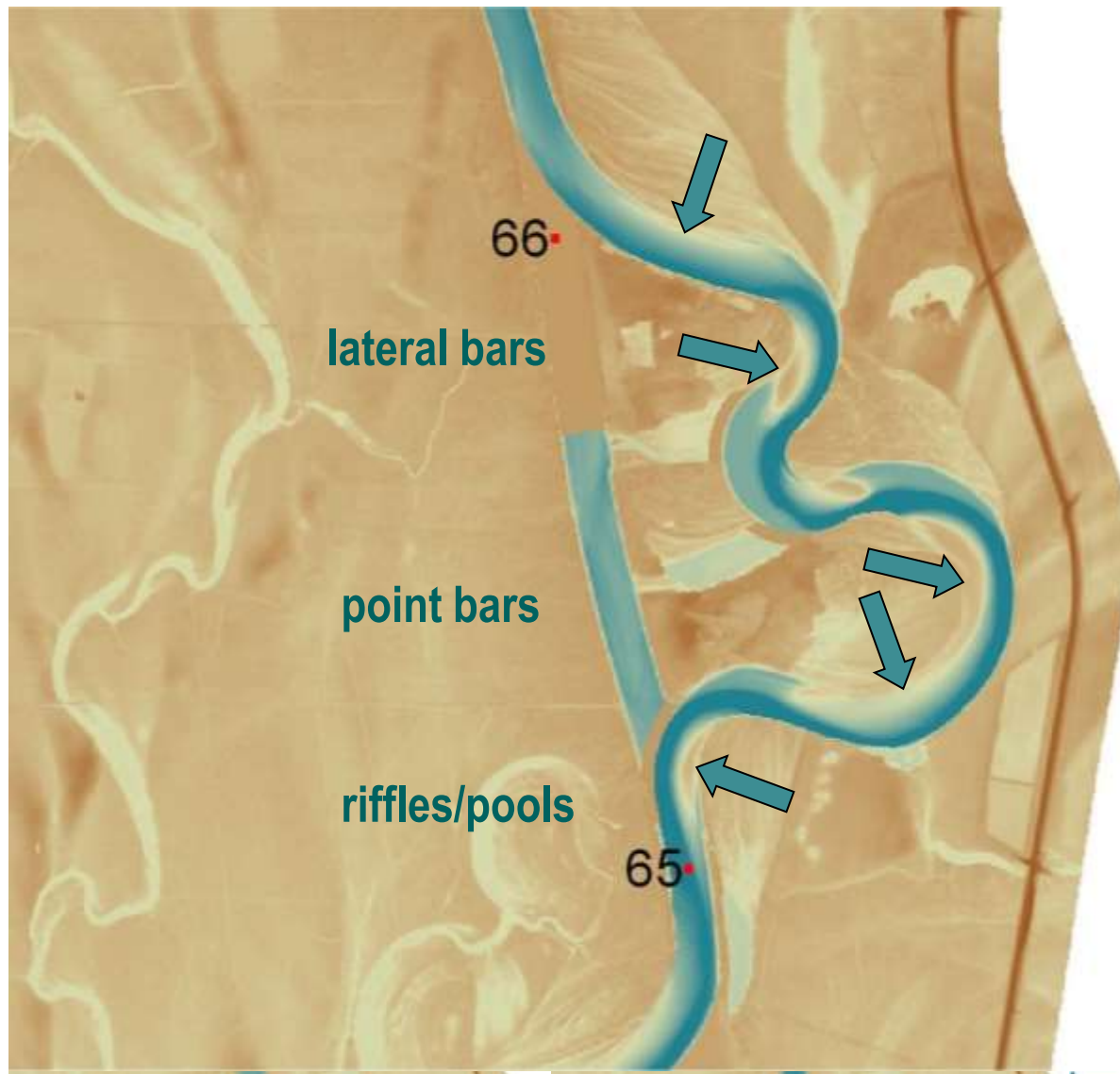
Flood protection & meanders integration

$$\Delta H_{\text{dyke}} \sim 20 \text{ cm}$$

$$\Delta H_{\text{dyke}} \sim 8 \text{ cm}$$

Changes in the channel morphology - habitat diversity

current situation



Lessons learned

- Visual improvement → gardening, low effect/high costs ☹️
- Flow distribution in active river → rapid sedimentation, eco degradation ☹️
- Local measures ☹️ → restoration strategy 😊
- Optimizing tools → numerical, physical models, field survey 😊
- Morphodynamic equilibrium → sustainable restoration 😊
- Abiotic and biotic monitoring → success or failure ? 😊

Natural section of the Morava river (Osypáné brehy) – Czech Republic



Re-introducing of natural hymo conditions - sustainable restoration & max. ecological benefit



Thank you ...

