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Data Collection, hydraulic and morphological modelling of the
Danube River and the Sava River in the Republic of Serbia
Lot 1: **Hydraulic and morphological modelling of the SRB-
CRO common stretch of the Danube River**

Stakeholders' Forum Meeting Number 08

Under the “Preparing FAIRway 2 works in the Rhine-Danube corridor”

03/07/2024, Belgrade

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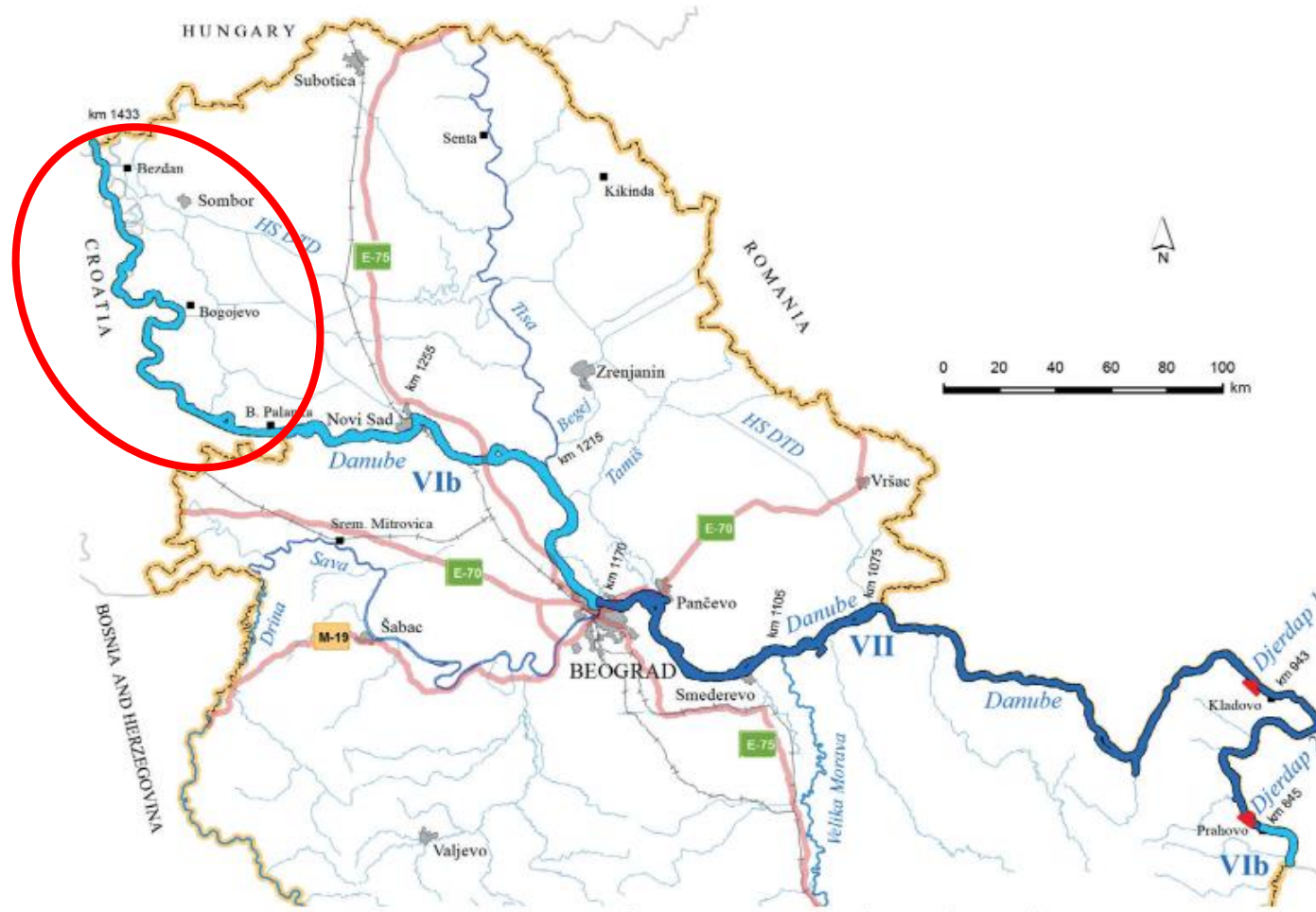
A Few Words About Us

- Hidrozavod DTD was founded in 1947 as a project bureau within the Directorate for Construction of the Danube-Tisa-Danube Hydrosystem
- Operates as an independent company **since 1952**
- Vast experience in studies, research, design and engineering in **water management, hydro-technical constructions & environmental protection**
- Projects in the region (Serbia, Bosnia and Herzegovina, Croatia, Montenegro), as well as in Morocco, Libya, Iraq, Zambia, Angola
- Today, company has **70 permanently employed staff**

Basic Project Data

- Contract: Data Collection, hydraulic and morphological modelling of the Danube River and the Sava River in the Republic of Serbia - Lot 1: **Hydraulic and morphological modelling of the SRB-CRO common stretch of the Danube River**
- Contracting Authority: Ministry of Construction, Transport and Infrastructure
- Contractor: Hidrozavod DTD AD Novi Sad, Republic of Serbia
- Contract signature date: 11 June 2024
- Commencement date: 14 June 2024
- Duration: 12 months (provisionally adjusted to 6 months)
- Contract is part of activities within the EU CEF funded project “Preparing FAIRway 2 works in the Rhine-Danube Corridor”

Project Area



The project area is the SRB-CRO common stretch of the Danube River (137 km)

Source: <http://www.iscgm.org/gmd>

Objective & Purposes

Overall objective

- To contribute to creation of competitive transport system of Serbia by improvement infrastructure alongside the Danube River, in accordance with the national policy and strategy provisions and with the respect of EU transport system development plans in order to ensure fast, safe, reliable and environmentally friendly transportation, smooth flow of freight and mobility of people.

Purposes

- To facilitate inland waterway works in the Rhine-Danube Corridor, by preparation of the **technical solutions** for joint river-engineering measures in the Croatian-Serbian cross-border section;
- To **explore alternatives** for interventions as a basis for removal of existing bottlenecks at the mutual sector;
- To foster development of a **joint framework plan** between countries to remove navigational bottlenecks

Expected Results

- Developed **1D hydraulic model** of the whole common Croatian and Serbian river stretch of the Danube River for the selected flows, which shall confirm the Stakeholder's Forum and the CA. **Updated existing Low Water Navigation Levels** (ENRs (LWNLs)) at selected water level gauges (at least recognised by the Danube Commission and agreed with the Stakeholder's Forum). The 1D hydraulic model can be used as a supporting tool in recalculation of the ENR (LWNL).
- The **results should be checked with the general trend of decreasing water levels** as the river bed deepening through incision due to old and existing river regulation is estimated already in the magnitude of 1 m in the past 70 years (comp. presentation of E. Tamas, uni Budapest at 43. IAD conference 2021).
- **Redefined navigational bottlenecks** in order to check and, if necessary, update existing bottlenecks at mutual sector, based on 1D modelling results;
- **Prioritized identified bottlenecks** in order to perform hydrodynamic and morphological modelling of selected bottlenecks;
- **Defined criteria for the multi-criteria analysis**, where proposed criteria will be discussed and agreed within the Stakeholders' Forum. Criteria shall take into account at least navigational, environmental and cost (feasibility) issues;

Expected Results

- **Defined alternative solutions for prioritized sectors and hydrodynamic and 2D morphological modelling.** All proposed alternatives shall be discussed within the Stakeholders' Forum. It is foreseen to have a **sufficient number of model simulations** (at least two per prioritized identified bottleneck), in order to reach the quality level which will be acceptable and preferable for all involved parties;
- Developed **integrated study on alternative solutions** containing results of 1D hydraulic modelling, defined critical sectors for navigation, prioritized critical sectors for navigation, criteria of the mutually agreed multi-criteria analysis, alternative solutions, results of modelling of alternative solutions, application of the multi-criteria analysis, elaboration of favourable selected solutions, addressing the climate change issue and including all activities of the Stakeholders' Forum in all phases of the process. The study will contain most of elements for further progress and coordinated implementation of measures.

Activities Breakdown – part 2

Provisional Adjusted Timetable

No.	Activity/Task/Output/Report	2024						2025					
		Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
		Month of the Contract											
		M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
Activity 3	Definition of criteria for the multi-criteria analysis												
Task 03-01	Definition of MCA												
Task 03-02	Elaboration of Technical report on the definition of the MCA												
Meeting	Stakeholders' Forum meeting				☺								
Output 03-01	Technical report on the definition of the MCA elaborated				☺								
Activity 4	2D hydrodynamic and morphological modelling												
Task 04-01	Data Collection												
Task 04-02	Model Setup												
Task 04-03	Model Calibration												
Task 04-04	Model Verification												
Task 04-05	Definition of Variants for each Bottleneck												
Task 04-06	Preparation of Model for Considered Variants												
Task 04-07	Analysis of Results												
Task 04-08	Application of MCA												
Task 04-09	Elaboration of Technical Report on 2D Modeling and Application of MCA												
Meeting	Stakeholders' Forum meeting				☺								
Meeting	Stakeholders' Forum meeting						☺						
Output 04-01	2D Model Calibrated and Running						☺						
Output 04-02	Bottlenecks Variants Defined						☺						
Output 04-03	Technical Report on 2D Modeling and Application of MCA						☺						
Activity 5	Elaboration of an Integrated study on alternative solutions												
Task 05-01	Elaboration of an Integrated study on alternative solutions												
Meeting	Stakeholders' Forum meeting						☺						
Output 05-01	Integrated study on alternative solutions elaborated						☺						

Activities Breakdown – part 3

Provisional Adjusted Timetable

No.	Activity/Task/Output/Report	2024						2025					
		Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
		Month of the Contract											
		M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
Activity 6	Project Management												
Task 06-01	Reporting												
Task 06-02	Ensuring Adequate Visibility												
Task 06-03	Project Closure												
R2	MPR01 (for the M2)		☹										
R3	MPR02 (for the M3)			☹									
R4	MPR03 (for the M5)					☹							
R5	MPR04 (for the M5)												
R6	MPR05 (for the M7)												
R7	MPR06 (for the M8)												
R8	MPR07 (for the M9)												
R9	MPR08 (for the M10)												
R10	MPR09 (for the M11)												
R11 (Output 06-01)	Interim report				☹								
R12	Draft Final report					☹							
R13 (Output 06-02)	Final report						☹						

Summary of Outputs (Thematic Milestones)

No.	Output	Contractual delivery time	Provisional adjusted delivery time
01	1D model calibrated and running	M03	M03
02	Updated ENRs for selected gauging stations	M03	M03
03	Updated bottleneck Catalogue	M04	M04
04	Approved list of prioritized bottlenecks to be modeled	M04	M04
05	Selected and agreed criteria for the multi-criteria analysis	M05	M04
06	2D models developed	M10	M06
07	Integrated study on alternative solutions developed	M11	M06

Team of Experts



Key Expert 1 - Team Leader, Mr. Romeo SOARE, a distinguished expert in the field of waterway management in the Danube region

Key Expert 3 - Hydrological Expert, Ms. Jasna PLAVŠIĆ, Ph.D, a professor at the Faculty of Civil Engineering of the University of Belgrade



Key Expert 2 – River Hydraulics Expert, Mr. Nikola ROSIĆ, Ph.D, a professor at the Faculty of Civil Engineering of the University of Belgrade

Key Expert 4 – Environmental Specialist, Mr. Stefan SKORIĆ, Ph.D, a research associate professor at the Institute for Multidisciplinary Research of the University of Belgrade



- Project office established in Belgrade
- Team of experts mobilized

Obtaining the Existing Documentation & Data in Progress

- The data required for the 1D hydraulic modelling
 - **Hydrological data:**
 - Hydrology (available data about water levels and discharges at the gauging stations along the observed stretch)
 - **Spatial Data:**
 - Topography (available DEM from the public repositories, DEM generated from the LIDAR surveys, etc.)
 - River morphology (The data about the measured cross-sections or available DTM of the riverbed)
 - Data about structures (river training works and bridges)
 - Floodplain data (The available data about riparian forests, vegetation, channel network etc.)

Obtaining the Existing Documentation & Data in Progress

- The data required for the 1D hydraulic modelling
 - The quality of the spatial data
 - **Digital Elevation/Terrain Model (DEM/DTM)**
 - DTM with 1m grid – if possible, would be appreciated
 - **River morphology**
 - The Geodetic Datum and projection file for the surveyed and delivered data (predefined EPSG)
 - The data about the flood protection embankments (any format will be appreciated)
 - The data about cross-sections on a 100m distance preferable, interval of 200m would be sufficient as well
 - The data should be in a following formats:
 - X, Y, Z (.csv) – the name of the file should contain the name and river chainage of the cross-section
 - X, Y, Z (.dxf) with digitized riverline
 - Distance from the left fixed point, Z – the same rule for the file names
 - Separate file with: Name, Chainage, X, Y, Z (.csv) of the left and right fixed points
 - For the critical stretches, the interval between the cross-sections could be shorter

Obtaining the Existing Documentation & Data in Progress

- The data required for the 1D hydraulic modelling
 - The quality of the spatial data
 - **The river training structures and bridges:**
 - The data about river training structures structures (.dxf or any available format)
 - The data about bridges (coordinates of the pillars, its shape and dimensions)
 - **Floodplain data:**
 - Any available data in any available format will be appreciated
- **This list is provisional and not conclusive**

Next steps

- Focus on **obtaining existing documentation and data**, as development of 1D model is depending on it
- Setting up **1D model**
- Drafting the proposal for **criteria for the MCA**

Q&A

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Thank you for your kind attention

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