



INTERNATIONAL SAVA RIVER BASIN COMMISSION

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## Executive Summary

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## Detailed design and prototype installation for the RIS on the Sava River

Contract Number: 2-09-10/17-3

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<b>Project title: Detailed design and prototype installation for the RIS on the Sava River</b>				
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For the Consultant

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## Glossary of Terms

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<b>Term</b>	<b>Meaning</b>
<b>AIS</b>	Automatic Identification System
<b>B&amp;H</b>	Bosnia and Herzegovina
<b>EU</b>	European Union
<b>RIS</b>	River information services
<b>ToR</b>	Terms of Reference
<b>WP</b>	Work Package

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## 1. INTRODUCTION

### 1.1. Overview

The objective of Project is to provide fully operational prototype of the services according to the EU RIS Directive, including AIS based tracking and tracing and interconnection with existing RIS systems on the Serbian and Croatian section of the Danube River, during the period of 6 months.

The objective of this summary is to present activities that were undertaken during project period within the framework provided by the Contract.

The RIS services should be implemented in a harmonized way based on existing technologies and system solutions developed in Croatia and Serbia for RIS implementation on the Danube River. This systematic approach should be used for both system and service design.



## 1.2. General background

The Sava River is navigable over the stretch of 594 km (starting from the confluence with the Danube, according to the new river chainage) and links the economies of 4 Sava riparian states of Slovenia, Croatia, Bosnia and Herzegovina and Serbia. Based on the existing and/or planned construction of the traffic infrastructure that links the Sava River with several ports on the Adriatic, the existence of port infrastructure along the Sava River and the connection with the Danube, the Sava River provides advantages for intensifying further development of inland waterway transport.

Intensifying traffic and transport on rivers usually has a negative impact on navigation safety, even if the “traditional” measures, such as marking or properly maintained fairway, are performed during the navigation period.

River Information Services (RIS) dramatically improve safety of inland waterway navigation, creates hi-tech, standardized and friendly environment and speeds up processes of all actors and stakeholders thus lowering overall transport cost and increases the efficiency of inland navigation as a transport mode.

### 1.3. Project summary

The overall objective of this Contract is to improve the safety and efficiency of inland waterway navigation on the Sava River.

Specific objectives comprise:

- Enhancing of the traffic safety by monitoring and managing the traffic on the Sava River waterway;
- Optimizing utilization of the Sava River (esp. at bottlenecks like shallow water/narrow passages and similar);
- Establishing manageability of the traffic on the Sava River by providing the possibility of giving navigational/directional aids to the traffic;
- Facilitating future implementation of the RIS systems in Sava basin;
- Enabling creation and maintenance of specific databases to improve statistics;
- Enabling the authorities to manage and plan the traffic operation and strategy;
- Improving electronic interchange of information for facilitating cross border operations (improve Integrated Border Management Strategy) and support authorities in law enforcement;
- Enabling quick and timely response in the event of an accident or similar;
- Improving safety, manageability and esp. timely response in any incident which involves hazardous cargo;
- Enabling the authorities to distribute information to other operators and organizations to integrate the information in logistic chains and enable seamless transport operations;
- Enabling economical growth of related activity sectors, such as tourism;
- Reducing environmental hazard and polluting emissions and spills due to accidents, illegal actions and/or normal operation.

Results achieved includes complete technical specification in order to allow the procurement of a proper RIS system, its implementation and operation on the Sava River, which complies with EU RIS Directive (2005/44/EC).

The main outcomes:





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- Elaborate a Detailed Design of the RIS system;
- Execute Assessment of Conformity of the proposed RIS system;
- Develop the Detailed Design and prepare the Technical Specifications, Cost Estimates and Tender Documentation;
- Install and operate the prototype of the services during the period of 6 months.

## 1.4. Task description

The Project is organized by way of Work Packages (WP) fully compatible with the requirements of Terms of Reference (ToR). The list and structure of the activities within the Project fully supports project objectives, overall and specific ones.

WPs according to the ToR are as follows:

- WP1.** Assessment of the current situation
- WP2.** Detailed design of the RIS system
- WP3.** Detailed field survey (range test)
- WP4.** Conformity assessment
- WP5.** Prototype installation
- WP6.** Cost estimates
- WP7.** Implementation schedule
- WP8.** Preparation of Technical specifications
- WP9.** Tender documentation
- WP10.** Environmental impact assessment

### **WP1. ASSESSMENT OF THE CURRENT SITUATION**

Detailed analysis of the already existing RIS on Sava River and analysis of the existing services on the Croatian and Serbian Danube are starting point in Project. Besides assessing the situation regarding the physical infrastructure and procedures, a thorough assessment of the legal situation is foreseen in order to gain a comprehensive understanding of the entire situation.

#### **Task 1.1.: Analysis of the existing RIS on the Sava River and analysis of the existing services on the Serbian and Croatian Danube**

Currently available RIS services, in both Croatian and Serbian Danube, comprises of:

- Fairway Information Service by means of Electronic Navigation Charts (ENC);
- Fairway Information Service by means of Notices to Skippers (NTS);
- Tracking and Tracing Service by means of Inland AIS.

Bosnia and Herzegovina at this time has no RIS implementation projects.



### **Task 1.2.: Analysis of responsibilities of governmental and commercial organization of beneficiary countries in relation to the project**

The Consultant analyzed and documented the responsibilities of the governmental and commercial organizations in relation to the project.

List of all relevant organizations is made.

### **Task 1.3.: Analysis of local and regional organizational structure of the governmental organizations with relation to the RIS, and inventory of available infrastructure and resources which could be involved in the development of RIS (telecommunication infrastructure, pylons, towers, premises, etc)**

The related governmental organizations with relation to the project are identified and documented in organizational charts.

Infrastructures and resources, which could be involved in the development of RIS, are documented for each relevant organizational unit of the government.

All premises of the relevant governmental offices located alongside Sava are visited, plans (if available) obtained, pictures of potential locations for RIS equipment taken and the pre-condition for installation assessed. These include the power supply, telecommunication and Information Technology (IT) infrastructure, Very High Frequency (VHF) communication devices and their range.

As an input for the calculation of the radio propagation, the Consultant identified the relevant infrastructures alongside the Sava River. These include all relevant facilities from the all available GSM network providers assessing their Global Positioning System (GPS) positions and height of the antenna masts.

### **Task 1.4.: Preparation of the list of vessels in operation belonging to the governmental organizations of beneficiary countries that are feasible to be equipped (AIS transponder and Inland Electronic Chart Display and Information System (ECDIS) viewer in information mode) for proper utilization of RIS**

The list of vessels belonging to the governmental organizations in relation to the project, which are in regular operation for the authorities and are feasible to be equipped (vessels above a certain size with power supply, etc.), is obtained from the beneficiaries and other governmental organizations with relation to the project.

Consultant visited all vessels and:

- Checked if RIS Systems are already in operation;

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- Checked the available space for the installation of RIS equipment in the wheelhouse;
- Checked the available space for the antennas;
- Checked possible installation of cables;
- Taken pictures of the wheelhouse;
- Documented the results.

### **Task 1.5.: Preparation of a Programme of Requirements taking into account the above mentioned and the requirements of the EU-RIS Directive**

Within this task, the Consultant compared the current status of RIS Systems and Services which are already in operation on Croatian and Serbian Danube and compare these to the requirements of the RIS Directive. The requirements of the EU-RIS Directive relate to the minimum set of RIS Services, additional RIS Services and the legal harmonization.

For RIS services that will be implemented on the Sava River, the technical design and technical specification is made in compliance with EU-RIS Directive and already existing RIS services in the beneficiary countries.

### **WP 2: Detailed design of the RIS system**

The main emphasis lies on developing a concept for RIS to be implemented along the Sava River waterway. The concept shall enable the implementation of a RIS system alongside the entire Sava waterway in the beneficiary countries.

This concept is presented in a form of Detailed Technical Design of the RIS related systems. Existing RIS services on Croatian and Serbian section, existing achievements on the Croatian and Serbian Danube as well as ongoing activities are taken into account. Entire system concept is in compliance with the relevant technical standards, including national and international standards and recommendations in the field of RIS; in particular form the EU such as the Commission Regulation (EC) No 414/2007 of 13 March 2007 concerning the technical guidelines for the planning, implementation and operational use of RIS (RIS Guidelines) and EU RIS Directive.

The Consultant proposed a system concept for all RIS Services, as required by the ToR. RIS Services according to the ToR comprises of services that are decomposed in the following tasks:

**Task 2.1.: Fairway Information Service by means of ENC;**

**Task 2.2.: Fairway Information Service by means of NtS;**

**Task 2.3.: Fairway Information Service by means of Differential Global Positioning System (dGPS) and AIS;**

**Task 2.4.: Tracking and Tracing Service by means of Inland AIS;**

**Task 2.5.: Electronic Ship Reporting (ERI);**

**Task 2.6.: Hull database;**

**Task 2.7.: Gateway portal;**

**Task 2.8.: Portal for commercial users.**

According to the requirements of the ToR, the Consultant proposed the list of potential locations for the network of AIS base stations. This is done on the basis of calculations and mathematical methods with the aim to provide the full coverage and in total not less than 95% of the total length of the Sava River in the beneficiary countries.

National and international regulations in the field of telecommunication and if they influence selection of the potential locations are analyzed.

### **WP 3: Detailed field survey (range test)**

One of the services of the Consultant is a production of technical documentation required for the construction of the radio networks and fixed radio communications. Integral parts of this documentation are propagation prediction, calculation of coverage area and radio connection range.

Tasks 3.1., 3.2. and 3.3. are identical in their structure but are related to different beneficiary country as it is stated below:

**Task 3.1.: Croatia;**

**Task 3.2.: Bosnia and Herzegovina;**

**Task 3.3.: Republic of Serbia.**

Each above mentioned task comprises of:

- Detailed planning and preparation of the range tests;
- Installation and test of the measuring equipment on the vessel;
- Execution of the range test.

**Task 3.4.: Post processing**

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This task assumes data analysis of the measured data. A signal level/river kilometer diagram is produced. The Consultant documented the results and listed the distribution of the field strength and drawn the conclusions for the AIS network.

### WP 4: Conformity assessment

The RIS system on the Sava River will be developed in accordance with the existing and already defined services. In order to ensure a full harmonized implementation throughout Europe, the planned RIS system is compared with the systems of other Danube countries, i.e. with RIS systems of at least three EU member states and in addition to Croatia and Serbia, for the Sava and the Danube River.

### WP 5: Prototype Installation

In order to verify the compliance of the proposed system Consultant developed the prototype that will be operational at least six months after the acceptance by the Beneficiaries. If necessary, the extension of prototype operation will be considered for additional time period.

The prototype is installed in beneficiary countries as it is stated in the tasks below:

**Task 5.1.: Croatia;**

**Task 5.2.: Bosnia and Herzegovina;**

**Task 5.3.: Republic of Serbia.**

The Consultant delivered fully operational prototype to ISRBC and Beneficiaries and all equipment will be the property of the ISRBC and Beneficiaries.

### Task 5.4.: System integration

This task focuses on the system integration of installed prototypes in previous tasks 5.1. to 5.3. Result of this action is a fully operational RIS prototype system on the Sava River in the Beneficiary countries.

### WP 6: Cost Estimates

The costs for a RIS System can be divided into three categories:

- Investment costs;
- Operational costs;
- Maintenance costs;

The Consultant compiled the different cost factors for the implementation and operation of the RIS System. Minimal and optimal options are calculated in order to support a decision, which possibility to choose for the system implementation and operation.

#### **WP 7: Implementation schedule**

Consultant elaborated a time schedule, which is based upon the experiences of previous RIS implementation. The findings of the other tasks, which have influence on the technical specification, are compiled and provided as input to WP 8: Preparation of technical specifications.

#### **WP 8: Preparation of Technical Specification**

The main emphasis lies on preparing a complete specification for the entire RIS system which has been developed concept wise in the preceding phases of the project. The objective is to set up the foundation for the entire system specification wise.

Following activities are done within this task:

- Obtain input from other tasks and from beneficiaries;
- Preparation of technical specification for the complete system;
- Verify collected information and the technical specifications with the ISBRC.

The Consultant prepared the technical specification for the RIS System on the Sava River within the separate document. Special emphasis lies on the relevant directives, regulations, standards, especially those at the European level, but also consider for instance national telecommunication regulations of each beneficiary country.

Requirements are detailed on a functional basis and clearly itemized and verifiable when testing. Supplier-specific requirements are avoided.

#### **WP 9: Tender Documentation**

The tender documentation specifies all non technical conditions of the tender dossier. The tender documentation includes the commercial conditions, evaluation procedures, contractual obligation, etc.

This task deals with enabling a proper tender and binding procedure for the RIS system according to the tendering procedures as defined in the Rules of Procurement Procedures of ISBRC.

Consultant compiled the tender dossier, which consists of the technical specification and the tender documentation.

#### **WP 10: Environmental Impact Assessment**



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The RIS system on Sava shall comply with the Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment (OJ L 175 of 05 July 1985) as amended, and also with the pertinent BIH, Croatian and Serbian regulations. Therefore an environmental impact assessment is elaborated by the Consultant.

Assessment of the physical interventions due to the implementation of RIS and assessment of the effects on the environment is made.



## 2. RESULTS

### 2.1. Assessment of the current situation

In the scope of detailed design and prototype installation for the RIS on the Sava River it is helpful to have an overview of RIS activities in other European and non-European countries. This task provides details on those activities. The basis for the implementation of RIS in Europe is the RIS directive of the European Union, i.e. Directive 2005/44/EC.

Currently available RIS services on Croatian and Serbian Danube comprises of:

- Fairway Information Service by means of Electronic Navigation Charts (ENC);
- Fairway Information Service by means of Notices to Skippers (NTS);
- Tracking and Tracing Service by means of Inland AIS.

Bosnia and Herzegovina had no previous experience with RIS and therefore no RIS system is implemented in the country.

Due to no experience in the field of RIS, there is no administrative body that would be directly responsible for RIS infrastructure and applications. Also no infrastructure is implemented on the B&H inland waterways and B&H has not participated in any RIS activities outside its borders.

The problem that imposes difficulties for RIS administration constitution is an organisational and political structure in the country.

Bosnia and Herzegovina has several levels of political structuring under the federal government level. Most important of these levels is the division of the country into two entities: Republika Srpska and the Federation of Bosnia and Herzegovina. At this time there are three main Harbour Master's Offices on the Sava River in Bosnia and Herzegovina:

- Harbour Master's Office Brčko (Republika Srpska)
- Harbour Master's Office Brčko district (Brčko district)
- Harbour Master's Office of B&H inland waterway navigation (Federation of Bosnia and Herzegovina)

Having in mind above mentioned organisational structure it is quite difficult to define single RIS authority. For the installation of harmonized RIS system it is highly recommended that there is one unique RIS authority responsible for the whole RIS system on the Sava River. Harbour Master's

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Offices on the Sava River belong to different entities so it is essential to achieve consensus on establishment of a single RIS administration.

Responsibilities of governmental and commercial organisation of Beneficiary countries are categorized and listed in this document.

Local and regional organizational structure of governmental organisations important for this project located around the area of the Sava River is listed according to the specified Beneficiary country.

Available governmental infrastructure and resources that could be involved in the development of the RIS system on the Sava River is defined. Potential candidate sites for the AIS base station installation have been identified.

List of vessels feasible to be equipped for proper utilization of RIS is also defined. One of the crucial actions for successful RIS implementation on the Sava River is equipping the vessels with proper RIS equipment (AIS transponder and Inland ECDIS viewer in information mode).

Within the prototype installation for the RIS on the Sava River three suitable governmental vessels are equipped with RIS equipment, i.e. one in each country (Croatia, Serbia and B&H).

For the selection of the vessels to be equipped the following requirements have to be fulfilled:

- The vessel must have a valid certificate
- A closed cabin should be available to protect the equipment from the environment
- 24VDC power supply
- 220VAC power supply

Within this first selection process five (5) vessels in Croatia have been identified to meet the requirements. Recommended ship for the equipment programme is the ship of Inland Waterways Agency stationed in Slavonski Brod.

The preliminary investigation of the governmental vessels in direct contact with the relevant stakeholders showed that Serbian Authorities have launched the extensive equipment programme for governmental vessels within the RIS implementation project for the Danube River which basically covers all existing and currently available governmental vessels, which are also used on the Sava River. Since the equipment programme planned by Serbian authorities (with the assistance of EU) has already been launched there is no need for one in the scope of this project. Ship to be equipped for prototype installation will be the one owned by Plovput.



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Four (4) vessels in B&H have been identified to meet the requirements. Defined vessels are in possession of the state owned company VP “Sava”. Vessels owned by the police department were also an option but they do not fulfil defined requirements.

Services on inland waterways in the European Union (EU) have been published in 2005 defining the goals, standards, structure and implementation period for RIS in the EU. Although project beneficiary countries are not yet members of the EU (Croatia is an EU candidate country), their path towards EU has been clearly defined and as such they need to take into the consideration European standards when implementing new development projects, therefore EU RIS Directive (2005/44/EC) needs to be closely considered within the framework of this project.



## 2.2. Detailed design of the RIS system

This document is focused on developing a concept for RIS to be implemented along the Sava River waterway. The concept shall enable the implementation of a RIS system alongside the entire Sava waterway in the beneficiary countries.

System concept for all RIS services is proposed. RIS on the Sava River comprises of the following services:

- Fairway Information Service by means of ENC
- Fairway Information Service by means of NtS
- Fairway Information Service by means of Differential Global Positioning System (dGPS) and AIS
- Tracking and Tracing Service by means of Inland AIS
- Electronic Ship Reporting (ERI)
- Hull database
- Gateway portal
- Portal for commercial users

Each service is described in the terms of purpose, main functions, users, main components, standards and interfaces.

## 2.3. Detailed field survey (range test)

Detailed field survey was the most delicate part of the Project due to its dependence on external circumstances. In compliance with the article 4.5., Changed Circumstances of the Client/Consultant Services Agreement, time for completion of the field survey was extended until the circumstances no longer apply plus a reasonable period not exceeding 42 days for resumption of them.

Measuring period had to be extended due to the following circumstances:

- extremely low water level on the Sava River in beneficiary countries,
- equipment failure,
- vessel failure,
- car failure,
- sub zero temperatures,
- national holidays and
- illness of a crew member.

The survey results are based on measurements that did not consider the use of different antenna types at the base stations. The optimization of the AIS network was done in the final network simulation. Consultant selected the best antenna configuration based on technical characteristics of each antenna type and Consultants experience. Hence, the results from data processing have more significance and are the final results of this AIS network planning task.

### CROATIA

Based on the measured signal strength on the Croatian Sava section, coverage of the total length of the Sava River in Croatia is calculated. AIS network design based on measured data provides coverage of 84,91% of the total length of the Sava River in Croatia. This coverage is noncompliant with the ToR requirement of not less than 95% coverage of the total length of the Sava River in the beneficiary countries.

This unsatisfactory coverage ratio is a result of existence of critical sections along the Croatian Sava River waterway. Critical sections can be solved by adding additional base stations or by optimising installed antenna type.

Based on the range test results the base station sites listed are proposed to be used for shore based AIS infrastructure for Croatia.

Consultant proposes final network plan for shore based AIS infrastructure for Croatia that includes five (5) AIS base stations on the following locations:

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- Sisak silo 1
- Košutarica (Jasenovac)
- Stara Gradiška
- Slavonski Brod (Đuro Đaković tower)
- Županja

If requested by Contracting Authority, coverage ratio of 100% can be achieved by adding additional two (2) base stations on the following locations:

- Gunja
- Davor

AIS base stations set up on these two locations will eliminate all above defined critical sections.

## BOSNIA AND HERZEGOVINA

Based on the measured signal strength on the Croatian Sava section, coverage of the total length of the Sava River in Bosnia and Herzegovina is calculated. AIS network design based on measured data provides coverage of 96,74% of the total length of the Sava River in Bosnia and Herzegovina. This coverage is compliant with the ToR requirement of not less than 95% coverage of the total length of the Sava River in the beneficiary countries.

Consultant proposes final network plan for shore based AIS infrastructure for Bosnia and Herzegovina that includes five (5) AIS base stations on the following locations:

- Brčko government building
- Svilaj (GSM mast)
- Gradiška west (2 GSM masts)
- Srbac
- Međeđa

Critical sections can be solved by adding additional base stations or by optimising installed antenna type.

If requested by Contracting Authority, coverage ratio of 100% can be achieved by adding one (1) additional base station on the following location:

- Orašje, mast

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AIS base station set up on this location will eliminate all above defined critical sections. It is optional and not necessary for optimal system operation. Signal gaps in Bosnia and Herzegovina do not impose problems for system operation.

## SERBIA

Based on the measured signal strength on the Serbian Sava section, coverage of the total length of the Sava River in Serbia is calculated. AIS network design based on measured data provides coverage of 100% of the total length of the Sava River in Serbia. This coverage is compliant with the ToR requirement of not less than 95% coverage of the total length of the Sava River in the beneficiary countries.

Consultant proposes final network plan for shore based AIS infrastructure for Serbia that includes three (3) AIS base stations on the following locations:

- Obrenovac, coal power plant Nikola Tesla B (TENT B)
- Sremska Mitrovica (Harbour Master's Office building)
- Bosut (mobile telephony mast)

Proposed AIS network design provides coverage of 100% of the total length of the Sava River in Serbia.

In order to optimize network coverage base station at location:

- Baza Plovput in Belgrade

can be installed. This base station is not essential to assure a full coverage of the defined section of the Sava River because AIS base station located at the coal power plant Nikola Tesla B (TENT B) covers this area. Having in mind traffic density at the Sava River estuary in Belgrade, this location can also be included as an AIS base station location in order to assure the best coverage possible in situations with high traffic volume. This location is optional and not necessary for optimal system operation.

## 2.4. Conformity assessment

Conformity assessment is based on a definition of the assessment criteria, i.e. defining system components that are analyzed. An important criterion is the conformity of the system with implemented systems in other neighboring and European countries and with already existing systems in the beneficiary countries. Assessment of the concept conformity analyses each system component with respect to the defined criteria.

Results of the assessment related to the standards and the conformity of the system with the ones in other countries are summarized within this particular document.

In the scope of this assessment of the concept conformity different system components are analyzed. Based on the ToR these components include but are not limited to:

- Electronic Navigational Charts
- Electronic provision of Notices to Skippers
- AIS based Vessel Tracking and Tracing
- Electronic Ship Reporting Systems
- Hull database registration systems and hull data exchange
- Provision of dGPS correction signal by means of AIS

The specific requirements for the RIS implementation on the Sava River, and the outcome of the evaluation of user needs, require an adaptation of this component list to:

- Electronic Navigational Charts
- Electronic provision of Notices to Skippers
- AIS based Vessel Tracking and Tracing
- Electronic Ship Reporting Systems
- Hull database registration systems and hull data exchange
- Provision of dGPS correction signal by means of AIS
- National and international data exchange

The Beneficiaries have confirmed that the radiotelephony network available in the relevant Harbour Masters Offices is up to date and that the available equipment meets current needs. For a proper and efficient usage of a new radiotelephony network neither the personnel nor the organizational



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framework are currently available or foreseen within the time frame of the project. Additional safety related communication will be introduced by a digital communication on the basis of the AIS system. The international data exchange includes not only hull data but also tracking & tracing data, ERI data, etc.

The main evaluation criteria for the concept conformity are:

- Conformity to the European and international standards and recommendations
- Conformity to the EU RIS Directive
- Conformity to the other European RIS systems

Assessment of the conformity for each system component is done according to the above mentioned criteria. Those criteria do not apply to all system components as some of them have not yet been standardized or regulated. In particular, existing standards and the EU RIS Directive do not cover all different services and components of the RIS system.

As the design of the RIS system implemented on the Sava River has been based on all relevant standards and regulations, as well as on the lessons learned from the other European RIS systems, it is ensured that the RIS implementation on the Sava River will be fully compliant with the applicable standards and regulations, and also compatible to all other compliant systems in the Europe.

RIS system implemented on the Sava River will be in compliance with the EU RIS Directive.

## 2.5. Prototype installation

System server is set up and installed in Consultants premises, during the operation period, for providing the real time and historical ability for vessels tracking and tracing within the range of the AIS base station installed on the Sava River.

Base station locations contain base station transponder, base station controller, UPS, switch, internet connection or wireless link, GPS and VHF antennas. All components are mounted into 19" rack cabinet. GPS and VHF antennas are connected to the base station transponder. All components are connected to switch using LAN cables.

A workstation with Inland ECDIS viewer will be installed in the premises of the ISRBC in order to provide overview of the traffic in the test stretch of the Sava River. Workstation is still not installed due to the fact that ISRBC is moving to the other location.

Vessels are equipped with a PC and ECDIS screen, providing the platform for an Inland ECDIS Viewer operation in working and in information mode, installed and connected with the onboard Inland AIS. Installed Inland ECDIS Viewer is in compliance with the latest EU standards for Inland ECDIS, ENC and Electronic Reporting Standards.

All installed equipment is listed in Annex to this document.

### CROATIA

On the shore side, an AIS base station is currently installed in Slavonski Brod on top of the Inland Waterway Agency building but will be transferred to Đuro Đaković tower when safe conditions for equipment housing will be assured.

Workstation with Inland ECDIS viewer is installed in the premises of the Harbour Master Office Slavonski Brod in order to provide overview on the traffic in the test stretch of the Sava River.

On the onboard side, Inland Waterway Agency vessel is equipped with an AIS and Inland ECDIS viewer in Information mode.

### SERBIA

On the shore side an AIS base station is currently installed in Sremska Mitrovica on top of the Sremska Mitrovica Harbour Masters Office building.

Workstation with Inland ECDIS viewer is installed in the premises of the Harbour Master Office Sremska Mitrovica in order to provide overview on the traffic in the test stretch of the Sava River.



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On the onboard side, Plovput vessel is equipped with an AIS and Inland ECDIS viewer in Information mode.

**BOSNIA AND HERZEGOVINA**

On the shore side an AIS base station is currently installed in Brčko on top of the Brčko government building.

Workstation with Inland ECDIS viewer is installed in the premises of the Harbour Master Office Brčko district in order to provide overview on the traffic in the test stretch of the Sava River.

On the onboard side, VP "Sava" vessel is equipped with an AIS and Inland ECDIS viewer in Information mode.

## 2.6. Cost estimates

The costs for the procurement of RIS on the Sava River have been categorised according to the two tenders for each beneficiary country. The Service Tender includes the overall management of the system integration, the development work on the sub systems. This includes the procurement of hardware and software components for system development in a flexible manner which allows for an architecture conforming to all the requirements.

The Supplies Tender has been split in two lots. This step was necessary to separate the General IT equipment (many products available on the market) from the very specific RIS equipment (only few manufacturers).

Table 1 summarises the costs for the Supplies and the Services Tender for each beneficiary country costs for minimal RIS system configuration.

**Table 1: Implementation costs for minimal RIS system configuration**

	Croatia	Serbia	Bosnia and Herzegovina	All
<b>Services</b>	€ 391.500	€ 198.000	€ 2.354.000	
<b>Supplies</b>	€ 225.200	€ 123.700	€ 328.600	
<b>Total</b>	<b>€ 616.700</b>	<b>€ 321.700</b>	<b>€ 2.682.600</b>	<b>€ 3.621.000</b>

Table 2 summarises the costs for the Supplies and the Services Tender for each beneficiary country for optimal RIS system configuration.

Table 2: Implementation costs for optimal RIS system configuration

	Croatia	Serbia	Bosnia and Herzegovina	All
<b>Services</b>	€ 507.500	€ 212.000	€ 2.381.200	
<b>Supplies</b>	€ 276.100	€ 142.700	€ 360.500	
<b>Total</b>	<b>€ 783.600</b>	<b>€ 354.700</b>	<b>€ 2.741.700</b>	<b>€ 3.880.000</b>

Table 3 summarises RIS system maintenance costs for each beneficiary country.

Table 3: Maintenance costs

	Croatia	Serbia	Bosnia and Herzegovina	All
<b>AIS network</b>	96.000 €	36.000 €	72.000 €	
<b>RCC links and software</b>	1.260 €	630 €	980 €	
<b>NCC links and software</b>	0 €	0 €	10.000 €	
<b>ENC update</b>	15.000 €	15.000 €	15.000 €	
<b>NtS update</b>	5.000 €	5.000 €	5.000 €	
<b>ERI update</b>	20.000 €	20.000 €	20.000 €	
<b>Supervision and control</b>	40.000 €	25.000 €	35.000 €	
<b>Total</b>	<b>177.260 €</b>	<b>101.630 €</b>	<b>157.980 €</b>	<b>436.870 €</b>

## 2.7. Implementation schedule

For the scheduling of the public procurement and the contracting, the procurement rules of the ISRBC and the experience with previous procurement activities are used as a basis.

For the development of the implementation schedule the following knowledge, experience and framework conditions are considered:

- Complexity of the tendered system as described in the technical specification (WP 8)
- Proposed re-use of existing systems
- Experience from similar implementation projects in Europe (especially with regard to elaboration of the detailed design and acceptance procedures)
- Limited resources of the beneficiaries for getting familiar with the system

According to the defined conditions preferred order of implementation has been defined. This definition has taken into account not only the practical aspects of the implementation but also the need for creating user acceptance by creating benefits for users as early as possible.

On the other hand, the resulting implementation schedule has been simplified as much as possible in order to give the necessary freedom to the System Integrator to propose a detailed schedule according to his specific implementation approach.

The implementation schedule has been developed taking into account the priority and the dependencies of the individual sub-systems, operational constraints, and the availability of facilities and resources from the side of the beneficiaries.

The period of execution is scheduled for 12 months in Croatia, 9 months in Serbia and for 24 months in Bosnia and Herzegovina.

Detailed implementation schedule for each beneficiary country is defined in Annex 2 to this document.

The basic implementation schedule which is given in the Annex 2 shall be refined (and even partly adapted) by the successful tenderer in order to obtain a detailed schedule for the overall project as well as for the implementation of the individual subsystems according to the tenderer's specific methodology.

## 2.8. Preparation of Technical specifications

This task has a twofold objective, lay the foundation for the entire system specification-wise and at the same time enable a proper tender and bidding procedure for the RIS system on the Sava River according to the Rules of Procurement Procedures of ISRBC.

The specifications are written for the envisaged RIS system, after which the elements that are contained are clearly and unambiguously identified to enable proper tendering. Collected information and the technical specifications are verified with the Beneficiaries and the Contracting Authority.

The technical specification of the system is the basis for the tender documentation for the implementation of the RIS on the Sava River. The specification work takes into account:

- System design documentation and the results of the field survey
- Evaluation of user needs and the special requirements of the beneficiaries
- Rules of Procurement Procedures of ISRBC

Implementation of the RIS system on the Sava River is structured through two tenders:

- Service tender
- Supply tender

The overall implementation of the system will be carried out through the Service Tender. The Supply tender has to provide the necessary supplies for the implementation and is separated in two lots:

- Lot 1: General IT equipment
- Lot 2: RIS specific equipment

The reason for having two lots is to be able to separate the standard off-the-shelf IT equipment from the very specific supplies related to the RIS implementation.

The overall system to be implemented consists of the following main components:

- Fairway Information Service by means of Electronic Navigational Charts (ENC)
- Fairway Information Service by means of Notices to Skippers (NtS)
- Fairway Information Service by means of dGPS and AIS
- Tracking and Tracing Service by means of Inland AIS
- Electronic Ship Reporting System (ERI)

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- Hull database
- Gateway portal
- Portal for commercial users

The technical specification starts with an overall description of the system elements followed by a system description of each RIS component. The aim is to give an overview on the system concept and the functionalities required. The detailed specification for each system (architecture, functional, non-functional, optional requirements and standards) are defined. The supplies related to each system are summarised.

Technical specifications also deal with the system integration and the system performance to be achieved. Requirements on Documentation and Training are described. Focus is also given on the System Implementation, Operation and on the System Acceptance.

All references that are not available to the public are contained within this document. It has to be taken into consideration in addition to the requirements and descriptions stated in this particular document.





## 2.9. Tender documentation

The procurement procedures are defined in the Rules of Procurement Procedures of ISRBC. The tender documents have been prepared in full compliance with the above procedures and on the basis of the Tender Documentation for this Contract. The Consortium consulted the Contracting Authority in order to have the latest eventual updates of such procedures.

The Tender Documentation has been separated to the two tenders relevant for this project:

- Service Tender - Implementation of the RIS system on the Sava River;
- Supplies Tender - Supply of Equipment for the RIS system on the Sava River.

Since the WP 6 Cost Estimates is prepared on the basis of the costs of RIS implementation per countries, the Tender Documentation is made in a way that tenders could be launched separately (one per country).

This approach secures to the Contracting Authority wide range of possibilities to launch tenders by countries, for two of them, all three together or to provide to some of financial institutions only the core of tenders (e.g. ToR and Technical Specifications). It is even possible to prepare single tender (also one per country) consisting of services and supplies (compiling provided Tender Documentation), securing to Contract Authority even more possibilities.

Parts of Tender Documentation that should be defined by the Contracting Authority, in line with the tender requirements before launching them, are consequently marked.

In Service Tender, Implementation of the RIS system on the Sava River, Section 5 – Terms of Reference is given separately for all three countries as well as the 2D. Technical Specifications in Supplies Tender from Supply of Equipment for the RIS system on the Sava River. This allows Contracting Authority to simply copy and paste these activities to appropriate Tender Documentation.

## 2.10. Environmental impact assessment

Physical interventions due to the RIS installation on the Sava River are very limited, because antennas would mostly be mounted to existing masts for example the masts of the GSM network operators or placed on the governmental buildings. At all of these locations, other antennas had already been installed, so the additional physical intervention would basically be negligible. In Serbia, based on the new set of legislation (Law on non ionising radiation, new Law on planning and Construction, Law on EIA), for the activities for which Construction permit is not issued (which is the case for telecommunication objects), the Ministry for Environment and Spatial Planning issues the conclusion that EIA study is not needed and issues the conditions and measures for environment protection if it is needed, based on the request which should be submitted to the Ministry. Together with the request, the installer should provide location coordinates, short description and photos of all locations, and conceptual design.

However, in some cases AIS base stations will be installed in the nature protected areas as in Croatia. The approval under nature protection legislation should be given in all of these cases with a limited number of conditions by the competent authority. These conditions, if there are, could be indeed fulfilled without major problems. As a consequence, the implementation of the infrastructures in the framework of RIS will therefore have no harmful effects on the environment. As per the procedure, the request for conditions should be submitted to the Ministry of Environment and Spatial Planning of Republic of Croatia.

RIS will aim at the preparation of services for increased safety, efficiency and security. These services will contribute to the promotion of navigation, an environmentally friendly mode of transport in itself. The implementation of such services has the potential to reduce the number of accidents, and on this way to reduce possible emissions, oil spills etc.

For instance, real time information can be used to load ships according to the actual navigational conditions. RIS can thereby raise the fuel efficiency of navigation and the fuel consumption per tkm can be significantly reduced. With RIS skippers can also decide to adjust their cruising speed and can thus achieve more homogenous travel speed while approaching the locks/terminal.

An important side effect of this development is the reduction of external costs that depend on fuel consumption. By implementing RIS, existing transport volumes can be transported in a more environmental-friendly way and RIS contributes consequently to a modal shift of cargo from road to waterway, leading to a reduction of exhaust gaseous such as CO<sub>2</sub> and NO<sub>x</sub> but also of noise nuisance.



### 3. CONCLUSION

Implementation of the RIS system on the Sava River will increase safety, efficiency and security of the Sava River waterway. RIS services will contribute to the promotion of navigation, an environmentally friendly mode of transport in itself. The implementation of such services has the potential to reduce the number of accidents, and in this way reduce possible emissions, oil spills etc.

Utilization of the Sava River waterway will be optimized and traffic management simplified. Electronic interchange of information for facilitating cross border operations will be improved and allow support to authorities in law enforcement.

In the scope of the RIS implementation on the Sava River Consultant proposes separate supervision of the implementation process in order to assure efficient implementation. Supervision should be conducted through the separate tender procedure.



## **ANNEX 1: DETAILED COST ESTIMATES**



## CROATIA

### Services

Segment	Service	Quantity	Price	Total	Optimal config. Quantity	Total for optimal config.
<b>Shore Segment</b>	<b>Tracking &amp; Tracing System</b>					
	AIS Base station - Installation Documentation	5	€ 500	70.500 €	7	97.500 €
	AIS Base station - System Documentation	1	€ 3.000	3.000 €	1	3.000 €
	Base station: construction, installation, configuration and acceptance test	5	€ 6.000	30.000 €	7	42.000 €
	AIS BS Controller Software	5	€ 7.000	35.000 €	7	49.000 €
<b>Operator Segment</b>	<b>Electronic Reporting System</b>					
	ERI - system upgrade	1	€ 51.000	51.000 €	1	51.000 €
<b>Operator Segment</b>	<b>Hull Database System</b>					
	Hull Database - User Documentation	1	€ 5.000	5.000 €	1	5.000 €
	Hull Database - System Documentation	1	€ 7.000	7.000 €	1	7.000 €
	Hull Data int. data exchange interface	1	€ 5.000	5.000 €	1	5.000 €
	Hull Data Management Application and Database	1	€ 70.000	70.000 €	1	70.000 €
<b>Operator Segment</b>	<b>ENC Production and Distribution System</b>					
	Implementation of RIS Index and Reference Data	1	€ 30.000	30.000 €	1	30.000 €
	RIS Reference Data - Database and Mgmt. Software	1	€ 50.000	50.000 €	1	50.000 €
	Ortho photo images of the Sava River	1	€ 8.000	8.000 €	1	8.000 €
<b>Authority</b>	<b>Land User Work Stations</b>					
	T&T: Installation, configuration and acceptance test	11	€ 1.500	16.500 €	11	16.500 €
	Inland ECDIS Viewer with support for ERI and NtS	11	€ 7.000	77.000 €	11	77.000 €
	Land User Work Stations - User Documentation	1	€ 5.000	5.000 €	1	5.000 €
	Land User Work Stations - System Documentation	1	€ 5.000	5.000 €	1	5.000 €
<b>Ship Segment</b>	<b>Vessel User Terminals</b>					
	Ship equipment - User Documentation	1	€ 7.000	7.000 €	1	7.000 €
	Ship equipment - System Documentation	1	€ 10.000	10.000 €	1	10.000 €
	Ship equipment - Installation, configuration, acceptance test and training	5	€ 1.500	7.500 €	5	7.500 €
	Inland ECDIS Viewer Software - Maintenance	5	€ 500	2.500 €	5	2.500 €
<b>Operator Segment</b>	<b>System Integration</b>					
	System integration	1	€ 50.000	50.000 €	1	50.000 €
	<b>Permits</b>					
	Support for filing AIS Base station permits	5	€ 500	2.500 €	7	3.500 €
	<b>TOTAL SERVICE COSTS</b>			<b>391.500 €</b>		<b>507.500 €</b>



## Lot 1: General IT equipment

Item No.*	Item	Quantity	Price	Total	Optimal config. quantity	Total for optimal config.
1	Server	1	€ 4.000	4.000 €	1	4.000 €
2	Server rack	1	€ 2.500	2.500 €	1	2.500 €
3	UPS rack mountable	1	€ 4.000	4.000 €	1	4.000 €
4	KVM	1	€ 2.000	2.000 €	1	2.000 €
5	Network switch rack mountable	1	€ 500	500 €	1	500 €
19	LUWS type 1 (desktop)	9	€ 1.000	9.000 €	9	9.000 €
20	Display for luws type 1	18	€ 250	4.500 €	18	4.500 €
21	LUWS type 2 (mobile)	2	€ 1.000	2.000 €	2	2.000 €
22	Projector	0	€ 1.000	0 €	0	0 €
23	Printer	8	€ 400	3.200 €	8	3.200 €
<b>TOTAL</b>				<b>31.700 €</b>		<b>31.700 €</b>

\*referring to Technical specifications - Annex 1

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## Lot 2: RIS-specific equipment

Item No.*	Item	Quantity	Price	Total	Optimal config. quantity	Total for optimal config.
6	Base station controller	6	600 €	3.600 €	8	4.800 €
7	Server rack	6	2.000 €	12.000 €	8	16.000 €
8	Server rack outdoor	0	7.000 €	0 €	0	0 €
9	UPS rack mountable	6	1.000 €	6.000 €	8	8.000 €
10	UPS rack mountable outdoor	0	4.000 €	0 €	0	0 €
11	Network switch rack mountable	6	300 €	1.800 €	8	2.400 €
12	AIS transponder (base station)	9	13.000 €	117.000 €	11	143.000 €
13	VHF antenna omnidirectional	1	1.000 €	1.000 €	2	2.000 €
14	VHF antenna directional	7	1.000 €	7.000 €	9	9.000 €
15	VHF antenna coupler	3	100 €	300 €	4	400 €
16	VHF cable	1	300 €	300 €	1	300 €
17	DGPS generation module	1	5.000 €	5.000 €	3	15.000 €
18	GPS antenna	1	2.000 €	2.000 €	3	6.000 €
24	DGPS receiver	5	3.000 €	15.000 €	5	15.000 €
25	AIS transponder (vessel mounted)	7	2.500 €	17.500 €	7	17.500 €
26	Industrial PC	5	600 €	3.000 €	5	3.000 €
27	VHF antenna	5	150 €	750 €	5	750 €
28	LCD display	5	250 €	1.250 €	5	1.250 €
<b>TOTAL</b>				<b>193.500 €</b>		<b>244.400 €</b>

\*referring to Technical specifications - Annex 1

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## SERBIA

### Services

Segment	Service	Quantity	Price	Total	Optimal config. Quantity	Total for optimal config.
<b>Tracking &amp; Tracing System</b>						
<b>Shore Segment</b>	AIS Base station - Installation Documentation	3	€ 500	1.500 €	4	2.000 €
	AIS Base station - System Documentation	1	€ 3.000	3.000 €	1	3.000 €
	Base station: construction, installation, configuration and acceptance test	3	€ 6.000	18.000 €	4	24.000 €
	AIS BS Controller Software	3	€ 7.000	21.000 €	4	28.000 €
<b>ENC Production and Distribution System</b>						
	Ortho photo images of the Sava River	1	€ 8.000	8.000 €	1	8.000 €
<b>Land User Work Stations</b>						
<b>Authority</b>	T&T: Installation, configuration and acceptance test	10	€ 1.500	15.000 €	10	15.000 €
	Inland ECDIS Viewer with support for ERI and NTS	10	€ 7.000	70.000 €	10	70.000 €
	Land User Work Stations - User Documentation	1	€ 5.000	5.000 €	1	5.000 €
	Land User Work Stations - System Documentation	1	€ 5.000	5.000 €	1	5.000 €
<b>System Integration</b>						
<b>Operator Segment</b>	Adaptations of Central T&T applications and integration	1	€ 50.000	50.000 €	1	50.000 €
	<b>Permits</b>					
	Support for filing AIS Base station permits	3	€ 500	1.500 €	4	2.000 €
<b>TOTAL SERVICE COSTS</b>				<b>198.000 €</b>		<b>212.000 €</b>





## Lot 1: General IT equipment

Item No.*	Item	Quantity	Price	Total	Optimal config. quantity	Total for optimal config.
1	Server	0	€4.000	0€	0	0€
2	Server rack	0	€2.500	0€	0	0€
3	UPS rack mountable	0	€4.000	0€	0	0€
4	KVM	0	€2.000	0€	0	0€
5	Network switch rack mountable	0	€500	0€	0	0€
19	LUWS type 1 (desktop)	8	€1.000	8.000€	8	8.000€
20	Display for luws type 1	16	€250	4.000€	16	4.000€
21	LUWS type 2 (mobile)	2	€1.000	2.000€	2	2.000€
22	Projector	0	€1.000	0€	0	0€
23	Printer	7	€400	2.800€	7	2.800€
<b>TOTAL</b>				<b>16.800€</b>		<b>16.800€</b>

\*referring to Technical specifications - Annex 1



## Lot 2: RIS-specific equipment

Item No.*	Item	Quantity	Price	Total	Optimal config. quantity	Total for optimal config.
6	Base station controller	4	€ 600	2.400 €	5	3.000 €
7	Server rack	2	€ 2.000	4.000 €	3	6.000 €
8	Server rack outdoor	2	€ 7.000	14.000 €	2	14.000 €
9	UPS rack mountable	2	€ 1.000	2.000 €	3	3.000 €
10	UPS rack mountable outdoor	2	€ 4.000	8.000 €	2	8.000 €
11	Network switch rack mountable	4	€ 300	1.200 €	5	1.500 €
12	AIS transponder (base station)	5	€ 13.000	65.000 €	6	78.000 €
13	VHF antenna omnidirectional	2	€ 1.000	2.000 €	2	2.000 €
14	VHF antenna directional	1	€ 1.000	1.000 €	3	3.000 €
15	VHF antenna coupler	0	€ 100	0 €	1	100 €
16	VHF cable	1	€ 300	300 €	1	300 €
17	DGPS generation module	1	€ 5.000	5.000 €	1	5.000 €
18	GPS antenna	1	€ 2.000	2.000 €	1	2.000 €
24	DGPS receiver	0	€ 3.000	0 €	0	0 €
25	AIS transponder (vessel mounted)	0	€ 2.500	0 €	0	0 €
26	Industrial PC	0	€ 600	0 €	0	0 €
27	VHF antenna	0	€ 150	0 €	0	0 €
28	LCD display	0	€ 250	0 €	0	0 €
<b>TOTAL</b>				<b>106.900 €</b>		<b>125.900 €</b>

\*referring to Technical specifications - Annex 1

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## **BOSNIA AND HERZEGOVINA**



## Services

Segment	Service	Quantity	Price	Total	Optimal config. Quantity	Total for optimal config.
<b>Tracking &amp; Tracing System</b>						
<b>Operator Segment</b>	T&T - User Documentation	1	€7.500	7.500 €	1	7.500 €
	T&T - System Documentation	1	€10.000	10.000 €	1	10.000 €
	T&T Central Server - Software and Database Mgmt.	1	€400.000	400.000 €	1	400.000 €
	T&T portal for commercial users	1	€100.000	100.000 €	1	100.000 €
<b>Shore Segment</b>	AIS Base station - Installation Documentation	5	€ 500	2.500 €	6	3.000 €
	AIS Base station - System Documentation	1	€3.000	3.000 €	1	3.000 €
	Base station: construction, installation, configuration and acceptance test	5	€ 6.000	30.000 €	6	36.000 €
	AIS BS Controller Software	5	€7.000	35.000 €	6	42.000 €
<b>Notices to Skippers System</b>						
	NtS - User Documentation	1	€2.000	2.000 €	1	2.000 €
	NtS - System Documentation	1	€2.000	2.000 €	1	2.000 €
	NtS creation and access application (web interface or client)	1	€ 5.000	5.000 €	1	5.000 €
<b>Electronic Reporting System</b>						
<b>Operator Segment</b>	ERI - User Documentation	1	€7.000	7.000 €	1	7.000 €
	ERI - System Documentation	1	€10.000	10.000 €	1	10.000 €
	ERI System Application	1	€120.000	120.000 €	1	120.000 €
	ERI message creation and access application (web interface)	1	€ 30.000	30.000 €	1	30.000 €
<b>Hull Database System</b>						
<b>Operator Segment</b>	Hull Database - User Documentation	1	€5.000	5.000 €	1	5.000 €
	Hull Database - System Documentation	1	€7.000	7.000 €	1	7.000 €
	Hull Data int. data exchange interface	1	€5.000	5.000 €	1	5.000 €
	Hull Data Management Application and Database	1	€70.000	70.000 €	1	70.000 €

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Segment	Service	Quantity	Price	Total	Optimal config. Quantity	Total for optimal config.
<b>ENC Production and Distribution System</b>						
<b>Operator Segment</b>	ENC - System Documentation	1	€ 2.000	2.000 €	1	2.000 €
	Implementation of RIS Index and Reference	1	€ 30.000	30.000 €	1	30.000 €
	RIS Reference Data - Database and Mgmt. Software	1	€ 50.000	50.000 €	1	50.000 €
	AutoCAD latest version incl. AutoCAD Overlay	1	€ 10.000	10.000 €	1	10.000 €
	ENC Analyzer	1	€ 6.800	6.800 €	1	6.800 €
	ENC Analyzer Support	1	€ 4.500	4.500 €	1	4.500 €
	ENC Designer (incl. Referencer and Manager)	1	€ 5.600	5.600 €	1	5.600 €
	ENC Designer Support	1	€ 3.700	3.700 €	1	3.700 €
	ENC Optimizer	1	€ 1.250	1.250 €	1	1.250 €
	ENC Optimizer Support	1	€ 850	850 €	1	850 €
	S-57 FME Plug-in	1	€ 7.500	7.500 €	1	7.500 €
	S-57 FME Plug-in Support	1	€ 5.000	5.000 €	1	5.000 €
	FME Professional Edition	1	€ 2.200	2.200 €	1	2.200 €
	FME Professional Edition Support	1	€ 1.350	1.350 €	1	1.350 €
	Contouring Module	1	€ 5.100	5.100 €	1	5.100 €
	Contouring Module Support	1	€ 3.400	3.400 €	1	3.400 €
	Ortho photo images of the Sava River	1	€ 8.000	8.000 €	1	8.000 €
<b>Gateway</b>						
<b>Operator Segment</b>	Data Gateway - User Documentation	1	€ 5.000	5.000 €	1	5.000 €
	Data Gateway - System Documentation	1	€ 10.000	10.000 €	1	10.000 €
	Data Gateway - Development	1	€ 70.000	70.000 €	1	70.000 €
	Data Gateway - Interconnection	1	€ 25.000	25.000 €	1	25.000 €
				<b>110.000 €</b>		<b>110.000 €</b>

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Segment	Service	Quantity	Price	Total	Optimal config. Quantity	Total for optimal config.
<b>Land User Work Stations</b>						
<b>Authority</b>	T&T: Installation, configuration and acceptance test	13	€ 1.500	19.500 €	13	19.500 €
	Inland ECDIS Viewer with support for ERI and NtS	13	€ 7.000	91.000 €	13	91.000 €
	Land User Work Stations - User Documentation	1	€ 5.000	5.000 €	1	5.000 €
	Land User Work Stations - System Documentation	1	€ 5.000	5.000 €	1	5.000 €
<b>Vessel User Terminals</b>						
<b>Ship Segment</b>	Ship equipment - User Documentation	1	€ 7.000	7.000 €	1	7.000 €
	Ship equipment - System Documentation	1	€ 10.000	10.000 €	1	10.000 €
	Ship equipment - Installation, configuration, acceptance test and training	4	€ 1.500	6.000 €	4	6.000 €
	Inland ECDIS Viewer Software - Maintenance	4	€ 500	2.000 €	4	2.000 €
<b>Central Server</b>						
<b>Operator Segment</b>	Backup and restore solution for ERI, NtS and AIS Software	1	€ 6.000	6.000 €	1	6.000 €
	Server OS installation	1	€ 2.000	2.000 €	1	2.000 €
	Virtualisation Software	1	€ 15.000	15.000 €	1	15.000 €
				<b>23.000 €</b>		<b>23.000 €</b>
				<b>25.000 €</b>		<b>25.000 €</b>
				<b>120.500 €</b>		<b>120.500 €</b>

## Detailed design and prototype installation for the RIS on the Sava River

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Segment	Service	Quantity	Price	Total	Optimal config. Quantity	Total for optimal config.
<b>System Integration</b>						
<b>Management of System Integration</b>	Mobility during implementation	2	€ 60.000	120.000 €	2	120.000 €
	System Architect	200	€ 900	180.000 €	200	180.000 €
	Office	1	€ 60.000	60.000 €	1	60.000 €
	Other personnel cost (1 persons)	400	€ 250	100.000 €	400	100.000 €
	Other repair during project lifetime	1	€ 20.000	20.000 €	1	20.000 €
	Storage and implementation Facilities	1	€ 30.000	30.000 €	1	30.000 €
	Insurance for Storage Facilities	1	€ 30.000	30.000 €	1	30.000 €
	Application Expert & Installations Expert	100	€ 850	85.000 €	100	85.000 €
	Team Leader	200	€ 900	180.000 €	200	180.000 €
	Customer Specific Adaptations	1	€ 750	750 €	1	750 €
	T&T System integration	1	€ 20.000	20.000 €	1	20.000 €
	RIS Centre - Installation Documentation	1	€ 5.000	5.000 €	1	5.000 €
	RIS Centre - System Documentation	1	€ 10.000	10.000 €	1	10.000 €
Central Server: Installation, configuration and acceptance test	1	€ 20.000	20.000 €	1	20.000 €	
Network installation (network setup, routers, switches, cabling)	1	€ 10.000	10.000 €	1	10.000 €	
Mast rent and Internet connectivity for AIS basestations, minimum 128kb/s flatrate	4	€ 13.200	52.800 €	5	66.000 €	
Internet connection 3-5Mbit/s, flatrate, separate connection, fixed IP	1	€ 18.000	18.000 €	1	18.000 €	
Overall System - System Documentation	1	€ 30.000	30.000 €	1	30.000 €	
<b>Permits</b>						
	Support for filing AIS Base station permits	5	€ 500	2.500 €	6	3.000 €
				<b>2.500 €</b>		<b>3.000 €</b>
				2.500 €	6	3.000 €

Detailed design and prototype installation for the RIS on the Sava River

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Segment	Service	Quantity	Price	Total	Optimal config. Quantity	Total for optimal config.
<b>Training</b>						
<b>Operator Segment</b>	Training for RIS Provider	1	€5.600	5.600 €	1	5.600 €
	CAD/GIS training	1	€6.000	6.000 €	1	6.000 €
	Data Gateway administrator training	1	€5.600	5.600 €	1	5.600 €
	ENC Tools training	1	€3.000	3.000 €	1	3.000 €
	ERI system administrator training	1	€3.200	3.200 €	1	3.200 €
	FME training	1	€3.000	3.000 €	1	3.000 €
	Hull DB system administrator training	1	€3.200	3.200 €	1	3.200 €
	NtS system administrator training	1	€3.200	3.200 €	1	3.200 €
	T&T system administrator training	1	€3.200	3.200 €	1	3.200 €
	Training for Customer Specific Adaptations	1	€1.000	1.000 €	1	1.000 €
	Training Centre: Inland ECDIS Viewer with ERI and NtS	7	€7.000	49.000 €	7	49.000 €
<b>Authority</b>	ERI User training	3	€2.000	6.000 €	3	6.000 €
	Hull DB system User training	1	€3.200	3.200 €	1	3.200 €
	NtS submission training	1	€2.000	2.000 €	1	2.000 €
	T&T (TTI) training	2	€2.000	4.000 €	2	4.000 €
<b>Ship Segment</b>	Vessel crew training	1	€2.000	2.000 €	1	2.000 €
<b>TOTAL SERVICE COSTS</b>				<b>2.354.000 €</b>		<b>2.381.200 €</b>





## Lot 1: General IT equipment

Item No.*	Item	Quantity	Price	Total	Optimal config. quantity	Total for optimal config.
1	Server	5	€ 4.000	20.000 €	5	20.000 €
2	Server rack	1	€ 2.500	2.500 €	1	2.500 €
3	UPS rack mountable	1	€ 4.000	4.000 €	1	4.000 €
4	KVM	1	€ 2.000	2.000 €	1	2.000 €
5	Network switch rack mountable	1	€ 500	500 €	1	500 €
19	LUWS type 1 (desktop)	11	€ 1.000	11.000 €	11	11.000 €
20	Display for LUWS type 1	22	€ 250	5.500 €	22	5.500 €
21	LUWS type 2 (mobile)	9	€ 1.000	9.000 €	9	9.000 €
22	Projector	1	€ 1.000	1.000 €	1	1.000 €
23	Printer	11	€ 400	4.400 €	11	4.400 €
<b>TOTAL</b>				<b>59.900 €</b>		<b>59.900 €</b>

\*referring to Technical specifications - Annex 1

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## Lot 2: RIS-specific equipment

Item No.*	Item	Quantity	Price	Total	Optimal config. quantity	Total for optimal config.
6	Base station controller	6	€600	3.600 €	7	4.200 €
7	Server rack	6	€2.000	12.000 €	7	14.000 €
8	Server rack outdoor	0	€7.000	0 €	0	0 €
9	UPS rack mountable	6	€1.000	6.000 €	7	7.000 €
10	UPS rack mountable outdoor	0	€4.000	0 €	0	0 €
11	Network switch rack mountable	6	€300	1.800 €	7	2.100 €
12	AIS transponder (base station)	9	€13.000	117.000 €	10	130.000 €
13	VHF antenna omnidirectional	3	€1.000	3.000 €	4	4.000 €
14	VHF antenna directional	4	€1.000	4.000 €	4	4.000 €
15	VHF antenna coupler	2	€100	200 €	2	200 €
16	VHF cable	2	€300	600 €	2	600 €
17	DGPs generation module	1	€5.000	5.000 €	3	15.000 €
18	GPS antenna	1	€2.000	2.000 €	3	6.000 €
24	DGPS receiver	4	€3.000	12.000 €	4	12.000 €
25	AIS transponder (vessel mounted)	7	€2.500	17.500 €	7	17.500 €
26	Industrial PC	4	€600	2.400 €	4	2.400 €
27	VHF antenna	4	€150	600 €	4	600 €
28	LCD display	4	€250	1.000 €	4	1.000 €
29	National RIS centre vessel	1	€80.000	80.000 €	1	80.000 €
<b>TOTAL</b>				<b>268.700 €</b>		<b>300.600 €</b>

\*referring to Technical specifications - Annex 1

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## **ANNEX 2: IMPLEMENTATION SCHEDULE**

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## **CROATIA**

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	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Mobilization	Orange	Orange										
Shore Segment												
Base station Installations												
Visit												
Redaction of the visit reports												
Preparation/Administrative tasks												
Installation				1	1	1	1	1	1	1	1	1
Tests												
Validation												
LUWS												
Preparation/Administrative tasks												
Installation				2	2	3	3	3	3	3	3	3
Tests												
Validation												
Training												
RIS Center												
Installation RIS Center												
Software upgrade and installation												
Tests												
Validation												
Charts production												
Upgrade of existing system												
Tests of upgrade and Ortophoto												
Validation												
HULL Database												
Development and installation												
Tests												
Validation												
FIS by dGPS												
Development and installation												
Tests												
Validation												



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## **SERBIA**

Detailed design and prototype installation for the RIS on the Sava River

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	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12																																											
	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Week 15	Week 16	Week 17	Week 18	Week 19	Week 20	Week 21	Week 22	Week 23	Week 24	Week 25	Week 26	Week 27	Week 28	Week 29	Week 30	Week 31	Week 32	Week 33	Week 34	Week 35	Week 36	Week 37	Week 38	Week 39	Week 40	Week 41	Week 42	Week 43	Week 44	Week 45	Week 46	Week 47	Week 48	Week 49	Week 50	Week 51	Week 52			
Mobilization	Orange	Orange																																																					
Shore Segment																																																							
Base station Installations																																																							
Visit																																																							
Redaction of the visit reports																																																							
Preparation/Administrative tasks																																																							
Installation																																																							
Tests																																																							
Validation																																																							
LUWS																																																							
Preparation/Administrative tasks																																																							
Installation																																																							
Tests																																																							
Validation																																																							
Training																																																							
RIS Center																																																							
Installation RIS Center																																																							
Software upgrade and installation																																																							
Tests																																																							
Validation																																																							
Charts production																																																							
Tests Ortophoto																																																							
Validation																																																							





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## **BOSNIA AND HERZEGOVINA**



**Detailed design and prototype installation for the RIS on the Sava River**

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