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ENI: European Neighbourhood Instrument

Assistance for Dnipro Transport Development

Project Identification No.
EuropeAid/139464/DH/SER/UA

Final Report “Analysis of River Information Services on the Dnipro”

Date: 22 June 2020
REPORT COVER PAGE

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Report date: 22 June 2020

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**Assistance for Dnipro Transport Development**

EuropeAid/139464/DH/SER/UA

(Contract No: ENI/2018/404-292)

**Final Report “Analysis of River Information Services on the Dnipro”**

Date: 22 June 2020
Author: Cas Willems
Disclaimer

The content of this publication is the sole responsibility of the author and can in no way be taken to reflect the views of the European Union.

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<td>ADN</td>
<td>Activity Based Costing Accord Européen relatif au transport international des marchandises Dangereuses par voies de Navigation intérieures</td>
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<td>AIS</td>
<td>Automatic Identification System</td>
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<td>ASM</td>
<td>Application-Specific Message</td>
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<td>AtoN</td>
<td>Aids to Navigation</td>
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<td>BERMAN</td>
<td>BERth MANagement message</td>
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<tr>
<td>BICS</td>
<td>inland shipping information and communication system</td>
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<td>CAS</td>
<td>Calamity Abatement Support information services</td>
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<td>CCNR</td>
<td>Central Commission for the Navigation on the Rhine</td>
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<td>CEMT</td>
<td>Conférence Européenne des Ministres de Transport</td>
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<td>CESNI</td>
<td>Comité Européen pour l’Élaboration de Standards dans le Domaine de Navigation Intérieure</td>
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<td>CEVNI</td>
<td>Code Européen de Voies de la Navigation Intérieure (European Code for Inland Waterways)</td>
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<td>CHD</td>
<td>Waterway Charges and Harbour Dues information services</td>
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<td>COMPRIS</td>
<td>Consortium Operational Management Platform for RIS</td>
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<td>CSTDMA</td>
<td>Carrier Sense Time Division Multiple Access</td>
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<td>DC</td>
<td>Danube Commission</td>
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<td>DG</td>
<td>Dangerous Goods</td>
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<tr>
<td>DINA</td>
<td>Digital Inland Waterway Area</td>
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<td>EC</td>
<td>European commission</td>
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<td>ECDIS</td>
<td>Electronic Chart Display and Information System</td>
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<td>EDI</td>
<td>Electronic Data Interchange</td>
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<td>EHDB</td>
<td>European Hull Data Base</td>
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<td>e-NAV</td>
<td>e-Navigation</td>
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<tr>
<td>ENI</td>
<td>European Navigation Identifier (Unique European vessel identification number)</td>
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<td>ERDMS</td>
<td>European Reference Data Management System</td>
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<td>ERI</td>
<td>Electronic Reporting International</td>
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<td>Abbreviation</td>
<td>Description</td>
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<tr>
<td>ERINOT</td>
<td>ERI NOTification message</td>
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<td>ERIRSP</td>
<td>ERI ReSPonse message</td>
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<tr>
<td>ES-TRIN</td>
<td>European Standard laying down Technical Requirements for Inland Navigation vessels</td>
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<tr>
<td>ETA</td>
<td>Estimated Time of Arrival</td>
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<td>ETD</td>
<td>Estimated time of Departure</td>
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<td>EU</td>
<td>European Union</td>
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<td>EUR</td>
<td>Euro</td>
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<td>FIS</td>
<td>Fairway Information Services</td>
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<td>GIS</td>
<td>Geographic Information System</td>
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<td>GPS</td>
<td>Global Positioning System</td>
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<td>GSM</td>
<td>Global System for Mobile Communication</td>
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<tr>
<td>HS Code</td>
<td>Harmonised commodity description and coding system</td>
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<tr>
<td>IALA</td>
<td>International Association of Marine Aids to Navigation and Lighthouse Authorities</td>
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<tr>
<td>ID</td>
<td>Identifier</td>
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<tr>
<td>IEC</td>
<td>International Electro technical Commission</td>
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<td>IEHG</td>
<td>Inland ENC Harmonization Group</td>
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<td>IENC</td>
<td>Inland ENC</td>
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<td>IHO</td>
<td>International Hydrographic Organisation</td>
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<td>ILE</td>
<td>Information services for Law Enforcement</td>
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<td>IMO</td>
<td>International Maritime Organisation</td>
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<td>INDRIS</td>
<td>Inland Navigation Demonstrator for River Information Services</td>
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<td>Inland ECDIS</td>
<td>Inland Electronic Chart Display and Information System</td>
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<tr>
<td>Inland ENC</td>
<td>Inland Electronic Navigational Chart</td>
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<td>ISO</td>
<td>International Organisation for Standardisation</td>
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<td>ISRS</td>
<td>International Ship Reporting Standard</td>
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<td>IT</td>
<td>Information Technology</td>
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<td>ITL</td>
<td>Information for Transport Logistics information services</td>
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<tr>
<td>Acronym</td>
<td>Description</td>
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<td>IWT</td>
<td>Inland Waterway Transport</td>
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<td>LBM</td>
<td>Lock and Bridge Management information services</td>
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<td>LOCODE</td>
<td>LOcation CODE for ports and freight stations (UNECE code)</td>
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<td>MKD</td>
<td>Minimum Keyboard and Display</td>
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<td>MMSI</td>
<td>Maritime Mobile Service Identity</td>
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<td>NtS</td>
<td>Notices to Skippers</td>
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<td>PAXLST</td>
<td>Passenger List Message</td>
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<td>PIANC</td>
<td>Permanent International Association of Navigation Congresses</td>
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<td>RIS</td>
<td>River Information Services</td>
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<td>RIS COMEX</td>
<td>RIS enabled Corridor Management Execution.</td>
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<td>SaR</td>
<td>Search and Rescue</td>
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<td>SOTDMA</td>
<td>Self Organising Time Division Multiple Access, used for AIS</td>
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<td>ST</td>
<td>Statistics information services</td>
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<td>STI</td>
<td>Strategic Traffic Information</td>
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<td>TIS</td>
<td>Traffic Information Services</td>
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<td>TM</td>
<td>Traffic Management information services</td>
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<td>TP</td>
<td>Traffic Planning information services</td>
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<td>TPM</td>
<td>Transport Management information services</td>
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<td>TTI</td>
<td>Tactical Traffic Information</td>
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<tr>
<td>UNECE</td>
<td>United Nations Economic Commission for Europe</td>
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<td>UkrRIS</td>
<td>River Information Services in Ukraine</td>
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<td>VDL</td>
<td>VHF Data Link</td>
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<td>VHF</td>
<td>Very High Frequency</td>
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<td>VP</td>
<td>Voyage Planning information services</td>
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<td>VTS</td>
<td>Vessel Traffic Services</td>
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<td>VTT</td>
<td>Tracking and Tracing</td>
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<tr>
<td>XML</td>
<td>eXtended Mark-up Language</td>
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Executive Summary

The concept of River Information Services was adopted in Ukraine and has resulted in information services on the Danube and Dnipro rivers presented by UkrRIS. In the Assistance Program for the Dnipro Transport Development the status of River Information services on the Dnipro will be assessed and proposals will be depicted to enhance and extend River Information Services on the basis of the needs and requirements of IWT on the Dnipro.

Chapter 2 of the report deals with detailed information on the RIS directive as formalized by the European Commission under directive 2005/44/EC and connected to this directive the Commission Regulations on RIS guidelines and the technical RIS standards. The following European Commission Regulations on the RIS key technologies are in force:

- Vessel Tracking and Tracing: Commission Regulation no. 2019/838;
- Notice to Skippers: Commission Regulation no. 2018/2032 and;

In addition to the commission regulations there is a set of specific RIS topics which are relevant to create a sound basis and provide basic services as there are the RIS index and the European Vessel Identification code (ENI) but also the Application Specific Messages as an enhancement of AIS.

The chapter provides also information on the intentions for updating the RIS directive and the most recent RIS Guidelines as published by PIANC and as such creating a solid basis for implementing RIS in the coming years.

Chapter 3 is focussed on the assessment of the operation of the existing River Information Services on the Dnipro as to be compliant with the requirements of EU directive, RIS guidelines and Commission Regulations. An overview of existing services as provided by UkrRIS and the State Hydrographic Service, the technologies used and the operations of RIS towards its users.

The principle conclusions as depicted in this chapter are:

- The implemented River Information Services in Ukraine is restricted to Fairway and Traffic Information Services and are focussed on safety of traffic and not on improvement of efficiency of traffic and transport. There is a rather small group of actual users of RIS.
- The key technologies as in operation on the Dnipro do not comply with the Commission Regulations, only the iENC’s for the Dnipro can be compliant on short notice with the Commission Regulation on Electronic Chart Display and Information System for inland navigations (inland ECDIS)

Chapter 4 will deal with the enhancement and extension of River Information Services on the Dnipro with advices and related pre-conditions on short term, medium term and long-term improvements and expansions of RIS on the Dnipro

UkrRIS can be enhanced on short term with little effort to a more advanced and compliant River Information Services and consequently will provide:

- Lock management information services for lock operators;
- Port and terminal traffic information services for port and terminal operators;
- RIS services for emergency response organisations, and;
- By combining iAIS and Inland ECDIS in Information mode more effective safety services are provided on board of vessels.

The precondition is that basic key technologies be made compliant with the Commission Regulations and basic reference data will be adopted like there are in the special RIS Index and the ENI vessel code.

For the medium and long term, it is advised to:

- Extend the VHF network;
- Extend voyage reporting and introduce electronic reporting;
- Upgrade the AIS network and the central operator system, and finally;
- Introduce traffic planning.
1 Introduction

1.1 The position of RIS in the Assistance Program for Dnipro Transport Development

The Dnipro river is part of the important section of the E40 waterway, and the part downstream of Kyiv, the Dnipro is a class Vb waterway. The transport sector is important in Ukraine’s economy and efficiency improvements are particularly important for increasing competitiveness. Information and communication technologies and more recent digitalisation is transforming our economy and society at a rapid pace. This is a worldwide development, in which ICT and digital technologies are used in all transport modes as an important source of growth, innovation and new business.

In Inland Waterway Transport the concept of River Information Services was introduced in the early 90’s of the previous century. In the meantime, this concept is world-wide under implementation. The concept of River Information Services was also adopted in Ukraine and has resulted in information services on the Danube and Dnipro rivers presented by UkRIS. In the Assistance Program for the Dnipro Transport Development the status of River Information Services on the Dnipro will be assessed and proposals will be depicted to enhance and extend River Information Services on the basis of the needs and requirements of IWT on the Dnipro.

1.2 The concept of River information Services

River Information Services (RIS) is the concept for information services in inland navigation to support traffic management and transport management in inland navigation. In 1998, the European Union started developing the concept of River Information Services in a research environment.

The potential of RIS to improve the position of inland navigation within the transport chain has been recognized by international organisations including the United Nations Economic Commission for Europe (UNECE), the Central Commission for the Navigation of the Rhine (CCNR), the Danube Commission and PIANC.

1.2.1 Research projects on the development of River Information Services

The RIS concept has been developed and detailed in the European research projects INDRIS and COMPRIS in the period from 1998 till 2005 in the Growth Programme of the European Commission. These projects did lead to the acceptance of the RIS concept in Rhine and Danube countries.

The INDRIS project has successfully demonstrated the technical implication of the RIS concept and many of its elements. The success of INDRIS has resulted in the initiation of the project COMPRIS. This research project was a co-operation between 44 - public and private - partners from Danube and Rhine countries dealing with inland navigation even beyond the European Union. In the COMPRIS project some organisations from Ukraine were participating.

1 PIANC =Permanent International Association of Navigation Congresses, is an international professional organisation that provides expert guidance and advice on technical, economic and environmental issues pertaining to waterborne transport infrastructure, waterways as well as ports and marinas.
The COMPRIS project was the last phase in the development life cycle of the RIS concept and can be seen as the final step towards implementation of River Information Services on pan-European level. After the completion of the project, the market was brought through the project in a position to offer their solutions and services based upon and making use of the tested concepts and the specified technical standards.

COMPRIS was also the basis for the European Commission to formalise in 2005 River Information Services in the RIS directive.

Important achievements of the research period on River Information Services were:

- The development of a framework for European co-operation on the implementation of RIS and the RIS technical standards;
- The development of more user-oriented applications not only for Vessel Traffic Management and safety of navigation but oriented also to value-added services to the transport industry;
- AIS transponders according to the IMO standards can be applied in inland navigation, thus contributing to safe navigation. They are particularly useful in areas of mixed traffic of maritime and inland navigation, areas with high shipping densities and areas with special navigational difficulties.
- Inland ECDIS turned out to be a very strong platform for a number of tactical and strategic applications;
- Intelligent coding of Notices to Skippers brought national oriented Notices to Skippers to a European level, independent from the languages in de European members states, Russia and Serbia;
- Electronic Reporting proved to be successful in avoiding confusing communication on transport data especially for dangerous goods transport.

1.2.2 Formalisation of River Information Services

In 2005, the EU RIS Directive of the European Union (2005/44/EC) entered into force. This RIS directive created in Europe a boost to the implementation of RIS. The directive is applicable to all connected waterways of class IV or higher across the European Union and provides binding rules for the authorities on the implementation of RIS services according to agreed regulations. The European Commission supported the Member States with several funding programs for further research, pilot projects and the implementation of RIS in the Member States.

Following the RIS directive the EC formalised also the RIS Guidelines as guidance for the implementation of River Information Services. The RIS Guidelines were adopted as Commission Regulation (EC) No 414/2007 concerning the technical guidelines for the planning, implementation and operational use of RIS referred to in Article 5 of Directive 2005/44/EC. The RIS guidelines were based on the PIANC RIS guidelines edition 2.

The RIS directive contains binding rules for the authorities on the implementation of RIS services according to agreed technical standards. These standards are formalised as technical Commission Regulations annexed to the RIS directive. Since 2000 RIS Expert Groups have played a major role in the development of these technical standards. The RIS Expert Groups were international technical platforms ensuring the harmonized development and maintenance of RIS standards. The RIS Expert Groups acted as advisory bodies of institutions like the European Commission, the Central Commission for Navigation on the Rhine, the Danube Commission and United Nations Economic Commission for Europe (UNECE) on RIS standardisation processes.
The standards for the RIS key technologies Inland ECDIS, Notice to Skippers (NtS), Vessel Tracking and Tracing (VTT) and Electronic Reporting International (ERI) were formally accepted by the CCNR and UNECE and through the UNECE by the Danube Commission.

The RIS expert groups are since 2020 working and giving their advices under the umbrella of CESNI².

1.3 River Information Services on the Dnipro in the context of this report

This report reflects the analyses of River Information Services on the Dnipro. Chapter 2 deals with the information on the RIS directive as formalized by the European Commission under directive 2005/44/EC and connected to this directive the Commission Regulations on RIS guidelines and the technical RIS standards.

Chapter 3 is focussed on the assessment of the operation of the existing River Information Services on the Dnipro as to be compliant with the requirements of EU directive, RIS guidelines and Commission Regulations. More specific is the assessment focussing on:

- Fulfilment of the minimum requirements for RIS, the services and information to be provided and the technical specifications of the RIS key technologies to be applied;
- Effectiveness and efficiency of RIS;
- The effectiveness and efficiency are assessed with respect to:
  - The use of RIS harmonised and standardized key technologies in practice;
  - The information exchange between related systems and services in practice;
  - The use of reference data like harmonised codes for infrastructural objects, cargo and vessels;
  - The information categories and functions in operation in RIS on the Dnipro, and;
  - Involvement of relevant actors in implementation and operation of RIS services.

Chapter 4 will deal with the enhancement and extension of River Information Services on the Dnipro with advices and related pre-conditions on short term, medium term and long-term improvements and expansions of RIS on the Dnipro based on:

- The actual and future objectives, users and needs for information services on the Dnipro;
- The actual and future key technologies and systems, and;
- The RIS directive and connected Commission Regulations.

² CESNI = Comité Européen pour l’Élaboration de Standards dans le Domaine de Navigation Intérieure. In 2015 the CCNR and the European Union agreed on establishing a European committee for drawing up standards in the field of inland navigation. Ukraine is an observing State in the context of CESNI.
2 RIS directive, RIS guidelines and technical Commission Regulations

2.1 The RIS Framework Directive 2005/44/EC

In 2005 the European Parliament and the European Council adopted Directive 2005/44/EC, dealing with harmonised River Information Services (RIS) on Inland Waterways of the Community. The so-called "RIS Directive" aims to establish a framework for the deployment and use of harmonised River Information Services in the European Community, in order to support inland waterway transport with a view to enhance safety, efficiency and environmental performance and to facilitate interfaces with other transport modes. The definition of RIS, as stated in the RIS Directive (2005/44), is the following:

"River information services means that the harmonised information services to support traffic and transport management in inland navigation, including, wherever technically feasible, interfaces with other transport modes".

The basis for the RIS framework directive has been a bottom up approach in the Member States of the European Union and initiated by the Member States Germany, Austria and the Netherlands. The Member States of the Rhine and Danube countries had the intention to share in a harmonised way traffic and transport management data mutually and with and between the waterway users on the European inland waterway network in order to improve safety and efficiency of inland waterway transport.

The RIS framework directive 2005/44 is available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32005L0044

Besides the RIS directive, the following European Commission Regulations are in force, jointly forming the legislative framework:

- Vessel Tracking and Tracing: Commission Regulation no. 2019/838;
- Notice to Skippers: Commission Regulation no. 2018/2032, and;

Directive 2005/44/EC specifies the responsibilities of Member States, the minimum requirements for RIS, the services to be provided and the technical specifications to be applied. The Commission Regulations inland ECDIS, Vessel Tracking and Tracing, Notices to Skippers and Electronic Reporting provide the specific information and provide answers on the question how the technologies are to be implemented. The Commission Regulation on RIS guidelines specifies how to plan, implement and operate River Information Services.

In addition, and in direct relation to especially Electronic Reporting as defined in the RIS directive, the Directive 2013/49/EU, amending Annex II to Directive 2006/87/EC, addresses issues related to the Unique European Vessel Identification Number (ENI) and the European Hull Database.

The RIS framework directive includes the following obligations on the electronic exchange of data concerning navigation and voyage planning on inland waterways with potential RIS users:
• The waterway authorities have to provide for inland waterways of class Va\(^3\) and higher in accordance with the Classification of European Inland Waterways, Electronic Navigational Charts (ENC’s) suitable for navigational purposes and as specified in the Commission Regulation on inland ECDIS;
• Under the condition that ship reporting is required by national or international regulations, the competent authorities should be able to receive electronic ship reports of the required data from ships on a standardised way as defined in the Commission Regulation on Electronic Reporting;
• In cross-border transport, the information as provided via Electronic Reporting shall be transmitted to the competent authorities of the neighbouring State and any such transmission shall be completed before arrival of the vessels at the border;
• The waterway authorities are obliged to provide Notices to Skippers, as standardised, encoded and downloadable messages in compliance with the Commission Regulation on Notices to Skippers. The standardised message shall contain at least the information necessary for safe navigation;
• When the waterway authorities are intending to implement facilities for tracking and tracing of vessels this shall be done in accordance with the Commission Regulation on Vessel Tracking and Tracing where the inland navigation version of Automatic Identification systems (AIS) is specified;
• The competent authorities of the Member States shall establish RIS centres according to regional needs.

All member states should also appoint a national RIS competent authority.

As can be read in above mentioned obligations the RIS directive puts only requirements on the waterway authorities of the Member States. The Member States shall encourage the potential RIS users like skippers, shippers and fleet owners to use the services provided on the inland waterways, it is however not mandatory to use these services on the basis of the RIS directive.

The RIS directive applies to the implementation and operation of River Information Services on all inland waterways of the Member States of class IV\(^4\) and above which are linked to a waterway of class IV or above and as such is part of the European inland waterways network as depicted in figure 1. In this figure the part of the European Network where the RIS directive is mandatory is given in red.

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3 CEMT = Conférence Européenne des Ministres des Transports, The Classification of European Inland Waterways is a set of standards for interoperability of navigable waterways forming part of the Trans-European Inland Waterway network. It was created by the European Conference of Ministers of Transport in 1992.

CEMT class V subclass a is a fairway for vessels with a length of max 110 m, breadth of max 11,4 m, draught of max 2,8 m and a tonnage of max 3000 ton

4 CEMT class IV is a fairway for vessels with a length of max 85 m, breadth of max 9,5 m, draught of max 2,5 m and a tonnage of max 1500 ton.
2.2 The RIS Commission Regulations

2.2.1 Commission regulation on the guidelines for implementation and operation of RIS

The PIANC Guidelines for the development, implementation and operation of River Information Services have been the basis for the RIS Guidelines as formally accepted by the European Commission. The RIS Guidelines edition 2 are published by the European Commission as Commission Regulation no. 2007/414/EC.

The RIS guidelines define the objectives of RIS and the information needs based on these objectives of the stakeholders. The RIS guidelines further provides an overview of the Services as the essential core-principal of River Information Services and as given in the figure no 2.
Mainly traffic related

1. **Fairway information Services (FIS)**
2. **Traffic information Services (TIS)**
   a) Tactical traffic information (TTI)
   b) Strategic traffic information (STI)
3. **Information to support Traffic Management (TM)**
   a) Local traffic management (vessel traffic services - VTS)
   b) Lock and bridge management (LBM)
   c) Traffic Planning (TP)
4. **Information to support Calamity Abatement (CAS)**

Mainly transport related

5. **Information to support Transport Logistics (ITL)**
   a) Voyage planning (VP)
   b) Transport management (TPM)
   c) Port and terminal management (PTM)
   d) Cargo and fleet management (CFM)
6. **Information to support Law Compliance (ILC)**
7. **Information to support Statistics (ST)**
8. **Information for Waterway Charges and Harbour Dues (CHD)**

*Figure 2: River Information Services*

The RIS Guidelines provide special guidance on the design and implementation of the different services depicted in figure 2 by decomposition of the services in functions and information categories.

Finally, the key technologies needed for the provision of the different services are specified and detailed in the RIS guidelines. These key technologies are:

- Inland ECDIS;
- Vessel Tracking and Tracing;
- Notices to Skippers;
- Electronic reporting.

In figure no 3 on the next page the relation between the RIS services and the RIS key technologies is clarified.

The key technologies are further detailed in the next sub paragraphs.
2.2.2 Commission regulation on Inland ECDIS

Inland ECDIS is a system for the display of electronic inland navigation charts and additional information. Its purpose is to contribute to the safety and efficiency of navigation. Inland ECDIS is used simultaneously to reduce the workload when navigating the ship as compared to traditional navigation. Inland ECDIS is the basis for other River Information Services (RIS).

Commission Regulation on inland ECDIS is based on edition 2.4 of the Inland ECDIS product specification for Inland Electronic Navigational Charts (Inland ENCs) and the presentation library edition 2.4. Edition 2.4 is also containing a Product Specification for bathymetric Inland ENCs.

The Commission Regulation is based on the standardisation product of the European expert group on inland ECDIS and the worldwide Inland ENC Harmonization Group (IEHG) and the Inland ECDIS expert group.

Maritime ECDIS and Inland ECDIS are based on the same software specifications, but use different Feature Catalogues, Lookup Tables, Symbol Libraries and Conditional Symbology Procedures. If both sets of these digital parts are installed in an application, it is able to display maritime ENCs and Inland ENCs. ECDIS applications that contain only the object catalogue and the presentation library of the maritime ECDIS do not display the object types that have been added for the inland waterways. The Inland ENC Harmonization Group is recognized as the competent expert group for Inland ENC standardisation by IHO and is participating in the working group of IHO for the development of future ENC standards.

The Inland ECDIS standard comprises the following sections:

- Section 1: Performance standard – redrafted in accordance with International Maritime Organisations (IMO) Resolution MSC.232(82);
- Section 2: Data standard for Inland ENCs – complements International Hydrographic Organisations (IHO) Standard S-57;
• Section 2A: Codes for producers and waterways – complements IHO Standard S-62;
• Section 3: Presentation standard – complements IHO Standard S-52;
• Section 4: Operational and performance requirements, methods of testing and required test results – redrafted in accordance with International Electrotechnical Commission (IEC) Guideline 61174;
• Section 5: Glossary of terms – redrafted in accordance with IHO Standard S-32, Appendix 1.

The electronic chart developed according to the ECDIS standard differs fundamentally from a paper chart. The electronic display of the chart is only one aspect of ECDIS. ECDIS is also an information system, which enables its users to provide other information about the displayed objects besides their graphics presentation.

There is in the operational use of inland ENC a fundamental difference with the maritime ENC:

**ENC in information mode**

In the information mode, Inland ECDIS equipment acts as an electronic atlas and serves to guide and to provide information about the waterway. It is not intended to navigate the vessel. When connected to a positioning sensor the chart picture can be adjusted automatically in a way that the ship’s own position is fixed in the centre of the screen. It is also possible to display other vessels, which are equipped with Inland AIS, if the application is connected to an Inland AIS transponder. In the maritime world ENC’s are used in information mode. In this report inland ENC applications used in Information Mode are called “inland ENC viewers”.

**ENC in navigation mode**

Navigation mode means the use of the Inland ECDIS for navigating the vessel by using radar and underlaid chart image. Inland ECDIS equipment being able to operate in the navigation mode means radar equipment - as defined by the regulations concerning the minimum requirements and test conditions for radar installations - used for navigation and requires type test and approval. The vessel’s position must be derived from a continuous positioning system whose accuracy is consistent with the requirements of safe navigation. The position and heading determination must meet the requirements as defined in the inland ECDIS standard.

2.2.3 Commission Regulation on Vessel Tracking and Tracing

Safety of inland navigation and support to vessel traffic management were the basic requirements for vessel tracking and tracing in inland navigation. An important requirement special in countries with mixed traffic - rivers and ports in the maritime environment where inland navigation and maritime traffic merge - that maritime and inland navigation tools for tracking and tracing are interoperable. This did lead to an AIS – Automatic Information System - device as used in the maritime world but amended for inland navigation with respecting the interoperability.

AIS is a ship borne radio data system, exchanging static, dynamic and voyage related vessel data between vessels and between vessels and shore stations. Ship borne AIS broadcasts the vessel’s identity and vessels characteristics, the vessel position, cargo and voyage data and other dynamic and semi dynamic data. By receiving these transmissions, shipborne or shore based AIS stations within the radio range can automatically locate, identify and track AIS equipped vessels on an appropriate display.
like radar or Inland ECDIS. AIS is not a navigation system like radar or replacing Vessel Traffic Services but supports them.

There are different types of AIS devices such as:

- Class A mobile stations, mandatory for sea going vessels falling under the IMO SOLAS;
- Class B mobile stations with limited functionality to be used by e.g. pleasure crafts, and base stations for the use on shore, and;
- AIS base stations

The information content of Inland AIS basically complies with the information content of maritime AIS, while providing additional information specific to inland waterways. All data transmitted can be received by both maritime and Inland AIS devices to be visually displayed and analysed. However, the specifically Inland AIS information is only transmitted and assessed by Inland AIS devices.

Inland AIS transponders must be compliant to IMO Class A transponders and must therefore be capable of receiving and processing all IMO AIS messages (according to ITU-R M.1317-1 and IALA technical clarifications on ITU-R M.1371-1) and of course the specific messages as defined in the Commission Regulation of the European Commission on Vessel Tracking and Tracing.

The Standard for Vessel Tracking and Tracing in Inland Navigation comprises the following sections:

- The usage of vessel tracking and tracing in inland navigation (functional description);
- Inland AIS Standard (including Inland AIS radio messages (VDL Messages, VHF data link), and;
- Annexes with information on Emma codes, examples of signal status, etc.

2.2.4 Commission Regulation on Electronic Reporting

Electronic reporting and electronic messaging are the way to a paperless environment in inland shipping. All necessary information is available at the right time and in the right place. The messages address the parties concerned ensuring a fast dispatch and transparent procedures with appropriate controls and simplified IWT processes. Electronic reporting supports services like traffic management, calamity abatement, statistics and not in the last place transport management.

Information on vessel and cargo data over a large area is important for all those participating in transport operation: authorities, lock operators, emergency services, port operators, fleet operators. For that reason, electronic ship reporting systems are set up. The standard for Electronic Ship Reporting in Inland Navigation describes the messages, data items and codes to be used in electronic ship reporting for the different services of RIS.

The principle and standard of Electronic Reporting specify reporting for underneath processes:

- From Ship-to-authority:
  - Transport notification messages on the voyages of loaded or empty ships;
  - Arrival notification and position reports at locks, bridges, reporting points of traffic centres;
Transport notification. The transport notification is used to inform the competent authorities of the intention to make specified voyage with a specified ship, either carrying a specified cargo or being empty;
Arrival notification and position reports. Arrival notifications are used to inform the local waterway operators – such as lock masters, bridge operators, traffic centre operators, ports and docking crew – of the impending arrival of a ship.

- From authority-to-authority. Authority-to-authority messaging consists mainly of transport notifications for ships, carrying cargo or being empty, travelling from one jurisdictional area to the other.

The Commission Regulation on Electronic Reporting describes:

- The messages, data items, codes and references to be used in electronic reporting for the different services and functions of River Information Services
- The basic and most important recommendations for electronic reporting.
- The relation between private parties (shippers, skippers, terminal operators, fleet managers) and public parties (waterway authorities, public ports). The relationship between private parties without involvement of public partners (e.g. the relationship between skippers and terminal operators) is not addressed.

The technical specifications of the standard define the structure of four messages for electronic ship reporting in inland navigation, based on the UN/EDIFACT message structure and customised, where required, for the purpose of inland navigation.

The standards contain the messaging procedures and the messages types being:

- ERINOT, the notification message to be used for the reporting of voyage related information and of information on dangerous and non-dangerous cargo carried on-board vessels sailing on inland waterways;
- ERIRSP, the response messages with respect to the different functions (new voyage, modification or cancellation) of the ERINOT message;
- BERMAN, the berth management message combines the pre-arrival notification respectively general declaration into one single notification;
- PAXLST, this message to be used for the exchange of data in inland navigation between the captain/skipper or carrier and designated authorities such as ISPS terminals, customs, immigration, police. The message is also used to transfer passenger/crew data from a designated authority in the country of departure to the appropriate authorities in the country of arrival of the means of transport.

As special annexes the standard includes the message implementation guidelines and classifications codes for types of means of transport in inland navigation.

2.2.5 Commission Regulation on Notices to Skippers

Notices to Skippers is information on (semi-) dynamic status of fairways and information on planned works and obstructions. Traditionally Notices to Skippers have been distributed by VHF, in writing, on notice boards or by fax. But these services are provided in the national language only. A skipper on the Danube for example would have to be able to read notices in German, Slovak, Hungarian, Croatian, Serbian, Bulgarian, Romanian, and Russian language. The Notices to Skippers as defined in the RIS context are provided in a language independent format.

5 UN/EDIFACT= United Nations Electronic Data Interchange For Administration, Commerce and Transport
Information on restrictions and obstructions on the inland waterway network are not only read by skippers but is also used in iENC viewers and voyage planning applications. The objective of standardisation of the Notices to Skippers was also the possibility to provide machine readable files, which can be used directly by this kind of applications.

The international standard for Notices to Skippers provides a standardized data format, which can be used for publishing Notices to Skippers on the internet (pull-services) or for distribution by e-mail (push services). The content of the messages is encoded in a machine-readable XML-file. This file can be used by software applications like voyage planning or inland ENC viewer on board of a vessel or by internet sites. The encoded information can be used directly for calculations, as for example in voyage planning, or be translated to the language of the user and displayed. The reference tables of the standard contain the languages of the member countries of the European Union, and additional 2 languages, namely Serbian and Russian language. This guarantees that a skipper is able to read and understand the Notices to Skippers for all the major European waterways. The main services that benefit from the Notices to Skippers standard are Fairway information Services including inland ECDIS and traffic management services.

The Commission Regulation on Notices to Skippers provides

- Automatic translation of the most important content of notices in all the languages of the participating countries,
- A harmonized structure of datasets in all the participating countries to facilitate the integration of notices in voyage-planning systems,
- A standard for water-level information and weather information.

Based on the standard the Notices to Skippers are compatible with the data-structure of Inland ECDIS to facilitate integration of notices to skippers in Inland ECDIS and the standard facilitates data-exchange between different countries.

2.3 Special topics

2.3.1 RIS index

The RIS Index is a standardised structure for the description of geo-related RIS reference data. The RIS Index serves the purpose of addressing waterway objects unambiguously in RIS systems. Reference data of objects relevant for Inland Navigation (e.g. gauge stations, waterway axes, lock chambers, bridges, harbours, berths, terminals) shall be maintained by member states within their area of competence.

The location code used in the RIS is a unique 20-digit alpha-numerical code – the ISRS (International Ship Reporting Standard) location code - which consists of the following data elements:

- UN Country code (2 letters);
- UN Location code (3 letters);
- Fairway section code (5 digits, alpha-numerical);
- Object reference code (5 digits, alpha-numerical);
- Fairway section hectometre (5 digits, numerical).

This location code is based on the so called LOCODE as also used in the maritime world.
The RIS Index is a list of location ISRS location codes with additional information on the objects like their characteristics (name, fairway, etc.), restrictions (available depth, clearance, etc.), operating times, etc.

The RIS index is essential in the production of ENC’s and the publication of Notices to Skippers and it is the basis for traffic management applications like voyage planning and the prediction of ETA’s. The RIS index is part of the Commission Regulation for Notices to Skippers and will for sure be included as mandatory requirement in the next edition of the RIS directive.

2.3.2 ENI and Hull database

The ENI number (European Number of Identification or European Vessel Identification Number) is a registration for ships capable of navigating on European inland waters. Like the IMO number, it is a unique, eight-digit identifier that is attached to a hull for its entire lifetime, independent of the vessel’s current name or flag.

The ENI number consists of eight Arabic numerals. The first three digits identify the Competent Authority where the number is assigned, and the last five digits are a serial number.

The ENI number is based on the Rhine Vessel Certification System previously used for ships navigating the Rhine. The ENI number is issued by the national Competent Authority for vessel inspection.

In order to ensure the uniqueness of ENI numbers, the European Vessel Hull Database (EHDB) operated and maintained by the European Commission provides a central repository of all ENI numbers issued in Europe.

2.3.3 European Reference Data Management System

Reference data are used by various RIS applications. They include data on the inland waterway network infrastructure, for instance the location of locks, bridges and ports. These data are provided by national authorities. Skippers consult these data through various RIS applications; therefore, the data is consolidated and maintained in a structured manner, in order to facilitate the usage of consistent data in applications.

The ERDMS is a database operated by the European Commission that collects all reference data and facilitates the management and publication of the RIS data codes and reference tables. The codes maintained by the ERDMS relate to, for example, the:

- RIS index (see previous special topic): data related to infrastructure (RIS objects) on inland waterways (such as junctions, locks, bridges, berths, gauges etc).
- ADN codes (dangerous cargo codes): as specified in Directive 2008/68/EC
- HS codes (goods codes): harmonised system codes from the customs organisation (non-dangerous goods)
- Container types: to identify the type of container (ISO 6364)
- Ship type: to describe the type of transport (UN Rec 28)
- Notices to Skippers codes
2.3.4 Application Specific Message

Inland AIS can do more than just providing identity and the position of a vessel. Inland AIS can also be used for the exchange of other navigation and voyage related information between vessels and between vessel and shore beyond what is implemented in the Inland AIS station.

Inland AIS allows the transfer of Application Specific Messages (ASM) via the AIS radio link (AIS VDL) as a means of communication for external applications. The use of Inland ASM is a kind of data exchange between externally connected users of two or more Inland AIS stations with connected external application. The data content does not affect the operation of the Inland AIS stations.

An appropriate way for the display of ASM content on board is through a connected Inland ENC viewer. The shore system also needs to support the transmission and handling of these messages and provide means for input and output of the related information.

Examples for this kind of information which can be provided by Inland AIS are ETA/RTA, actual water level, or signal status at a lock or bridge and bridge height. The commonality of this information is the relevance for the tactical navigation and the timeliness in which the information should be provided to the skipper.

2.3.5 AIS Aids to Navigation

AIS provides a suitable means for emphasising classic Aids to Navigation (AtoN) for the marking of buoys, wrecks, wind farms, etc. A special AIS AtoN message transfers the position and the meaning of the Aids to Navigation as well as information if the buoy is on the required position or if it has been swept away. Inland AIS makes use of

Figure 4: RIS key technologies and reference data
this AIS AtoN message but introduces an additional coding of inland specific Aids to Navigation, following CEVNI\(^6\).

This AIS AtoN message can be either transmitted by an AIS shore station or by a special AIS AtoN station mounted on a buoy or lighthouse. Using the Inland AIS AtoN report message allows for informing about a real buoy lying in the water or for informing about a position where no real buoy is present, a so-called virtual AtoN.

Virtual AtoN’s may be displayed on an ECDIS chart and might be used to mark a wreck immediately after the accident before real buoys can be brought out, or to mark a fairway in conditions where buoys won’t last.

Ships equipped with an appropriate display system like Inland ECDIS, can display the information contained in the Inland AIS AtoN report message, e.g. as a symbol on the chart at the reported position of the AtoN.

2.3.6 Electronic Reporting - Voyage plan message ERIVOY

In line with the developments in inland shipping to the increasing use information technology for the exchange of data with authorities and partners, the standard voyage plan notification message, ERIVOY is meant to be used.

This ERIVOY messages can be used as a message from a carrier, its agent or a ship to the responsible waterway authorities and where applicable involved commercial parties to report a voyage plan and its particulars. The voyage plan includes expected passage of waypoints and it is meant to provide a transport route schedule of a certain ship and its voyage.

The availability of routing information on forehand will facilitate in special traffic management and transport management and traffic planning and will ensure easier and safer passages of locks, bridges and other barriers. In this way a better planning of a voyage is feasible and in case of any changes or calamities re-planning becomes easier.

The ERI voyage plan notification ERIVOY is based on the UN-EDIFACT IFTSAI, the Transport Scheduling and Information message as published in the UN/EDIFACT D 04B directory. The function of this IFTSAI standard transport schedule and information message is to request a transport schedule or availability information and or to answer to such a request. The message is in line with the requirements of the maritime industry.

The ERIVOY message has been used in different pilot projects on the inland waterway network and will most probably be in part of in the next version of the electronic reporting standard.

2.4 Status of RIS directive and the RIS guidelines

2.4.1 Update of the RIS directive

The RIS directive is based on the basic definition of the requirements and features of River Information Services as a result of research and development projects in the early years of RIS. In 2020 it can be concluded that the RIS directive was a perfect instrument for the initial deployment of River Information services in the period 2005

\(^6\) CEVNI= European Code for Inland Navigation
till 2015 but requires an update. The European Commission intends to update the RIS directive and hopes to publish the updated directive in 2022.

Since the publication of the RIS directive in 2005 the RIS has been further developed and implementation took place European and even worldwide and has resulted in many lessons learned that requires updating the RIS directive. The RIS directive was in 2005 based on results of projects and initiatives in a research environment. Since 2005 European wide and even world-wide in first instance RIS key technologies were implemented and since 2010 the real RIS services came into operation. In recent period the principle of Corridor Management is developed taking into account the requirements in the IWT transport domain.

An important reason for the need of updating the RIS directive is also the considerable need for information services in the intermodal transport domain. In this context the European Commission took the initiative of the ‘Digital Single Market”. In direct relation to this the European Commission started in 2016 the initiative on the Digital Inland Waterway Area (DINA). DINA addresses specific problems in the inland waterway sector caused by a lack of digitalization and to provide a platform for further improvements in the inland navigation transport domain in the near future. The objective is to translate the requirements of the Digital Single Market Strategy and DINA to the level of River Information Services and in this way integrate RIS into the digital agenda for transport especially for transport-related River Information Services.

On the basis of the lessons learned during implementation of RIS in Europe in the last decade the following topics are on the agenda for the amendment of the RIS directive:

- Ensure a harmonized minimum level of service across the EU and/or alternatively by corridor, which reflects today’s needs today’s multi-modal transport market as also intended by the DINA initiative;
- Facilitate harmonised information services for effective and efficient cross-border traffic and transport management and enhance services for transport and logistics operators which are in line with the (intermediate) results of the multi-national TEN-T corridor management studies;
- The scope of RIS should remain the same, however the restriction of the RIS directive to class IV and higher should be amended, in special voyage planning requires also RIS information and functionality at lower CEMT classes, preferably the RIS directive should be applicable for fairway classes III and higher;

Most probably the following more specific obligations will be included in the upcoming revised RIS directive to be formalised in 2022:

- The application of standardized RIS reference data as the RIS Index (location code) and the ENI code; this includes a harmonised coded European waterway with the RIS index in the basis of the coded waterways;
- Carriage requirement for IWT vessels for carrying Inland AIS in combination with an inland ENC viewer with as a minimum option for iENC in Information mode;
- Electronic voyage reporting for IWT vessels.

These are obligation for European Member States with fairways on the connected IWT network and for IWT vessels on that network. It is however advised for Ukraine to take in account these possible obligations in the measures that will be taken to upgrade River Information Services in the coming years.
2.4.2 PIANC RIS guidelines in the relation to the RIS directive

As mentioned before the Commission Regulation 2007/414 on RIS guidelines was based on the PIANC RIS guidelines, edition 2. This edition was published in the research period of River Information Services.

PIANC published in 2019 edition 4 of the RIS Guidelines. The updates in edition 3 and edition 4 of the RIS Guideline were needed as the development and implementation of River Information Services provided many lessons learned to be taken in account in the RIS guidelines.

The PIANC RIS Guidelines also became a basis for UNECE Resolution No. 57 on RIS Guidelines and Recommendations for River Information Services (TRANS/SC.3/165). CCNR has published the RIS Guidelines edition 3 based on CCNR protocol 2003-I-22. Both organisations are in the process of adopting the edition 4 of the PIANC RIS Guidelines.

Important reasons for the updates in edition 3 and 4 were:

- The implementation status and many lessons learned during the first decade of real implementation and operation of RIS;
- RIS is under implementation throughout the world and requires RIS guidelines that bring added value to authorities and organisations planning to implement RIS in their domain. A conversion of the European-oriented RIS guidelines into RIS guidelines that are optimal for use on a worldwide scale was needed;
- Since 2010 studies have been conducted in RIS enabled Corridor Management. The concept of Corridor Management can be recognised as the next step in the deployment of RIS supporting inland navigation as an important transport mode in the international multimodal logistic chain;
- Developments in the maritime world with respect to e-Navigation will influence River Information Services. The adaptation of the RIS guidelines towards multimodal use of information services worldwide is of utmost importance for all modes of transport.

It is expected that the European Commission will make use of the updated PIANC RIS guidelines when a revision of the RIS directive and the Commission Regulation 2007/414 will take place.
3 Status of RIS on the Dnipro in Ukraine

3.1 Assessment of RIS on the Dnipro

In this chapter the assessment of the status of River Information Services as implemented and in operation on the Dnipro in Ukraine is described and is based on:

- Visit to the RIS centre of UkrRIS in Odessa;
- Meetings with:
  - Mr O. Lyashenko and his team responsible for UkrRIS with focus on RIS key technologies and systems, RIS operational and technical services and RIS users;
  - Mr I. Gladkykh professor at the Odessa Maritime Academy, representing Ukraine in UNECE inland Transport Committee the Working Party on Inland Water Transport on River Information Services, member of the IEHG and RIS expert group on inland ECDIS;
  - Mr. D. Volodymyr of UkrVodShlyakh (UVS) with focus on pilot operations and lock operations in their possible relation to River Information Services;
  - Mr. D. Padakin, Head of State Hydrographic Service “Ukrmorcartographia” of Ukraine, Mr. O. Marchenko, head of the charting branche, Mrs. A Miagkova, head of international relations and Mr. V. Belinsky and their teams with focus on inland ECDIS;
  - Mr. D. Yagello, commercial manager of UkrRichFlot, with focus on RIS related services and systems on board of vessels;
- Literature on RIS in Ukraine;
- Assessment of the UkrRIS website and the website of the State Hydrographic Service of Ukraine.

The assessment will be related to the RIS directive, RIS guidelines and RIS technical Commission Regulations as described in detail in chapter 2 of this report.

In chapter 3.2 a general overview of the status of RIS on the Dnipro will be described, the findings are analysed in detail and split into:

- Chapter 3.3: RIS key technologies;
- Chapter 3.4: RIS Dnipro objectives, services and functions and users.

In chapter 3.5 the overall conclusions will be drawn on the status of RIS on the Dnipro.

3.2 General overview of RIS on the Dnipro

RIS on the Dnipro in Ukraine consists of four main elements:

- A RIS centre in Odessa where the technical RIS systems are centralised and the operational services and technical services are provided. Connected to the main centre in Odessa there are 6 sub-centres;
- A technical infrastructure along the Dnipro with:
  - AIS base stations;
  - VHF communication;
  - Water gauges;
- The UkrRIS website;
- Inland ECDIS charts produced and distributed by State Hydrographic Service “Ukrmorcartographia”.

3.2.1 RIS centre Odessa and subcentres

The UkrRIS centre in Odessa is situated in the Port of Odessa and consists of:

3.2.1.1 An operations room with a RIS operator console and a technical operator console.

The RIS centre in Odessa and the Sub-centres are in operation 24 hours/7 days. There are only 4 RIS operators at each (sub)centre, the RIS operators have shifts of 24 hours followed by 3 days off (24 hrs on, 72 hrs off).

Operators are trained on the job, there are no courses for RIS operators. Practical training and exercises on emergency response – included using the information of AIS and voyage reporting journal - has been performed with passengers’ vessels and simulating groundings. Each region has their own emergency response service.

The tasks of the RIS operators in the main RIS centre and subcentres are:

- Monitoring the traffic situation on the Dnipro;
- Vessels report are obliged to their voyages on the Dnipro. The RIS operator communicates with the vessels by VHF or telephone on their voyages and integrates the information in the voyage database or “Voyage journal”;
- Interaction between main centre and sub-centres;
- Update information on the official website UkrRIS (only in the main centre);
- Create and transfer Notices to Skippers (only in the main centre).
The connection to different types of user groups are maintained through the regional subcentres. To be mentioned are port operators, port centres, different governmental organisations like customs and security services.

UkrRIS provides of 24 hours real time (round-the-clock) information exchange with the State Hydrographic Service of Ukraine, provides a constant exchange of information with the State Enterprise “Maritime Search and Rescue Service” of Ukraine, provides the exchange of information with the Unified Monitoring System using an AIS monitoring system in the Black and Azov Seas in the zone of responsibility of Ukraine.

The main RIS centre also uses information from the Kherson Sea Trade Port, where ships receive permission from port authorities to call vessels on inland waterways (IWW). Ships carrying dangerous goods on board, going to the Dnipro, receive permission to enter the IWW. The Kherson port authorities provide by email information for the logbook of UkrRIS about the category of dangerous goods carried, according to European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN) and its quantity on board.

UkrRIS has on the other hand no international connections with other systems or services or interfaces.

The subcentres are situated near locks in buildings where also the lock operations take place.

![Subcentres on the Dnipro](image)

*Figure 7: RIS subcentres on the Dnipro*

The operations room is equipped with a video wall, displaying a traffic image where AIS information is integrated in an inland Electronic Nautical Chart (iENC). The iENC’s are also the basis for the displays in the operator consoles in the RIS main centre and the subcentres. The iENC’s are produced and distributed by State Hydrographic Service “Ukrmorcartographia”.

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3.2.1.2 Technical room

In the technical room of the main RIS centre in Odessa the following technical infrastructure is in operator:

- Central AIS network server. The central data processing server and communication server with AIS base stations;
- Database for AIS data recordings. All traffic information is recorded and available in case of accidents and for statistics;
- AIS broadcast server for the distribution of information through AIS base stations;
- Client server for the distribution of AIS data to authorised users;
- Internet access server as web server for the distribution of AIS data;
- WEB portal;
- Operator display control and diagnostics system.

The technical operations are supported by a technical maintenance system called Octopus sensing the technical conditions of the RIS systems and RIS infrastructure. The technical monitoring system provides status information and alarm functions in case of failure. The technical operator is monitoring the Octopus maintenance system and has the task to take action when system failures occur.
3.2.2 Technical infrastructure along the Dnipro

3.2.2.1 AIS network

The AIS network on the Dnipro consists apart from the central server in the main RIS centre of 24 Transas (T-214) land based AIS base stations, operating according the maritime AIS standard. The base stations provide full and mutual overlapping coverage of the Dnipro.

<table>
<thead>
<tr>
<th>№ п/п</th>
<th>Название</th>
<th>Км</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kyiv</td>
<td>852</td>
</tr>
<tr>
<td>2</td>
<td>Vishnyky</td>
<td>845</td>
</tr>
<tr>
<td>3</td>
<td>Taromskoe</td>
<td>410</td>
</tr>
<tr>
<td>4</td>
<td>Steyky</td>
<td>795</td>
</tr>
<tr>
<td>5</td>
<td>Rzhishchev</td>
<td>790</td>
</tr>
<tr>
<td>6</td>
<td>Tisiby</td>
<td>710</td>
</tr>
<tr>
<td>7</td>
<td>Bubnovska Sloboda</td>
<td>704</td>
</tr>
<tr>
<td>8</td>
<td>Svidivok</td>
<td>660</td>
</tr>
<tr>
<td>9</td>
<td>Moskalenyk</td>
<td>655</td>
</tr>
<tr>
<td>10</td>
<td>Ratsevo</td>
<td>592</td>
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<tr>
<td>11</td>
<td>Keleberda</td>
<td>520</td>
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<tr>
<td>12</td>
<td>Kintsevolivka</td>
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<td>13</td>
<td>Pazyrkoe</td>
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<td>14</td>
<td>Dnepropetrovsk</td>
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<td>Voyskove</td>
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<td>Energozer</td>
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<td>Zolotaya Balka</td>
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<td>20</td>
<td>Kachkarovka</td>
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<td>22</td>
<td>Pomyatovka</td>
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<td>23</td>
<td>Kherson</td>
<td>28</td>
</tr>
<tr>
<td>24</td>
<td>Kizomys</td>
<td>0</td>
</tr>
</tbody>
</table>

*Figure 9: AIS base stations*

3.2.2.2 VHF network

Communication with the vessels on the Dnipro river takes place via VHF network. VHF communication is used for voyage reporting – see chapter 3.3 – and for safety related communication and emergency response.
The network does not have full coverage on the Dnipro and in those areas without VHF coverage, communication with the RIS (sub)centre takes place via the public mobile network (4G). The possibility of mobile telephone communications with the vessels is available, the tel. numbers are published on the UkrRIS website. UkrRIS provides telephone communications with the vessels. There are no dead zones of telephone communications for UkrRIS with the vessels on the Dnipro.

3.2.2.3 Water gauges along the Dnipro

At several place on the Dnipro there are water gauges, the information of the water gauges is published on the UkrRIS website (see chapter 3.2.3.). Underneath table gives the position and the reference water level of the water gauges.

3.2.3 The UkrRIS website

The UkrRIS centre operates an impressive web portal with the following fairway and traffic related information:

- Notices to Skippers;
- Fairway information;
- Infrastructural information on ports, locks, bridges, hydroelectric power stations;
- Traffic Information;
  - AIS position information
  - Reported voyages;
  - Transports with dangerous cargo;
- Data on vessels (hull data);
- Historical traffic data;
- Hydrological and meteorological information;
- Maps;
- Costs for locking and use of the fairway;
- Information for pilots;
- Normative documents and useful links.

Part of the information on the website requires authorisation.
The UkrRIS website has 800 registered users. Terminal operators make use of the traffic information as included on the UkrRIS web portal. Regional and National Inspection Agencies have access to the traffic information of the UkrRIS web portal.

3.2.4 UkrRIS functional structure

In underneath figure the functional structure of UkrRIS is given.
3.3 RIS key technologies

UkrRIS can be split up, in terms of technologies, in the underneath described RIS key technologies. In the description the status of the key technologies will be related to the Commission Regulations as part of the RIS directive.

3.3.1 Inland ECDIS

As already mentioned, inland ENC’s are produced and distributed by State Hydrographic Service “Ukrmorcartographia”. The State Hydrographic Service published via Notices to Mariners and via the UkrRIS website the iENC’s as well as the corrections and updates. Inland ENC’s are not for free. Payment for the charts include updates.

The iENC as produced and published by the State Hydrographic Service is based on the standard edition 2.0 but will be upgraded on short notice on to iENC edition 2.3. The Hydrographic Service is preparing to use on short notice iENC edition 2.4. The Commission Regulation for inland ECDIS no 2018/1973 is based on edition 2.4 of the standard.

iENC’s include bottom profiles, this data is updated 2 times a year. Bottom profiles are integrated according the IHO S44 standard for surveyance.

The ENC’s are produced by using the dKart kernel software of the company Jeppesen in combination with the SevenC’s software, the company Chartworks is contracted in the production of the maritime and the inland nautical charts.

The ENC’s are used by shipping companies of which some do use the iENC’s but in general the paper charts are used. Only on board of some big vessels and the new fleet iENC’s are in use some of them integrated with the radar image.

*Figure 13: One of the new push barges of Nubilon (Anatolii Hankevych) equipped with inland ECDIS radar overlay (including AIS)*
iENC viewers of software suppliers like Cmap, Tresco (Navigis) and Periskal (Navigo) are not in operation on the Dnipro. The Hydrographic Service is of the opinion that there are, except for some big vessels, no iENC viewers in operation on the Dnipro due to the fact that iENC's are not mandatory. On board of most of the vessels on the Dnipro, the use of AIS is restricted to the minimal keyboard display (MKB), consequently vessels do not have an iENC based traffic image in their steer house.

Second consequence of the lack of iENC viewers is that Notices to Skippers are not integrated in the iENC’s on board of vessels.

3.3.2 Vessel Tracking and Tracing

On the Dnipro there is for commercial vessels longer than 20 m a carriage requirement for AIS, 95% of all vessels sailing on the Dnipro are equipped with AIS, 30% of the vessels are equipped with type AIS-B\(^7\) transponders.

The AIS network as well as the AIS transponders in use on the Dnipro are based on the maritime standard and are not in accordance with the tracking and tracing standard as defined in commission regulation no 2019/838.

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\(^7\) Class B transceivers transmit at a lower power and at a lower reporting rate than class A transceivers. Class b is aiming at lighter commercial and leisure markets. Class A transponders use a system called Self Organised Time Division Multiple Access (SOTDMA), which enables them to negotiate with other Class A transponders to reserve a time slot and book future ones. Class B transponders use a different technology called Carrier Sense Time Division Multiple Access (CSTDMA).
The information content of Inland AIS basically corresponds with that of maritime AIS, while providing additional information specific to inland waterways. In view of their shared information content, Inland AIS and Maritime AIS are compatible. All data transmitted can be received by both maritime and Inland AIS devices to be visually displayed and analysed. However, the specifically Inland AIS information is only transmitted and assessed by Inland AIS devices.

Specific for inland AIS are:

- ENI Number for inland vessels;
- The dimensions of a vessel as well as draught, speed, course and heading are to be specified with higher accuracy;
- Blue sign – sailing on the ‘wrong’ side of the fairway – as used in inland waterways is not available in a maritime AIS;
- Categories of dangerous cargo (specification of the amount of “blue cones”) as used in inland navigation cannot be included in the Maritime AIS.

3.3.3 Notices to Skippers

The Notices to Skippers is compiled by SHS in combination with UkrRIS and published on the UkrRIS web site and is of excellent quality and meet the requirements of the Commission Regulation number 416/2007 for Notices to Skippers and provides these in the format: XML-messages, Text and Code.

The NtS of UkrRIS however does not comply with the Commission Regulation no. 2018/2032 on Notices to Skippers.

Notices to Skippers on the Dnipro complies in large extend with the Commission Regulation by issuing the following messages in a standardised format:

- Fairway and traffic related messages consist of notices that provide information on a fairway section or an object.
- Notices that provide information on the water levels.
- Notices that provide information on the weather situation.

This Commission Regulation for NtS provides rules for the data transmission of fairway information via Internet. In special the following rules are not followed for the moment by the UkrRIS Notices to Skippers:

- automatic translation of the most important content of notices, using standard vocabulary based on code lists (the NtS Reference Tables as provided in Appendix E of the Commission Regulation on NtS);
- provide in a standardised structure of datasets to facilitate the integration of notices in voyage planning systems;
- compatibility with the data-structure of the RIS Index and Inland ECDIS to facilitate integration of NtS into iENC viewers as stipulated by RIS Directive 2005/44/EC on harmonised RIS on inland waterways in the Community.

3.3.4 Electronic Reporting

As mentioned in chapter 2.2.4, electronic reporting and electronic messaging is the way to a paperless environment in inland shipping. Information on vessel and cargo data over a large area is important for all those participating in transport operation: authorities, lock operators, emergency services, port operators, fleet operators. Electronic reporting supports services like traffic management, calamity abatement, statistics and not in the last place transport management.
The Commission Regulation on Electronic Reporting defines messages for reporting of the voyages, the cargo and in special also the dangerous cargo, the persons on board, the arrival and pre-arrival notification and berth management.

The method of reporting on the Dnipro river does not comply with Commission Regulation no. 2019/1744. Voyage reporting in UkrRIS is based on reporting by VHF – reporting by voice communication - and in some situations reporting by Public mobile communication network (4G). The reporting includes categories of cargo – no specification and amount of cargo has to be reported - and if relevant the type of dangerous cargo without specification of the amount of dangerous cargo. It is mandatory to report but in the new draft IWT law extended reporting (more information) is included.

For collecting and storing voyage reports there is an electronic journal (and reporting database). Reporting information is shared with organisations responsible for emergency response/search and rescue.

The reporting is done at the “entrance” of the river area, there is no intelligent/automated connection with the “maritime” ports were information on cargo is available.

AIS information and the reporting journal are linked, there is an automatic handover of the vessels-information in the journal to a new river-section – RIS-substation - by AIS geofencing.

3.3.5 Special topics

3.3.5.1 ENI and Hull database.

The ship registration of inland vessels in Ukraine is – if a vessel has a number – based on the IMO codes. The ENI number (European Number of Identification or European Vessel Identification Number) is a unique registration for ships navigating on European inland waters but is not introduced in Ukraine. The ENI numbering is a relevant identifier for RIS services in IWT in Europe.

To include Ukraine inland vessels in the European Vessel Hull Database (EHDB), operated and maintained by the European Commission, it is required that ENI codes for Ukraine inland navigation vessels are implemented.

3.3.5.2 RIS index

The RIS Index is a standardised structure for the description of geo-related RIS reference data but the index is not yet implemented in UkrRIS. The RIS index is essential in the production of ENC’s and the publication of Notices to Skippers and it is the basis for many types of RIS applications. The RIS index is part of the Commission Regulation for Notices to Skippers and will for sure be included as mandatory requirement in the next edition of the RIS directive.

3.3.5.3 European Reference Data Management System

As specified in chapter 2.3.3. reference data are used by various RIS applications. These reference data are provided by national authorities and consulted through various RIS applications. As UkrRIS is restricted in the use of the European RIS reference data it is evident that the European Reference Data Management Systems (ERDMS), operated by the European Commission, for the time being is not used.
3.3.5.4 Application Specific Message

UkrRIS is able to provide Application Specific Messages (ASM) via the AIS radio link (AIS VDL) as a data exchange method with externally connected users. The difficulty is that not all vessels are equipped with the appropriate AIS type to receive these messages. As soon as the majority of vessels will have the proper equipment the use of ASM is foreseen.

3.3.5.5 AIS Aids to Navigation

The State Hydrographic Service “Ukrmorcartographia” is using AIS AtoN as well as virtual AtoN’s only in the maritime domain. AIS provides in this domain a suitable tool for marking of buoys and wrecks. A special AIS AtoN message transfers the position and the meaning of the Aids to Navigation as well as information whether the buoy is on the required position or whether the buoy has been swept away.

On the Dnipro these AIS AtoNs are not in operation yet and as long as iENC viewers are not commonly used, virtual AtoNs do not have any added value.

3.3.5.6 Electronic reporting - Voyage plan message ERIVOY

This ERIVOY messages can be used as a message from a carrier, its agent or a ship to the responsible waterway authorities and where applicable involved commercial parties to report a voyage plan and its particulars. The voyage plan includes expected passage of waypoints and it is meant to provide a transport route schedule of a certain ship and its voyage. When thinking about corridor management with ETA’s at bridges, locks, ports and other waypoints the use of ERIVOY is very powerful. For the time being ERIVOY is not applicable on the Dnipro.

3.4 RIS Dnipro objectives, services and functions and users

3.4.1 RIS objectives

Based on the assessment of the implementation, operation and use of River Information Services on the Dnipro it can be stated that the objective of RIS is restricted to the improvement of safety of shipping on the Dnipro.

There are no services in operation that will improve the efficiency of traffic and transport on the Dnipro nor are services provided that will make inland navigation a more plannable, reliable and transparent transport mode.

3.4.2 RIS Actors

Achieving the objectives of RIS very much depends on the (information) needs of the stakeholders and interactions between these parties across national and organisational borders.

The following categories of potential stakeholders can be differentiated:

- RIS users in inland navigation operations. Examples of this user group are; skippers, ship owners, lock operators, pilots and VTS operators, terminal operators and port operators, etc.
- Governmental and regulatory bodies. Examples of this stakeholder group are water police, competent authorities for traffic management, and port authorities, bureau for statistics, Inspection agencies;
• Managers in inland navigation. Examples of this stakeholder group are fleet managers, water managers and waterway managers.

In Ukraine, apart from the information providers UkrRIS and State Hydrographic Service “Ukrmorcartographia”, there is a rather small group of actual users of RIS services. Part of the skippers are using the traffic information services but lock operators, terminal and port operators cannot be seen as users of the traffic services.

The fairway information services as published on the UkrRIS web portal can be seen as attractive for a wider variety of users. Apart from organisations responsible for emergency services there are apparently no governmental or regulatory bodies that can be seen as stakeholders for RIS services.

3.4.3 RIS services

UkrRIS as implemented and operated on the Dnipro is restricted in its services to:

• Fairway information Services (FIS)
• Traffic information Services (TIS) on tactical and strategic level.

There are no services in operation supporting traffic management or transport management as depicted in the overview of RIS services of figure 2 in chapter 2.2.1. It is remarkable that although the UkrRIS sub-centres are situated in the buildings for lock operations there is no functional link between UkrRIS and these lock operations.

UkrRIS provides information to the organisations responsible for emergency response and is as such supporting on a basic level calamity abatement.

RIS related information is not used in situations of law enforcement and inspections. Whether RIS related information is used for statistics hasn’t become clear during the observations. There is no RIS information used for collecting the fees for locking and the use of the fairways.

3.4.4 RIS functions

In the next table the information functions of River Information Services on the Dnipro are analysed, and it clearly indicates that the focus of UkrRIS is at this moment on providing information on the fairway related functions and basic dynamic and static vessel data as traffic information.
### Table 1: Compliance of RIS on the Dnipro with respect to RIS functions

<table>
<thead>
<tr>
<th>Information Category</th>
<th>Functions</th>
<th>1st level</th>
<th>2nd level</th>
<th>UML/EMR compliant</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fairway and Infrastructure related</strong></td>
<td>Provide navigation-based information on fairway and/or navigable water area</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Provide meteorological information</td>
<td></td>
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<tr>
<td></td>
<td>Provide water level related information</td>
<td></td>
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<tr>
<td></td>
<td>Provide information on obstructions and limitations</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Land related information</strong></td>
<td>Provide information on land region</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Provide information on ports</td>
<td></td>
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<tr>
<td></td>
<td>Provide information on terminals</td>
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<tr>
<td></td>
<td>Provide information on locks</td>
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<tr>
<td></td>
<td>Provide information on bridges</td>
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<tr>
<td></td>
<td>Provide information on cables/pipes overhead and other special constructions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Provide information on waste reception facilities</td>
<td></td>
<td></td>
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<tr>
<td><strong>Dynamic vessel data</strong></td>
<td>Provide position information of vessels</td>
<td></td>
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<tr>
<td></td>
<td>Provide vessel dynamics (i.e. RoF, velocity, CoG, SoG, ...)</td>
<td></td>
<td></td>
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<tr>
<td><strong>Hull related information</strong></td>
<td>Provide event based triggers for vessel position</td>
<td></td>
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<tr>
<td></td>
<td>Provide information on hull data</td>
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<tr>
<td></td>
<td>Provide information on craft certificates</td>
<td></td>
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<tr>
<td><strong>Vessel - convoy related information</strong></td>
<td>Provide overall convoy data</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Voyage related data</strong></td>
<td>Provide information on origin of voyage</td>
<td></td>
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<tr>
<td></td>
<td>Provide information on intermediate discharge locations</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Cargo related data</strong></td>
<td>Provide information on passage points</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Provide information on destination of voyage</td>
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<tr>
<td></td>
<td>Provide information on date/ time of arrivals</td>
<td></td>
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<tr>
<td></td>
<td>Provide information on estimated date/ time of departures</td>
<td></td>
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<tr>
<td></td>
<td>Provide information on the predicted deviation of the original voyage plan (of skipper) at</td>
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<tr>
<td></td>
<td>Provide information on origin of cargo</td>
<td></td>
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<tr>
<td></td>
<td>Provide information on destination of cargo</td>
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<tr>
<td></td>
<td>Provide information on cargo details</td>
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<tr>
<td></td>
<td>Provide loading unit related information</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Persons on board</strong></td>
<td>Provide information on number of persons (crew, passengers, ...) on board</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Provide details on persons on board</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Traffic related</strong></td>
<td>Provide berth/terminal information</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Provide information on operational status of locks</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Provide information on actual passage time/duration at locks and bridges</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Provide information on predicted passage time/duration at locks and bridges</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Waterway section related information</strong></td>
<td>Provide information on average passage time/duration for certain categories / certain vessel types</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Provide information on traffic density on a certain stretch and/or corridor (for specific vessel classes)</td>
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<tr>
<td></td>
<td>Provide information on sailing time over a certain stretch for certain vessel classes per sailing direction</td>
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</tbody>
</table>

#### 3.5 Overall conclusions on the assessment of RIS on the Dnipro

Based on the assessment of River Information Services as implemented and operated in Ukraine in relation to the RIS directive, RIS guidelines, the Commission Regulation for Inland ECDIS, Vessel Tracking and Tracing, Notices to Skippers and Electronic reporting and the special topics the following conclusions can be drawn:

1. River Information Services in Ukraine is compliant with the following obligations on the electronic exchange of data as defined in the RIS framework directive:
   - The provision of Electronic Navigational Charts (ENC’s) suitable for navigational purposes but with the restriction as mentioned under conclusion no. 6;
- The provision of Notices to Skippers and contains more than only information for safety of navigation but with the restriction as mentioned under conclusion no. 7;
- The implementation of facilities for tracking and tracing of vessels by making AIS mandatory for vessels longer than 20 m but with the restriction as mentioned under conclusion no. 8;
- Ukraine has, in addition and in accordance with the advice mentioned the RIS Directive, implemented a RIS centre with 5 sub-centres on the Dnipro;

Electronic reporting is not applied on the Dnipro, consequently River Information Services in Ukraine does not comply with the RIS directive that the competent authorities should be able to receive electronic ship reports of the required data from ships.

For River Information Services the Ukraine authorities did not appoint, as defined in the RIS directive, a RIS Competent Authority.

2. The implemented River Information Services in Ukraine is restricted to those services that are focussed on safety of traffic and not on improvement of efficiency of traffic and transport. There are no services in operation that will make inland navigation a more plannable, reliable and transparent transport mode.

3. There is a rather small group of actual users of RIS services, part of the skippers is using the traffic information services but lock operators, terminal and port operators cannot be seen as users of the traffic services. Apart for organisations responsible for emergency services there are apparently no governmental or regulatory bodies that can be seen as stakeholders for RIS services.

4. The RIS information functions are focussed on infrastructure and fairway information and in a restricted way to vessel and voyage related functions.

5. The services provided for Inland navigation in Ukraine as defined in the RIS directive are restricted to:
   a. Fairway information Services (FIS);
   b. Traffic information Services (TIS) on tactical and strategic level.
There are no traffic management or transport management services in operation.

6. The inland Electronic Nautical Charts as provided by the State Hydrographic Service of Ukraine are based on the standard edition 2.0 but will be upgraded on short notice on to iENC edition 2.3. The hydrographic office is preparing the use of iENC edition 2.4 on short notice. As the Commission Regulation on Electronic Chart Display and Information System for inland navigations (inland ECDIS) no. 2018/1973 is based on edition 2.4, the inland ENCs in Ukraine will on short notice be compliant.

7. The Notices to Skippers as included in the very professional UkrRIS web portal are attractive but not compliant with the Commission Regulation on Notices to Skippers no. 2018/2032.

8. UkrRIS AIS network as well as the AIS devices on board are based on AIS according to the maritime standard. The AIS devices consequently do not comply with the Commission Regulation on Vessel Tracking and Tracing no. 2019/838.

Most probable the revised RIS directive that will be formalised in 2022 will include a carriage requirement for IWT vessels for carrying Inland AIS in combination with an inland ENC viewer with as a minimum option for iENC in Information mode.
9. Voyage reporting in Ukraine is based on voice reporting by VHF and in addition the content in the reporting journal differs from electronic reports as defined in the electronic ship reporting standard. The Ukraine reporting method and messages and content are consequently not compliant with Commission Regulation no. 2019/1744. Most probably the revised RIS directive that will be formalised in 2022 will make electronic reporting mandatory.

10. The combined use of the existing AIS network, inland ENC and Reporting information as available in UkrRIS could extend the information services and users substantially. These enhanced information services are:

   - Lock management information services for lock operators;
   - Port and terminal traffic information services for port and terminal operators;
   - RIS services for emergency response organisations;
   - Combined AIS and Inland ECDIS in Information mode as safety instrument on board of vessels.

These enhancements can be reached through very restricted measures. These measures will be depicted in chapter 4.

11. The RIS index, European vessel identification number ENI and the other reference data, relevant for an efficient use of different RIS key technologies and provision of information services are not in use in the RIS on the Dnipro. Most probably the revised RIS directive that will be formalised in 2022 will make the use of standardised reference data mandatory.

12. Application Specific Messages (ASM) for AIS and AIS Aids to Navigation are not implemented on the Dnipro yet.
4 Enhancements and extensions of River Information Services on the Dnipro

4.1 Introduction

In this chapter the possible enhancements and extensions of RIS on the Dnipro will be described and is based on the assessment of the actual RIS services as provided on the Dnipro and taking into account:

- The objectives of RIS for potential stakeholders/user of RIS in Ukraine;
- The practical information needs of the RIS users in Ukraine;
- The RIS directive, the commission regulations as well as the possible amendments in the RIS directive that will be updated in 2022;
- RIS services, systems and applications and technologies that will be advised in this chapter are available on the market and are in operation in inland navigation in Europe.

In addition to the proposals for RIS enhancements and RIS extensions, as described in chapter 4.2 till 4.4., it is also recommended to:

- Appoint a RIS competent authority in line what is stated in the RIS directive article 8; "Member States shall designate competent authorities for the RIS application and for the international exchange of data. These authorities shall be notified to the Commission";
- Take into account that the extension of the RIS services on the Dnipro and the introduction of different types of RIS services for the benefit of new user groups will require new expertise of employees working in the RIS domain e.g. UkrRIS centre and requires special training and education. It is suggested to develop specific training and education programmes. Consultation of members of the EDINNA group, the educational network of inland waterway navigation schools and training institutes, could be of added value;
- At this moment the organisation of services on the Dnipro is very scattered, this influences in a negative way the efficiency and effectivity of River Information Services on the Dnipro. Some examples for this are:
  - RIS would be very helpful for lock operations but, although RIS sub-centres are situated near lock operation centres, lock operators cannot use RIS;
  - The State Hydrographic Service is producing ENC’s but does not provided to UkrRIS ENC’s for free and there is no joint operation possible on the development of the RIS index;

An institutional setting in Ukraine as proposed in relation to the new Law on IWT (1182-1-d) would be very beneficial for the operational efficiency and effectivity of River Information Services and would considerably reduce the internal costs for the enhancement and extension of RIS as depicted in this chapter.

The enhancements and extensions are split into three scenarios:

- Enhancements on short term (implementation and operation within 0-3 years);
- Enhancements and extensions on medium term (design, implementation and operation within a period of 3-8 years);
- Extensions on the long terms (design, implementation and operation within a period 8-15 years).
In underneath table, the enhancements and the extensions are depicted in their compliance with the existing RIS Directive and the possible obligations in the new RIS directive as to be formalised in 2022.

<table>
<thead>
<tr>
<th>RIS Directive 2005/44/EC</th>
<th>New RIS directive to be formalised in 2022</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mandatory</td>
</tr>
<tr>
<td>Implementation RIS Index</td>
<td>yes</td>
</tr>
<tr>
<td>Implementation ENI</td>
<td>yes</td>
</tr>
<tr>
<td>Implementation RIS reference data</td>
<td>yes</td>
</tr>
<tr>
<td>upgrade to inland ECDIS edition 2.4</td>
<td>yes</td>
</tr>
<tr>
<td>Upgrade to NtS standard no. 416/2007</td>
<td>yes</td>
</tr>
<tr>
<td>RIS for lock operations</td>
<td>Yes, but an essential service</td>
</tr>
<tr>
<td>RIS for emergency response</td>
<td>Yes, but an essential service</td>
</tr>
<tr>
<td>RIS for port and terminal operations</td>
<td>Yes, but an essential service</td>
</tr>
<tr>
<td>Mandatory use of iAIS and iENC on board</td>
<td>Yes, mandatory on part of the IWT network</td>
</tr>
<tr>
<td>Extension of VHF network</td>
<td>Is not part of the actual or future RIS directive but audio communication is essential for safety and emergency operations of the RIS centre.</td>
</tr>
<tr>
<td>Extension voyage reporting</td>
<td>yes</td>
</tr>
<tr>
<td>Information exchange with external systems</td>
<td>yes</td>
</tr>
<tr>
<td>Upgrade AIS</td>
<td>yes</td>
</tr>
</tbody>
</table>
network to iAIS

<table>
<thead>
<tr>
<th>Introduction electronic reporting</th>
<th>yes</th>
<th>yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implementation traffic planning</td>
<td>yes</td>
<td>Yes, but the extension is an essential corridor management service</td>
</tr>
</tbody>
</table>

**Remarks**

- The proposed enhancements and extensions will not take into account possible organisational, legal and financial restrictions.
- In the proposals for enhancements and extension as depicted in this chapter an estimation of costs for the procurement of software and hardware is included. The internal costs for the preparation of requirements, the specification of the procurement as well as small software updates are not included as this depends from organisational capabilities, procedures and effectiveness of the governmental organisations.
- In this chapter the term:
  - “enhancement” means that improvements of the RIS can be achieved based on the existing technology and services as already in operation in UkrRIS
  - “extension” means that additional technologies, systems and services are needed.

Figure 15 on the next page will provide in a schematic way an overview of the short-term, mid-term and long-term scenarios. In this schedule the chapters are given where the topics can be found.
4.2 Short term - Enhancements of River information Services on the Dnipro

4.2.1 Implementation and operation of the RIS index

Already in the early days of RIS there was awareness for the importance of a uniform encoding scheme for the location codes, in order to avoid severe interoperability issues. This led to the introduction of the RIS Index, intended to be a register of all locations with relevance for RIS and supplying to RIS users all relevant data concerning navigation and voyage planning on inland waterways. The RIS index is
This project is funded by the European Union

Assistance for Dnipro Transport Development
EuropeAid/139464/DH/SER/UA
(Contract No.: ENI/2018/404-292)

The project is implemented by
Consortium led by
Ecorys

utilised by Tracking and Tracing technologies, Inland Electronic Navigational Charts, Notices to Skippers and Electronic Reporting.

In order to achieve a harmonised, common European RIS Index, the national competent authorities responsible for RIS provide the national RIS Indices according to a common encoding scheme in a coordinated approach.

The RIS Index covers the following information needs:

- **Skippers** - need to know (electronically) all information during the pre-planning of a voyage (such as the dimensions of the bridges on the route, blockages of the fairway or locks) as well as on route (for example location information to fulfil their electronic reporting obligations or ad-hoc blockages of the fairway)
- **Authorities** - need to know the places of departure and destination, the respective places of loading and discharge and moreover most probably the place of border crossing - a combination of the various elements could be very useful.

The European RIS standardisation groups did provide the authorities a guide for encoding the relevant objects, it is advised to use the this RIS index encoding guide, this guide can be provided on request.

**Advice**

It is advised to develop and implement the RIS index for the Dnipro.

It is advised that once the RIS index for the Dnipro is produced to integrate this in the European Reference Data Management System (ERDMS) as operated by the European Commission.

**In practice**

For the implementation of the RIS index a joint operation would be needed between UkrRIS as provider of the Notices to Skippers and voyage reports and State Hydrographic Service “Ukrmorcartographia” as producer of the Inland ENCs. The ENC kernel of dKart and the SevenC’s software is prepared for the use of the RIS index.

**Costs**

This enhancement does not require the procurement of technical systems and will only require the development of a database – excel based - and labour. All European IWT member states have implemented the RIS index and can provide their experience and are surely willing to provide the database for RIS Index.

**4.2.2 ENI and the European Hull Database (EHDB)**

Inland waterways vessels operating on European inland waterways need to meet different requirements in relation to safety, administration and crew provisions.

To ensure safe operation a vessel has to obtain an inland navigation certificate issued in accordance with Directive (EU) 2016/1629 8 by a competent authority. In the

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8 Directive (EU) 2016/1629 defines general provisions for the EHDB e.g. that Member States shall enter the data identifying and describing the vessels (without specifying what data).
certificate there is data identifying the vessel (name of the vessel, type of the vessel, dimensions of the vessel etc.). One of the most essential data for the vessel is a unique European Vessel Identification Number (ENI). Only one single ENI can be assigned to one vessel. ENI is issued only once and remains unchanged throughout the whole lifetime of the vessel.

The European Commission is operating a central European Hull Database (EHDB) as specified in the Commission Delegated Regulation (EU) 2020/474. This database can be consulted by the members states and authorised organisations. The database contains all European inland vessels with the specifications and certificates.

The European Hull database includes:

- the data identifying and describing the craft in accordance with this directive;
- the data relating to the certificates issued, renewed, replaced and withdrawn, as well as the competent authority which issued the certificate;
- a digital copy of all certificates issued by competent authorities in accordance with this directive;
- the data on any rejected or pending applications for certificates in accordance with this directive.

**Advise**

1. It is advised to introduce the European Identification Number in accordance with the European coding mechanism for ENI which requires legal adaptation of ENI for IWT vessels in Ukraine;
2. Extension of the Ukraine ship register with the ENI for inland vessels;
3. Interact with the European Commission on integrating the IWT vessels of Ukraine in the EHDB.

**In practice**

In practice the activities related to this enhancement are restricted – apart from the legal implications – to:

- The extension of the ship register database of Ukraine and the UkrRIS hull database with the ENI code;
- The development of interface of this ship register database of Ukraine with the UkrRIS hull database and the RIS applications of UkrRIS;
- The interface of the ship register database of Ukraine with the EHDB on condition of the agreement of the EC to have the Ukraine inland vessels integrated in the EHDB.

In addition, all vessel and fleet owners should take measures on the implementation of ENI on the vessels of their fleet and in their technical systems like AIS.

**Costs**

This enhancement does not require the procurement of technical systems and will only require the extension of the ship register database and the interface with the UkrRIS hull database and the interface to the European hull database.

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9 Sea river vessels should be excluded from this ENI number as their IMO code should not conflict with this identification.
The estimated costs for the procurement of the software for the interfaces and extension is EUR 25,000 on the pre-condition that the interfaces and extensions are specified and agreed by the related governmental organisations.

4.2.3 Implementation of Reference data

Apart from the RIS index and ENI/Hull database it is advised to implement also the most essential reference data used in the RIS domain as there are:

- Hazardous substances / goods or AND codes;
- Non-hazardous substances / goods (HS codes);
- Ship types (hulls and combinations);
- Container type.

In practice the advice means that the codes of reference data will be adopted to the European practice as specified in the Commission Regulations of the RIS directive.

In combination with the implementation of the RIS index as specified in chapter 4.2.1 it advised to interact with the European Commission to become a user of the European Reference Data Management System and to integrate the RIS index of Ukraine in the ERDMS.

Costs

This enhancement does not require the procurement of technical systems and software.

4.2.4 Inland ECDIS edition 2.4

As already mentioned in chapter 3.3.1 inland ENC's are produced and distributed by State Hydrographic Service “Ukrmorcartographia”.

The inland ENCs as produced in Ukraine are based on edition 2.0 of the inland ECDIS standard but will be upgraded on short notice on to inland ECDIS standard edition 2.3. The State Hydrographic Service is preparing the upgrade to inland ECDIS edition 2.4. The Commission Regulation for inland ECDIS no 2018/1973 is based on the Inland ECDIS standard edition 2.4.

Advice

It is advised to implement the Inland ECDIS standard edition 2.4 on short notice and thus bringing River Information Services with respect to the inland ECDIS standard in compliance with the Commission Regulation no. 2018/1973.

Parallel to the implementation of the Inland ECDIS standard edition 2.4 it is advised as already mentioned in chapter 4.2.1 to implement the RIS index by connecting the RIS index to the iENC objects.

In addition, it is advised to consider providing inland ENC’s free of charge as common practice in European member states. Providing the inland ENC’s free of charge would be an incentive for potential users of the RIS safety services.
In practice

In practice the state hydrographic service should study the consequences of upgrading Inland ECDIS from edition 2.0 and edition 2.3 to edition 2.4 and decide on speeding up this upgrade and connect the RIS index to the iENC objects.

Costs

This enhancement does not require the procurement of technical systems and software.

4.2.5 Application of the Notice to Skippers standard

As already mentioned in chapter 3.3.3. the Notices to Skippers is compiled by SHS in cooperation with UkrRIS and published on the UkrRIS web site. The Notices to Skippers are of excellent quality and meet the requirements of the Commission Regulation number 416/2007 for Notices to Skippers.

Advice

It is advised to upgrade the NtS of UkrRIS to the newest version of the Notices to Skippers as published in 2018 in the Commission Regulation no 2018/2032 on Notices to Skippers.

In practice

In practice the upgrade is restricted to the revision of the software of the RIS portal of UkrRIS with respect to the Notices to Skippers.

Costs

This enhancement does not require the procurement of technical systems. The upgrade of the RIS portal with respect to the Notices to Skippers will cost EUR 70,000\(^{10}\) on the pre-condition that the software upgrade is specified by UkrRIS. Pre-condition for these costs is that the functional requirements for upgrading of the NtS in the RIS portal are well specified.

4.2.6 Enhancement of River Information Services for lock operations

Lock management information service is one of the very essential traffic management services of RIS. On the Dnipro there is no connection between the lock operations and the services provided by UkrRIS.

The UkrRIS website presents AIS based traffic images of the Dnipro, these traffic images include the approaching areas of every lock on the Dnipro, see as an example underneath image for the lock Nova Kakhovka.

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\(^{10}\) The upgrade does not include a revision of the complete UkrRIS portal.
The information is available, but the human machine interface has to be improved by using an inland ENC as a web-based lock management viewer. The lock management viewer could be extended easily with a basic lock management information system that provides a list of vessels, and their locking details, that are approaching the lock with an ETA for the lock.

A suitable lock management information system is used in Austria and is published in the PIANC document "Technical Report on the Implementation Status of River Information Services status 2010" (see annex 1).

**Advice**

Develop a traffic image with lock management information system for the Dnipro locks based on practical experiences in Europe, an example is given in annex 1.

**In practice**

Define together with the organisation responsible for lock operations the requirements for a lock management information system.

Procure an operator monitor console as well as the design, development and implementation and putting into operation of the lock management information system.

**Costs**

The costs for the procurement of hardware and the design, development, implementation and putting into operation of the lock management information system are estimated at EUR 35,000. Pre-condition for these costs is that the functional requirements for the lock management information system are well specified.

After the initial procurement, a lock operator management information system including web-based traffic image viewer will cost about EUR 3,500.
4.2.7 Enhancement of RIS for emergency response

The principal reason for the introduction in some countries of reporting and in special the transport of dangerous cargo was for safety. In the event of an accident, the waterway authorities are capable of providing information on the vessel and its cargo immediately to those organizations which are responsible for the abatement of a calamity or emergency. Since the introduction of River Information Services the electronic information on the vessels characteristics and its cargo as well as the tactical traffic image provides a solid basis for the assessment of the accident or emergency and the coordination of rescue forces and the traffic measures that should be taken in the case of an accident.

In this respect, the original RIS guidelines describe the following functionalities for calamity abatement services or emergency services:

- Provision of information on incidents focussed on traffic situation;
- Assessment of the traffic situation in case of an incident;
- Coordination the assistance of patrol vessels;
- Assessment of the possible effects of the accident on the environment, people and traffic;
- Presentation of information to patrol vessels, police boats, rescue vessels;
- Initiation and coordination of search and rescue activities;
- Taking measures on traffic, environment and people protection.

The UkrRIS information services can support the emergency services in these tasks in the different sections of the Dnipro by:

- Providing information to all stakeholders (patrol vessels, police boats rescues vessels) on the traffic situation in the emergency or incident area;
- Provide information on the characteristics vessels and vessel carrying dangerous cargo in the vicinity of the incident.


Advice

It is advised to develop an emergency support information tool for the different types of stakeholders for emergency response services on the Dnipro. These services can be based on the existing AIS and inland ENC based traffic information and the reporting information of the vessels sailing in the emergency section of the Dnipro.

In practice

Define together with the organisation responsible for emergency operations the requirements for an emergency information system. The emergency system is to be used on shore and on board of the involved vessels like police boats and rescue services.

Procure an operator monitor console as well as the design, development and implementation and putting into operation of the application of the emergency information system.
Costs

The costs for the procurement of hardware and the design, development, implementation and putting into operation of the emergency management information system are estimated at EUR 50,000. Pre-condition for these costs is that the functional requirements for the emergency management information system are well specified.

After the initial procurement, an emergency response management information system including web-based traffic image viewer will cost about EUR 4,000.

4.2.8 Enhancement of River Information Services with port and terminal traffic information services

Port and terminal management information Service is as lock management an essential traffic management service of RIS. On the Dnipro there is no connection between the port and terminal operations and the services provided by UkrRIS.

The UkrRIS website however presents AIS based traffic images of the Dnipro, these include the approaching areas and port areas of every port/terminal on the Dnipro.

Advice

Develop a port and terminal traffic image and a port or terminal management information system for the Dnipro ports and terminal. This system can be based on the same platform as for lock management.

In practice

Define together with the organisation responsible for port and terminal operations the requirements for a port and terminal management information system. Procure the design and development a generic web-based port and terminal management information system.

The terminal or port operator will be responsible for the procurement of the operator monitor console as well as the implementation and putting into operation of the port or terminal information system.

Costs

The costs for the procurement of hardware and the design, development, implementation and putting into operation of the port/terminal management information system are estimated at EUR 50,000. Pre-condition for these costs is that the functional requirements for the port management information system are well specified. The costs for hardware and software for the port management information system as well as the interface with UkrRIS – the voyage journal and the AIS network – is seen as the responsibility of the port/terminal operator.

After the initial procurement, a port and terminal management information system including web-based traffic image viewer will cost about EUR 4,000.

4.2.9 Mandatory use of inland AIS and inland ENC

An inland AIS device improves navigational safety. Using the inland AIS device and appropriate chart display systems enables the skipper to have a traffic image of the area where the vessel is navigating. This requires an inland AIS device in combination
with an electronic nautical chart display system where the AIS “plots” are overlaid on the electronic chart, enabling the skipper to see other vessels’ position and movements in the navigable channel. The MKB\(^{11}\) screen as integrated in the AIS device is not large enough to provide an acceptable traffic image. The CCNR has made it compulsory to possess and use an Inland AIS device connected to an Inland ECDIS device in information mode. This obligation applies to the Rhine.

Using an inland AIS device in combination with an electronic nautical chart (iENC) display as an iENC-viewer and is operated according to the inland ECDIS standard in “Information Mode”. More sophisticated installations combine the inland AIS device with a radar display together with an iENC, these systems operate in so called “Navigation Mode”.

There are many iENC viewers in Information Mode in operation in Europe, products of software suppliers like Cmap, Tresco (Navigis) and Periskal (Navigo). These iENC viewers have also the additional feature to present the Notices to Skippers connected to the object in the ENCs.

**Advice**

A minority of the vessels sailing on the Dnipro are using the AIS device in combination with an electronic nautical chart (iENC) display as an iENC viewer in Information Mode or in Navigation Mode. The consequences are as mentioned before that the AIS devices are not used in practice for safe navigation, therefor it is advised to create a carriage requirement for inland vessels sailing on the Dnipro to use AIS at least in combination with inland ENCs in information mode.

It is also suggested to create for inland vessel – not for sea-river vessels - a transition period for a shift from maritime AIS devices to inland AIS devices type A in compliance with the Commission Regulation on Vessel Tracking and Tracing no 2019/838.

It is suggested to create a funding mechanism for the owners of the inland vessels for the procurement of the ENC viewers in information mode.

**Costs**

- The estimated costs for an Inland AIS transponder and inland ENC viewer in “information mode” are EUR 5,500 including license costs for iENC’s
- The estimated costs for an Inland AIS transponder and inland ENC viewer including PC in “navigation mode” are: EUR 7,000 including license costs for iENC’s
- The costs for an Inland navigation radar are: EUR 15,000.

In these costs, installation works are not included.

4.3 Medium term – Enhancements and extensions of River Information Services on the Dnipro

4.3.1 VHF network

As already mentioned in chapter 3.2.2.2 the VHF network that is in operation for the moment is not providing full coverage of the Dnipro. The VHF communication between the UkrRIS centre and the vessels is essential for voyage reporting and as a safety

\(^{11}\) MKB = Minimal Keyboard and Display
communication tool in case of an emergency. Extension of the VHF network with coverage of the whole river and sufficient redundancy in the transmission equipment is needed.

**Advice**

Extend the existing VHF network for safety communication on the Dnipro to full coverage of the Dnipro.

**In practice**

Define the functional and technical requirements of the extension of the existing VHF network.

Procure the development, implementation, putting into operation and the maintenance of the extension of the VHF network for the Dnipro.

**Costs**

The costs of one VHF base-station are: EUR 10,000

The amount and positions of VHF stations has to be defined on the basis of field strength calculations and a field survey. The above-mentioned costs are without antenna-mast and construction and installation works.

**4.3.2 Extension of voyage reporting with detailed cargo and crew and passenger information**

For the moment the reporting procedure does not include the detailed information on the cargo and is for non-dangerous cargo restricted to the reporting of the type of cargo. As under chapter 4.2.3 on the European Reference Management System the coding of dangerous and non-dangerous cargo is standardised according ADN and HS codes, the reporting can be harmonised and compliant with the European cargo reporting standard.

**Advice**

For safety, transport planning and statistical purposes it is advised to extend the reporting of voyages with the information on cargo and number of crew/passengers on board.

**In practice**

In practice the extension will lead to the adaptation of the voyage reporting journal and the publication of this measure to the stakeholders and the RIS operators to extend their reporting procedure with additional information.

The software of the voyage reporting journal needs to be extended.

The bureau for statistics of Ukraine needs to be informed on the extension of RIS with transport information.

**Costs**

The costs for the procurement of the design, development, implementation and putting into operation of the voyage reporting journal are estimated at EUR 20,000.
Pre-condition for these costs is that the functional requirements for the adaptation of the journal software is well specified.

4.3.3 Information exchange with Ukraine maritime management information systems

Since 2014 a Port Community System is in operation in the Ukraine seaports. Also in Kherson - a port with mixed traffic and the starting point of the inland navigation - the PCS is in operation. The flow of documents started to be transferred to paperless transport documents since the introduction of the PCS. Paperless transitions are in operation in the case of registration of vessel calls and cargo handling in the seaports of Ukraine.

Amongst many other processes the Ukrainian PCS takes care of:

- Electronic declarations of the cargo (freight forwarder) (duty) for the export from the ports of loading / empty containers (inner, passing transit);
- Information in case of goods import into Ukraine;
- Customs permit for cargo release from the checkpoint and port territory;
- Reception/sending messages module to/from other information systems;
- Information transmission for the port operators.

Advice

It is of added value to create an interface between the PCS of the seaports in Ukraine and the voyage journal of UkrRIS in order to exchange information of sea-river ships that pass Kherson towards the Dnipro vice versa.

In practice

Define in cooperation with the PCS operator of the seaports the interface requirements between the PCS and the UkrRIS voyage journal.

Based on these the interface requirements, a procurement should be launched for the development, implementation and putting into operation of the interface software.

Costs

The costs for the procurement of the design, development, implementation and putting into operation of the software for the interface between the PCS of the seaports and UkrRIS are estimated at EUR 40,000. Pre-condition for these costs is that the functional requirements for the adaptation of the journal software is well specified and the source code of the PCS software can be provided.

4.3.4 Upgrade AIS network to and inland AIS network including new operator system

As mentioned in chapter 3.6 the AIS network of UkrRIS is based on maritime base stations and consequently does not comply with the Commission Regulation for VTT of the EC. In addition it has to be mentioned that the technical central monitoring and server infrastructure as available in the RIS centre in Odessa is rather outdated and is missing some functionality available in modern RIS centres.

Advice

It is advised to renew the maritime AIS base station by inland AIS base stations that comply with the most recent Commission Regulation for VTT and in addition renew the central monitoring and server system in Odessa.
In the upgraded network it is advises to:

- Include the ASM functionality to create to possibility to address a vessel or group of vessels with dedicated messages;
- Include – in agreement with the hydrographic office as responsible organisation for Aids to Navigation (AtoN) – the technical and functional features of monitoring AIS AtoNs or virtual AtoN.

It is also recommended to consider the centralisation of RIS services on the Dnipro in the existing main RIS centre in Odessa and abolish the sub-centres. There is no technical or functional reason to stick to the concept of sub-centres. Measures should be taken to centralise also the communication with vessels that report their voyages and with local authorities. The centralisation is expected to increase the efficiency of UkrRIS.

In annex 3 a description is given of the AIS network with central server system called DIMAMONIS as implemented in recent years in the Netherlands. On request the functional requirements and specifications of the system can be provided.

**In practice**

The functional requirements and specifications of the upgraded iAIS network and central monitoring and server system should be defined. The relevant stakeholders of the system should be consulted to come to the adequate requirements.

Procure the design, development, implementation and putting into operation and the upgraded iAIS network and central system.

It might be of added value to contact the Dutch ministry of transport to discuss the specifications the DIAMONIS systems as applied in the Netherlands and as depicted in annex 3.

**Costs**

The costs for the hardware and the design, development, implementation, putting into operation of the iAIS network and the control system are estimated at EUR 1,800,000.

Pre-condition for these costs is that the functional requirements for the upgrade of the iAIS network and the control system is well specified.

**4.4 Long term – Extensions of River Information Services on the Dnipro**

**4.4.1 Introduce electronic reporting on the Dnipro**

Shifting from voyage reporting by VHF communication to electronic reporting and striving to a paperless IWT is not a sinecure and such a decision has to be taken with care and requires an excellent preparation and should be based on experiences in Europe.

The step to electronic reporting requires first of all the expertise and basic willingness of skippers, shippers and authorities to take this step and all stakeholders should have benefits of this step. E.g when skippers have to report their voyage this should replace reporting by VHF or providing transport documents in paper format.

In more detail the introduction of Electronic Reporting should:
Facilitate electronic data interchange among private partners (ship owners, skippers, shippers, terminals, ports) and authorities in inland navigation as well as with partners in the multi-modal transport chain involving inland navigation.

Avoid multiple reporting of skippers to competent authorities and limit the provision of the same data related to a voyage to different authorities and/or commercial parties.

On the Rhine electronic reporting is obliged - after many years of experience – for container vessels and tank vessels. On the other hand, in some of the member states electronic reporting is still in a pilot stage.

**Advice**

It is advised to introduce electronic reporting in a phased approach and make electronic reporting legally possible. Based on experiences and benefits it should be decided whether electronic reporting should be made mandatory.

**In practice**

The following phases are proposed:

1. Study the experiences in Europe on the introduction of Electronic Reporting where the experiences in Rhine countries – where electronic reporting is for some vessel categories mandatory – and Danube countries where at some places the reporting is in a pilot phase;

2. Study the applicating of BICS. BICS is a mature electronic reporting concept and application that has been introduced in 90’s of the previous century. See for more details the BICS website[2];

3. Study the application on electronic reporting that is at the moment of writing this report in a procurement procedure in the project RIS COMEX under the guidance of viadonau. In the next chapter a description will be given on RIS COMEX;

4. Study the electronic reporting facilities as integrated in the software of some of the iENC viewers mentioned in chapter 4.2.9;

5. Define, based on the experiences in the Danube countries and with the existing applications like BICS and the possibilities and requirements of stakeholders in Ukraine, a pilot on electronic reporting. This pilot can focus on a restricted category of vessels. Start a procurement procedure for the implementation and operation of a pilot electronic reporting and invite vessel owners and/or skippers for participation;

6. Based on the evaluation of the pilot define whether electronic reporting will be put into operation and amend the reporting journal into an electronic reports management information system.

**Costs**

The procurement of the organisation and evaluation of an electronic reporting pilot with a restricted number of vessels for a restricted period and the procurement of the implementation of the shore based electronic reporting software for this pilot is estimated at EUR 300,000.

Precondition is that on board of the vessels an existing application like BICS or similar will be used.
4.4.2 Traffic planning system

Corridor Management is the next step in the development of River Information Services. Corridor Management as a concept aims at improving and linking existing RIS services on a route or network in order to provide River Information Services not just locally, but on regional, national and international level. Therefore, Corridor Management will realise support for route planning, voyage planning, transport management and traffic management which are at present, if at all, just available in fragments. Corridor management will bring transport information services into maturity.

RIS COMEX is an EC funded project aiming at the definition, specification, implementation and sustainable operation of Corridor RIS Services. RIS COMEX started in the course of 2016 and will last until the end of 2021. The project area covers altogether 13 different European countries under the coordination of the Austrian Waterway Administration viadonau. See also the RIS COMEX project website.

The project aims in special on:

- Better planning of inland waterway transports;
- Reduction of waiting and travel times;
- Increase of efficiency within the execution of inland navigation transport;
- Optimal use of infrastructure (increased utilisation of capacities);
- Reduction of administrative barriers.

In this respect the implementation and operation of traffic planning services based on the corridor management concept would benefit on the long-term River Information Services in Ukraine.

In annex 4 the traffic planning concept is described, the annex is part or the PIANC “Technical report on the status of River Information Services - Update 2011-2019”. The traffic planner is tested in the Netherlands and is defined as input for the RIS COMEX project.

Advice

It is advised to study the results of RIS COMEX with respect to the voyage and traffic planning concept and application and decide on the added value for Ukraine and if positive implement and operated this concept.

In practice

Evaluate in 2021 the results of the RIS COMEX project with focus on the trials and operation of traffic planning and decide what the benefits will be for use on the Dnipro.

Test the traffic planning application as tested in the RIS COMEX project in a pilot environment on the Dnipro and adopt this traffic planning application and prepare the interfaces to the existing RIS infrastructure of UkrRIS. Invite for this pilot test vessels sailing on the Dnipro.

Costs

The procurement of the organisation and evaluation of a traffic planning pilot with a restricted number of vessels for a restricted period and the procurement of the implementation of the adaptation of traffic planning software on shore and on board for this pilot is estimated at EUR 600,000.
Precondition is that the existing traffic planning application of the RIS COMEX project will be adopted and adapted to Ukrainian infrastructure.
Annexes
Annex 1 Lock Management Services on the Austrian Danube

From the first of January 2009 the handwritten lock diary was replaced by an electronic tool supporting the management of all locking operations and processes on the nine Austrian Danube locks.

Following a successful implementation and several months of parallel operation, the new system was officially launched on 1 January 2009. Among the main tasks of the new system are the standardized documentation of all operational lock processes and the complete data registration of all completed lock operations, including detailed information on every single lock operation, such as grouping of vessels/convoys, convoy formations or entrance, exit and waiting times. Based on these data, the system enables the compilation of extensive statistics while reducing the administrative costs involved.

A close system-connection with the Austrian AIS infrastructure, as well as automatic vessel identification via voice radio further supports the lock personnel. The transmission of lock data between neighbouring locks along with a graphic display of the traffic situation at the upstream and downstream section of the lock provides detailed information on the approaching vessel traffic at every lock on the Austrian stretch of the Danube.

Besides the reduction of the workload of the operators, the system also has benefits for skippers. Computer aided optimisation of the lock chambers and improved planning capability by the usage of AIS data results in increased throughput and reduced waiting times. Further the reduction of administrative burden and communication needs on the VHF enables the operators to focus more on traffic safety.

Figure 17: Lock planning on the Austrian Danube
Annex 2 Calamity Abatement Management System in Flanders – C@LRIS

Because of the complex alarming chain in case of a calamity, Flanders invested in an electronic support tool, named C@LRIS, for handling calamities. Dependant from the region, the classification and the severity of a calamity, different kind of persons need to be informed. The principal objectives of C@LRIS are:

(a) Enrich incoming notification:
   - C@LRIS relies on the basic RIS-key services to enrich an incoming notification of a calamity. In case of an incident with a vessel C@LRIS can provide:
     - Position information of the ship, when there is not AIS on board the estimated position based on reporting information will be provided.
     - The cargo and number of passengers on board based on electronic reports

(b) Inform people in charge of operations:

   C@LRIS will automatically propose the correct set of responsible people and their preferred way of communication. Communication means as telephone, email, sms and fax are available in C@LRIS. All incoming and outgoing communication is recorded.

(c) Inform skippers and other waterway authorities

   After rescue forces are alerted, C@LRIS will inform the skippers by means of a draft NtS- and AIS-message, which will be processed by the NtS- and AIS-applications. Finally, a military VHF-broadcast service broadcasts the calamity information.

(c) Monitor the situation

   While the calamity is ongoing, feedback can stream back to C@LRIS, allowing the RIS-operator to keep up to date of the calamity. Visual feedback is also foreseen by means of a video wall with Inland ECDIS, AIS, NtS and voyage and cargo information.

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Figure 18: C@LRIS concept
Annex 3 iAIS network of the Netherlands

DIAMONIS provides information services for the exchange of AIS data between vessels and advanced traffic management applications, as can be seen in Figure 19 below.

Figure 19: System overview of DIAMONIS

In Figure 19 DIAMONIS and its communication partners are visualised, from bottom to top (the numbers below correspond to the layers in Figure 19):

1. Vessels (inland and maritime) equipped with AIS mobile stations or Inland AIS mobile stations (out of scope for DIAMONIS);
2. The Dutch Inland AIS Monitoring Infrastructure (DIAMONIS), roughly consisting of antennas, AIS base stations, core servers and software, is primarily used to collect and validate AIS data acquired from AIS mobile stations installed on board of vessels. Furthermore, DIAMONIS shall be able to transmit both AIS messages from shore to those vessels. Finally, DIAMONIS shall provide a web based TTI for a limited number of users. Note: the yellow coloured box at the centre of Figure 19 depicts the part of the infrastructure that is in scope for DIAMONIS;
3. Applications providing VTM (Vessel Traffic Management) functionality such as safety management, corridor management, calamity abatement, lock- and bridge planning, (partially) based on the acquired AIS data from vessels (out of scope for DIAMONIS). These applications may instruct DIAMONIS to transmit AIS messages from shore to vessels whenever necessary.

Major components and interconnections

Figure 20 provides a more detailed picture of DIAMONIS within its operating environment, identifying all major internal- and external components:
The description of the numbered blocks in Figure 20 is as follows:

DIAMONIS (1) itself consists of the following three major components I, II and III:

I. Base stations and antennas. RWS expects that approximately 40 base stations will be required for coverage of all relevant waterways in the Netherlands, including base stations for fail-over purposes to maintain the required availability. RWS will provide all WAN and local network facilities;

II. Core servers and software to process, store, retrieve and communicate AIS data between base stations and surrounding systems;

III. A web server used to generate interactive web based TTI’s. RWS vessel traffic management centres (2) as well as locks and bridges equipped with radar/VTS systems (e.g. control posts that already have the possibility to display radar-based TTI’s). The interface with the core servers, depicted using a bi-directional arrow, is mandatory. Depending on the characteristics of the final system, an additional link (depicted using a dashed arrow) between DIAMONIS base stations and VTS systems may be required in order to meet latency requirements for fusion of AIS data with radar data.

Existing AIS monitoring systems (3) in the Netherlands operated by RWS-partners. RWS-partners equipped with their own AIS infrastructure include, in no particular order, the Port of Rotterdam, Groningen Seaports, the Dutch Coastguard and SRK (Schelderadarketen, the Scheldt Radar Network). At a later, currently unknown date, cross-border connections will have to be implemented. DIAMONIS shall interface with RWS-partners (and systems abroad) in order to exchange validated AIS data.

Approximately 120 control posts without radar (4). These control posts are typically equipped with standard PCs and web browsers technology, which will be used to present a web based TTI provided by the DIAMONIS TTI web server(s).
Interfaces to specific traffic management applications (5) and all other (partially future) applications that will use AIS data. Among these applications is the “Strategic Position Server” (SPS), which is out of scope for DIAMONIS.
Annex 4 Traffic Planning in a test environment in the Netherlands

To improve the performance of the logistics chain and the operations of skippers, shipping companies, ports and terminal operators the interaction between traffic planning and voyage planning will be of large benefit. The objective of this study and pilot test was to come to more reliable voyage plans on these corridors and optimization of the passage times of locks and bridges.

The study included the development, provision and use in a pilot environment of voyage planning applications on board of vessels sailing on the corridors Rotterdam-Germany, Rotterdam-Belgium border and Rotterdam-Amsterdam.

In this activity cooperation with branch organisations in Inland Waterborne Transport was established and their requirements were the basis for the specifications of the voyage planning applications. The pilot was executed in close cooperation with inland skippers.

To create traffic planning services a Traffic Planning System was developed. This action has given detailed insight into the input needed from several sources to make traffic planning viable and operational. The input that was needed and included in the traffic planning system was:

- A network representing the inland waterway infrastructure, including characteristics of the waterways and objects;
- Information on temporary disturbances that influence the capacity of the infrastructure. This information is usually dispatched through Notices to Skipper (NtS) messages and distributed by means of Fairway Information Services (FIS);
- Intended voyages of ships provided by skippers by means of voyage plans – ERIVOY messages. An ERIVOY message consists of the route a skipper intents to sail with Estimated Times of Arrival at certain waypoints, such as junctions, objects, terminals;
- Messages from vessels that inform on the cargo it is transporting – ERINOT messages. This is necessary, since for optimal lock planning certain vessels transporting dangerous goods (blue cones vessels) are not allowed to occupy the same lock chamber together;
- Position of vessels sailing on the inland waterways. These are transmitted by means of AIS transceivers on board vessels. The vessel positions are fed into the Traffic Planning System to determine the deviation of the vessel according to its intended plan (the ERIVOY message);
- The operating systems (SCADA) of the objects provide status information of the object through a new developed information service: Object Data Services (ODS). It provides object related process status information, such as sailing in, doors closing, water levelling, doors opening, sailing out, etc. This information is needed to determine the requested time of arrival (RTA) for certain vessels at certain objects, so smooth sailing is facilitated to reduce waiting times at locks and optimize lock planning.
Figure 21: Information flow in the traffic planning and voyage planning concept

The Traffic Planning System uses all input data described above to generate optimal object passages for the total fleet of vessels. It generates lock planning advices and provides these to operators, such as lock-operators.

To facilitate skippers with optimal lock passages, the RTA (as calculated by the Traffic Planning System) is distributed to the vessel by means of Traffic Information Services (TIS). The individual RTA’s are sent to the vessels and displayed on their Voyage Planning System on board. The skipper can subsequently adjust the vessel’s speed thus saving fuel and/or time for optimal passage of the object. Even more importantly, the vessel will arrive at its designated terminal with a more reliable sailing time and improve the reliability of the inland waterway mode of transport within the total logistic chain.

Voyage Planning Systems on board of vessels receive RTA’s and other TIS information, along with FIS information. This information is then used to calculate more accurate ERIVOY messages, providing the skipper and the operator of the vessel’s designated terminal with more reliable sailing times. Therefore, the more accurate waiting times at objects and RTA’s the Traffic Planning System provides to the Voyage Planning System, the more reliable the ERIVOY messages will be. This truly improves the quality and reliability of the Traffic Planning Information Services.