

# **A NEW AGE OF RIVER ENGINEERING**

## **Middle Danube experience**



### **Authors:**

**Duška Kunštek, Ph.D.Civ.Eng.**  
**Head of Directorate for Inland  
Navigation**

**MSTI, HR,**

**Zdenko Tadić, B.Sc.C.E.,**  
**Technical Director at Hidroing  
Ltd., HR**



# What is river engineering?

**River Engineering is a branch of civil engineering dealing with the design and construction of various structures to improve and/or restore rivers for both human and environmental needs. (USACE).**

Permanent changing in rivers requests new approach of river engineering and adjustments to present situation.



# How will we make river engineering green?

Perceive the whole life cycle of the river

Take sustainable development as the concept

Carry out technical and economic analysis and environmental impact assessment

Reduce resource and energy consumption

Reduce pollution emissions

Protect the ecological environment to the greatest extent

Pay attention to the improvement of quality construction and operation efficiency

Build for harmonious development with resources, environment, ecology and society



# What is river engineering?

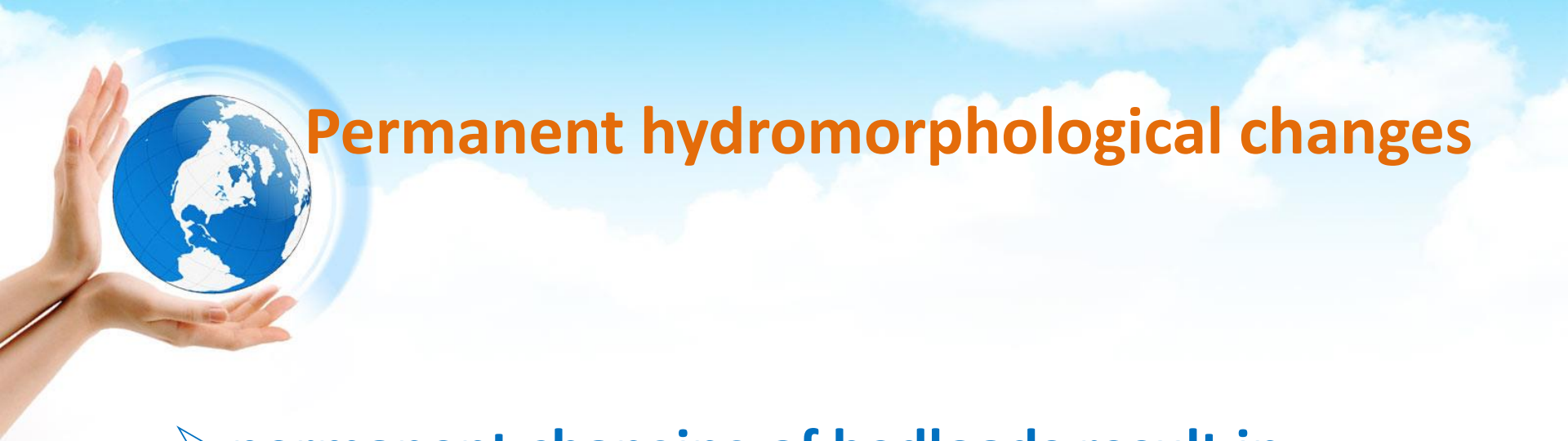
Reasons of new approach related to navigation:

- 1. Climate change – global**
- 2. Permanent hydromorphological changes**
- 3. Minimization of river regulations activities**
- 4. Transfer from load transport to touristic transport**



# Climate change

- long period of low flows – previously – reduction of navigation period
- accelerated drought – flood events
- adjustment of hydrological basic assumptions – new minimums and maximums, new hydromorphology, ...
- adjustment of the lowest navigable water level (EN)

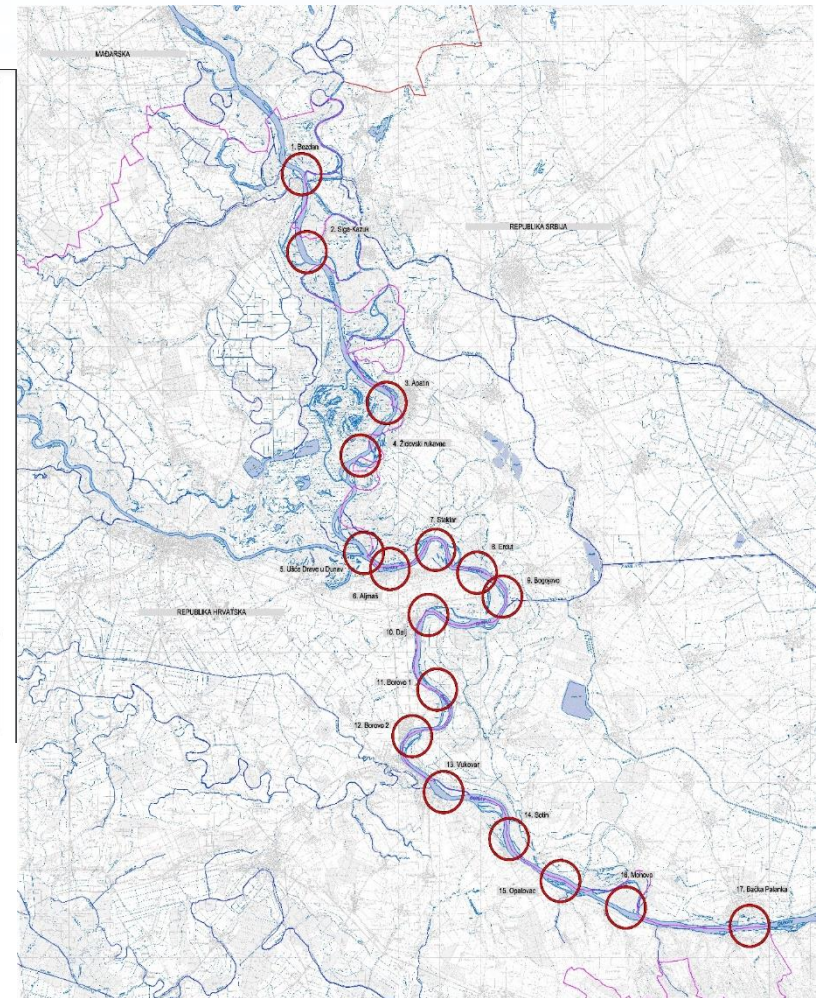
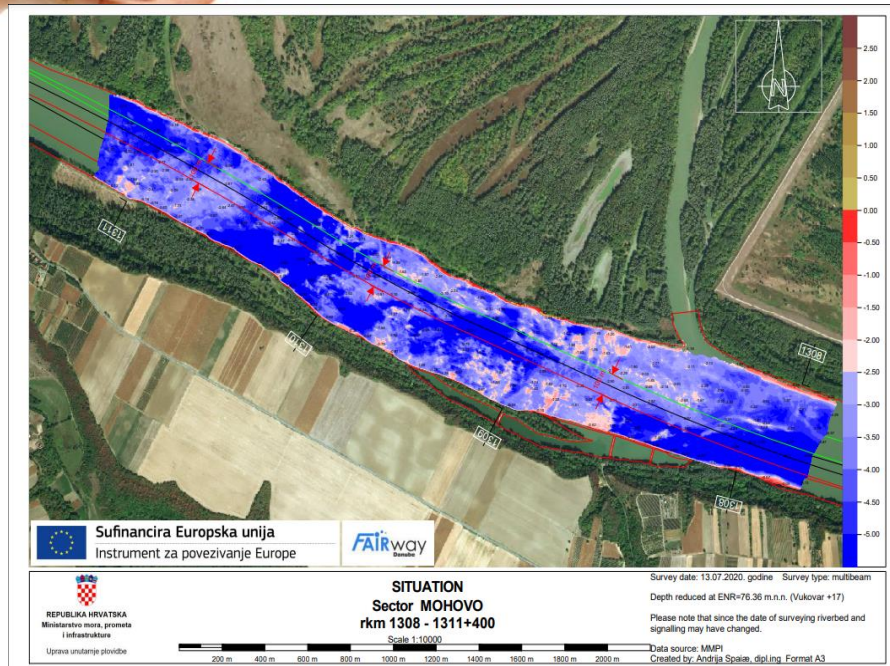


# Permanent hydromorphological changes

- permanent changing of bedloads result in permanent bottlenecks development
- permanent monitoring of existing situation with no civil activities on river
- permanent adjustment of waterway to present situation
- slow process of any other activities



# Permanent hydromorphological changes





# Minimization of river regulations activities

- almost no training activities for river regulation inside regulation lines and institutional level
- slow and complex process of obtaining ecological and construction permissions specially on border stretches
- no maintenance of existing structures – drawdown of their activities





# Transfer from load transport to touristic transport

- increasing the number of vessels in urban areas
- adjustment of urban embankments to ports for touristic vessels
- adjustments of river stretches to port locations due to docking, mooring and maneuvering
- increase of small ports for small and medium vessels



## CONCLUSION

- **Present situation request new approach of river engineering taking into account engineering combines knowledge from multiple disciplines:**
  - **Civil part (hydraulic engineering, hydrology, hydraulics, geology, fluvial geomorphology, sedimentation engineering, mechanics of alluvial channels, design of river training structures);**
  - **Ecological part: (river ecology ad nature ecology - including all directives);**
  - **Economical part;**
  - **Transport part.**



## CONCLUSION

- **Taking into account all mentioned elements new age of river engineering will need a lot of activities and interdisciplinary approach versus almost no activities as it is present.**



**THANK YOU FOR YOUR ATTENTION!**