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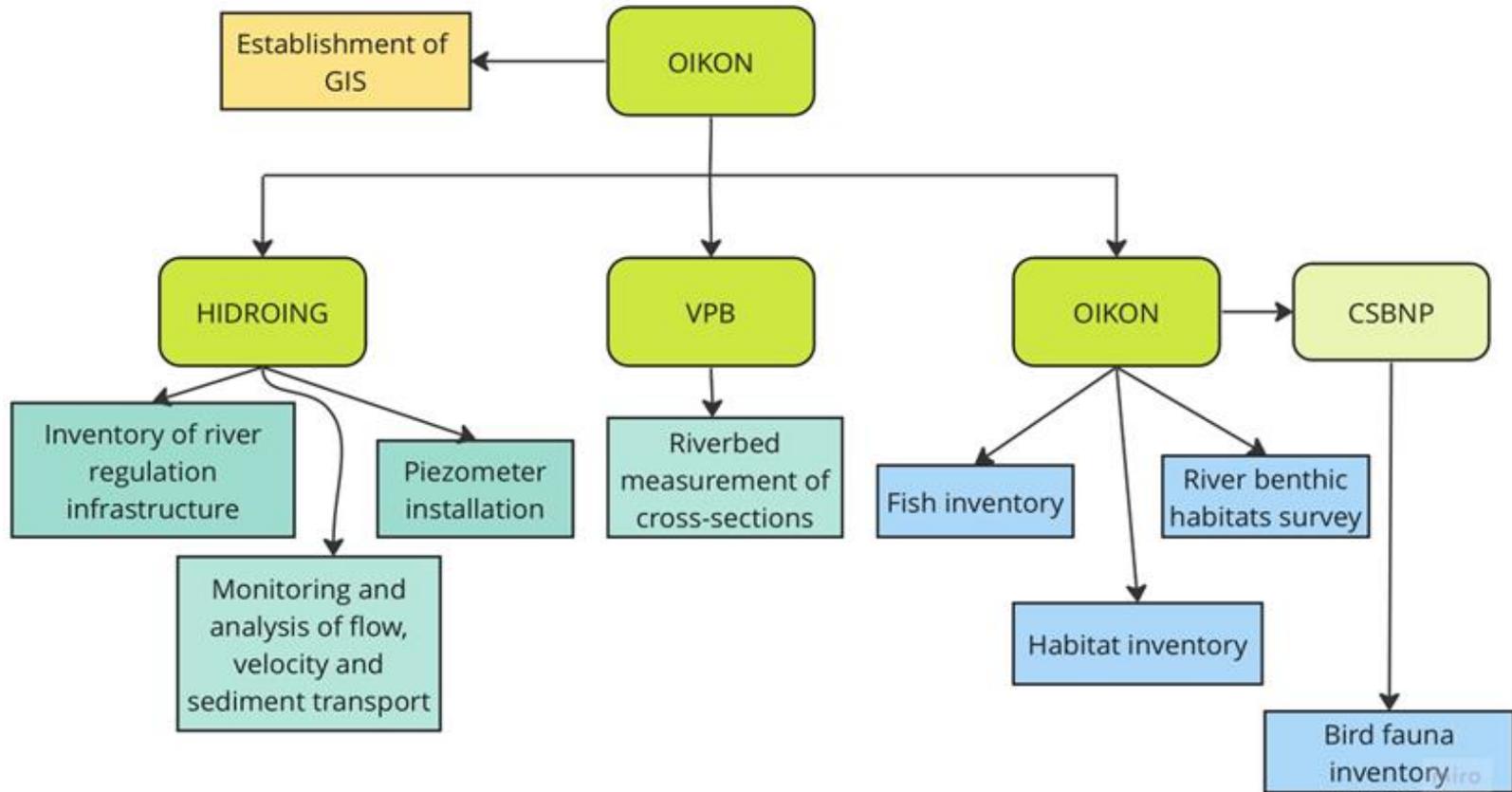


Monitoring of hydrological, hydraulic and morphological characteristics of the Danube and inventory of biodiversity components of the Croatian- Serbian common section of the Danube

Presentation of the consortium and planned monitoring activities



Presentation of the consortium



OIKON Ltd. – Institute of Applied Ecology

- ▶ leading licensed and accredited consulting company / research institute in the field of applied ecology in Croatia and the region
- ▶ 24 years of experience, with more than 1,500 contracts successfully completed for over 350 satisfied clients
- ▶ 70+ employees
- ▶ services in the fields of nature and environmental protection, industrial ecology, renewable energy, natural resource management, ecological modelling, landscape analysis and design, geographic information systems (GIS), remote sensing and ICT, environmental law, policy and economics, feasibility studies, as well as program and project management
- ▶ officially licensed for activities in the fields of environmental and nature protection, geodesy, as well as development of forest management plans
- ▶ ISO 9001:2015, ISO 14001:2015, ISO 45001:2018 and ISO 27001: 2013
- ▶ More info: www.oikon.hr

Hidroing Ltd.

- ▶ Design and consultancy company, specialized in water management projects. Main scopes of work:
 - River management and inland waterway infrastructure
 - Water supply and wastewater infrastructure
 - Solid waste infrastructure
 - Irrigation infrastructure
 - Environmental management projects
 - Construction supervision and project management
 - Consultancy in EU funded infrastructure projects
- ▶ Regional focus: projects namely in Croatia, with broader reach in SEE
- ▶ Offices: Osijek and Zagreb
- ▶ Employs 37 full-time professionals, with additional long-time partners
- ▶ Extensive capacity and know-how in engineering/monitoring equipment and software
- ▶ More info: www.hidroing-os.hr

Vodoprivredno-projektni biro, p.l.c.

More than 25 years of existing, 30 employees working in following domains:

- ▶ Floodplain management (300+ embankment projects)
- ▶ Water supply (60.000+ ha public irrigation system projects)
- ▶ Wastewater drainage and treatment
- ▶ Waterways planning
- ▶ Environmental protection
- ▶ Surveying (1000+ surveyed cross-section river profiles)
- ▶ More info: <https://www.vpb.hr>



Croatian Society for Birds and Nature Protection

- Founded in 1995
- Over 30 years of experience in bird studies along the Danube (Kopački rit wetlands)
- Other bird studies in whole Croatia (e.g., NW Dalmatia (2018-2022), Sava River (2008-current), fishponds (1993-current), Kornati NP, Delta of Neretva, Lonjsko polje etc.
- 4 full-time and 4 part-time employees
- Leading expert: Tibor Mikuska (<https://www.researchgate.net/profile/Tibor-Mikuska>)

Main project team members



Firm	Team Member	Position	E-mail address
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OIKON Ltd.	Ana Đanić	Team leader for river benthic habitats survey	adanic@oikon.hr
Croatian Society for Birds and Nature Protection	Tibor Mikuska	Team leader for bird fauna inventory	tibor.kopacki.rit@gmail.com
OIKON Ltd.	Branimir Radun	Team leader for GIS system establishment	bradun@oikon.hr

Implementation plan for carrying out the monitoring activities

1. MONITORING OF PARAMETERS IMPORTANT FOR WATERWAY MAINTENANCE

- 1.1 Inventarization of river regulation infrastructure
- 1.2 Riverbed measurement of cross-sections of Danube river
- 1.3 Monitoring and analysis of flow, velocity and sediment transport
- 1.4 Piezometer installation

2. BIODIVERSITY INVENTORY

- 2.1 Fish inventory (monitoring)
- 2.2 Habitat inventory
- 2.3 Bird fauna inventory
- 2.4 River benthic habitats survey

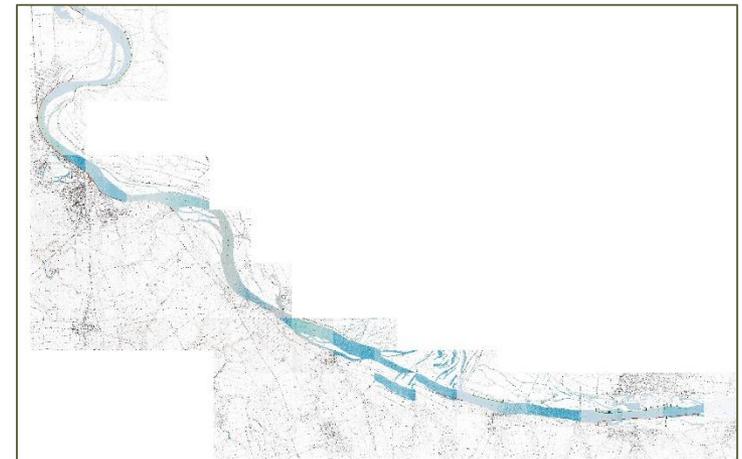
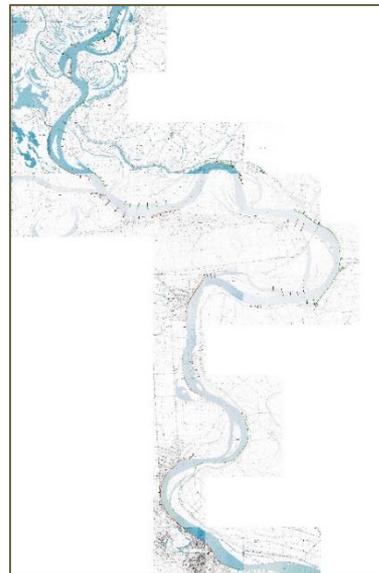
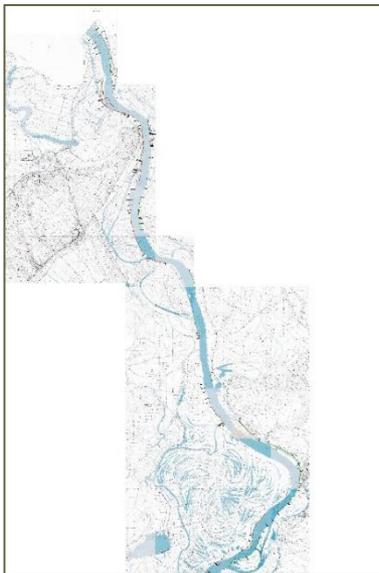
3. ESTABLISHMENT OF A GEOINFORMATION SYSTEM (GIS)

1. MONITORING OF PARAMETERS IMPORTANT FOR WATERWAY MAINTENANCE



Activity: Inventarization of river regulation infrastructure

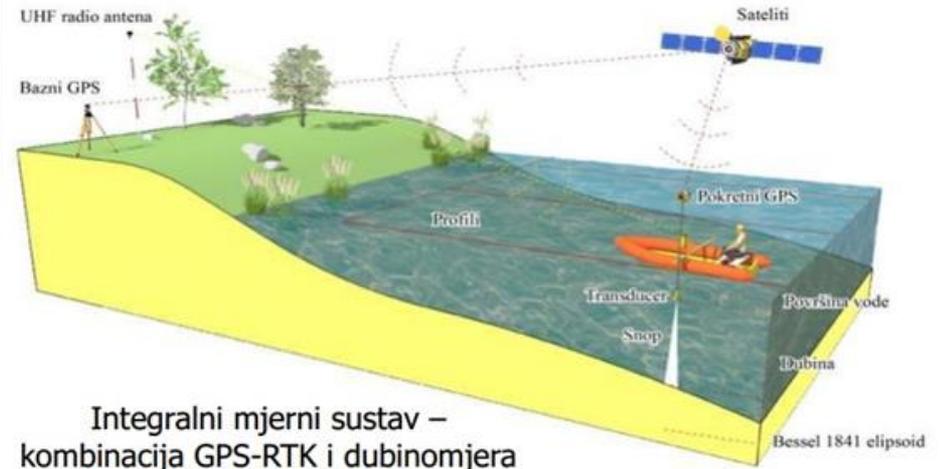
- ▶ Field work of inventarization and assessment of existing river regulation infrastructure on both sides of the Danube
- ▶ Core scope of the inventarization: revetments, groynes
- ▶ Estimation in progress (current estimate of 85 objects on the right bank and 89 objects on the left bank)
- ▶ Assessment of the current state and identification of extent of damages (where applicable)



Activity: Riverbed measurement of cross-sections of Danube river



- ▶ Equidistance 100m
- ▶ Two times, one in each year of project



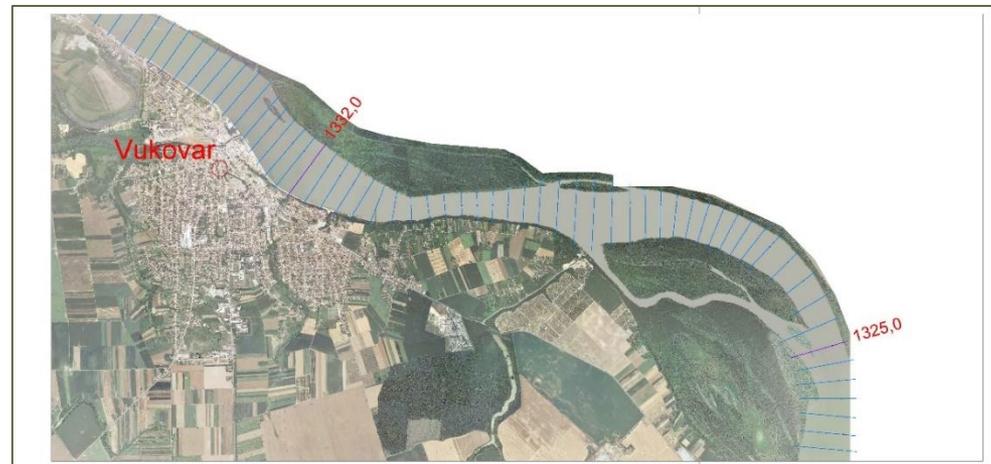
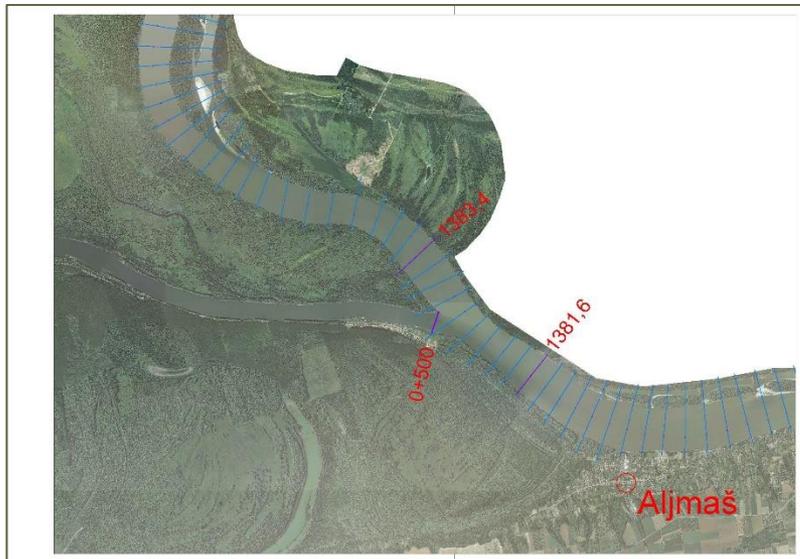
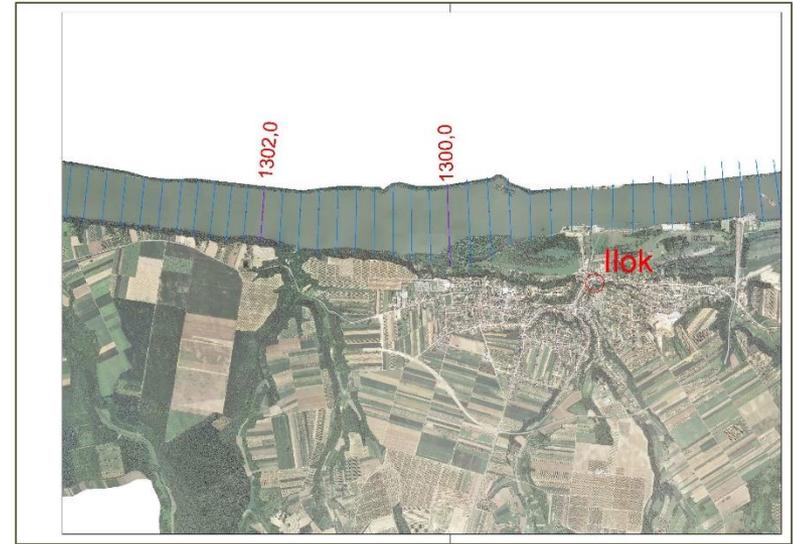
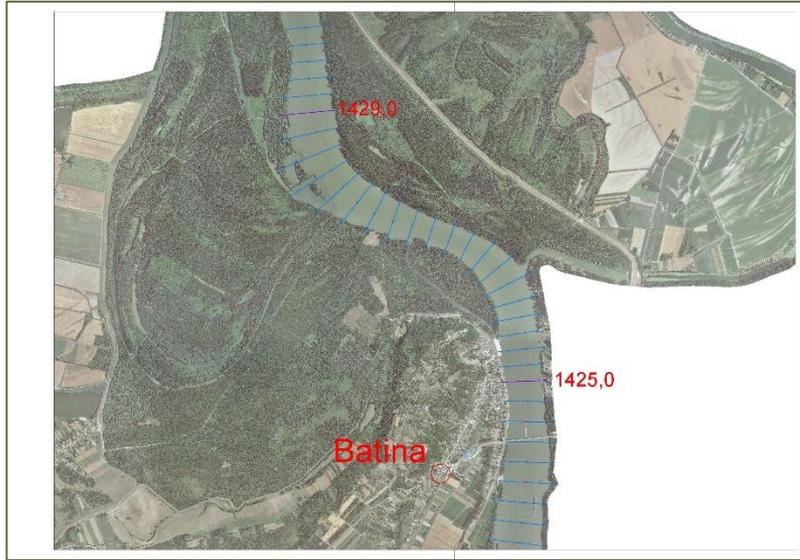
Activity: Monitoring and analysis of flow, velocity and sediment transport



- ▶ Flow/Velocity measurement campaigns on 3 locations (Batina, Vukovar, Ilok) in multiple profiles and in following intervals:
 - Low water levels
 - Medium water levels
 - High water levels
- ▶ Sediment measurement campaigns on 3 locations (Batina, Aljmas, Ilok) in multiple profiles and in following intervals:
 - Low water levels
 - Medium water levels
 - High water levels
- ▶ Analysis of the measured data



Activity: monitoring and analysis of flow, velocity and sediment transport



Activity: Piezometer installation



- ▶ Boring and installation of three piezometers with automated loggers for continued metering
- ▶ Measurements of groundwater levels and temperature near Danube
- ▶ Locations:
 - Batina – rkm 1425+250 (upstream section)
 - Aljmas – rkm 1380+000 (mid-section; confluence)
 - Ilok – rkm 1299+100 (downstream section)



2. BIODIVERSITY INVENTORY

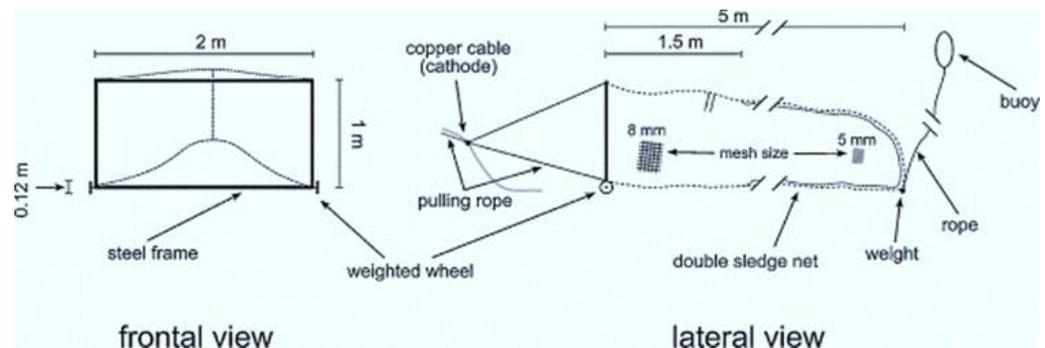
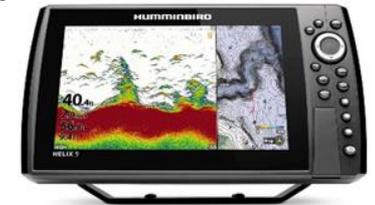
Activity: Fish fauna inventory (monitoring)

▶ Methods:

- Electric fishing ([CEN, EN 14011:2003](#))
- Electrified benthic frame trawl ([Bammer et al. 2015](#))
- Monitoring of winter habitats using sonar ([Wei et al. 2022.](#); [Gonzalez-Socoloske et al. 2009](#))

▶ On 17 Critical sections of Danube:

- Minimum of 42 transects of electric fishing (21 km in total)
- 13 transects (6,3 km) of night-time electric fishing
- Monitoring of all recognized winter habitats



Activity: Habitat inventory



▶ HABITATS IN DANUBE FLOODPLAIN

▶ Objective & output

▶ Mapping of habitat types of the critical sections in the Danube floodplain

▶ Final habitat map integrated into GIS database, scale 1:5.000

▶ Methodology

▶ The preparation of a preliminary habitat map – in progress, based on existing data and visual interpretation of orthophoto images, which will be the basis for further planning and implementation of field survey

▶ Field survey along critical sections – preliminary habitat map validation → final habitat map

Activity: Bird fauna inventory

- ▶ Breeding birds of Danube islands and sand bars (May-July)
- ▶ Breeding birds of Danube steep banks (May-July)
- ▶ Wetlands birds in Danube floodplain (17 sub-sites)
 - colonial waterbirds (April-July)
 - marshland breeding birds (April-July)
 - raptors (February-July)



Activity: Bird fauna inventory

- ▶ Migratory birds along the Danube – (March-May; September-November)
- ▶ Wintering birds along the Danube – December-February
- ▶ All inventory based on standard monitoring protocols for particular species (line transects and point counts) (e.g., JNNC, 2004

<https://data.jncc.gov.uk/data/dc33b514-d571-44b3-8936-08d2d7a1e1b1/CSM-Birds-2004.pdf>



Activity: River benthic habitats survey



- ▶ RIVER BENTHIC HABITATS (makroinvertebrates)
- ▶ Objective & output
 - River macroinvertebrate community structure in critical sections
 - Integration of data into GIS database
- ▶ Methodology
 - Standard methodology approach/methodology that is used for national monitoring of river benthic habitats (multihabitat sampling procedure for sampling major habitats proportionally according to their presence within a sampling reach; based on AQEM protocol, Water Management Company in Croatia, link: [METODOLOGIJA UZORKOVANJA LABORATORIJSKIH ANALIZA I ODREĐIVANJA OMJERA EKOLO-KE KAKVOÆE BIOLO-KIH ELEMENATA KAK \(voda.hr\)](#))
 - Timeline – sampling between May to October 2023, period of stable water level before sampling required

3. Establishment of a geoinformation system



▶ Activities within the scope of the project:

- Set-up and configuring of a local server on Clients premise
- Implementation of a WebGIS system (user requirement analysis, application development and implementation)
- Collection of monitoring data, systematization and GIS database establishment
- Creation of user manuals and conduction of training session
- GIS system maintenance (within 5 years from the end of the project)

Planned Field Surveys



	2023.											2024.							
MONITORING OF PARAMETERS IMPORTANT FOR WATERWAY MAINTENANCE																			
Inventarization of river regulation infrastructure	approx duration	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Field work on inventarization	7																		
Riverbed measurement of cross-sections of Danube river		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Riverbed measurement of cross-sections of Danube river	6																		
Monitoring and analysis of flow, velocity and sediment transport		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Field work measurement at Batina, mouth of Danube, Vukovar, Ilok	3																		
Piezometer installation		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Installation of 3 piezometers	2																		
BIODIVERSITY INVENTORY																			
Fish fauna inventory		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Electric fishing	6																		
Electrified benthic frame trawl	4																		
Monitoring of winter habitats using sonar	4																		
Habitat inventory		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Field work - habitat inventory	8																		
Bird fauna inventory		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Inventory of breeding birds of Danube islands and sand bars	5																		
Inventory of breeding birds of Danube steep banks	5																		
Inventory of wetlands birds in Danube floodplain	12																		
Inventory of migratory and wintering birds along the Danube	13																		
River benthic habitats survey		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
River benthic habitats survey	6																		
ESTABLISHMENT OF A GEOINFORMATION (GIS) SYSTEM																			

Status of obtaining permits



Permit/conditions	Authorized institution	Status	Request submitted	Expected duration of the procedure	Planned date of commencement of works
Permit for hydrographic surveys	MSTI, Border police, Port authority	In procedure	17.03.2023.	1-2 weeks	01.03.2023
Permit for measurement of flow and sediment	Border police	In procedure	announcement (via e-mail) before each field trip	-	01.04.2023
Biodiversity monitoring permit	Border police	In procedure	announcement (via e-mail) before each field trip	-	01.05.2023
Permit and special conditions for biodiversity inventory in the RC	MESD, Nature Protection Directorate	In procedure	27.02.2023.	60 days	01.05.2023
Permit fish fauna inventory in the RC	Ministry of Agriculture	Issued	24.02.2023.	-	01.04.2023
Permit and special conditions for biodiversity inventory in the RS	Ministry of Environmental Protection of the RS	Instructions issued, preparation of procedure	-	-	01.05.2023
Confirmation about the locations of mine-suspected areas	Ministry of Internal Affairs, Directorate of Civil Protection	In procedure	Planned for 27.03.2023.	30 days	01.05.2023
Permission to conduct research in the forest areas of the RC	Hrvatske šume (Croatian Forests), Forest Management Unit Osijek	In procedure	22.03.2023.	30 days	01.05.2023
Permission to conduct research in NP Kopački rit (PP Kopački rit)	JU NP Kopački rit	In preparation	-	-	01.05.2023
Permission to conduct research in PA Gornje Podunavlje	“Vojvodina šume” Public Company (Vojvodina Forests)	In preparation *	-	-	01.05.2023
Permission to conduct research in SRP Karadordevo	“Karadordevo” military institution	In preparation *	-	-	01.05.2023
Permission to conduct research in the forest areas of the RS	“Vojvodina šume” Public Company (Vojvodina Forests)	In preparation *	-	-	01.05.2023

(*) Initiation of the procedure after obtaining permission and special conditions for biodiversity inventory from the Ministry of Environmental Protection of the RS

Open challenges



▶ Possible risks considered in this phase of the project

- ✓ The duration of certain procedures for obtaining permits, permissions and special conditions
- ✓ Possible absence of high water levels of the Danube river considering last year's conditions and similar winter conditions this season



THANK YOU



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