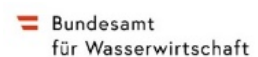




T3.1.1 List of problems - EN

SEDDON II (AT HU10)





Project coordination:

Helmut Habersack¹, Sándor Baranya², Károly Gombás³, Jürgen Gruber⁴

**Authors AT: Sebastian Pessenlehner¹, Marlene Haimann¹, Markus Eder¹, Doris Gangl¹, Angelika Riegler¹
Helmut Habersack¹**

Authors HU: Sándor Baranya², Szilveszter Dömötör³


Picture front page: IWA/BOKU

Vienna, Budapest, Győr June 2020

The project was cofinanced by the „European Regional Development Fund“.



BOKU – Wasserbaulabor
Errichtungs- und Betriebs-
Gesellschaft m.b.H.

 Bundesamt
für Wasserwirtschaft



SEDDON II (AT HU10)

Sedimentforschung und –management an der Donau II

A Duna hordalékvizsgálata II

¹ University of Natural Resources and Life Science, Vienna
Department of Water, Atmosphere and Environment
Institute of Hydraulic Engineering and River Research (IWA)

² Budapest University of Technology and Economics BME


³ North Transdanubian Water Directorate ÈDUVIZIG

⁴ BOKU - Wasserbaulabor Errichtungs- und Betriebs-Gesellschaft m.b.H.

⁵ Federal Agency for Water Management, Vienna
Institute for Hydraulic Engineering and Calibration of Hydrometrical
Current-Meters



BOKU – Wasserbaulabor
Errichtungs- und Betriebs-
Gesellschaft m.b.H.

 Bundesamt
für Wasserwirtschaft

1 List of Problems

A detailed understanding of sediment related problems is essential for a successful and sustainable management of large rivers. The Upper Danube in Austria and Middle Danube in Hungary face several sediment related problems, which impact, among others, ecology, flood risk management, navigation and hydropower. Output T3.1.1 lists these problems affecting the SEDDON II study reach.

1.1 Upper Danube – Austria

	Category	Problem	Description
Upper Danube	Problems related to river engineering	Flood risk protection	causes decoupling of river and floodplain, cut-off of side arms, reduced flood retention volumes, reduction of river length and width, increased flow velocities, increased shear stresses, river bed degradation
		Instream channel alterations	affect hydrodynamics and morphodynamics, cause increased erosion of river bed, sediment aggradation in groyne fields
		River bed incision	sediment input from upstream inhibited by torrent controls and hydropower plants, risk of riverbed breakthrough
		Prevented side erosion	fixed embankments inhibit lateral erosion, reduced channel width (river narrowing and straightening) causes enhanced sediment transport capacity, both lead to river bed incision
		Decoupling of river and floodplain	caused by bedload deficit and fixed embankments (no side erosion), leads to degradation of the riverbed in the main channel and aggradation of fine sediments in floodplain area followed declining groundwater levels and riparian dewatering
		Disconnected side arms	frequency and duration of inflows into side arms decreased, siltation, side arms transformed into riparian forest or dry out
		Ecology	changes in habitat diversity/ loss of habitats, reduction of species richness/negative impact on biodiversity, Interruption of continuity for organisms (latreal, longitudinal), degradation of ecological status, degradatin of hydromorphological status
		Recreation	Decreasing lowwater levels affect cruise tourism, decoupling of river and floodplain reduces accessibility for paddlers, and reduced fish biomass effects fishing
		Water supply	riverbed incision leading to falling groundwater tables and disconnection and siltation of sidearms has negative impacts on groundwater bodies used for various purposes (drinking water, industry, agriculture)
	Problems related to navigation	Hydro- and Morphodynamics	river channelization and dredging for navigation led to increased erosion and sediment transport, causes river bed incision
		Restrictions for navigation in low flow periods	areas with sedimentation represent bottlenecks for navigation, minimum water depth not met during low flow periods
		Ecology	wave splash, sediment turbulences, shear stress, pollution, surpression of river bed dynamics
	Problems related to hydropower	Reservoir sedimentation	Sediment retention upstream of hydropower plants, reservoir siltation, loss of storage capacity, during extreme floods large amounts of sediment remobilised
		Reservoir flushing	sudden increase in suspended sediment loads and turbidity, clogging of hyporheic interstices, reduced oxygen availability in benthic zones, increased stress or wounding of fish
		Interruption of sediment continuum	interrupted sediment continuum, deposition of suspended sediment and bedload in impounded reaches, sediment deficit in free-flowing sections
		Ecology	change in hydrology (flow velocity, hydrograph, temperature,...), changes in habitat diversity/ loss of habitats, reduction of species richness/negative impact on biodiversity, Interruption of continuity for sediments and organisms, degradation of ecological status degradatin of hydromorphological status

1.2 Middle Danube – Hungary

	Category	Problem	Description
Middle Danube	Problems related to river engineering	Flood risk protection	causes decoupling of river and floodplain, cut-off of side arms, reduced flood retention volumes, reduction of river length and width, increased flow velocities, increased shear stresses, river bed degradation
		Instream channel alterations	affect hydrodynamics and morphodynamics, cause increased erosion of river bed, sediment aggradation in groyne fields
		River bed incision	ford sections are rather in dynamic equilibrium, whereas narrow deep sections show continuous deepening.
		Prevented side erosion	width (river narrowing and straightening) causes enhanced sediment transport capacity, both lead to river bed incision. Natural banks are exposed to increased erosion leading to bank failure.
		Decoupling of river and floodplain	caused by bedload deficit and fixed embankments (no side erosion), leads to degradation of the riverbed in the main channel and aggradation of fine sediments in floodplain area followed declining groundwater levels and riparian dewatering
		Disconnected side arms	frequency and duration of inflows into side arms decreased, siltation, side arms transformed into riparian forest or dry out
		Ecology	changes in habitat diversity/ loss of habitats, reduction of species richness/negative impact on biodiversity, Interruption of continuity for organisms (latreal, longitudinal), degradation of ecological status, degradatin of hydromorphological status
		Recreation	Low water levels are decreasing in the lower sections of the connecting tributaries limiting recreational possibilities in the tributary.
		Water supply	maintanance works, like dredging can decrease the thickness of the layer providing drinking water at bank filtered banks. Deposition of fine sediments in shallow zones can fill the porous media (clogging), which can result in decreased qunatity of water supply.
	Problems related to navigation	Hydro- and Morphodynamics	river channelization and dredging for navigation led to increased erosion and sediment transport, causes river bed incision. Artificial break up of bed armour, due to dredging or when ships hit the river bed can result in increased erosion locally.
		Restrictions for navigation in low flow periods	areas with sedimentation represent bottlenecks for navigation, minimum water depth not met during low flow periods
		Ecology	wave splash, sediment turbulences, shear stress, pollution, surpression of river bed dynamics
	Problems related to hydropower	Reservoir sedimentation	large amounts of fine sediment is deposited in the Slovakian reservoirs (~20M m3), just upstream the Upper-Hungarian Danube sections, which is therefore strongly exposed to reservoir operation.
		Reservoir flushing	increased sediment load arrives to the Hunagrian section of the Danube, especially to the Szigetköz area during floods, when much higher discharge is led to the Old Danube by the Slovakian HPPs. The increased sediment load leads to the formation of fine sediment depositions in the floodplain, altering the river morphology and ecology.
		Interruption of sediment continuum	sediment continuum is interrupted by the Slovakian impunded reaches, where deposition of suspended sediment and bedload take place and results in sediment deficit in free-flowing sections
		Ecology	change in hydrology (hydrograph, temperature,...), reduction of species richness/negative impact on biodiversity, Interruption of continuity for sediments and organisms, degradation of ecological status, degradatin of hydromorphological status