"NETWORK OF DANUBE WATERWAY ADMINISTRATIONS"
South-East European Transnational Cooperation Programme

**STATUS QUO REPORT ON ENC ACTIVITIES**

**RS - PLOVPUT**

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<td>Activity:</td>
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Jointly for our common future
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# LIST OF ABBREVIATIONS

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<tr>
<th>ABBR.</th>
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<tbody>
<tr>
<td>CAD</td>
<td>Computer Aided Design</td>
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<tr>
<td>DGPS</td>
<td>Differential Global Positioning System</td>
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<td>DWG</td>
<td>AutoCAD file format (drawing)</td>
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<td>DXF</td>
<td>Drawing Exchange Format</td>
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<td>ECDIS</td>
<td>Electronic Chart Display and Information System</td>
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<td>ENC</td>
<td>Electronic Navigational Charts</td>
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<tr>
<td>GIS</td>
<td>Geographic information system</td>
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<tr>
<td>HIPS</td>
<td>Hydrographic Information Processing System</td>
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<td>IENC</td>
<td>Inland Electronic Navigational Charts</td>
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<tr>
<td>Plovput</td>
<td>Directorate for Inland Waterways Republic of Serbia</td>
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<tr>
<td>RIS</td>
<td>River Information Services</td>
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<td>rkm</td>
<td>River kilometar</td>
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<tr>
<td>S-57</td>
<td>Transfer Standard for Digital Hydrographic Data of International Hydrographic Organizaton</td>
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<td>S-58</td>
<td>Recommended ENC Validation Checks by International Hydrographic Organizaton</td>
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<tr>
<td>SQL</td>
<td>Structured Query Language</td>
</tr>
<tr>
<td>UN/ECE</td>
<td>The United Nations Economic Commission for Europe</td>
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<td>WGS84</td>
<td>World Geodetic System 1984</td>
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2 SCOPE OF DOCUMENT

Activity 5.2 is related to the harmonization of activities in the field of Inland ENC production and distribution.

According to description of work SWP 5.2 (Task 5.2.3) every partner shall identify and describe the status quo on ENC activities and what are the problems. The status quo shall at least contain relevant information about:

- IENC coverage of the national stretch (incl. reasons and solution if this is not achieved so far)
- Availability of depth information within the Inland ENCs
- The IENC production process from raw GIS data into IENC objects, involved persons or organizations, used equipment and software tools
- IENC publication process (distribution of updates and new releases)
- Sources (data basis) and accuracy for IENC charts
- Create and maintain IENCs according to the Inland ECDIS Standard
- Cooperation
- Updates, updating circle
3 IENC COVERAGE

Serbia has approx. 957 km of International Inland waterways (Danube, Sava and Tisza). The length of Serbian stretch of river Danube is 587 km, of river Tisza is 160 km and of river Sava is 210 km.

According to the UN/ECE classification of inland waterways Danube is class 6C from Hungary to Belgrade and class 7 downstream from Belgrade. Serbian stretch of Sava is class 3 and class 4 and river Tisza is class 4.

So far, with IENCs is covered whole Serbian stretch of river Danube (587 km) and river Tisza (160 km). River Sava is still not covered with IENCs, but it will be in first quarter of 2010. The main problem for finishing the IENCs of river Sava is the lack of marking system. There is ongoing project for marking the river Sava and soon as it finished, IENCs will be produced.

Serbian IENCs are produced in accordance with the Inland ECDIS Standard, Edition 1.02. Upgrade to Edition 2.0 of Inland ECDIS Standard is planned to be finished during 2010.

All objects included in Serbian Inland ENC’s are regarding the Minimum Contents of Inland ECDIS Standard 1.02:

- Bank of waterway/river bank
- Shoreline construction (e.g. dam, groin)
- Contours of locks and dams
- Boundaries of the navigation channel/fairway (if defined)
- Isolated dangers in the fairway below and above the water level, such as bridges, overhead cables and obstructions
- Shipping police regulations (e.g. buoys, beacons, lights, notice marks)
• Waterway axis with kilometers/hectometers or river mile indications

IENCs of Danube and Tisza river are available for free on Plovput’s web site.

www.plovput.rs
4 COVERAGE OF DEPTH INFORMATION

Serbian IENC’s doesn’t contain detailed bathymetry. The main problem is lack of quality depth information. Pilot project was done on a short section of river Danube, but it is not published as Serbian official IENC’s.

Implementation of bathymetry in IENC, section of Novi Sad
5  IENC PRODUCTION PROCESS

In Serbia main software tools that are used in IENC production process are CARIS, AutoCAD and SevenCS tools. All together are used for collection, editing and presentation of geographical, bathymetric data and also for managing of marking system.

5.1. Used software

5.1.1. Bathymetric data

For the purpose of post processing and preparing of surveyed data for further use in process of designing the fairway the survey department of Plovput use the following software:

- **Hydrographic Information Processing System HIPS (CARIS)**, is software tool that is used for cleaning and validation of multibeam echosounder bathymetric data
- **NavEdit (Trimble)**, is software tool that is used for cleaning and validation of singlebeam echosounder bathymetric data
- **Terramodel (Trimble)** is software tool that is used for controlling the density and distribution of soundings, generating depth contour lines and 3D terrain model
- **DXF Converter (ver. 3.5.6)**, is used for conversion of bathymetric data into S-57 format
- The bathymetric data are stored in MySQL database.

5.1.2. Geographical data and Marking System

The geographical and marking system data from survey, design and marking department of Plovput are prepared in AutoCAD in dwg and dxf format. Data are then converted into S-57 data format for further processing and creating IENC’s using SevenCS tools.

SevenCS tools that are being used in Serbia are:

- **ENC Manager (ver. 2.3.0)**, software tool for ENC data management and maintenance, production of IENC update files
- **ENC Designer (ver. 4.4.0)**, software tool for creating and editing of IENCs in compliance with S-57 Standard
- **ENC Optimizer (ver.2.2.12)**, software tool for Optimization of S-57 data

**DXF Converter (ver. 3.5.6)**, software tool for Conversion of AutoCAD data (dxf) into S-57 format
5.2. Production and maintenance process

Serbian Inland ENC’s are produced by Serbian Directorate for Inland Waterways -Plovput Belgrade. The basis for production of ENC is detailed orthophoto images combined with field survey measurements. Two groups of data are processed within the Inland ENC production and maintenance process, and they represent the minimum content of IENC’s:

- Geospatial data (Topographical information).
- Marking system data, including the data related to the fairway, buoys, notice marks, mooring places, etc.

Data are provided in one joint data set.

5.2.1. Geographical data (Topographical information)

The main sources of geographical data are orthophoto images and official topographic maps. All the relevant data that is needed for ENC production are vectorized and prepared by means of CAD and ENC tools. Here are the main steps of producing and encoding of all objects together with its attributes regarding Inland ECDIS Standard Edition 1.02:

1. Acquisition of raw topographic data from orthophoto images
2. Data editing and preparing for S-57 conversion in AutoCAD

3. Conversion of data into S-57 format and encoding of objects and attributes regarding the Inland ECDIS Standard 1.02 and Inland ECDIS Encoding Guide
5.2.2. **Marking System and fairway information**

Responsible authority for marking system (notice marks, buoys, mooring places etc) and fairway design in Serbia is Directorate for Inland Waterways – Plovput.

Here are the main steps of producing and encoding of all objects together with its attributes regarding Inland ECDIS Standard Edition 1.02:

1. Data editing and preparing in AutoCAD for conversion into S-57 format

2. Conversion of data into S-57 format and encoding of objects and attributes regarding the Inland ECDIS Standard 1.02 and Inland ECDIS Encoding Guide
6 IENC PUBLICATION PROCESS

Inland ENC of Serbian waterways are produced and updated by Directorate for Inland Waterways – Plovput, and are in compliance with Inland ECDIS Standard 1.02. IENCs are encrypted and published in S-57 format. IENCs of Danube and Tisza are available free of charge on Plovput’s web site.

www.plovput.rs

ENCs of river Sava are currently under construction and will be published at the beginning of next year.


7 IENC SOURCES AND ACCURACY

There are different sources of data used in IENCs production. For the geographical data orthophoto images and topographic maps were used. The use of orthophoto images insures very high accuracy of data used for IENCs. The accuracy of the orthophoto images is between 0.5m and 1m. The idea is to cover all Serbian waterways with high resolution orthophoto and satellite images. The problem is that there are no such quality images for entire waterways at the moment. First priority is the Danube and it will be covered during 2010.

The source data for designing the fairway are provided out of the hydrographical surveys. For the hydrographical survey Differential GPS for positioning data and singlebeam and multibeam echosounder for bathymetric data are used. The accuracy of positioning data is less than 10 cm. Accuracy of depth data is depending of the equipment but is not bigger than 10 cm.

Marking system data are derived from a field survey GPS measurement conducted by the Marking Department of Plovput. All GPS measurements are conducted with standard GPS accuracy for handheld GPS devices.

The accuracy of all data used in IENCs production is in compliance with the minimum requirements for the ENC production.
8 INLAND ECDIS STANDARD

Serbian Inland ENCs are produced according to the Inland ECDIS Standard Edition 1.02. Upgrade of the existing IENCs to the Edition 2.0 of Inland of the Inland ECDIS Standard is planned to be finished during 2010.

Quality control of the IENCs according to S-58, by means of using ENC Analyzer tool, is another issue that will be adopt during the 2010 through the project of RIS Implementation in Serbia.
9 UTILISATION OF LOCATION CODES AND RIS INDEX

The RIS index is not available for the Serbian waterways. It is planned to be finished during the 2010 also within the project of RIS implementation in Serbia.
10 COOPERATION

Serbia has common sectors on Danube with Croatia and Romania, and on Sava with Bosnia.
The common sector between Serbia and Croatia on river Danube is between 1295 rkm and 1432 rkm. The common sector with Romania on river Danube is between 846 rkm and 1054 rkm. On river Sava Serbia has common sector with Bosnia between 178 rkm and 210 rkm. Each country produce it own IENC’s.
So far the cooperation regarding the IENC production is established only with Romania and is operate trough the ENC Bilateral Working Group. The Group is established in 2006 and has very good common results so far, such as the common river bank and marking system.
11 CHART UPDATES, UPDATING CIRCLE

The process of updating the existing IENCs starts when some significant change regarding the depths, fairway or some other geographical and hydrological element on waterway is made.

Survey department of Plovput is responsible for providing information about depth changes. Design department is responsible for fairway design.

After updating, IENC’s are published on Plovput’s web site. Only the update existing Edition of IENC’s is published with remarks about changes. Still there are no new Editions of IENC’s.

We are getting the feedbacks from the users if there are some problems or if there is something that needs to be changed. This is mainly done by the e-mails or in direct contact with us. There are no defined procedures for retrieving the feedbacks from users.