Interreg
EUROPEAN UNION
Danube Transnational Programme
DanubeSediment

DanubeSediment

Danube Sediment Management - Restoration of the Sediment Balance in the Danube River

Péter Bakonyi

Budapest University of Technology and Economics

Project summary

- Project title:
  Danube Sediment Management - Restoration of the Sediment Balance in the Danube River (DanubeSediment)
- Project duration: 01/2017-06/2019 (30 months)
- Programme: Danube Transnational Programme
  - Programme Priority:
    PA2. Environment and culture responsible Danube region
  - Programme Specific Objective:
    SO2.1 Strengthen transnational water management and flood risk prevention
- Project Budget: 3.56M EUR
- 14 Project Partners (Germany, Austria, Slovakia, Hungary, Croatia, Slovenia, Serbia, Bulgaria, Romania)
- 14 ASPs
- Main project outputs: Danube Sediment Management Guidance, Sediment Manual for Stakeholders

Outline

- Project justification
- Main objective
- Project methodology
- Work packages
  - Objectives
  - Activities

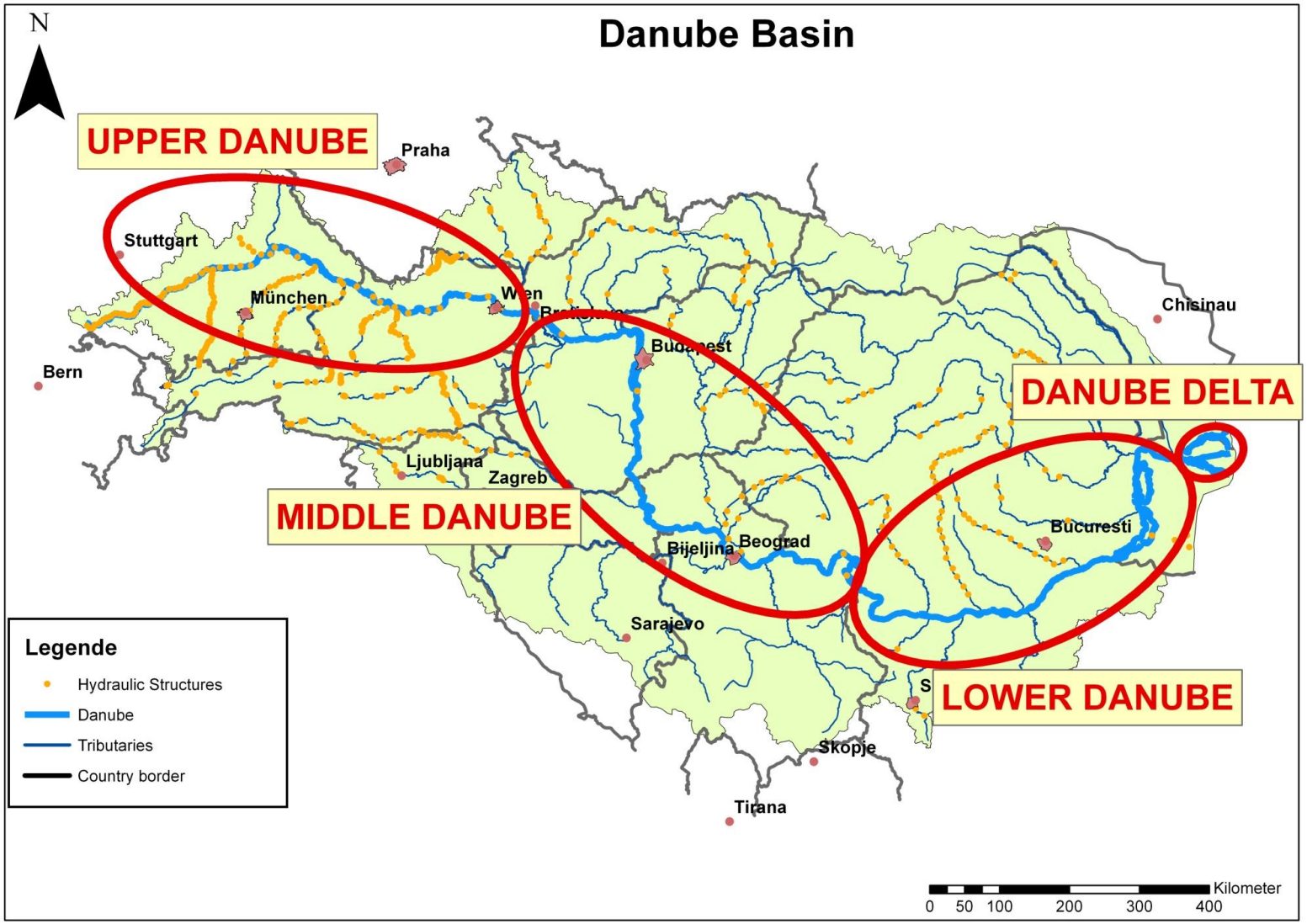
Project justification

- Increasing discrepancy between surplus and deficit of sediment
  - → increases flood risk
  - → reduces navigation possibilities
  - → reduces hydropower production
  - → deteriorates the ecological conditions
  - → decreases the ground water level

- According to the Danube River Basin Management Plans (2009 and 2015) it is not clear if the **sediment management is a significant water management issue or not**, since no such management strategy exists

- Sediment transport along the Danube River has an immediate impact on water management activities and flood risk and there is a strong need to bridge the knowledge gap

Project justification



Project justification – Existing Situation

- Driving forces and impacts – Danube River Basin

⇨ Hydropower plants

⇨ Flood protection

⇨ Navigation

⇨ Climate change

⇨ Changes in land use

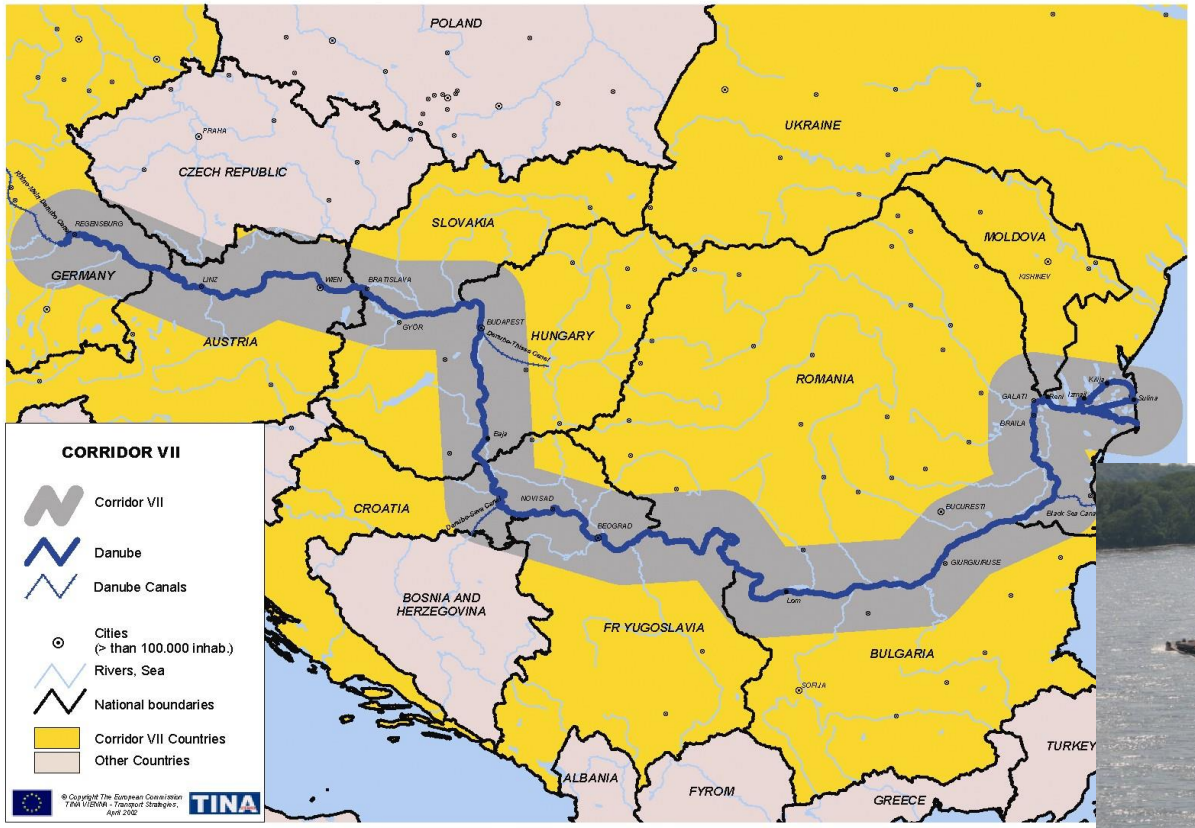
⇨ Point and diffuse source pollution

Project justification – Existing Situation

- Hydropower

Project justification – Existing Situation

- International Waterway

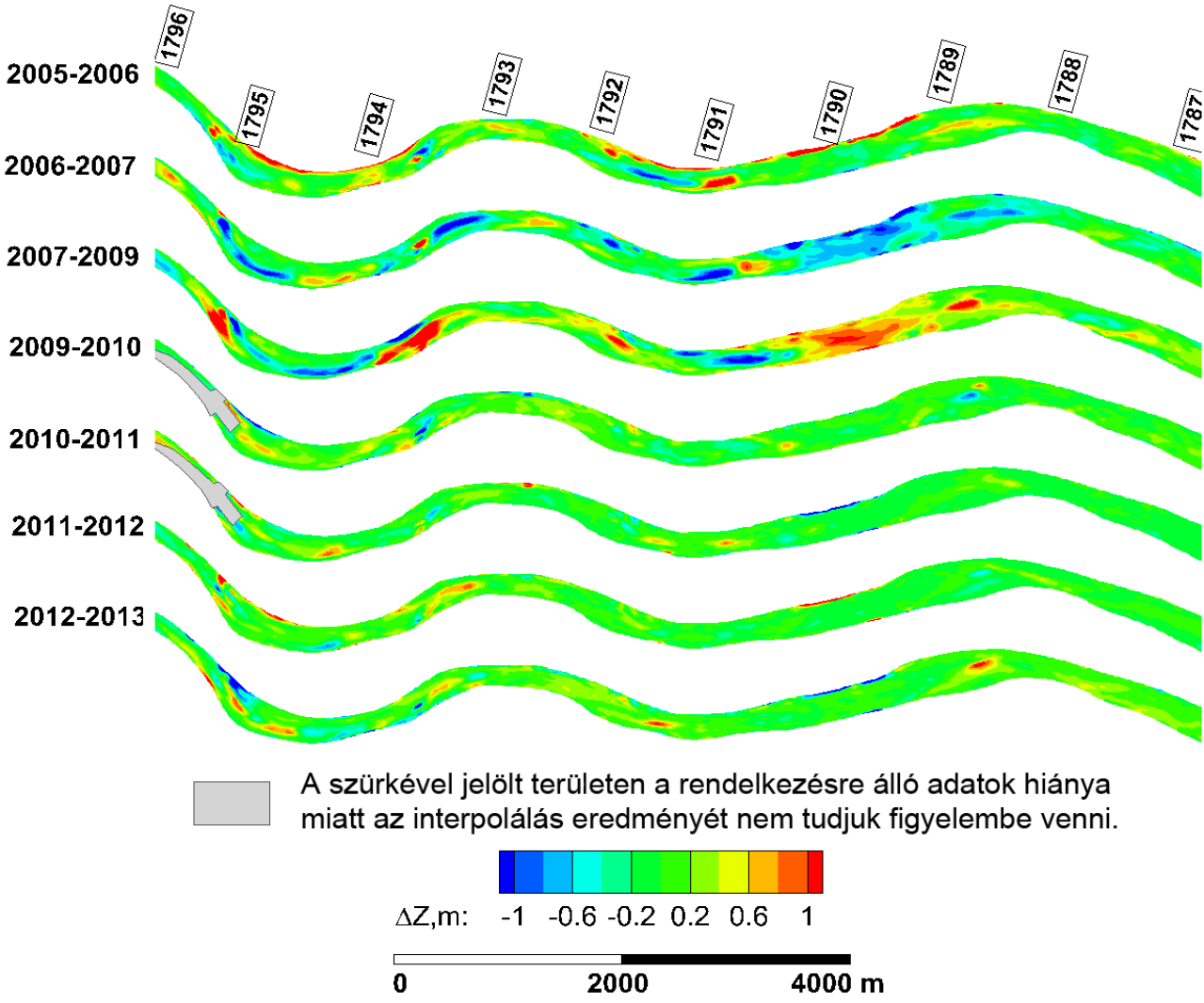


via donau, 2007

- 2411 km navigable (Sulina-Kelheim)
- Waterway transport in the Danube aims to be increased from 10 mio to 30 mio t / year (e.g. in Austria)

Project justification – Existing Situation

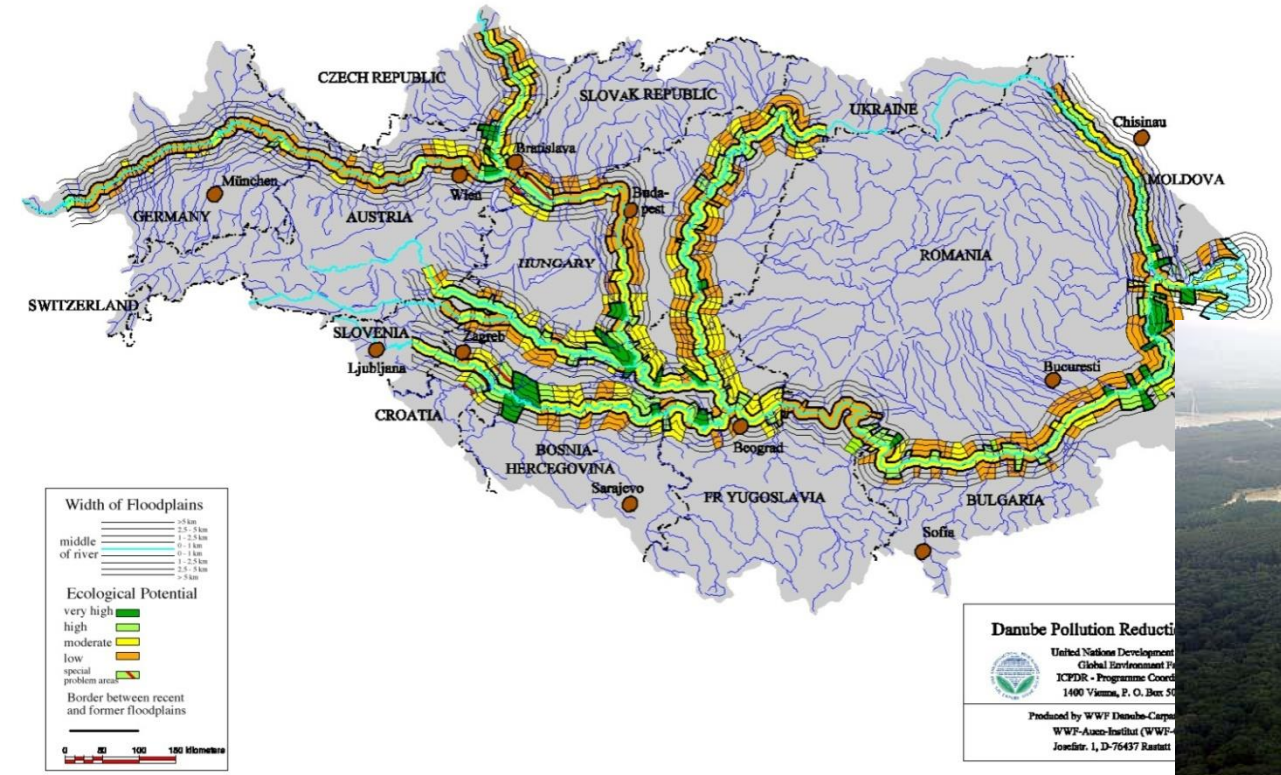
- Intensive morphological changes in the navigational channel (Hungary)



Project justification – Existing Situation

- Flood Risk Management

Ecological potential of floodplains in the Danube River Basin



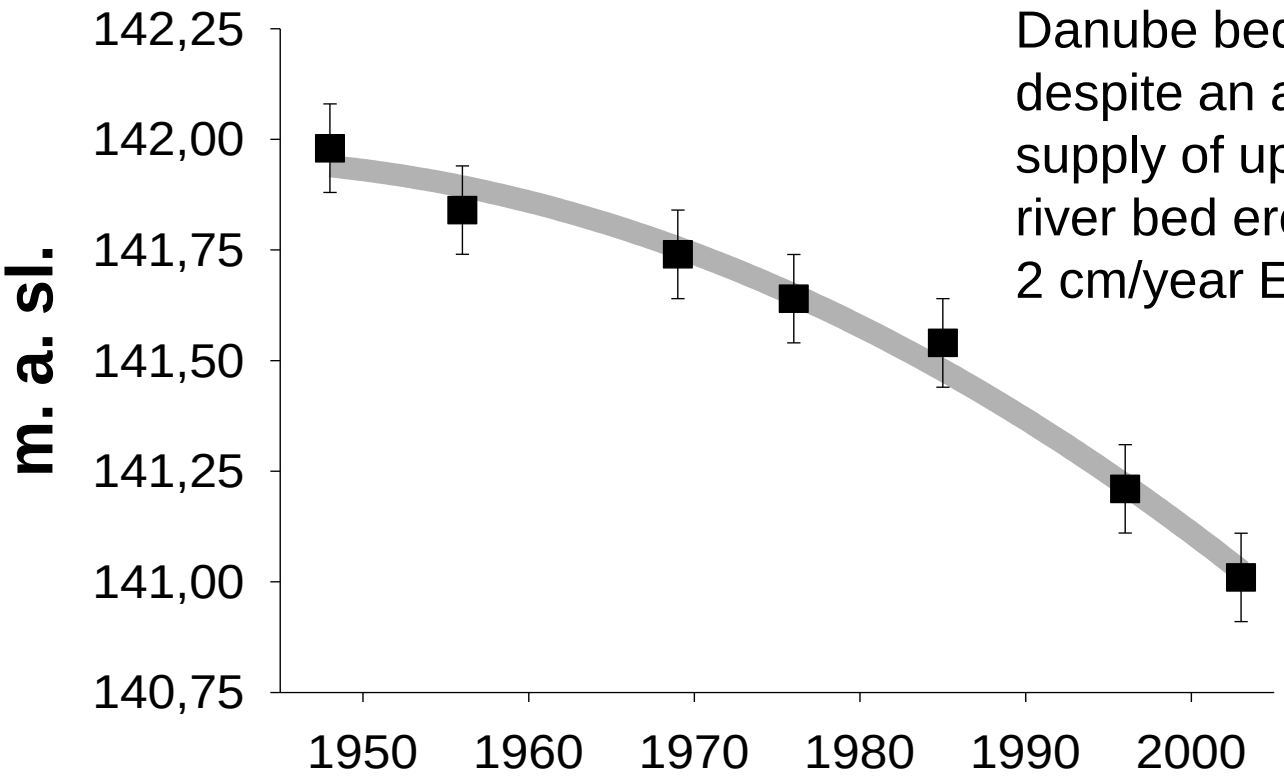
Loss of 80 % of the original floodplain area

Project justification – Existing Situation

- Flood Risk Management - Sedimentation on floodplains (Hungary)

Project justification – Existing Situation

- River Bed Degradation



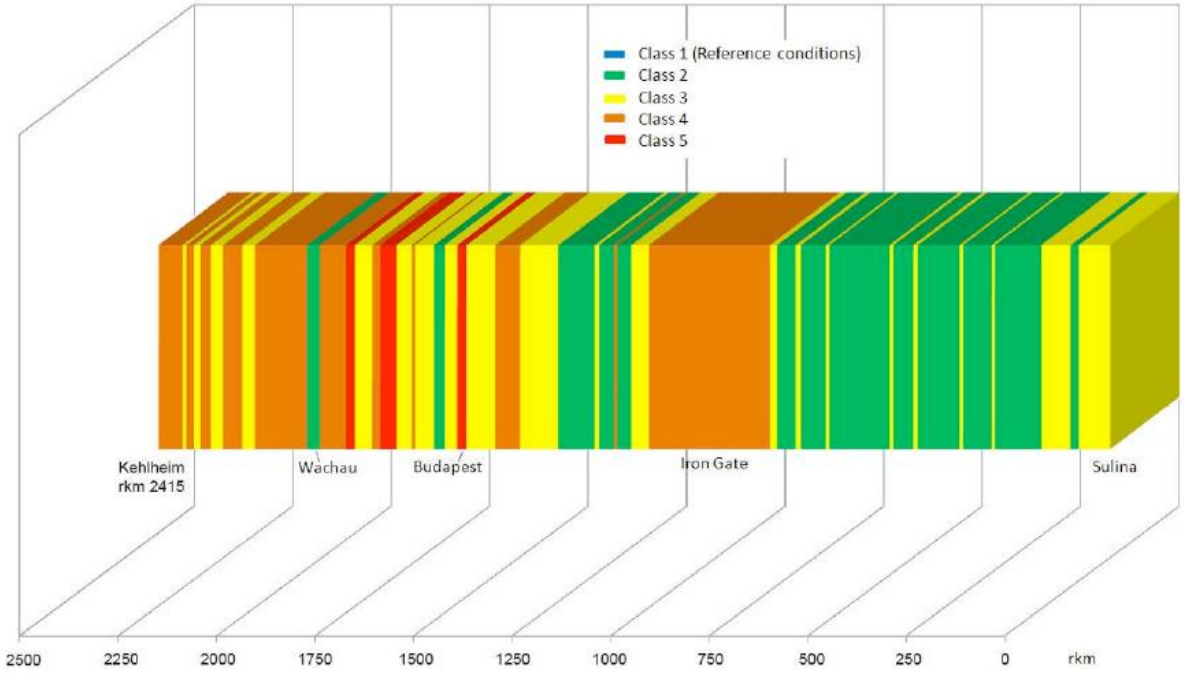
Danube bed degradation:
despite an artificial gravel supply of up to 200.000 m³/year river bed erosion of
2 cm/year East of Vienna

DonauConsult

Project justification – Existing Situation

- Hydromorphology

Overall total hydromorphological assessment in five classes – longitudinal visualisation



1/3 good hydromorphological conditions

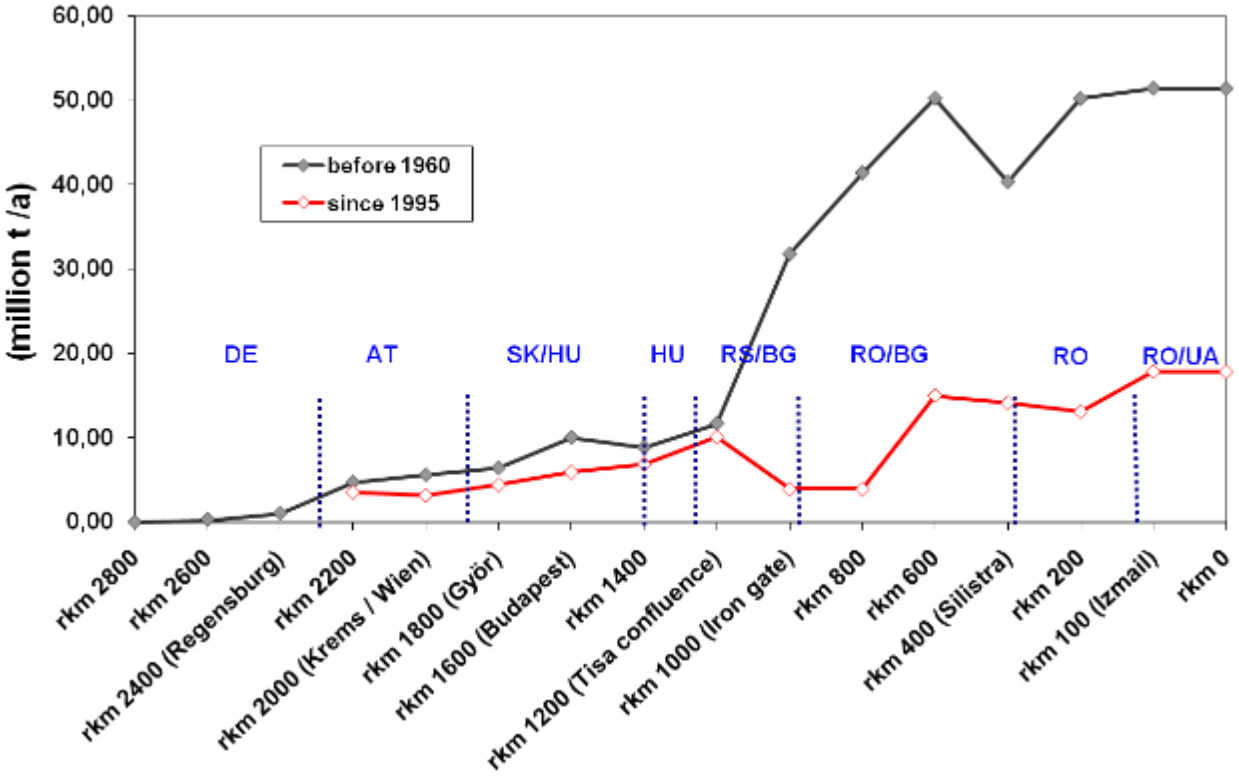
1/3 strongly altered

Upper Danube - most affected by significant hydromorphological changes

ICPDR, JDS, 2008

Project justification – Existing Situation

- Change of Suspended Sediment Yield



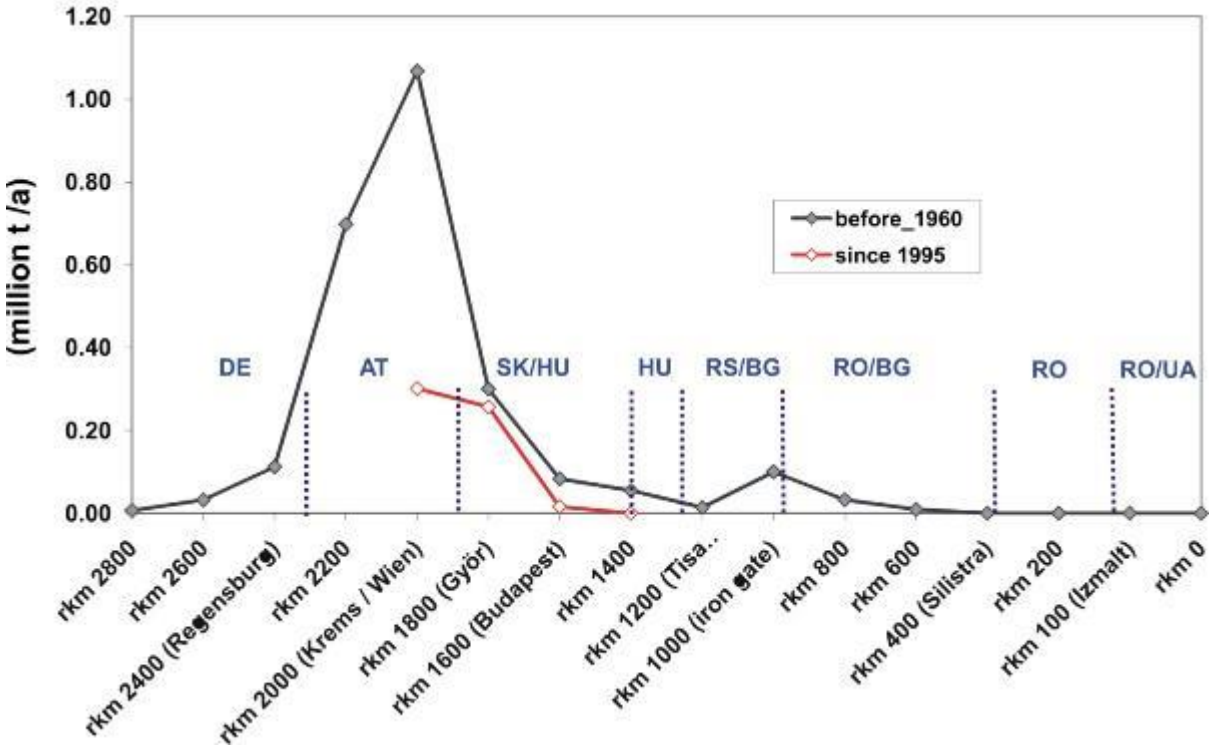
Surplus <-> Deficit

Deposition of suspended load in the reservoirs and impounded reaches

Danube Monography, 1993; Bruk et al., 2002; Bondar et al., 2000, Habersack, Jäger, Hauer, Schwarz, 2013

Project justification – Existing Situation

- Change of Bedload Yield



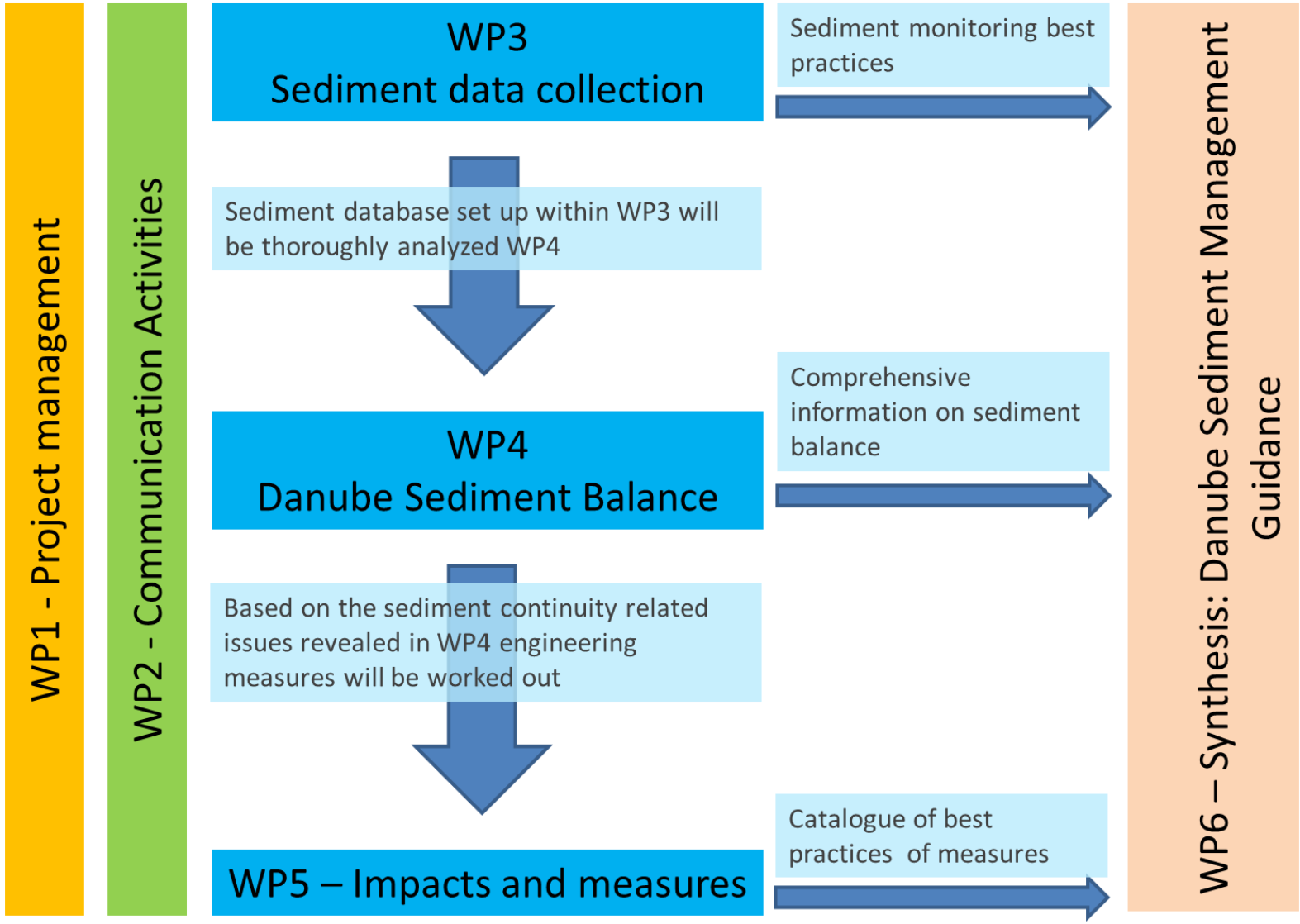
Coarse bed load supply practically stopped from upper reaches

Danube Monography, 1993; Bruk et al., 2002; Bondar et al., 2000, Habersack, Jäger, Hauer, Schwarz, 2013

Main objectives

- To **propose a** pragmatic transnational **quantitative sediment monitoring network**
- To **establish** for the first time **the sediment budget** for the Danube River considering the most important tributaries,
- To **identify reaches with surplus and deficit**, river bed aggradation and degradation, sediment-related problems in flood risk management, hydropower generation, navigation, ecology
- To **gain knowledge** and better understanding **of sediment transport and morphodynamic processes** in the Danube River
- To **develop a Danube Sediment Management Guidance** (DSMG) and a related **Sediment Manual for Stakeholders** (SMS)

Project methodology

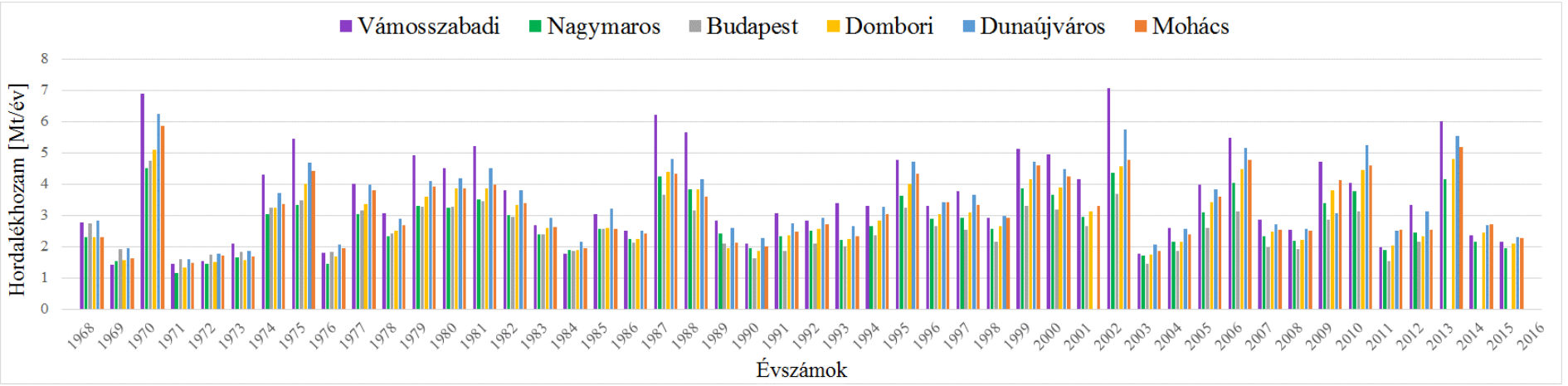


WP3 Sediment Data Collection: Objectives

- Reveal all available sediment data for the Danube and the major selected tributaries at the confluence
- Permanent interaction with the data owner stakeholders (water directorates, private companies, Project Partners)
- Limited sediment transport monitoring at short reaches with significant data gaps
- Comparative analysis and intercalibration of different sediment monitoring techniques
- Recommendations for the good practices of sediment monitoring techniques
- Training of sediment experts on an international workshop

WP3 Sediment Data Collection: Activities

- 3.1 Inventory of existing data
- 3.2 Comparative analysis
- 3.3 Assessment of sediment data
  - E.g. Annual sediment loads

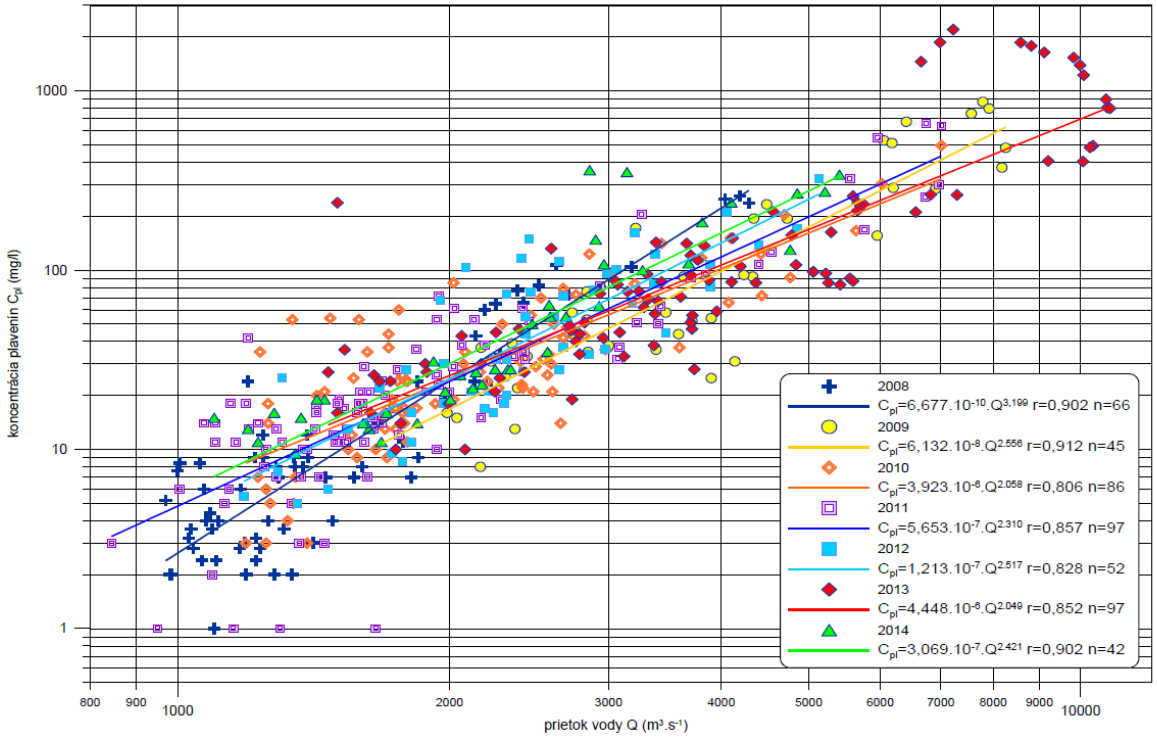


WP4 Danube Sediment Balance: Objectives

- Establish a sediment budget for the Danube River and selected tributaries, which implies quantification of the downstream fluxes of sediments through the Danube and **identification of surpluses and deficits**
- This also includes **redistribution of sediments** within various spatial and temporal units considering barriers (dams, HPP, etc.) and modifications (groyne fields) for sediment continuity; taking into further relevant interventions (dredging/dumping/feeding)

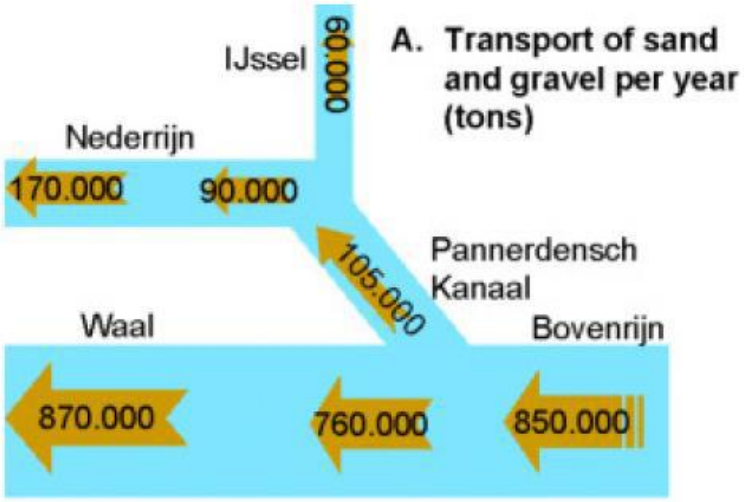
WP4 Danube Sediment Balance: Activities

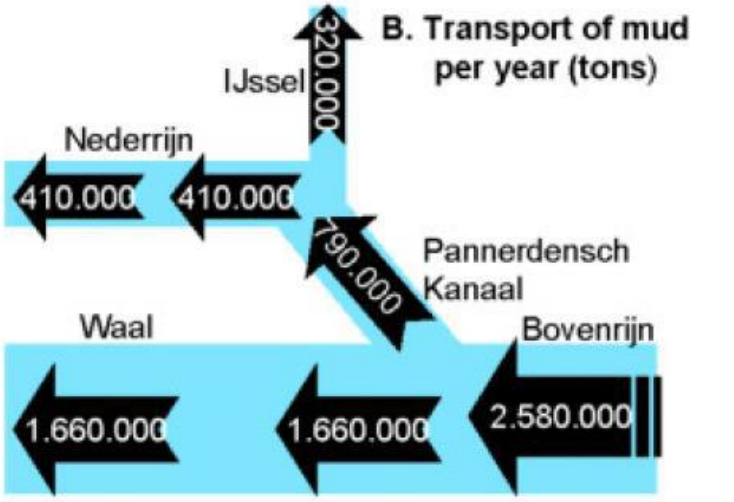
- 4.1 Data analyses for sediment balance
- 4.2 Assessment of the sediment balance for the Danube and major selected tributaries
- 4.3 Long-term morphological development of the River Danube in relation to the sediment balance



WP4 Danube Sediment Balance: Activities

- 4.1 Data analyses for sediment balance
- 4.2 Assessment of the sediment balance for the Danube and major selected tributaries
- 4.3 Long-term morphological development of the River Danube in relation to the sediment balance





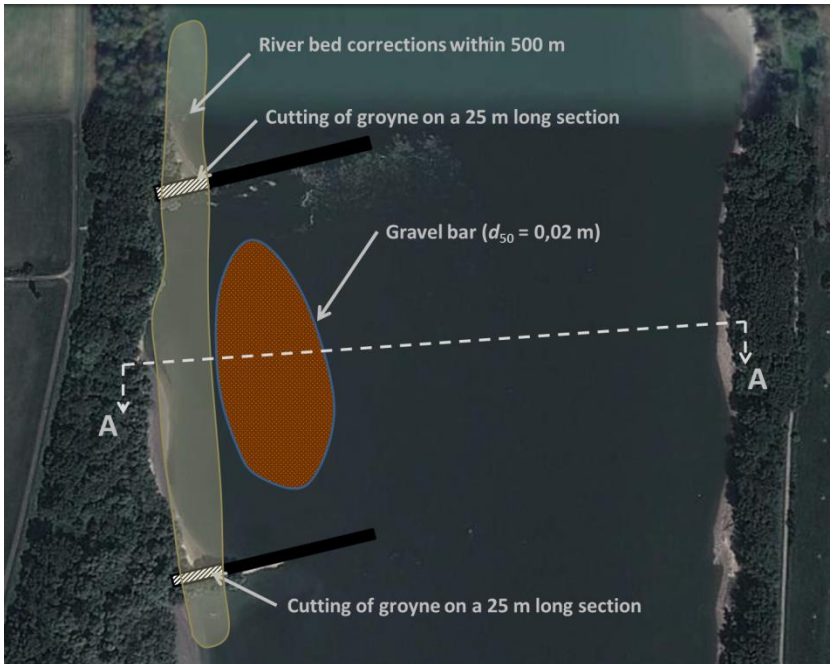
Spreafico and Lehman (2009): Erosion, Transport and Deposition of Sediments – Case Study Rhine

WP5 Impact and measures: Objectives

- To **introduce potential measures** for establishing a dynamic, sustainable sediment continuity to improve the sediment management in the Danube River
- To **review the key drivers** and to **perform an impact assessment** of significant hydromorphologcal alterations
- To **perform a risk analysis** on sediment regime

WP5 Impact and measures: Activities

- 5.1 Review of key drivers and the impacts of significant pressures on sediment quantity for Danube River
- 5.2 Risk assessment related to sediment regime (continuity and quantity)
- 5.3 Measures and good practices for improving the sediment regime
  - E.g. reconstruction of groynes



WP6 Danube Sediment Management Guidance: Objectives

- **Formulation of guiding principles** on sediment management for hydropower, navigation, river basin management (incl. ecology) and flood risk management, also relevant and available for other sectors e.g. agriculture, drinking water supply and dredging.
- **Integration of key findings** of WP 3-5, leading to effective sediment management measures
- Outcomes form a **key input** to the **Danube River Basin Management Plan** and the **Danube River Flood Risk Management Plan**
- **Delivering a sound basis** for answering sediment related questions and sustainable sediment management measures for the future work

WP6 Danube Sediment Management Guidance: Activities

- 6.1 Synthesis of WP 3 to WP 5
- 6.2 Development of the Danube Sediment Management
- 6.3 Stakeholder Involvement
- 6.4 Preparation of a Sediment Manual for Stakeholders

WP6 Danube Sediment Management Guidance: Objectives

- **Harmonized database** including metadata (maps, tables)
- Guidelines on **best practices on sediment transport monitoring**
- Maps showing sediment transport rates along the Danube River and major tributaries at the confluence
- Maps, tables, text on long, mid and short term morphodynamics (riverbed aggradation, degradation, river geometry)
- Maps and reports on **sediment balance**
- Report on **significant pressures**
- **Catalogue** of practical measures and recommendations to improve the Danube River sediment management
- Website, press releases
- **Danube Sediment Management Guidance**
  - Guideline on sediment transport monitoring and modelling
  - Danube River Sediment Balance (incl. Figures and Tables)
  - Guideline for improved planning of sediment related measures
- **Stakeholder Manuals** on sustainable sediment management in the DRB

Thank you for your attention