DIWA Report

Sub-Activity 4.1: Standardisation

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1 Executive Summary

Activity 4 of the Masterplan Digitalisation of Inland Waterways (DIWA) project is focusing on 4 topics. Standardisation, legal and regulatory framework, cybersecurity and privacy and data quality.

SuAc 4.1 of the Masterplan DIWA project identifies existing standards (and standardization frameworks) in the Road, Rail, Maritime as well as Inland Waterway sector. It was not the aim to make a complete inventory of all used standards, furthermore standards usually make use of / refer to other standards. The SuAc members concluded that such inventory would not provide a lot of added value. Therefore SuAc 4.1 takes-up questions and recommendations from other DIWA SuAc and tries to further elaborate on standardization perspectives and developments. The status-quo is analysed, standardization needs are further elaborated on in the chapter 'future situation'.

The following topics were identified that could contribute to improve RIS technical services:

- RIS.net: a proper technical specification of the digital RIS Inland Waterway Network is required for enhanced services like route- and voyage planning. It is recommended to finalize the specifications of RIS.net to provide the waterway sections and objects of relevance for inland navigation in a harmonized way.
- Uniform identification of locations: even though Electronic Reporting and Services based upon the RIS Index use the ISRS Location Code, the locations in the ERI Location Tables do not always have the same identifier as the RIS Index. Therefore, a certain location may have two different ISRS Location Codes depending on which code list is used to fetch the data. Harmonization/Merger of location codes is recommended.
- Maintenance procedures: reference data used in RIS technical services originate from different sources requiring different procedures for maintenance. It is highly recommended to start the task CESNI TI-21 (maintenance procedures) as soon as possible to analyse, specify and improve these procedures.
- Compliance with RIS technical standards: Common European Services contribute to proper implementation of RIS technical services as this is a pre-requisite for interconnection and seamless integration of information. It is recommended to make use of Common European Services for further improvement of standard conformity of national services.
- Exchange of data for traffic management: so far there is no technical RIS standard for exchange of data for lock and bridge management. It is recommended to further specify such a service. New developments such as "intention sharing in inland navigation" in the domain of traffic management should be analysed and the need for new standards identified.
- Object status Information: a modified DATEX II standard was implemented in RIS COMEX for operational status of bridges. It is recommended to further standardize this interface in order to safeguard harmonized implementation across the European waterways.
- Interfaces between different transport modes (road, rail, and inland waterway): to calculate an optimal route for cargo, For each transhipment location it must be known for which type of goods a transhipment location is suitable and which modalities are supported. It is recommended to consider and provide this within RIS.net.
- Waterway status information: so far there is no commonly agreed format/service for the exchange of data on the actual status of the waterways combining information from the waterway network, lock- and bridge operation times, Notices to Skippers as well as additional Object status Information. It is recommended to further investigate and specify such a Waterway status information service (as part of the RIS operational services[1]).
- Reduce amount of code lists required by legislation: efforts have been made to harmonize code lists on technical level, e.g. for types of means of transport, but due to the complexity and different requirements (e.g. goods reporting, statistics), creating an unambiguous conversion table has been difficult. In order to unburden the inland shipping entrepreneur as

[1] A RIS Operational Service (also referred to as 'RIS Services' before the 2019 PIANC RIS Guidelines) is an operational service that provides and uses information. See https://www.pianc.org/publications/inland-navigation-commission/wg125-1

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much as possible in the sense that he/she should not provide the same kind of data several times, it is recommended to:
    - reuse existing code lists as much as possible and to harmonize code lists in the revision of standards,
    - establish conversion tables and keep in mind that 95% is sufficient,
    - elaborate a list of duplicate code lists and ask the national representatives to address this in the respective committees, e.g. IMDG.
- The European rail sector is going to develop a new single platform named 'DP-Rail' for (standardised) data exchange between all involved parties in a rail transport. Some services will be valuable for multimodal transport. IWT should (further) investigate what is the best way to exchange data with this data hub for seamless multimodal (or synchromodal) transport.
- Paper-based procedures: research on legal restrictions to use digital documents showed that there are several restrictions, mainly related to supervision and enforcement by the government. It is recommended to investigate digitization of procedures on an EU-wide basis in a transformation from paper to digitally available information for routines required by authorities (e.g. inspections). eFTI is an initiative of the European Commission to promote it to businesses and enforce it to authorities.
- At the time of writing, the European Commission decided to exclude all national legislation concerning ERI from eFTI, effectively ensuring that ERI does not fall under the scope of eFTI. This avoids a conflict between ERI and eFTI, as the eFTI Regulation states that all electronic reporting must use certified eFTI platforms, which is not possible for the RIS Technical Service Electronic Reporting. It is, however, foreseen that the revision of the RIS Directive will contain the obligation extract all (eFTI relevant) info in the ERI messages from a certified eFTI platform when creating an ERI message. As a consequence, this activity still recommends to keep a close eye on eFTI.
- Test standards: ensure high quality and correct standard conform implementation of products. It is recommended to develop test standards for products and services that are implemented by multiple parties to support uniform and harmonised implementation of services.
- Standard APIs of Common European Information Platforms such as EuRIS: The CEF funded project RIS COMEX introduced a Common European Information Platform for inland waterway transport, which is jointly governed and operated by fairway authorities and waterway managers of several EU Member States and non-EU countries. EuRIS makes extensive use of APIs for exchanging data on waterway infrastructure and traffic information. It is recommended to make the API specifications openly available, and to identify the APIs that could be subject for a broader standardisation. Furthermore, it is recommended to include the EuRIS APIs into the interface architecture of the emerging Common European Mobility Data Space, an initiative of the European Commission. Standard inland navigation APIs will facilitate the interconnectivity and interoperability with other information systems, e.g. Port Community Systems.
- CESNI and its permanent working group CESNI/TI operate under a formal mandate to standardise and harmonise developments in the field of information technology in European inland navigation. It is recommended to strengthen the cooperation with CESNI/TI and for the CESNI Member States to actively engage in the design and development of the CESNI/TI work programme.

<u>Standards in the road sector (ITS)</u>

The road sector has more than 200 standards for different services and applications, such as electronic fee collection, eCall, public transport, automatic vehicle and equipment identification, cooperative intelligent transport systems, traffic and travel information, and data exchange specifications for traffic management and information (DATEX). Cooperative intelligent transport systems consist of several standards, including those for contextual speeds, ITS station facilities for the transfer of information between ITS stations, and communication profiles for secure connections between trusted devices. DATEX II is a standard used for the exchange of traffic information and traffic data in Europe, and it can be considered the "RIS standards for the road." DATEX II has several parts covering different aspects of traffic management, and its exchange protocols are specified separately from the content specifications, allowing flexible use of the content specifications with any defined exchange protocols. There are elements which could be applied to IWT relatively easy, particularly for movable bridge status data (which has already been done in the Netherlands).

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Standards in maritime sector (e-Navigation)
There is a long tradition of adopting standards from the maritime world for inland purposes (e.g. AIS, ENC) and certainly in mixed traffic areas it is important that both maritime and inland vessels use mutually comprehensible communication and data exchange via compatible standards.
The most significant development in maritime in the area of standards in the upcoming years is the introduction of the S-100 framework of standards. S-100 covers various products related to hydrography, navigation, and marine traffic management.
While the Masterplan DIWA project has identified S-100 as a topic of interest, an in-depth impact analysis of its various components on the IWT and/or RIS standards is not feasible within the project's timeframe. Therefore, it is recommended that impact analysis within relevant CESNI working groups continues, with special attention given to additional/new topics like S-421 Route Plan, SECure COmmunication (SECOM), and Maritime Autonomous Surface Ships (MASS). These topics are important to investigate as they could potentially have an impact on the development of RIS services and their cyber resilience.

Standards in the rail sector (ERTMS)
The ERI messages and the HERmes 30 message have some similarities in the general data and also some differences in the more specific information. Although both transport modes still can have their own messages, the incorporation of certain entries can also be useful in IWT.

Like the recent development of a central information platform in IWT, the rail sector as well decided to centralise the provision of relevant information about train composition and train (including waggon) movements. The new platform (DP-Rail) will use already established messages for gathering data. The more centralised approach of data provision will make it easier for IWT to exchange data in case of multimodal freight transport.

In the rail sector, the UIC has defined a V-cycle approach in order to follow a structured pathway for the development of new standards and specifications. This approach includes all relevant stakeholder and has a clearly defined sequence of processes. The Inland navigation sector could review its own approach of standardisation and try to learn from rail if optimisation is needed.

Standards in the RIS area
The European Committee for drawing-up standards in the field of Inland Navigation (CESNI) was set-up in order to adopt technical standards in various fields, in particular regarding vessels, crew and information technology. The respective regulations at the European and international level, including those of the European Union and the Central Commission for the Navigation of the Rhine (CCNR), may refer to these standards with a view to their application.

The RIS technical services are published by CESNI in ES-RIS (European Standard River Information Services. In 2019, four temporary working groups have been set-up to further develop the RIS technical services. The first edition of ES-RIS, ES-RIS 2021/1, was adopted by CESNI in April 2021. Meanwhile a second edition of ES-RIS (edition 2023/1) has been adopted and published by CESNI.

ES-TRIN (European Standard laying down Technical Requirements for Inland Navigation vessels) and ES-RIS are revised and published every two years.

An amendment of the RIS Directive is needed in order to refer to ES-RIS.

RIS Index:
The RIS Directive requires Member States to provide all relevant data concerning navigation and voyage planning on inland waterways to RIS users in an accessible electronic format. However, the electronic format is not further specified in a commission implementing regulation. The RIS Index was established as a first harmonized reference dataset for Notices to Skippers (NtS) over 20 years ago to refer to objects on waterways in NtS messages. The RIS Index makes use of the ISRS Location Code to identify objects, but there was no common agreement on the maintenance procedures for the ISRS Location Code, resulting in objects not being referred to with the same ID in different services and applications. The ISRS Location Codes are also maintained for electronic reporting in the ERI Location Tables, but these codes are not always in line with the ISRS Location Code assigned to a specific object in the RIS Index. It is strongly recommended to complete the merger of the ERI Location Codes with

the RIS Index Location Codes to have a single code list with unique identifiers for specific objects. There are three types of locations to draw special attention to:

- Locations outside the area of competence of RIS authorities but within the RIS area (e.g. private ports)
- Locations outside of the RIS area (e.g. Oslo)
- Locations used and maintained by logistics (e.g. private terminals)

It is recommended to have a pragmatic approach first and a sustainable solution second. The need for further technical specifications and improvement was expressed by involved stakeholders, therefore CESNI defined task TI-15 to prepare technical specifications for data for navigation and voyage planning.

VisuRIS COMEX Reference Network Model

In the CoRISMa project first attempts were made to create a European Nautical Network Data Services (NNDS) based on the RIS Index. However, this network was derived from individual RIS Index points and did not provide parameters of specific links (Fairway sections) between objects. When EuRIS was implemented, the VisuRIS COMEX Reference Network Model was developed to provide all relevant objects with required attributes and their relations, including the parameters of the physical links. The VisuRIS COMEX Reference Network Model is a EuRIS application specific implementation and a general specification for future standardization is required and provided by the RIS.net concept.

RIS.net

The RIS Index lists objects of relevance for Inland Navigation, and the VisuRIS COMEX Reference Network Model was developed to add specifications for fairway links. The RIS.net concept combines information from the RIS Index and the VisuRIS COMEX Reference Network Model, adding also capabilities for services not yet included in EuRIS. The concept needs technical validation and defined maintenance procedures. The RIS.net concept needs to be implemented before standardization, and the RIS Index will be supported through legacy support. A new generic RIS_ID is included in the RIS.net concept to address issues with the ISRS Location Code as the primary ID of locations. The RIS.net concept is expected to be finalized in 2023, with a demonstrator to prove the concept by using selected test data sets. The rolling-out of the RIS.net concept could start in 2025, with national reference data to support the implementation. All steps could be carried out in a European project; thus, it is recommended to allocate sufficient funds in a European project for these tasks.

New messages for voyage information

The ERIINFO message shall be sent out by Vessel Traffic Management systems automatically or by an operator under special circumstances to inform the skipper that an update of the voyage plan (ERIVOY) is requested.
The Object Access message will be sent to the respective skippers to inform whether their vessels will be included in an upcoming locking cycle.
The Requested Time of Arrival (RTA) message provides the vessel with a preliminary lock cycle plan or bridge passage plan to give information needed to optimize their approach to an object, including RTA.

Object status information:

In the Netherlands a large number of bridges were equipped with sensors that transmit their operational status to the national access point for road data using the DATEX II standard.

The modified DATEX II standard was implemented in RIS COMEX for the provision of object status data both towards EuRIS and from EuRIS to third parties. The lock status data structure includes lock status, lock planning, and obstructions. These specifications are being used by Rijkswaterstaat (NL), VNF (FR), viadonau (AT), and Státní plavební správa (CZ) for providing object status data.
Expanding DATEX II with fairway specific elements like lock status was deemed not prudent since it would be an overkill for the IWT domain to use the entire DATEX II standard which contains many for IWT irrelevant items and it would be inefficient for the road domain to have to take IWT into account for a comparatively small part of the standard.
It would be advisable however to integrate the preliminary standard used in the COMEX project in the RIS technical services to safeguard harmonized implementation across the European waterways.

Inventory of paper-based procedures

The Dutch Ministry of Infrastructure conducted a research on the legal and information needs of transport for all modalities, including inland water transport, resulting in a list of 170 information needs by different governmental organizations. The research aimed to determine whether there are legal restrictions to digitize documents, and it was found that there are a number of restrictions in legislation, mainly related to supervision and enforcement by the government. The upcoming eFTI regulation is an opportunity to support further digitalization, but it's not clear which information needs will be affected. Laws and regulations, procedures, organizational and supporting systems need to be adapted to support digital transformation. The Masterplan DIWA project aims to work towards paperless transport, but the digitalization of individual documents for transport needs further investigation on an EU-wide basis.

<u>eFTI</u>

In a broader sense, eFTI (electronic Freight Transport Information) is a set of data elements processed electronically for the purpose of exchanging regulatory information amongst economic operators (mainly companies involved in freight transport and logistics) and between operators and competent authorities. The eFTI approach enforces standardization and harmonization through an EU regulation, and it establishes a legal framework for road, rail, maritime, inland navigation and air transport operators to share information with enforcement authorities in an electronic format. eFTI can bring data models for different transport modes together towards synchromodality, as it enables standard information interfaces. The eFTI data model (which is still under construction) is based mainly on the UN/CEFACT Multi-Modal Transport Reference Data Model. For inland navigation it is envisioned that eFTI and ERI will be partly overlapping. The development of a (partial) conversion service from ERI information to eFTI information (and vice-versa) may be possible to support the transition/migration, although there are legal consequences which should be investigated by SuAc 4.2. IWT has an advantageous position regarding the introduction of eFTI and could gain a competitive advantage via swift implementation. DIWA Ac 5 and any other follow-up projects should take further developments of eFTI into account.

<u>Test Standards:</u>

Test standards ensure the correct implementation of required functions, interoperability between different manufacturers, and a high level of quality of the product. They provide commonly agreed test procedures and are the basis for certification and type approval. The European committee for drawing up standards in the field of inland navigation (CESNI) has defined test standards for various equipment used in inland navigation, such as vessel tracking and tracing systems and electronic chart display and information systems, among others. It is recommended to develop test standards for international standards that have to be used by multiple parties in inland navigation to support a uniform and harmonised implementation of the appropriate technical services.

<u>Harmonization of code lists:</u>

Enumerations and code lists in standards are required to ensure clear and accurate interpretation of content. Code lists also help to reduce the size of data exchanges. Different IWT (Inland Waterway Transport) related standards have established various code lists based on their requirements, for example for types of means of transport or goods items. There are different requirements towards vessel types or goods items for statistics, cargo- and voyage reporting or vessel certification. Also, there are different categories of reference data, each with their own maintenance procedures. Efforts have been made to harmonize code lists, but due to the complexity and overlapping definitions, creating an unambiguous conversion table has been difficult, not only from a technical perspective, but also from an organisational point of view. It is recommended to reuse existing code lists and harmonize code lists in the revision of standards.

<u>Connecting nodes between different modes:</u>

The need for standard interfaces between different transport modes (road, rail, and inland waterway) is emphasized in the SuAc 2.2 report. To calculate an optimal route for cargo, there should be a link between locations, at least multimodal inland terminals in first step. To achieve this, a cross reference between different location code lists used by different transport modes is necessary, with standardized attributes for efficient and sustainable itinerary based on real-time information. This was investigated by Subgroup 1 of DTLF and could be important for the implementation of eFTI in a multimodal or synchromodal environment. Faulty or missing data on transhipment points should be reported by logistic service providers through a tool provided in RIS.

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Compliance with the RIS technical standards
The RIS Directive and Commission Implementing Regulations aim to harmonize the implementation of RIS technical services across Europe. However, monitoring compliance with legal provisions has been difficult due to implementation on national-level without interfaces. In addition, standards were not always unambiguous and left room for interpretation of the requirements. The EuRIS Portal, developed in the RIS COMEX project, revealed deficits in interconnecting and integrating national data sources into a common European service. Common European Services are necessary for proper implementation of RIS technical services and to put pressure on authorities to improve data and services by making visible faulty and missing information.

Waterway status information
In order to have an overall waterway status information, data from various sources needs to be combined to support voyage planning and overall infrastructure management. The digital inland waterway network serves as a baseline, with operating times and limitations for objects or sections, such as locks, published via NtS. Live status information can be fed into the system from local data sources, such as lock management systems. Sounding results can also complement the data available for specific sections, with a bottleneck service established on the Danube corridor to provide this information. To provide actual status information, data is aggregated from various sources, and a standardized interface is needed to exchange processed data.

Conclusions
Overall it can be concluded that in the field of standardization, works on the reference data and interfaces are required, both within the IWT/RIS domain, but also towards other modes of transport, to support multi-/synchro modality. In a fully connected, digitised world, processes and routines have to be re-thought to leave stamped paper documents behind. Legislation needs to regulate that the required information shall be accessible online to enforcement and inspection authorities.

2 Introduction

Uniform (technical) standards ensure consistency, efficiency, safety and unambiguous interoperability between systems and services. In this report standardization gaps in Inland Waterway Transport (IWT) are analysed and standards in other modes of transport are assessed.

RIS and IWT specific terms and abbreviations are used in this report. Where it was deemed feasible explanation was given in this report, otherwise sources like https://www.risdefinitions.org provide a good source of information.

2.1 Sub-Activity 4.1

The SuAc will investigate relevant standards in the context of this Action. As this Action will operate in a multimodal environment, the **inventory** will focus **on standardisation of collection, integration, exchange, presentation and analysis of data**, **information and systems in the domain of road, rail and waterborne transport**.

For the standardisation study, close cooperation was sought with the standardisation experts in inland navigation and the RIS domain. Interfaces with CESNI/TI[2] and the DTLF/DINA[3] expert groups of the European Commission was established. For the **expertise on standardisation in other transport domains** contacts was established in the Intelligent Transport Systems (ITS), European Rail Traffic Management System (ERMTS) and e-Navigation expert groups or correspondence groups including organisations such as International Maritime Organisation (IMO), International Association of Lighthouse Authorities (IALA), International Hydrographical Office (IHO), European

[2] European Committee for drawing up standards in the field of inland navigation (CESNI) Information Technologies (TI): https://www.cesni.eu
[3] Digital Transport and Logistics Forum (DTLF) / Digital Inland Waterway Area (DINA)

Telecommunications Standards Institute (ETSI), International Telecommunication Union (ITU), International Organization for Standardization (ISO), World Customs Organization (WCO), International Electronical Commission (IEC). Even if some of these international organisations don't have the mandate to publish standards officially with legal binding character, it can be useful to align with their point of view. When there is a need to refer to official standards, care must be taken to refer to the proper organisation (like IMO, ITU, IHO, ISO, IEC, ETSI, …).

3 Objectives of SuAc 4.1 Standardisation

The objectives, tasks and expected results for this Sub-Activity are outlined in the following subchapters.

3.1 Objective

The objective of this SuAc is to describe relevant standards in relation to IWT, business developments (activity 2) and technological developments (activity 3) having a specific focus on Gaps.

3.2 Tasks

Following tasks were identified in order to meet the objective of SuAc 4.1:

- Investigate and make an inventory on standards and recommendations in relation to Inland Waterway Transport (IWT), the business developments as defined in activity 2, and the technological developments as defined in activity 3, that are under development or implemented.

  The benefit of such of an extensive inventory on standards in relation to IWT was discussed by the SuAc members and it was concluded that trying to list all standards would require a lot of effort at the same time not seeing the benefit of such exercise. Therefore, it was concluded to focus on identified gaps and also to investigate if there are developments in other transport domains that could have an impact on IWT.

- Assess the possibilities of standardisation on the digital transition in the period 2022-2032 and define the needs and requirements for implementing new or amended standards.

- Draft the report on the inventory on standardisation and proposals for measures to be taken on standardisation in relation to the Masterplan Digitalisation of Inland Waterways.

3.3 Expected Results

Report on standardisation gaps and proposals for measures to be taken on standardisation in relation to the Masterplan Digitalisation of Inland Waterways.

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4 Work approach

This report was drafted by the members of this Sub Activity. During the Kick-Off meeting a brainstorm session on the standardisation gaps took place. These gaps were further elaborated on and also fed by ideas from the Work Program, SuAc Members and input for DIWA Activity 4. These topics were investigated via Desktop Research, and the results were presented and discussed in the following SuAc meetings. After the second meeting, a first draft report containing several placeholders for Desk Research topics that should be further elaborated or written down in a structured way, was created.

4.1 Interdependencies with other sub-activities

In masterplan DIWA activity 2 (Business developments), activity 3 (technical developments) and other SuAcs of activity 4 (legal and regulatory framework, cybersecurity and privacy, data quality) several references are made to standards. The content of this chapter is a summary of relevant aspects taken from the activity 2, 3 and 4 reports. The input from other SuAcs is further elaborated on in chapter 8.1 'Interactions with other Sub-Activities'.

Smart shipping (SuAc 2.1)

SuAc 2.1 identifies the following issues for Smart Shipping to support increasing automation levels of vessels:

- Lack of sufficient industry standards: connecting new systems on hardware that's already into place is difficult and most situations will need custom made solutions,
- Currently no agreed standards regarding digital communication between ship and shore are applicable (in comparison with C-ITS on the road),
- There is a lack of performance standards. The components present are often not intended to function in an integrated system with components from other suppliers.

Authorities are expected to take the lead in formulation of communications standards for ship-ship communication and ship-shore.

Standardisation is seen as a basic need to make sure that navigation can be done in a safe way. Proper standardised data models are required, or at least a minimal agreed representation of actual situations, navigational data, in order to be able to enable higher levels of automation in dynamic environments between various operators and actors. This is seen by one of the users as the 'common ground' for safe and explainable decision-making.

Standardisation and harmonisation are also related to data formats. Especially when system-system communication increases. If data input isn't standardized and the way in which data is delivered not harmonised, exchange of data between systems becomes hard and less reliable because some data will be lost. To exchange data, standardisation of communication protocols is needed as well. Making sure that data exchange is possible throughout corridors.

The European Union (EU) Directive 2005/44/EC and the River Information Services (RIS)-standards are examples of standards that do not take into account highly automated sailing.

SuAc 2.1 refers to a 2021 CCNR report which states that the CCNR "will update its own regulations (RPR, RVIR, RPN) and also propose to the European Committee for drawing up Standards in the field of Inland Navigation (CESNI) the development of any standards it deems necessary to ensure the safety of navigation and to allow the harmonisation of regulations on a European scale."
When looking towards the desired future state SuAc 2.1 calls for the development of a common communication standard and data architecture. Including a governance structure that allows for safe (cyber secure) communication and making sure that all privacy aspects are taken care of. In 2032 there is expected to be a uniform data exchange standard in place to ensure that systems development by different companies are able to communicate with each other. Making it possible to reach a coordinated transport system. All parties in the supply chain should by then have agreed on a common data architecture and governance structure to data exchange between relevant parties. To be able to

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share information in a way that all other ships are able to receive and produce this information, standardized data models are in place.
At the moment it is recognized that standards for communication between vessels for smart shipping purposes are not specifically developed for smart shipping purposes. SuAc 2.1 points towards VHF Data Exchange System (VDES) and PIANC WG 210 for suggested technical solutions.
With regard to data services provided by authorities, SuAc 2.1 expresses the concern that there could be gaps in standardisation due to smart shipping developers (or users) not being the main users of information provided by authorities. Also regarding standardisation (as for data quality) a feedback loop from these users towards the authorities is deemed very important.
It is furthermore stressed that standardisation should be supported by a process that never stops.

Specific question directed at SuAc 4.1:
Uniform data exchange requires the standardisation of communication protocols: open standard for real-time, secure data exchange. But, standards can vary from region to region. What are the developments on a standardized European protocol?

Synchromodality (SuAc 2.2)

SuAc 2.2 states that a necessary condition for the optimal use of inland shipping is that standard (information) interfaces within the various transport modes road, rail and inland waterway are put in place and their interoperability across modes is assured.
Research by SuAc 2.2 finds that RIS, CEERIS (Central and Eastern European Reporting Information System) and EuRIS have made a lot of progress in harmonising standards, however within the area of logistics and intermodal data exchange there are still a lot of not harmonised standards. Therefore SuAc 2.2 calls for public parties from all European countries to set-up harmonised standards in the commercial and private platforms of inland waterways, to reach an international harmonised level of synchromodality. Today, different standards are used for each portal, which leads to problems and in-consistency in-between systems. It would be great to have a common 'language' between the systems for the future.

Port & terminal information service (SuAc 2.3)

SuAc 2.3 recognizes:
Throughout the processes and information exchanges, the stakeholders involved can vary by each terminal or port so that standards are often far from being implemented.
By standardising and simplifying requirements for barges and other stakeholders, the authorities can help increase the efficiency and attractiveness of IWT and support political goals to promote more sustainable transport.
A trend for Terminals: Improving standardisation/automation in information exchange with business partners (cargo party, barge/rail/truck operator) along the supply chain (implement TOS, interfaces, other EDI).
When looking towards the desired future state, SuAc 2.3 calls for:

- Standardised information exchange - one way (reporting, broadcasting), two way (reporting with approval). Established organisations and procedures on the EU level will continue to develop standard adaptions according to changing conditions.
- Barges are equipped and have the systems available. Skippers/crew/barge operators are trained/certified to work with harmonised standards.
- Reporting is done at required points on the passage in a digital standard format through the push of a button or automated by a geofence trigger
- Customs notifications are submitted when required upon entering/leaving EU waters. The format and communication method will be standardized, e.g. using a Fairway Authority (FA) platform or community system offering an interface to customs authorities.

SuAc 2.3 recommends:
Review and develop API/interface standards to facilitate data exchange with

- Local port authority systems/Port Community System (PCS) platforms, forwarding barge voyage information
- Navigation devices/onboard computers, software applications on barges, facilitate automated reporting, Notices to Skippers (NtS) distribution
- Terminal operator systems receiving information on berth availability, operational data.

Ideally there should be a common interface standard to exchange barge traffic data (based on ERINOT and future eFTI) between FA (Fairway Authority) platform and seaport PCS.
Facilitate creating minimum standards for equipment (navigation, reporting) on board to stimulate the digital interaction between the vessel, FA and cargo party.
Ports may develop standards for harbour dues, uniform procedure/format to report to the port authority, uniform billing criteria.
Ensure internet connectivity and necessary communication equipment on board, adopt to reporting standards ERI/AIS.
Provide standards and input options to publish/retrieve information on barge voyage schedules (line schedules, usually for container traffic); interested parties could retrieve voyage schedules into their system.

Other suggestions from SuAc 2.3:
A harmonised standard message may be designed, which could serve for RIS/ERI purposes and DG/ADN reporting and for Customs, Police or National Single Window (NSW) reporting, then would be sent to one authority or to a platform and distributed to other authorities.
Follow/evaluate initiatives and standards of current business practices for cargo information exchange (if there is a political willingness, legal foundation, and resources to act not only as a regulator but also as a trade facilitator through enhanced platforms).
Further integration of systems used in IWT to systems used mostly in seaports such as NSW and PCS can be achieved using the same standard (suggestions for use of COPINO, CUSCAR, COPRAR and IFTMIN are given).
Standards from The Digital Container Shipping Association related to the just-in-time port call, track and trace, bill of lading etc. could be a starting point for developing solutions for IWT.

Specific question/statement directed at SuAc 4.1:
The role of reference databases will become more important (RIS Index, ERDMS, EHDB, etc.), therefore, the maintenance of reference data needs to be reliable, and responsibilities for reference data need to be defined.

RIS enabled corridor management (SuAc 2.4)
SuAc 2.4 identifies slow update cycles for standards and different interpretation of the standards as a risk for the success and adoption of RIS enabled corridor management. Subsequently evolution of standards following actual technical development by optimised standardisation procedures, less room for interpretation of the standards, standardisation of interfaces/messages/etc. (also for multimodal data exchange) is seen as a prerequisite for future actions.
Central solutions like EuRIS are recognised as a means to increase the level of standardisation because authorities and national service/data providers are forced to be conform with EU standards and to build interoperable services in order to be able to provide the services and data to the users via such a central solution.

Another recommendation is to standardise non-standardised ERI Messages if required and based on operational experiences and optimisation (e.g. WASDIS, CUSCAR/ERIMAN, INVRPT, ERIINFO, BERMAN, eFTI XSD).

Standardisation measures should allow IWT to reach at least the same information/standardisation position as road/rail/maritime/aviation.

Specific question/statement directed at SuAc 4.1:
RIS related standardisation requirements are to be aligned and considered within SuAc 4.1.

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ITS, ERTMS, e-Navigation (SuAc 2.5)

SuAc 2.5 mentions standards when describing other transport modes. Of special interest are standards from the maritime domain (i.e. S-100 framework by IHO, standardisation of bridge layout by IMO) because of their applicability in mixed (inland, maritime) traffic areas. A gap was identified between rail/maritime and IWT regarding providing path (route) offer/path (route) request which could be closed by adopting/creating a standard for it.
Harmonising of all the Inland and Maritime electronic reporting messages seems infeasible given the many differences in reporting requirements and information needs. A 'translation service' between Inland and Maritime reporting systems could be of interest for maritime ports as it could enable automated exchange of ETD/RTA information:

- The earliest possible departure time from a terminal for inland barges, based on the ETA of the maritime vessel carrying the cargo
- A required time of arrival for the inland barge based on the scheduled departure time of the maritime vessel that will transport the cargo in the next leg of its voyage

If there is sufficient interest in this type of service, an effort could be made to create the necessary standards to cover the information needs. Given that this type of service would require a lot of internal information from the Terminals where the cargo is (un)loaded to/from the barges to maritime vessels and vice-versa, this would be a service operated by the Terminals themselves.

Specific question/statement directed at SuAc 4.1:

"In addition, the train composition message (TCM, a subset of the HERMES 30 message) has been introduced in passenger and freight transport to exchange relevant train information between railway companies in Europe. The message has to be sent from the railway company to the next one, describing the composition of the train (locomotive, wagons)." (cfr 4.4.1 Key Insights of ERTMS)
Within Sub-Activity 4.1 it might be interesting to investigate the differences and similarities between this HERMES 30 Message and the ERI messages.

The Maritime environment relies heavily on the S-100 standard to provide digital services. Within Sub-Activity 4.1 it might be interesting to investigate the differences and similarities between this S-100 standard and the ERI messages. (cfr 5.1.2 Comparison of Maritime Services and RIS Operational Services through documentation)

The different transport modes are applying different terms for voyage, trip, path, route, etc. Within Sub-Activity 4.1, clear and unambiguous definitions should be elaborated.

Specific recommendations directed at SuAc 4.1:

Rec 3: Elaborate on the standardisation and harmonisation of the bridge layout and human-machine-interfaces on the bridge. (cfr 4.5.1)
Rec 5: Look for similarities (or inspiration) between S-211 and S-421 standard with the ERI technical service in RIS. (cfr 5.1.4.2)
Rec 14: Investigate the differences and similarities between this HERMES 30 Message and the ERI messages. (cfr 4.4.1)
Rec 19: The different transport modes are applying different terms for voyage, trip, path, route, etc. Within Sub-Activity 4.1, clear and unambiguous definitions should be elaborated.

New technologies (SuAc 3.1)

The New technologies draft report states that digitalisation in logistics requires a high degree of interconnectivity and thus standardisation. Creating standards and providing data of the waterways/objects/fleet to harmonise European efforts, helping the development of a more connected and intermodal solution is advised.
New technologies and their associated standard are evaluated in the SuAc 3.1 report.

Aligning of various innovative developments is advised, and as part of that, definition of standards for the clustered use cases (e.g. definition of a common interface for the exchange of IoT data from the fairway infrastructure).

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Specifically, regarding the creation of standards SuAc 3.1 states:
The creation of standards is a key element in the effort of a harmonised European inland waterway. Standards can be created through legal measures, through dedicated harmonisation efforts or through market pull. The latter is especially valuable since it focuses on the voluntary commitment of all stakeholders which allows for a much faster and harmonious implementation. By creating powerful tools such as EuRIS or other applications, fairway authorities can incentivise private (and public) entities to comply with standards set by the respective authorities. Through the exchange and use of standardised and harmonised data, external stakeholders are pulled towards the standards set within the platform or application. Thus, standards can be created by behavioural incentives. However, this can also be a potential detriment: if other more popular platforms or services do not adhere to standards desired by the fairway authorities, they may pull users towards them, creating a fragmented landscape of different standards and practices. Consequently, legal measures or dedicated harmonisation efforts still play a crucial role in the creation of standards. Nonetheless, the SuAc 3.1 authors believe that all three methods should be applied, with a focus on market pull.

IWT connectivity platform (SuAc 3.2)

SuAc 3.2 has looked into connectivity platforms in several domains. These all have standardisation aspects. Of particular interest are: S-100 (maritime), IDS (data spaces), eFTI (transport data). RDF/SPARQL (linked data),
SuAc 3.2 also concludes that there isn't a clear standard for an IWT data model for transport for seamless data exchange between seaports, customs, terminals, etc.

Specific recommendations/suggestions directed at SuAc 4.1:
Look into standardised formats for IWT service providers to provide machine readable information via EuRIS, offering a pointer towards the relevant systems and APIs of the IWT service provider.
Investigate the IDS global standard and the Design Principles for Dataspaces position paper to identify amendments to EuRIS that would make it easier to link with other dataspaces.

Specific question/statement directed at SuAc 4.1:
There are several initiatives on federative platforms which we recommend to follow-up on from a technical point of view. Perhaps the standardisation aspects of these initiatives should also be considered?

Smart sensoring & PNT (SuAc 3.3)

SuAc 3.3 calls for development of European (performance) standards containing requirements for evolving sensors and Positioning, Navigation and Timing (PNT) equipment used for automatic/autonomous vessels.

Information model & data registry (SuAc 3.4)

SuAc 3.4 describes the value of the RIS.net concept (upcoming standard) and recommends to assess the concept with focus on:

- The impact for current and future technical services (specifically NtS, ERI and iENC, including S-401 & S-402).
- The intermodal connections, e.g. by integrating the Maritime Resource Name (MRN) as a reference.

Specific questions/statements directed at SuAc 4.1:

1. EuRIS as a cache/buffer between RIS authorities and ERDMS
2. recognise EuRIS as important data registry in CESNI and EU context and evolution of it
3. put RIS.net as priority topic on related CESNI/TI working groups
4. RIS.net looks like a promising upcoming standard for IWT, maybe there can be recommendations on the path towards making RIS.net an official standard? Pitfalls one should take into account?

Technology in other transport domains (SuAc 3.5)

The objective of the DIWA Sub-Activity 3.5 was to study digital technologies and associated technological developments in other modes of transport, namely in the road/Intelligent Transport System (ITS), rail, maritime, and – to a limited extend – aviation, with a view to learn from them in whatever regard. This meant to determine which digital technologies and associated technological developments could be adapted to the Inland Waterway Transport (IWT) fairway & navigation domain in the future, how this could be done in principle, and what this would require. This necessitated firstly the study of those developments that have left a sufficiently sizeable trace of engagement at the mode studied, and secondly the methodological assessment of their adaptability to the IWT fairway & navigation domain.

There is much on the move regarding digitalisation in other modes of transport. Also for maritime as the most relevant other mode this holds true, even to the extent of imminent fundamental technological transitions. Hence, – even if no other recommendation would have been drawn – the following might be the one to sum everything up: It is high time that the IWT fairway & navigation domain engages itself with the technology-oriented architectures, specific digital candidate technologies, and useful combinations as inspired by progress in other modes, together with their organisational and regulatory pre-requisites and fall-outs as indicated and recommended.

SuAc 3.5 has specific recommendations/questions for investigation by 4.1:

1. **Study-REC-Overcoming-Ambiguities-2 to Sub-Activity 4.1:** Study and report all relevant existing technical standards, recommendations, and related terminology with the goal to identify definition ambiguities that may impede progression to higher IDLs (IWT Digitalisation Level; described in the 3.5 report).
2. **Study-REC-Required-Technical-Standards-Framework-When-Employing-IDLs-1 to Sub-Activity 4.1:** Study the potential shape and structure of the future IWT fairway & navigation domain's technical standards framework for application of the IDL concept as a new guiding principle for IWT development when applied to the different functional entities of the IWT fairway & navigation domain, in particular for arriving at IDLs I, II, and III.
3. **Study-REC-Required-Technical-Standards-Framework-When-Employing-IDLs-2 to Sub-Activity 4.1:** As a follow-up to Study-REC-Required-Technical-Standards-Framework-When-Employing-IDLs-1 identify the necessary amendments to the existing technical standards framework and to all relevant individual technical standards.
4. **Study-REC-AV's+ROV's-Impact-On-Technical-Standards to Activity 4.1 and to whom it may concern:** Study the expected impact of Autonomous Vessels and/or Remotely Operated Vessels on technical standards relevant for the technical service provision of IWT fairway & navigation authorities and ports, when entering into operational relationships with these vessels.
5. **Study-REC-NDLC-Consequences-for-Technical-Standards to Activity 4.1:** Determine the consequences of extensive application of H2H-, H2M-, and M2M-NDLCs to the domain of technical standards, in particular when migrating towards IDLs II and III, where 'digital information exchange by default' is required, and provide migration suggestions how technical standards would need to be amended.
6. **Study-REC-Service-Portfolio-Declaration-Demands-On-Technical-Standards to Sub-Activity 4.1:** Study the required technical standards and/or amendment of existing technical standards to facilitate public digital service portfolio declarations by authorities when ramping up towards IDLs II and III.
7. **Study-REC-SECOM-Impact-1 to Activity 4:** Study inter-disciplinary and based on the results of the prioritised recommendations Study-REC-Communication-Profiles-1 and Study-REC-Communication-Profiles-2 – as a matter of priority - the applicability, pre-requisites, resulting requirements and benefits of the two options 'Full Functionality SECOM implementation' and 'Just Secure Data Protocol SECOM implementation' at IWT fairway & navigation domain.
8. **Study-REC-SECOM-Impact-2 to Activity 4:** As motivated by Study-REC-SECOM-Impact-1, study inter-disciplinary – as a matter of priority - potential impact on IWT Fairway & Navigation in general, and on the ICT infrastructure of authorities in particular of the required SECOM data product ecosystem as implied by EN IEC 63173-2.

9. **Study-REC-VDES to Activity 4**: Study inter-disciplinary and based on the results of the prioritised recommendations Study-REC-Communication-Profiles-1 and Study-REC-Communication-Profiles-2 – as a matter of priority - the operational, regulatory, and technical pre-requisites, resulting requirements and benefits of VDES adaptation to IWT fairway & navigation domain per se, taking into account current developments in the maritime domain.
10. **Study-REC-IMT-2020 to Activity 4**: Study inter-disciplinary and based on the results of the prioritised recommendations Study-REC-Communication-Profiles-1 and Study-REC-Communication-Profiles-2 – as a matter of priority - the operational, regulatory, and technical pre-requisites, resulting requirements and benefits of an IMT-2020 adaptation to IWT fairway & navigation domain (data, voice) per se, taking into account current developments in the maritime domain.
11. **Study-REC-CDLMR to Activity 4**: Study inter-disciplinary and based on the results of the prioritised recommendations Study-REC-Communication-Profiles-1 and Study-REC-Communication-Profiles-2 – as a matter of priority - the operational, regulatory, and technical pre-requisites, resulting requirements and benefits of an CDLMR adaptation to IWT fairway & navigation domain (voice primarily, potentially data) per se, taking into account current developments in the maritime domain.
12. **Study-REC-VLC to Activity 4**: Study inter-disciplinary the operational, regulatory, and technical pre-requisites, resulting requirements and benefits of an Visual Light Communication (VLC) adaptation to IWT fairway & navigation domain, taking into account increasing automation in the IWT fairway & navigation domain at large and the advent of autonomous vessels in particular.
13. **Study-REC-Carrier-Agnostic-Use-Of-ASM to Activity 4**: Study inter-disciplinary the operational, regulatory, and technical pre-requisites, resulting requirements and benefits of an carrier agnostic use of the internationally defined Application Specific Message (ASM) in the IWT fairway & navigation domain, taking into account specifically the definition work done and current developments in the maritime domain.
14. **Study-REC-Data-Model-For-Voicelesser-IWT to Activity 4**: Study inter-disciplinary – as a matter of priority - the operational, regulatory, and technical pre-requisites, resulting requirements and benefits of the introduction of a data model for using Nautical Datalink Communication (NDLC) with the goal of a voicelesser IWT fairway & navigation domain, taking into account specifically the stepwise approach described, the definition work done in the maritime domain, as well as the examples provided by the aviation and rail domains.
15. S**tudy-REC-Imminent-Introduction-of-S100-World-Paradigm-1 to Activity 4**: Study inter-disciplinary – as a matter of priority - the potential implications of the introduction of the 'S-100 World' paradigm on the present state as well as on the migration towards higher IDLs of the IWT fairway & navigation domain, as suggested by IMO's pending revision of its ECDIS Performance Standards while other international organisations concurrently continue to develop other standards and recommendations for the S-100 framework, with a view to identify the operational, architectural, technical and regulatory pre-requisites for facilitating its introduction.
16. **Study-REC-S101(ECDIS)-Introduction to Activity 4**: Study inter-disciplinary – as a matter of priority - the potential implications of the introduction of S-100-based ECDIS in parallel to the S-57-based ECDIS on Inland-ECDIS in particular and on the digitalisation of IWT Fairway & Navigation at large, as IMO is about to revise their existing ECDIS Performance Standards and thereby, amongst other things, allow for the practical usage for navigation of the IHO developed S-100-based ECDIS (S-101), with a view to identify the operational, architectural, technical and regulatory pre-requisites for facilitating its introduction.
17. S**tudy-REC-S100-Metadata-Registry-Impact to Activity 4.4**: The S-100-Framework contains the S100-Metadata-Registry which is built in conformity to ISO 19135 Metadata standard and allows for, amongst many other things, the capture of data quality per data object. As motivated by Study-REC-Imminent-Introduction-of-S100-World-Paradigm, the potential impact of the S100-Metadata-Registry is brought to the attention of Sub-Activity 4.4 for their study of the potential impact on IWT Fairway & Navigation.
18. **Study-REC-Imminent-Introduction-of-S100-World-Paradigm-1 to Activity 4**: As motivated by Study-REC-Imminent-Introduction-of-S100-World-Paradigm-1, study inter-disciplinary – as a matter of priority - the potential implications of the introduction of all other existing or planned data products of the 'S-100 World', as forecasted by IHO, on the present state as well as on the migration towards higher IDLs of the IWT fairway & navigation domain, with a view to identify

the operational, architectural, technical and regulatory pre-requisites for facilitating their potential introduction.

19. **Study-REC-Standardised-Route-Plan-Exchange-via-S421 to Activity 4**: Study inter-disciplinary – as a matter of priority - the potential implications of the introduction of a standardised route exchange of route plans using S-421 in the context of a S-100-based ECDIS on the present state as well as on the migration towards higher IDLs of the IWT fairway & navigation domain, as suggested by IMO's pending decision, with a view to identify the operational, architectural, technical and regulatory pre-requisites for facilitating its introduction.
20. **Study-REC-IALA-S200-World-Data-Product-Adoption to Activity 4**: Study inter-disciplinary – as a matter of priority - the potential implications of the introduction of the S-200 World data product specifications as under development at IALA to the IWT fairway & navigation domain as soon as IMO will have taken the fundamental decision to migrate towards the S-100 based ECDIS (and potentially S-421 based route exchange) on the present state as well as on the migration towards higher IDLs of the IWT fairway & navigation domain, with a view to identify the operational, architectural, technical and regulatory pre-requisites for facilitating their introduction.
21. **Study-REC-Reconciliation-of-ASM-with-S100-World-Data-Models to Activity 4**: Study inter-disciplinary – as a matter of priority - the options to reconcile the two different data modelling approaches represented by the existence of both the ASM and the S-100 world way of data modelling, taking into account a criteria base from an IWT fairway & application point of view.

5 Assessment of standardization gaps

In order to assess standardisation gaps, input and feedback was collected from the participants of SuAc 4.1 during the kick-off meeting and further investigated within the framework of desktop research.
The standardisation gaps have been looked-at from five different categories:

- Organisational
- Redundancies / Overlaps
- Functional
- Legal
- Other

The result of the brainstorming is depicted in Figure 1 and summarised in Annex 1. Most of the gaps and solutions are pragmatic and practical suggestions. In some cases, a reference is made towards a certain chapter. All gaps and solutions should be accessed by relevant standardisation body as points of attentions.

As a general aim it was concluded that user feedback should be considered for the elaboration or addition of standards rather than regulations, however standardisation must be created first and then adaptions according to the real world can be made.

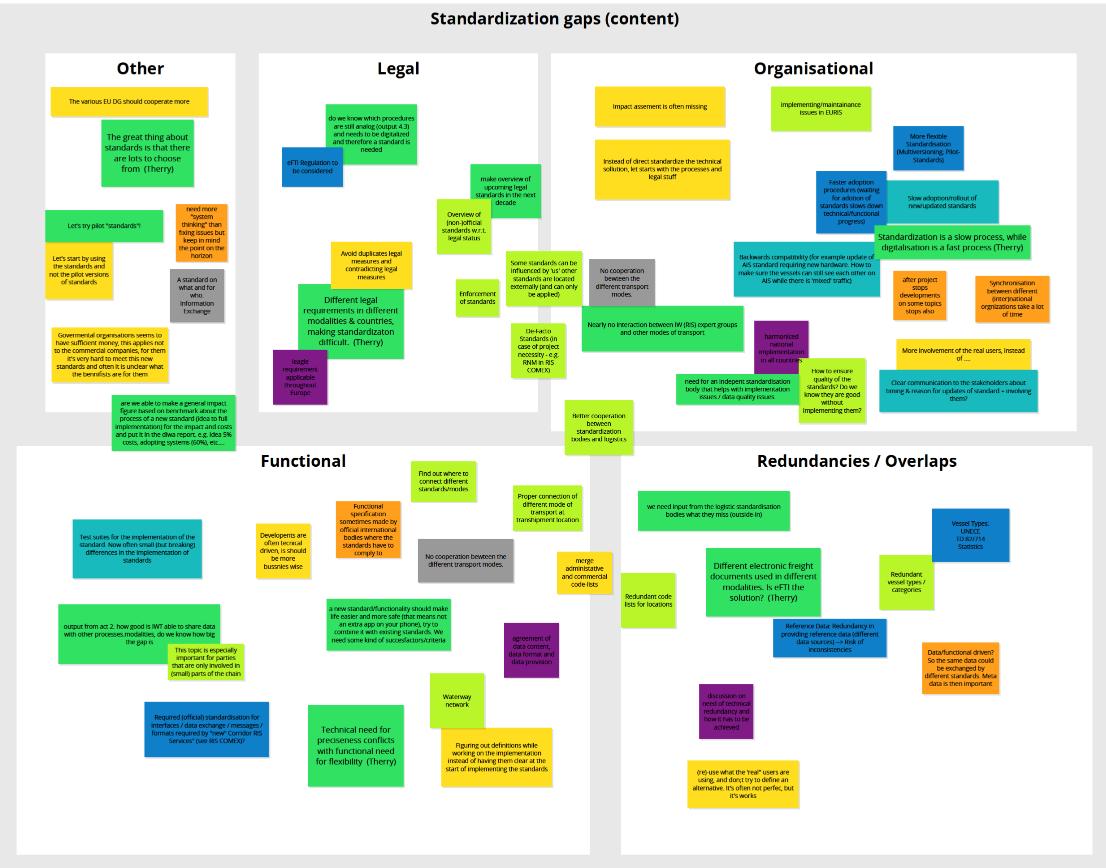

Figure 1: Standardisation Gaps (result of the first brainstorming session which are further elaborated on in the chapters below)

The results of the brainstorming are further elaborated on in Annex 1.

6 Current situation

Standards and standardization frameworks in the different transport modes are analysed in this chapter. It is important to find out where different transport modes can actually be connected and different standards can be connected (interoperability).

6.1 Standards in the road sector (ITS)

More than 200 standards have been drafted for the road sector. These standards can be found on www.itsstandards.eu. Different services/applications are tackled by these standards:

- Electronic Fee Collection: 58
- eCall: 43
- Public transport: 43
- Automatic vehicle and equipment identification: 17
- Cooperative intelligent transport systems: 9
- Traffic and travel information: 17
- Data exchange specifications for traffic management and information (DATEX): 11

Standards for cooperative intelligent transport systems (C-ITS) and data exchange for traffic management (DATEX) are of possible particular interest for IWT.

Cooperative intelligent transport systems

The C-ITS topic contains these standards:

- CEN ISO/TS 17419 Classification and management of ITS applications in a global context
- CEN ISO/TS 17423 ITS application requirements and objectives for selection of communication profiles
- CEN/TS 17425 Data exchange specification for in-vehicle presentation of external road and traffic related data
- CEN/TS 17426 Contextual speeds
- CEN/TS 17429 ITS station facilities for the transfer of information between ITS stations
- CEN ISO/TS 18750 Local dynamic maps
- ISO/TS 19091 Using V2I and I2V communications for applications related to signalized intersections
- CEN ISO/TS 19321 Dictionary of in-vehicle information (IVI) data structures
- CEN ISO/TS 21176 Cooperative intelligent transport systems (C-ITS) – Position, velocity and time functionality in the ITS station
- CEN ISO/TS 21177 Intelligent transport systems — ITS station security services for secure session establishment and authentication between trusted devices
- CEN ISO/TS 21185 Intelligent transport systems — Communication profiles for secure connections between trusted devices.

A number of subject areas are not applicable for IWT or are already covered by IWT standards. With the idea of voicelesser communication in mind (SuAC 3.5) and experiments already being executed regarding intention sharing[4] several standards are of possible interest for application in IWT:

- CEN/TS 17429 ITS station facilities for the transfer of information between ITS stations
- CEN ISO/TS 21177 Intelligent transport systems — ITS station security services for secure session establishment and authentication between trusted devices
- CEN ISO/TS 21185 Intelligent transport systems — Communication profiles for secure connections between trusted devices.

The actual current (extent of the) application of these standards in operational vehicles (and the resulting maturity) could not be established during this study. However the standards seem to have stabilized (updated in 2018/2019). Therefore it is recommended to investigate these standards further when moving from the experimental stage of intention sharing to testing and operational phases (REC 15). It is, after all, important to be able to exchange this data in a secure an unambiguous manner

[4] RWS (2022): https://open.rws.nl/publish/pages/8711/intention_sharing_simulator_study_final_4.pdf

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between vessels on the European fairways, regardless of their origin. Care should also be taken to keep aligned with maritime in this case. Should maritime adopt a different and/or incompatible standard, this could lead to dangerous situations in mixed traffic areas (see also 6.2).

DATEX

DATEX II[5] is the electronic language used in Europe for the exchange of traffic information and traffic data. By means of DATEX II, traffic information and traffic management information is distributed in a way that is not dependent on language and presentation format. This means that there is no room for misunderstandings and / or translation errors by the recipient, but the recipient can choose to include spoken text, an image on a map, or to integrate it in a navigation calculation.

DATEX II is a multi-part Standard, maintained by CEN Technical Committee 278, Road Transport and Traffic Telematics
DATEX II data content standards:
Part 1: Context and framework
Part 2: Location referencing
Part 3: Situation publication
Part 4: Variable Message Sign (VMS) publications
Part 5: Measured and elaborated data publications
Part 6: Parking publications
Part 7: Common data elements
Part 8: Traffic management publications and urban extensions
Part 9: Traffic signal management publications

DATEX II Exchange ISO standard:
The DATEX II exchange protocols are specified separately from the content specifications, allowing flexible use of the content specifications with any defined exchange protocols.
One such set of definitions is produced by the DATEX II project organisation and standardised jointly by CEN TC/278 and ISO TC/204

DATEX II can be considered „the RIS standards for the road" and appears to be similarly governed (as RIS standards). DATEX II does however cover more and different subjects than the RIS standards and seems to focus on dynamic information.

DATEX II Assessment (see DIWA SuAc 3.5 "Manual on Inland Waterway Transport Digitalisation and Assessment Methodology"):

DIWA Assessment metrics	Assessment results
DIWA-TRL	9 (Market expansion)
DIWA-Adaptability	+ (Adaptability with minor modifications) 0 (Adaptable with substantial modifications)
DIWA-Adaptation demands	+ (Intermediate adaptation resource/time demands) 0 (Substantial adaptation resource/time demands)
DIWA-Technology radar	2022-2026
DIWA-IDL impact	II (Connected IWT fairway & navigation domain)

Rationale: The DATEX II is an established standard which in itself is very road specific. There are however elements which can be applied to IWT relatively easy. In particular this holds true for actual and anticipated movable bridge status data. This data is of interest for waterway users and the part of the DATEX II standard that covers this, can be used. In fact, this has already been done in the Netherlands including an extension for locks which was subsequently taken up by the COMEX project and implemented in the EuRIS portal[6]. See also 6.6.4

[5] datex2.eu
[6] https://www.eurisportal.eu/default.aspx?path=Actueel/ObjectActualStatusMap&KL=en

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6.2 Standards in maritime sector (e-Navigation)

There is a long tradition of adopting standards from the maritime world for inland purposes (e.g. AIS, ENC) and certainly in mixed traffic areas it is important that both maritime and inland vessels use mutually comprehensible communication and data exchange via compatible standards.
The most significant development in maritime in the area of standards in the upcoming years is the introduction of the S-100 framework of standards.

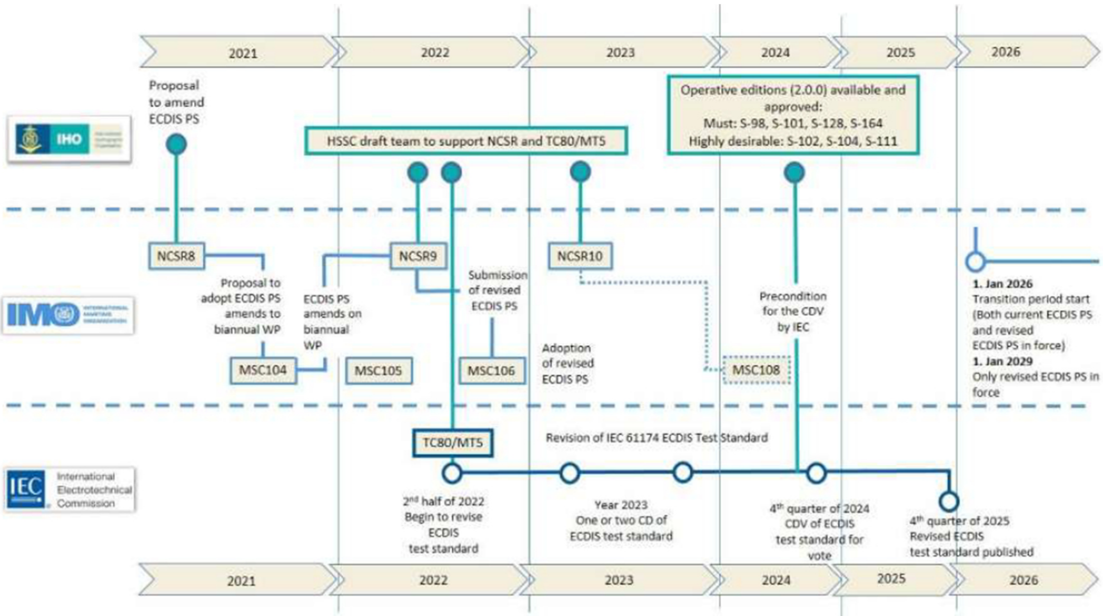

Figure 2: Transition period of the ECDIS performance standard defined by IHO, IMO, IEC[7]

Within the Masterplan DIWA project both sub activities 2.5 and 3.5 have identified S-100 as a topic of interest to be investigated.
The S-100 framework covers the following products[8]:
International Hydrographic Organization (IHO) (S-101 to S-199)

- S-101 Electronic Navigational Chart (ENC)
- S-102 Bathymetric Surface
- S-103 Sub-surface Navigation
- S-104 Water Level Information for Surface Navigation
- S-111 Surface Currents
- S-112 Open - (See Decision HSSC9/38)
- S-121 Maritime Limits and Boundaries
- S-122 Marine Protected Areas
- S-123 Marine Radio Services
- S-124 Navigational Warnings
- S-125 Marine Navigational Services
- S-126 Marine Physical Environment
- S-127 Marine Traffic Management
- S-128 Catalogue of Nautical Products
- S-129 Under Keel Clearance Management (UKCM)
- S-130 Polygonal Demarcations of Global Sea Areas
- S-131 Marine Harbour Infrastructure
- S-164 IHO Test Data Sets for S-100 ECDIS

[7] https://iho.int/uploads/user/About%20IHO/Council/S-100_ImplementationStrategy/S-100%20Roadmap_Annex%201_v2.0.pdf
[8] http://s100.iho.int/home/s-100-specification-numbers

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International Association of Light Authorities (IALA) (S-201 to S-299)

- S-201 Aids to Navigation Information
- S-210 Inter-VTS Exchange Format
- S-211 Port Call Message Format
- S-212 Port Call Message Format
- S-230 Application Specific Messages
- S-240 DGNSS Station Almanac
- S-245 eLoran ASF Data
- S-246 eLoran Station Almanac
- S-247 Differential eLoran Reference Station Almanac

Intergovernmental Oceanographic Commission (IOC) (S-301 to S-399)
Inland ENC Harmonization Group (IEHG) (S-401 to S-402)

- S-401 IEHG Inland ENC
- S-402 IEHG Bathymetric Inland ENC

Joint Technical Commission for Oceanography and Marine Meteorology (WMO/IOC JCOMM) (S-411 to S412)

- S-411 JCOMM Ice Information
- S-412 JCOMM Weather Overlay
- S-413 Weather and Wave Conditions
- S-414 Weather and Wave Observations

International Electrotechnical Commission - Technical Committee 80 (IEC-TC80) Numbers (S-421 to S-430)

- S-421 Route Plan

NATO Geospatial Maritime Working Group (GMWG) for Additional Military Layers (AML) Numbers (S-501 to 525)

Since an in-depth impact analysis of these items on the IWT and/or RIS standards is not feasible within the Masterplan DIWA timeframe and some items have already been picked up by the relevant CESNI working groups, it is recommended that impact analysis within the CESNI working groups continues. Special attention is warranted for the following topics:

S-421 Route Plan (REC 35)

Part of the developments under RIS has been the ERIVOY message. This message enables the vessel operator to share the intended route and associated ETA information with authorities and/or with authorized parties via the EuRIS platform. Also forecasted route and associated ETA information by authorities can be shared with vessel operators. It was recommended to investigate the overlap and gaps between S-421 and ERIVOY. The knowledge gained from this investigation is expected to give direction to the development of ERIVOY and/or possible translation services to and from S-421.

After an investigation of S-421 it seems that S-421 may actually be more interesting as an inspiration for a future standard concerning intention sharing. While it is true that S-421 shares a lot of high-level information exchange with the existing ERI messages (especially ERIVOY), these messages are already quite established and seem to gain little to no benefit in extending towards the more geographically focused aspects of S-421. For intention sharing however, this focus on geographic information could be interesting as an example of how the intended geographical route, including uncertainties/margins on the provided path, can be provided. S-421 also enables a kind of back-and-forth communication between the vessel and the shore side to negotiate alternative paths. A system that could also be of interest in intention sharing (e.g. if possible collision risks are detected during the exchange of the intentions).

The examples of use cases for route, as elaborated in the Annexes A of S-421 (IEC 63173-1:2021) could also be of interest, as they provided information on how digital information exchange can be established. While some of them may be less relevant for IWT in Europe given the possibilities of the Common European Services (e.g. Route cross checks for receiving updated regional information that could affect a ship's route plan are covered by voyage computation on EuRIS) or are very specific for the maritime domain (e.g. Ice Navigation), some of the information can be interesting for automating this information exchange with onboard systems. Other concepts are known in RIS but may currently be limited to national implementations (e.g. Enhanced monitoring keeping track of a vessel's position compared to its intended route and generating alerts in case of deviations), or are not yet under consideration (e.g. Route optimization services).

SECOM (REC 37)

SECure COmmunication (IEC63173-2) was originally referred as a standard to be used for S-101. While this reference was later removed, the need for secure communications is not likely to diminish in the upcoming years (see also SuAc 3.5 and 4.3 reports). It is recommended that all RIS services (except AIS – which is open by design) investigate this standard and its possible adoption to secure the RIS service interfaces. Users of e.g. NtS webservices or EuRIS API's would then be sure that the data/information originates from a trusted source and was not altered in transit. This is an important step in raising the cyber resilience of RIS.

MASS (REC 34REC 28)

IMO is steadily making progress in outlining and defining what elements of current rules, regulations and concepts are affected by the advent of remotely operated vessels and/or autonomous vessels under the Maritime Autonomous Surface Ships heading. It is recommended to keep a close eye on developments and standards proposed regarding MASS (e.g. intention sharing) and possibly influence them when IWT developments in this area are going faster than maritime. Incompatibility between maritime AV/ROV vessels and inland AV/ROV vessels regarding data exchange will lead to safety issues in mixed traffic areas.

6.3 Standards in the rail sector (ERTMS)

The rail sector in Europe has agreed to a European Rail Traffic Management System (ERTMS) to create a single railway system for many European countries and to provide a standardised signalling and speed control system (more detailed information in report of Sub-Activity 2.5, chapter 4.4). In the same way, they want to harmonise the international data exchange and information provision.

The Regulation (EU) No 1305/2014 defines the technical specification for the interoperability of 'telematics applications for freight subsystems' (TAF TSI). It's the framework for an efficient interchange of information. It deals with applications for freight transport and with linking with other modes of transport.
In accordance to the Directive (EU) 2016/797 (on the interoperability of the rail system in EU) several Technical Specification for Interoperability (TSI) for different subsystems were created. This directive also covers the 'telematics applications' of the rail system, including applications for passenger and freight services.[9]

6.3.1 Information exchange for freight transport

The development of the Technical Specifications for Interoperability of Telematics Applications for Freight (TAF TSI) has the objective of improving the efficiency of the service, thereby increasing market share and revenue and also increasing the sustainability of rail transport. Key elements of a successful freight service are the ability to track shipments, determine the timing of delivery to customers and maximise the productivity of the transport chain. Among other, these objectives can be cost-effectively achieved using information systems.

In order to benefit from a single European rail transport system through the implementation and operation of the TAF TSI, various tools have been developed to achieve for example a single communication system, harmonised working processes or standardised communication interfaces. Additionally, the TAF TSI describes the business process between railway operators, railway

[9] Source: Online gateway to EU Law, https://eur-lex.europa.eu/

infrastructure managers, waggon keepers and the freight customers (see Figure 3). It also shows the process how the customers get transport-related electronic messages from the contracted railway operator.

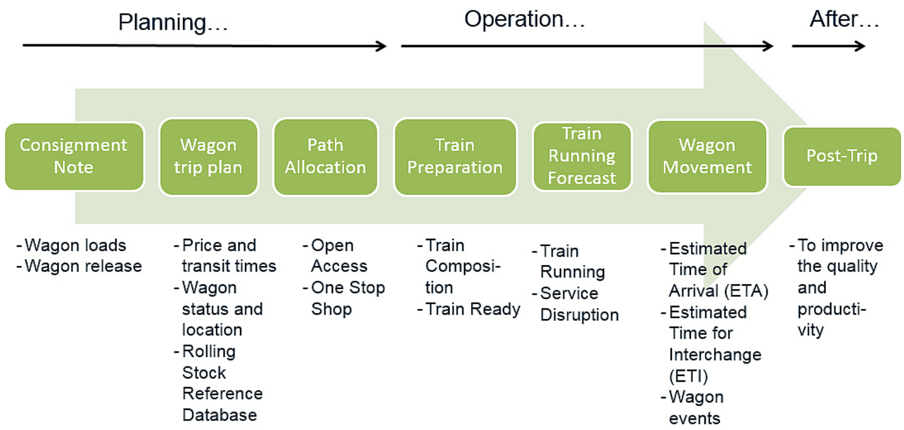

Figure 3: TAF TSI functions for information exchange in the transport process

Source: United Nations ESCAP, Electronic information exchange systems in rail freight transport, p.13

In rail transport, among others, various messages are used that are very relevant for freight transport as well as for movement and status of a train and the waggons. The following table shows some messages that fulfil the processes and functions (see Table 1) shown for cargo movement.

Table 1: Electronic information exchange in rail transport

Consignment note	The lead railway operator of the freight transport creates the electronic consignment order message containing all information needed to carry a consignment from the consignor to the consignee
Path request	The railway operator and the infrastructure manager exchange a set of path request messages in order to agree on the path between the start and end point of a journey and to determine where a train (with given length, mass etc.) can run on the infrastructure
Train preparation	During the train preparation, the railway operator has to send the train composition (traction unit, waggons) to the next operator(s) as well as to the infrastructure manager(s) with whom the operator has contracted a path section. Every time after train preparation when a train is ready to start, the railway operator has to send a train ready message to the infrastructure manager
Train Running	The train running forecast message provides information about the expected time at contractually agreed forecast points. The message is sent by the infrastructure manager to the railway manager and the neighbouring infrastructure managers involved in the journey If a service disruption event is detected, the Railway Manager or Infrastructure Manager, depending on who is directly affected by the incident, sends a service disruption message to the other parties involved in the rail freight transport
Wagon Movement	This message contains the estimated time of interchange (ETI) or updated ETI of the waggon and is sent from one railway operator to the next in the transport chain. The last railway operator in the transport chain of the waggons sends the estimated time of arrival (ETA) or updated ETA to the lead railway operator
Post-trip assessment	On the basis of a quality parameter, a route or a location and a measurement period in which the actual results are to be measured against predefined criteria to support quality improvements of services and processes

Source: United Nations ESCAP, Electronic information exchange systems in rail freight transport

6.3.2 Key messages in rail transport

Some of the messages that transmit information to ensure the essential transport processes can contain elements which are potentially interesting for other transport modes. The messages like Train Composition Message (TCM) and the HERmes 30 message (H30) probably also have information that is useful for multimodal transport.

6.3.2.1 Train Composition Message (TCM)

The railway undertaking, who is responsible for the freight transport, has to create a message containing the information about the composition of the train. Prior to the departure of the train, this message has to be sent to all infrastructure managers operating a section of the route of the freight transport as well as to the next responsible railway operator, if there are more. Every change in the composition has to be updated in the message and sent to the involved parties.

The TCM can be created as a new message of its own, but can also be transformed from the HERmes 30 message (see next subchapter). It is used as a linking of international trains with different national train numbers using the train composition information. The TCM is provided to terminals as well. It contains information like shown in the following table.

Table 2: Information in Train Composition Message

Operational train number (OTN) identifier
Journey section from-to
Codes of Infrastructure Managers and Railway Undertakings
Time stamps
Train: Length
Train: Weight
Train: Number of waggons
Train: Max. speed
Air brake type
Hand brake type
Technical restrictions
Wagon positions
…

Source: Digital Train 1.0 & 2.0, Enhanced real-time communication about train composition and estimated time of arrival; https://cms.rne.eu/system/files/210308-presentation-prime_issuelogbook.pdf

6.3.2.2 HERmes 30 message

For the rail freight transport the Train Composition message is often not sufficient. The UIC HERmes 30 message[10] (or H30 message) additionally provides more information. It includes advance information about international freight trains and the transported goods. It is a standard in the rail sector and has the intention to cover all needs of the railway operators. Currently, there are several similar versions (1.01, 1.03, 1.04b, etc.) in use. In the next years, it is planned to achieve the full rollout of the version 2.

ERINOT (in IWT)
The ERI messages are pursuing the aim of a paperless environment in Inland Waterway Transport. The information shall be available at the right time to the appropriate parties at the right time. They have to ensure simple, fast and transparent procedures with appropriate controls. The information contains vessel and cargo data, which are important for all in the transport process involved parties, like authorities, lock operators, emergency services, port operators and fleet operators.[11]

Further messages for reporting in IWT are ERIVOY (voyage information), PAXLST (crew information) and MHDS (minimum hull dataset). These messages are also used combined to create an envelope that forms a complete dossier on the voyage.

[10] Source: HERmes 30 message, draft version 2, https://uic.org/IMG/xlsx/h30xml_2.1_2021-11-16.xlsx
[11] Source: Electronic Ship Reporting, https://ris.cesni.eu/32-en.html

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The following two tables (Table 3 + Table 4) show the findings of the comparison of the ERI messages (IWT) with the H30 message (Rail). They show similarities and the differences between these two standards:

Table 3: Similarities between ERI and H30 messages

Information	Description
Crew on Board	Information about the travelling personnel
Voyage Number	A unique number as identifier of the voyage
Vehicle ID	A unique number as identifier of the vehicle
Departure point of the journey	-
Route points	Relevant intermediate points of the trip
Destination point of the journey	-
ETA (estimated time of arrival)	Estimated date and time at arrival at next transhipment point
ETD (estimated time of departure)	Planned date and time of departure at (first) departure point
Means of transport for cargo	A unique number as identifier and more information about the additional means of transport (barge/waggon) for the carriage of cargo
Maximum load	Maximum allowed weight of the transported good
Type of freight commodity	Harmonised name or code of the commodity
Weight of individual freight	Actual weight of the cargo per additional means of transport (barge/waggon)
Information about dangerous goods	Information on dangerous goods per additional means of transport (barge/waggon)

Despite different uses, the analysis of the two standards show strong similarities (see Table 3) in the provision of general information on the transport vehicle, the voyage, the transportation and the cargo. Key components are the identification of the voyage and the used vehicle(s). Other similar information is the declaration of the driver or skipper on board. The information about route, departure and arrival are required for a nonstop transport operation in both transport modes. In addition, there is further information about the means of transport, load and maximum allowed load as well as freight commodity that is particularly important for logistics processes. In order to ensure safe transport processes, the notification of dangerous goods is mandatory.

The second table lists the differences between both standards (it is in H30, but not in ERI) with potential importance for IWT in the future:

Table 4: Differences between ERI and H30 messages

Information	Description
Maximum vehicle speed	Maximum possible speed of the vehicle for the intended direction
Vehicle's Control command system	The type of control command system used in the vehicle. Important for remote control or influencing the vehicle.
Last location for loading or change of composition of vessel/train	The last location where changes to the composition or cargo were made.
Data about Means of transport for cargo - commercial:	
Operational origin	Name of country, station and origin company of the means of transport
Consignor client	Sending body of transport unit
Consignee client	Receiving body of transport unit
List of interchange or border crossing points	All points for handovers or crossing borders
Commercial forwarding data	Information of the forwarding country and Station, Consignment note, Dispatch number and date
Loading status	Current loading status
Intermodal units - commercial:	
Unit dimensions	Length and height

Origin of the commercial department	Name of country, station and company as well as dispatch number and date
Consignor client	Sending body of freight
Destination for the commercial department:	Country, Station, Company
Consignee client	Receiving body of freight
Type of customs procedure applied	Import or export customs clearance, transit procedures, temporary storage

The different requirements of these two transport modes also cause differences in the reporting needs to involved parties of a transport operation. Some information elements were identified in the H30 message which are not already used in an ERI message but would potentially have some value for IWT (in the future).
For example, the maximum possible speed (upstream/downstream) provides additional information about the actual maximum speed that can be realised during the voyage, which can be used to optimise the timing of different ships, e.g. at locks. With consideration of a future application of smart ships on inland waterways, the information of the used control command system on a vessel can help to adjust the traffic behaviour towards it. For a more accurate representation of the upcoming transport operation, the changes in loading or the composition of the vessel are useful supplementary information. The data on the means of transport (like barges) can support to keep an overview of ownership and responsibilities of them. The information on intermodal transport units can facilitate further transport planning or terminal operations and can already be preliminary information for upcoming commercial activities. It also helps to clarify the responsibilities for transport units.

6.3.3 Information exchange tools

In order to fulfil the desired functions of the TAF TSI, different platforms and tools have been developed and are provided by the UIC, the RNE (see Sub-Activity 2.5 report, chapter 4.4.1) and HitRail (is linking the international applications of European railways). These tools were developed on a commercially oriented basis and have been (co-)funded by the European Union. In the European railway area, the following important IT tools (see Figure 4), among others, are in use for harmonised data exchange and processes:

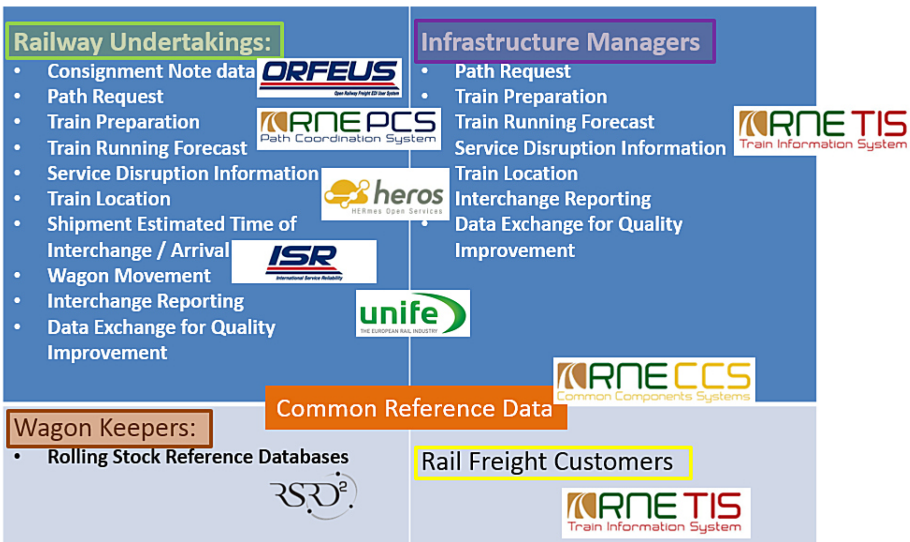

Figure 4: Tools fulfilling TAF TSI functions
Source: United Nations ESCAP, Electronic Information Exchange Systems in Rail Freight Transport, p.17

The IT tools shown in Figure 4 are described in more detail in the following table:

Common Components System (CCS)	Includes 3 elements to ensure interoperability: • Common Interface (CI; see report of SuAc 3.2, chapter 5.5.2) • Central Reference File Database (CRD) • Certification Authority (CA)

Open Rail Freight EDI User System (ORFEUS)	Enables the exchange of … • Consignment Order Message (COM) → ECOM (COM+) message (=TAF TSI compliant) • CUV waggon notes data
Path Coordination System (PCS)	Enables the coordination of path request. For Users like railway operators, infrastructure managers, railway capacity allocation bodies and rail freight corridors
HERmes Open Services (HEROS)	Enables the exchange of messages with detailed information in advance about the train composition • HERmes 30 message • (previous) Train Composition Message (TCM; only receive) Important for trains which run in collaboration between several operators
Train Information System (TIS)	Provides real-time train data (freight, passenger) to support international train management Enables data exchange of raw data based on TAF/TAP TSI messages
Improved Service Reliability (ISR)	Enables the exchange of movement information for wagons in international traffic

Source: United Nations ESCAP, Electronic Information Exchange Systems in Rail Freight Transport, p.16-22; and OPTIYARD Optimised Real-time Yard and Network Management; Deliverable D2.1[12],

6.3.4 A new single platform

In the year 2025, the European rail sector wants to launch a digital platform for seamless, interoperable data exchange for core rail freight operations in the European rail area. The name of the portal is 'DP-Rail' (Digital Platform for Rail Freight[13]). The general objective is to remove remaining barriers to interoperability in the freight market. In the same way, the coverage of harmonised data exchange shall be increased. The access to high-quality key information shall ensure the competitiveness of rail freight transport in the future.

Some of the reasons given (see website dp-rail.eu) for the development of the platform:

- To enable seamless interoperable data exchange across borders and companies
- To allow low-cost integration of small(er) entities and players
- To enhance standardisation and support TSI implementation
- To avoid multilateral, customised and costly interfaces
- To reduce manual data gathering efforts for participating entities

Some innovations of the platform will bring some improvements within the railway sector. Others will also have an impact on multimodal cooperation due to their harmonisation. The following services will contribute, at least in parts, to multimodal (as a preliminary stage to synchromodal) transport:

- The Digital Train Handover (DTH) ensures automated digital workflows of all relevant information to the require stakeholders including authorities. This includes information about customs, dangerous goods and waste.
- The Digital Consignment Note (DCN) distributes a (standardised) consignment note to all in the transport involved railway companies regardless of their IT maturity level.
- The Telematics Data Sharing (TDS) provides telematics data to the stakeholders in the transport chain.
- The ETA Data Sharing provides accurate and reliable information about the estimated time of arrival (ETA) of trains.

Some of the applications are going to use the Consignment note (ECN), the HERmes 30 message and the Technical waggon data to pre-fill the data fields of the messages of the DP-Rail services (see Figure 5). Missing entries can be added afterwards. Especially for the hand-over, take-over and the

[12] Source: OPTIYARD Optimised Real-time Yard and Network Management, Source: https://optiyard.eu/wp-content/uploads/2019/02/OptiYard-Del21-Definition-and-selection-of-suitable-methods-for-real-time-data-analytics.pdf
[13] Source: DP-Rail, https://dp-rail.eu/

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transit of trains the format of the already standardised Hermes 30 message is used as well as the messages for handed-over, taken-over and refusal of a train.

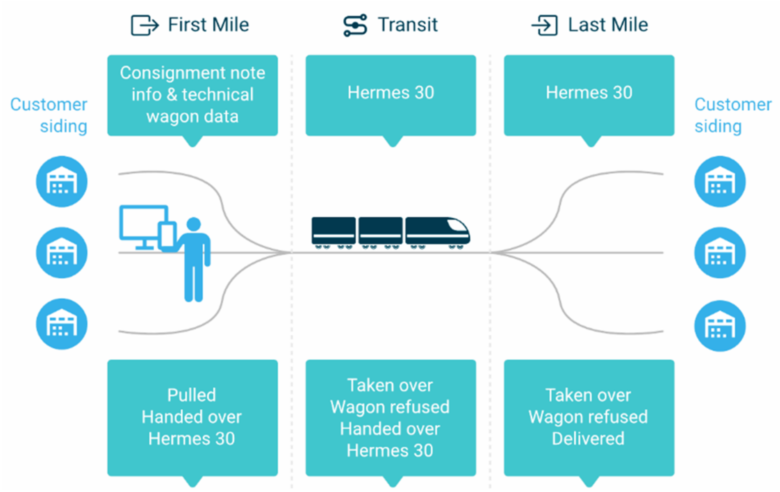

Figure 5: Processes in rail freight transport
Source: https://dp-rail.eu

The platform is TAF/TSI compliant and supports additional implementations. It removes further barriers of interoperability and is taking the next step towards the final Single European Railway Area.

6.3.5 Standardisation process

During the many years of trying to standardise as many things as possible, the railway sector was also able to agree on a common procedure for standardisation. The UIC has committed to the V-cycle approach (see Figure 6) in defining requirements and functional specifications.

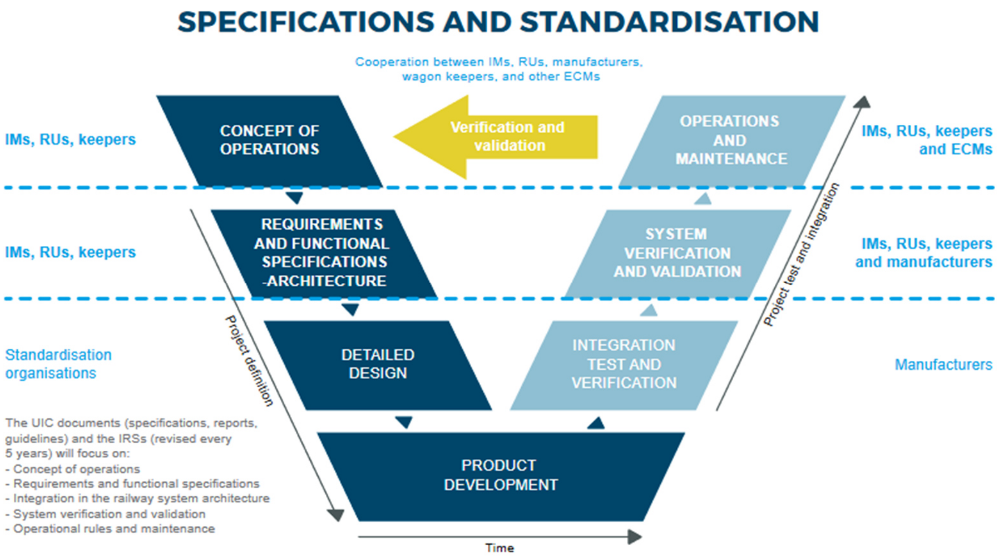

Figure 6: The V-cycle approach in rail transport
Source: UIC Activity Report 2020-2021, p.58

The UIC is establishing links to standardisation organisations, like ISO, ETSI, IEC or CEN-CENELEC. These organisations are supporting to assess the technical impact of the new specifications in order to subsequently define appropriate standards. The UIC's requirements and specifications ensure that the new standards will meet the needs of the railways. In this process, compatibility frameworks and

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gap analyses are in place between the standardisation organisations and UIC. Before the integration of new standards, the UIC publishes test conditions and maintenance frameworks.[14]

The V-cycle approach can also be applied to standardisation by other actors in the sector, such as ERA (European Union Agency for Railways) or OTIF (Intergovernmental Organisation for International Carriage by Rail).

6.3.6 Conclusions

The European rail sector has agreed on a European Rail Traffic Management System (ERTMS) to create a single railway system for several European countries and standardize signalling and speed control. Electronic information exchange systems play a vital role in improving rail transport efficiency, and various tools have been developed to standardize communication interfaces, harmonize working processes, and achieve a single communication system. Several messages are used for freight transport as well as for the movement and status of a train and wagons. Train Composition Message (TCM) is a message containing information about the composition of the train, which has to be sent to all infrastructure managers operating a section of the route of the freight transport, as well as to the next responsible railway operator, if there are any. The HERmes 30 message (H30) and TCM can contain elements that are potentially useful for multimodal transport.

Both, the HERmes 30 message for rail freight transport and the ERI message for IWT provide information about the transport vehicle, the voyage, transportation, and cargo, there are some differences in the information reported. For example, the H30 message provides information about the maximum vehicle speed, vehicle control command system, and last location for loading or change of composition of the vessel/train, which are not present in the ERI message. These differences reflect the specific needs of the transport mode and could have implications for future applications, such as smart ships.

The European rail sector is planning to launch a digital platform called DP-Rail in 2025 for seamless, interoperable data exchange for core rail freight operations in the European rail area. The platform aims to remove remaining barriers to interoperability in the freight market, increase the coverage of harmonised data exchange, and ensure the competitiveness of rail freight transport in the future. Some of the innovations of the platform include digital train handover, digital consignment note, telematics data sharing, and ETA data sharing.

The railway sector has also established a V-cycle approach for standardisation, which includes defining requirements and functional specifications, assessing technical impact, defining appropriate standards, and publishing test conditions and maintenance frameworks. The approach can also be applied to standardisation by other actors in the sector, such as ERA or OTIF. The inland navigation sector could review its approach to standardisation and learn from the rail sector if optimisation is needed (REC 7).

6.4 Standards in the RIS area

The European Directive 2005/44/EC on harmonised river information services (RIS) on inland waterways in the Community (RIS Directive) sets requirements for implementation of RIS in the Member States, defining

- Applicability
- Responsibilities of Member States
- Minimum requirements for RIS
- Data Exchange
- Services to be provided
- Technical specifications to be applied

The RIS technical services are specified in commission implementing regulations.

[14] Source: UIC Activity report 2020-2021, International Union of Railways; https://uic.org/IMG/pdf/uic_activity_report_2020-2021.pdf, p. 57f

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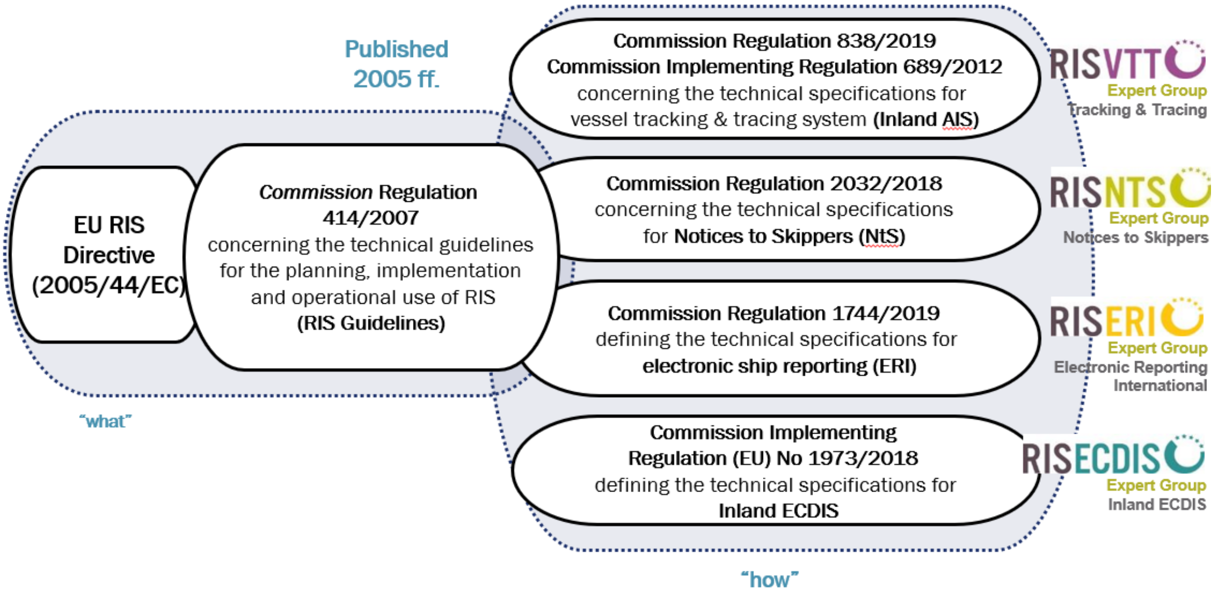

Figure 7 European Commission RIS standardisation framework

In 2015, the European Committee for drawing-up standards in the field of Inland Navigation (CESNI) was set-up in order to adopt technical standards in various fields, in particular as regards vessels, crew and information technology. The respective regulations at the European and international level, including those of the European Union and the Central Commission for the Navigation of the Rhine (CCNR), may refer to these standards with a view to their application.[15]

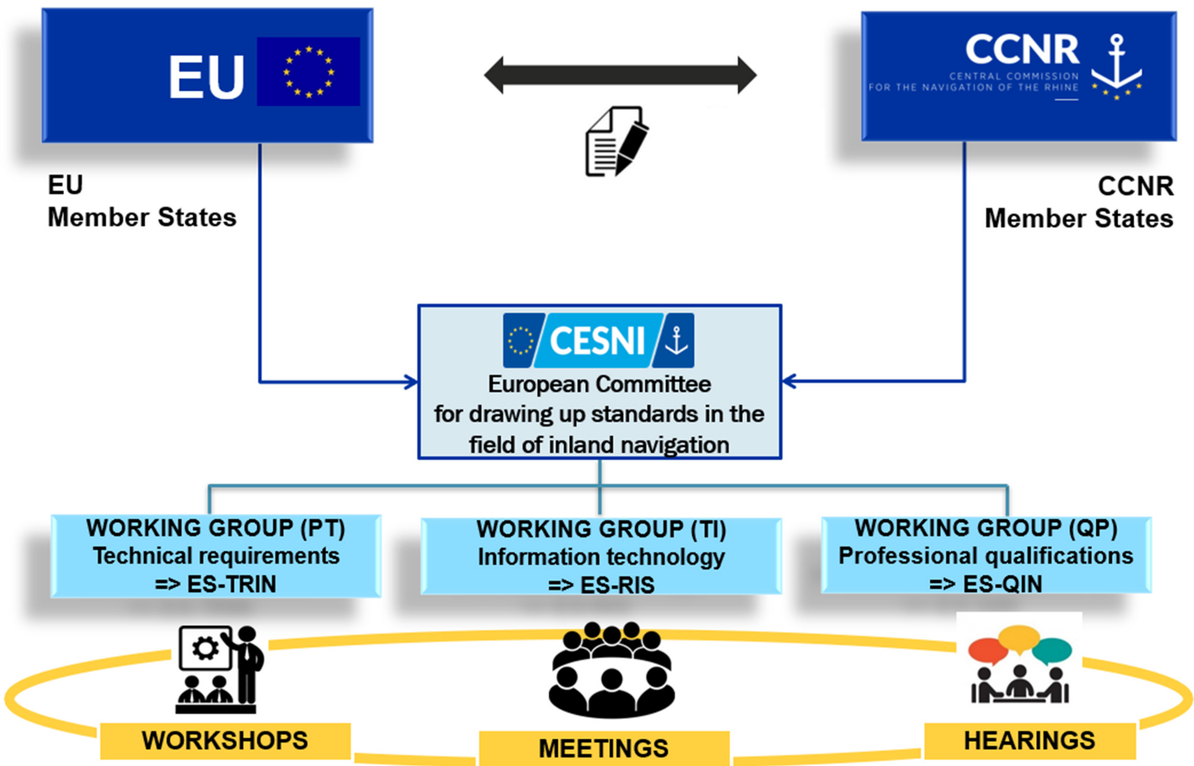

Figure 8 CESNI framework

The CESNI has a lot of partners - be it States and Organisations as depicted here:

[15] Source: https://www.cesni.eu/en/

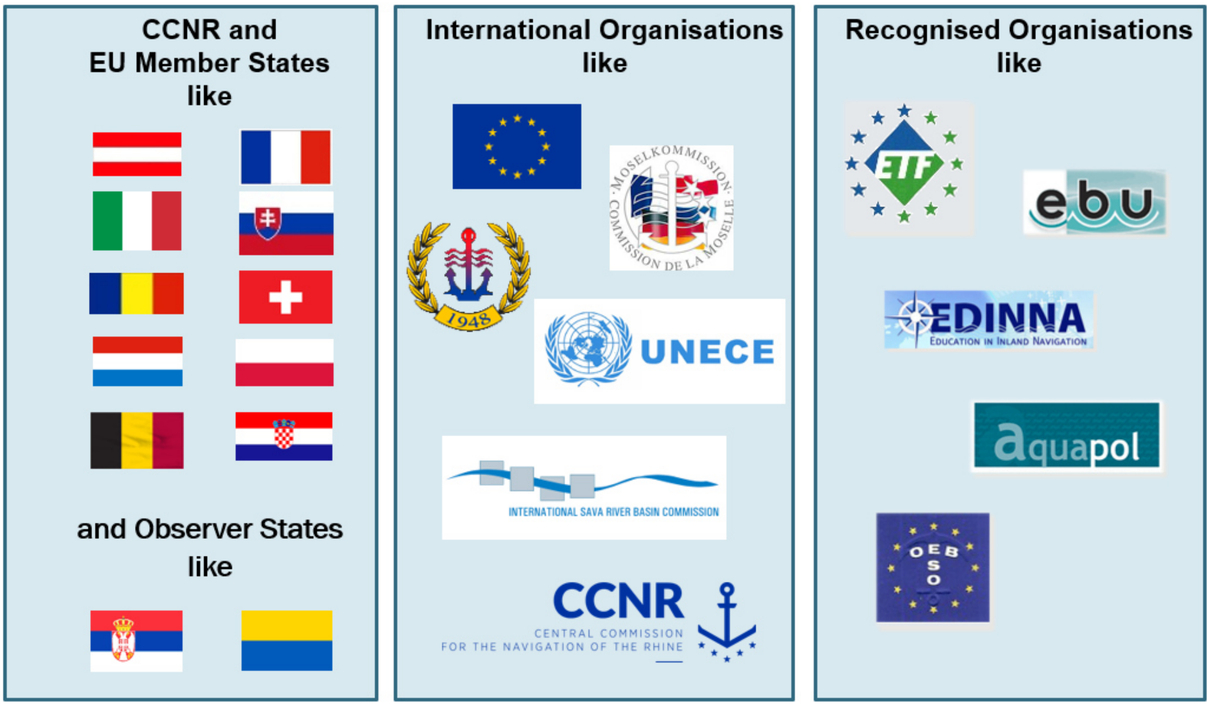

Figure 9 CESNI Member States and associated Organisations

The RIS technical services are published by the CESNI in ES-RIS (European Standard River Information Services). The first edition of ES-RIS, ES-RIS 2021/1, was adopted by the CESNI in April 2021.

In 2019, four temporary working groups have been set-up to further develop the RIS technical services:

- Temporary Working group for Electronic Chart Display and Information System for Inland Navigation (CESNI/TI/Inland ECDIS)
- Temporary Working group for Electronic Reporting International (CESNI/TI/ERI)
- Temporary Working group for Vessel Tracking and Tracing (CESNI/TI/VTT)
- Temporary Working group for Notices to Skippers (CESNI/TI/NtS)

It is recommended to strengthen the cooperation with CESNI/TI and for the CESNI Member States to actively engage in the design and development of the CESNI/TI work programme (REC 26).

ES-TRIN (European Standard laying down Technical Requirements for Inland Navigation vessels) and ES-RIS are revised and published every two years.

An amendment of the RIS Directive is needed in order to refer to ES-RIS.

6.5 Intermodal Standards

Due to lack of resources in SuAc 4.1 only specific standards have been looked into in more detail. Nevertheless, it needs to be taken into account that there are several additional standards used in different modes of transport published by UN CEFACT, CEN, IEEE, ITU.

6.6 Inventory of ‘de facto’ standards

6.6.1 RIS Index

The RIS Directive, in Article 4(3)(a), requires Member States to “supply to RIS users all relevant data concerning navigation and voyage planning on inland waterways. These data shall be provided at least in an accessible electronic format”. However, the electronic format is not further specified in a commission implementing regulation.

The RIS Index was established well over 20 years ago as a first harmonised reference data set for Notices to Skippers (NtS) to refer to objects on the waterways in NtS messages. Later on, the scope was extended to serve also other RIS standards on a European level.
In the Framework of the RIS Expert Groups, it was agreed upon to commonly use the RIS Index for the provision of objects of relevance for Inland Navigation in the RIS context. Nevertheless, the RIS Index was not unambiguously specified in all the details. In order to reduce the room for interpretation, the RIS Index Encoding Guide was first started in the PLATINA project and then further developed by the Joint Task Force on the RIS Index.

The RIS Index makes use of the ISRS Location Code to identify objects. This code is composed of five attributes, which contain meaningful information upon creation of the code. This meaningful information may change at some point, therefore, the use of it as a unique identifier is prone to error. As there was no common agreement on the maintenance procedures for the ISRS Location Code when this code was introduced as an object identifier, the implementation in the RIS technical services is not harmonised. The result is that (some) objects are not referred to with the same ID in different services and applications.

Commission Implementing Regulation (EU) 2018/2032 ERDMS concerning the technical specifications for Notices to Skippers requires that the ISRS Location Codes and the reference data of objects are maintained by the Member States in the RIS Index and submitted to the ERDMS operated by the European Commission according to the Maintenance procedures for the RIS Index published on the ERDMS website[16]. One of the identified issues is, that referred maintenance procedures are not worked-out to the required extent.

In addition, ISRS Location Codes are also maintained for electronic reporting in the ERI Location Tables (BCSPLTS – srs_location). Since there are different origins/responsible organisations, these ISRS Location Codes are not always in line with the ISRS Location Code assigned to a specific object in the RIS Index. The consequence is that for an object there could be different codes depending on which reference data table is used.

To consider the requirements of Electronic Reporting for more detailed specification of terminal types, the RIS Index has been enhanced to cover additional object functions in the year 2011 by means of ERI Change Request 25. In the year 2015 the RIS Index Version 2.0 covering these requirements was approved by all RIS Expert Groups. The merger of locations was started in a few countries but was not completed.

If the codes do not match it is not possible to find ports of call as specified in an ERI message in other RIS systems, because of non-corresponding locations in the RIS Index. If locations are not known it is not possible to use them for route- and voyage planning.

It is strongly recommended to complete this merger of the ERI Location Codes with the RIS Index Location Codes to only have a single code list with unique identifiers (ISRS Location Codes) for specific objects (REC 3). Depending on the function (e.g. Berth with transhipment, Tanker-Terminal), objects could be filtered and made available in applications in order not to bother users with locations that are not applicable for their processes.

There are three types of locations to draw special attention to:

- Locations outside the area of competence of RIS authorities but within the RIS area (e.g. private ports)
- Locations outside of the RIS area (e.g. Oslo)
- Locations used and maintained by logistics (e.g. private terminals)

[16] See NtS Commission Implementing Regulation ANNEX chapter 4.3 (https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32018R2032&from=EN)

Recommendation to have a pragmatic approach in first place and to have a sustainable solution in second place, to be discussed in CESNI/TI Task TI-21[17] which should be started as soon as possible (REC 9).

Overall, the specification of the RIS Index changed through time and is nowadays not in line with the practical implementation of the RIS technical services. It is therefore not recommended to lift the RIS Index to the level of an official standard.

The need for further technical specifications and improvement was expressed by involved stakeholders and, on the level of CESNI/TI, resulted in the definition of task TI-15 in the work programme of CESNI/TI “Prepare technical specifications for data for navigation and voyage planning”. For EuRIS, the need for data for route- and voyage planning had to be dealt with in practical terms. In RIS COMEX, the RIS.net was specified, see chapter 7.2.

6.6.2 VisuRIS COMEX Reference Network Model

The requirement for a digital inland waterway network was already identified quite some years ago. In the CoRISMa project, a study on European Nautical Network Data Services (NNDS) was executed, taking the RIS Index as a baseline and interpreting the ISRS Location Codes. All the known RIS Index objects were located on a map and connected making use of the fairway section code and the fairway hectometre.

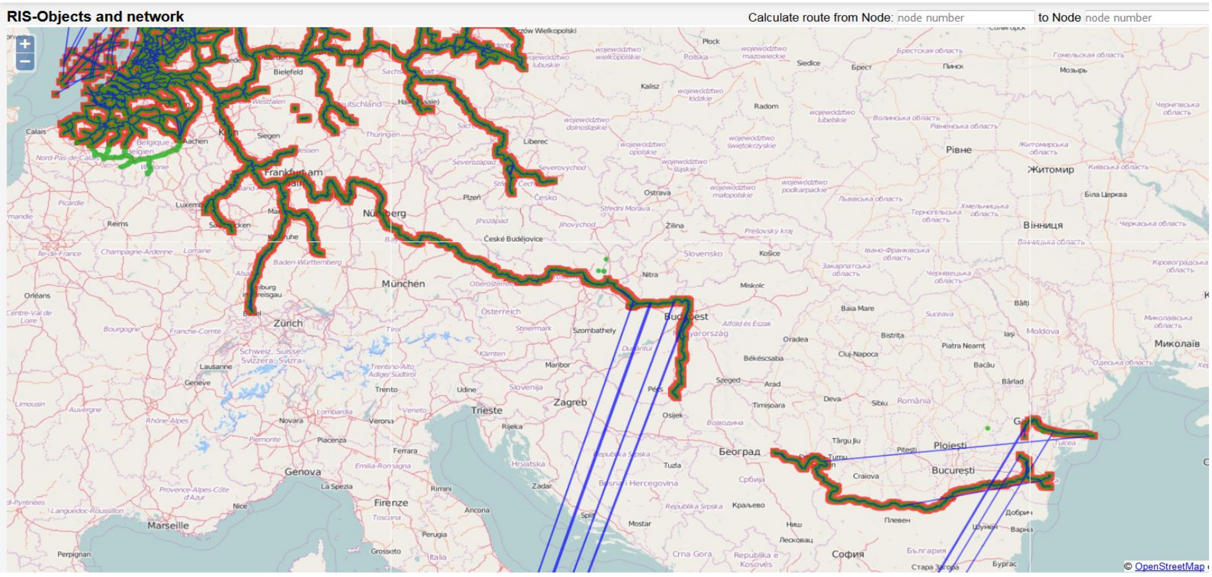

Figure 10 CoRISMa NNDS pilot

Nevertheless, this network was derived from individual RIS Index points and the links were not further specified:

[17] CESNI TI-21: “Develop guidelines and provide advice on the harmonised use and maintenance of the data of the RIS Index and other reference data required by the RIS Standards, such as the ERDMS”

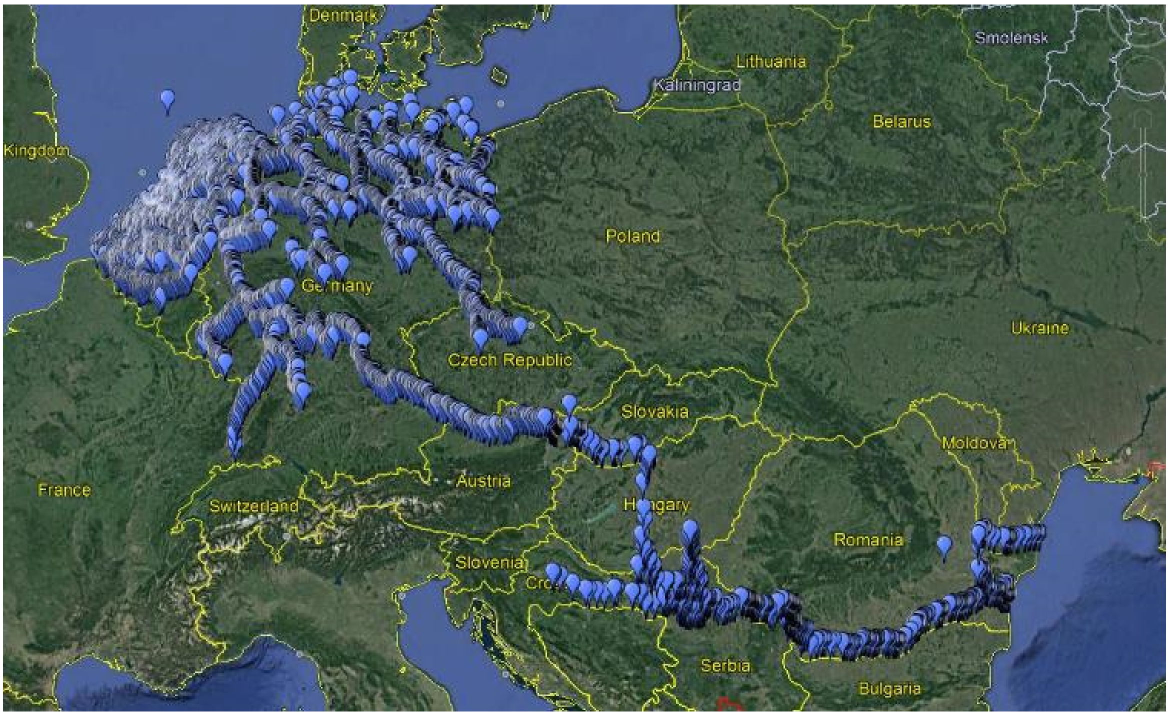

Figure 11 RIS Index points (status 2015 during the CoRISMa project)

When EuRIS was implemented, the need for digital inland waterways network information became evident. To have available all relevant objects with required attributes and also the relations between the objects, the VisuRIS COMEX Reference Network Model was developed. Besides the objects and their relations, it also includes the parameters of the physical links (Fairway sections). Information that was not provided via the RIS Index was added in separate tables. The big advantage of this approach is that the well-established RIS Index could be used in EuRIS. The disadvantage is that besides the RIS Index, a parallel data structure has to be maintained that has multiple relations to the RIS Index. The consequence is that both have to be updated and published at the same time, thus this approach is more complex to maintain and prone to error. By means of the VisuRIS COMEX Reference Network Model, important experience has been gained and requirements for a digital inland waterway network have been specified and rolled-out in practical terms. In comparison to the data available in CoRISMa in 2015 the data quality and coverage significantly improved as one can see in Figure 12.

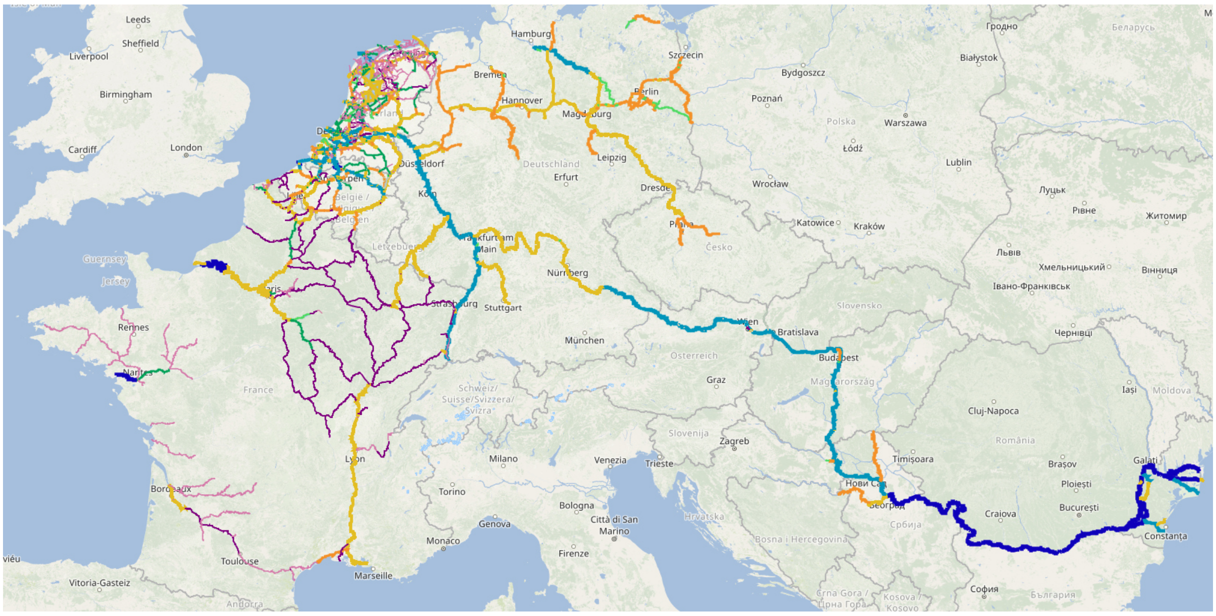

Figure 12 EuRIS Inland Waterways CEMT class map based on VisuRIS COMEX Reference Network Model (01/2023)

Nevertheless, the VisuRIS COMEX Reference Network Model is a EuRIS application specific implementation. A general specification for future standardisation is provided by the RIS.net concept which combines all the information from the RIS Index and the VisuRIS COMEX Reference Network Model and add even more features that have not been rolled-out in EuRIS so far. The RIS.net concept is explained in chapter 7.2.

6.6.3 ERIINFO and update requests for voyage plan

The ERIINFO message shall be sent out by Vessel Traffic Management systems under special circumstances and should be displayed to the skipper. Based on the message and the respective code (see Table 5 ERIINFO codes returned to the skippers) the skipper can decide to send an update of the ERIVOY message and possibly an update of the ERINOT message. This message can be generated automatically or manually by an operator. This message is supported by the EuRIS platform, where it can be consulted by skippers in their Message Inbox.

Code	Description
901	No service at the object. Request update voyage plan
902	Limited service at the object. Request update voyage plan with additional passage time
911	Blockage of the object. Request update voyage plan or new voyage plan
912	Partial obstruction of the object. Request update voyage plan with additional passage time
913	Blockage of fairway section. Request update voyage plan or a new voyage plan
914	Partial obstruction of fairway section. Request update voyage plan with additional passage time
921	Delay due to dense traffic at object. Request update voyage plan with additional passage time
960	Submitted ETA for next object no longer feasible according to prognoses. Request update voyage plan
961	Submitted ETA for next waypoint no longer feasible according to prognoses. Request update voyage plan
980	Submitted ETA for destination no longer feasible according to prognoses. Request update voyage plan

Table 5 ERIINFO codes returned to the skippers

Object Access

The Object Access message will be sent to the respective skippers once the lock/bridge schedule is final, the skipper will be informed of his position in the lock or passage and in which order entry will take place. In essence this information is provided to a group of vessels to state which vessels are included in a locking cycle. This message is supported by the EuRIS platform, where they can be consulted by skippers in their Message Inbox.

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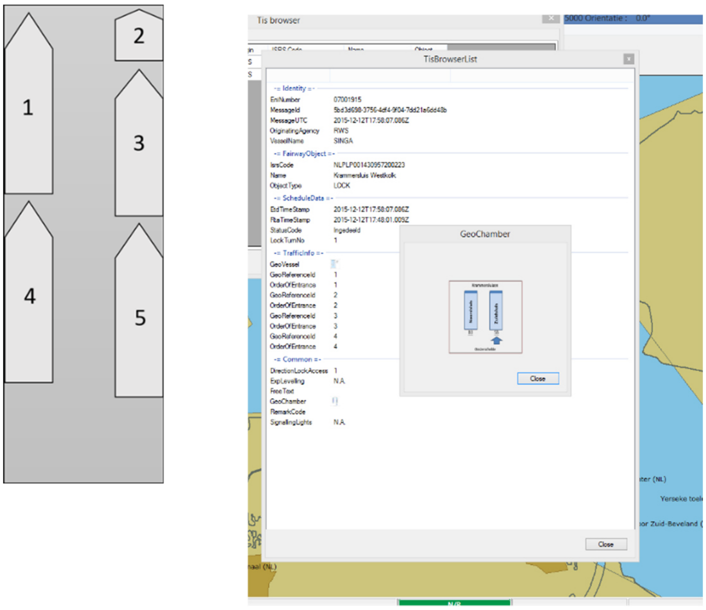

Figure 13 Object access information

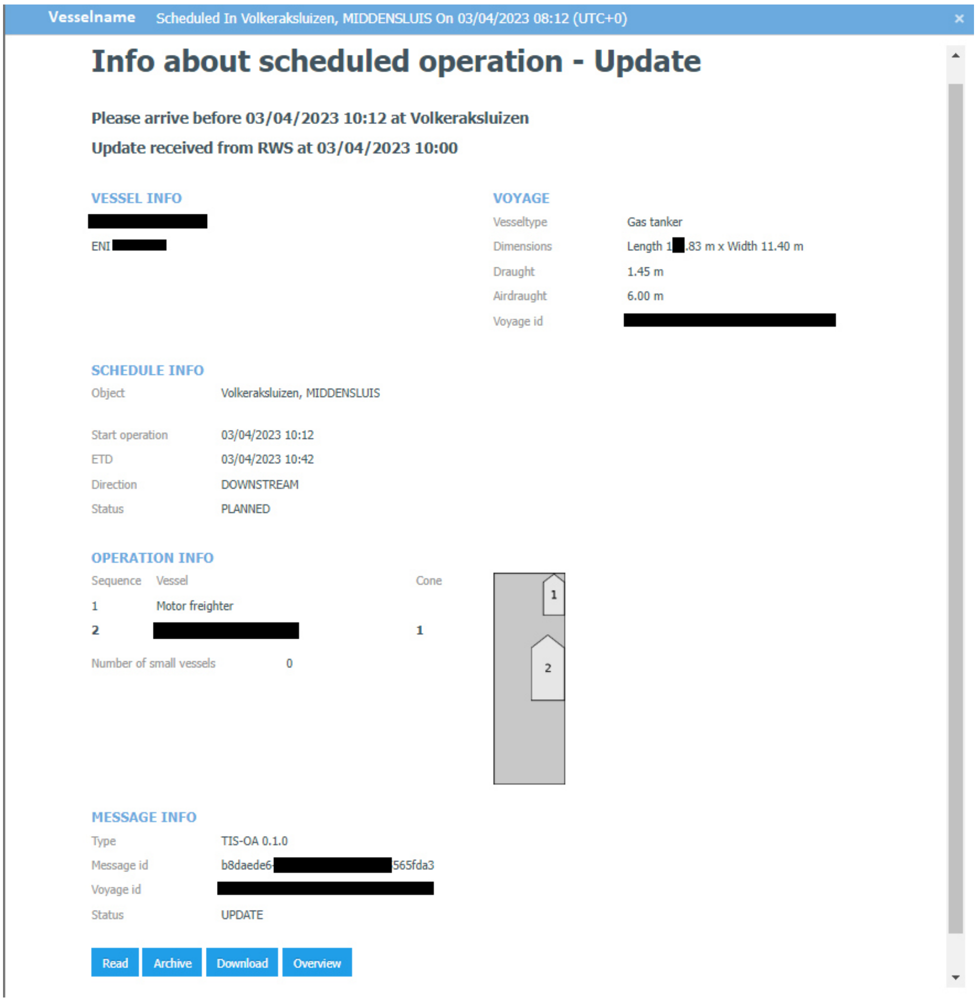

Figure 14 Lock operation schedule information provided to users

RTA (Requested Time of Arrival)

During the approach of an object, the vessel will be included in a preliminary rotation plan or bridge passage plan, starting from a defined time period ahead or from passing a predefined reporting line, and will be provided with (local) traffic information and object planning information needed to optimize the approach (required time of arrival, RTA; preliminary rotation planning for a lock). The RTA-time by the respected will be communicated by means of this message which similar to the AIS message. This message is also supported by the EuRIS platform, where it can be consulted by skippers in their Message Inbox.

Structured messages (e.g. RTA and OA) and API's (e.g. Object status information discussed in the next section) make it easier to handle lock/bridge approach and passing for automated/remotely operated vessels since the information can be processed and responded to by machines.

6.6.4 Object status information

In 2013 the Dutch Ministry of Infrastructure launched a project (Blauwe Golf Verbindend / Blue Wave Connecting) to equip a large number of bridges with sensors to transmit their operational status (open/closed). The bridge status was collected, transformed into a DATEX II standard and provided to the national access point for road data in the Netherlands[18] and also to an information webpage for fairway users. In fact, the DATEX II standard is in this case filled with the ISRS code.
In another Rijkswaterstaat project, operational lock data was extracted. This provided the opportunity to extend the object status data provision for fairway users. For this, the part of the DATEX II standard concerning bridge status was used as a template for lock status, resulting in the following expansion:

Path	Data
/lock	All locks
/lock/details/<isrs>	Lock details
/locks/since?<timestamp>	List of lock details (using same timestamp approach as with bridges)

In response to the request a list of objects will be returned sorted by descending change data (most recent on top).

lockDetails

Field	Description
lockStatus	ENTERING_DOWNSTREAM, ENTERING_UPSTREAM, LOCKING_DOWNSTREAM, LOCKING_UPSTREAM, BLOCKED, FREE_PASSAGE, UNKNOWN, OPERATIONAL_(STANDBY), PREPARING_UPSTREAM, PREPARING_DOWNSTREAM, EXITING_UPSTREAM, EXITING_DOWNSTREAM
lockPlanning	List of planned locking times (see lockplanning data structure)
Obstructions	List of obstructions (see obstructions data structure)

lockPlanning

Field	Description
sailingDirection	Locking direction: UPSTREAM, DOWNSTREAM
greenLightAtEntrance	Green light for entry in chosen sailing direction. This is the planned datetime for entry
redLightAtEntrance	Red light for entry in chosen sailing direction. Locking will start. This is the planned datetime for start of locking
greenLightAtExit	Green light for exit in chosen sailing direction. Locking is completed. This is the planned datetime for completion of locking
Certainty	PLANNED, EXPECTED, APPROVED, CURRENT, TERMINATED, CANCELLED.

[18] https://www.ndw.nu/

Within the COMEX project, this was put forward as an example as to how a TIS 4 service (Actual overview regarding the operational status or operation of objects) could be implemented. During several meetings the options were discussed and the modified DATEX II standard was adopted by the COMEX project as a preliminary standard for provision of object status data both towards EuRIS and from EuRIS to third parties. At the time of writing of this report, in addition to Rijkswaterstaat (NL) also VNF (FR), viadonau (AT) and Státní plavební správa (CZ) have started providing object status data in accordance with the preliminary standard.
Expanding DATEX II with fairway specific elements like lock status was deemed not prudent since it would be overkill for the IWT domain to use the entire DATEX II standard which contains many for IWT irrelevant items and would be inefficient for the road domain to have to take IWT into account for a comparatively small part of the standard.
It would be advisable however to integrate the preliminary standard used in the COMEX project in the RIS standards suite to safeguard further implementation of the TIS 4 RIS service across the European waterways (REC 16).

6.7 Inventory of paper-based procedures

During 2019 the Dutch Ministry of Infrastructure conducted a research[19] on the legal needs (law, regulations, etc.) of information needs of transport for all modalities. For Inland Waterway Transport this resulted in a list of 170 information needs by different governmental organisations. The main objective of the research was to determine whether there are legal restrictions to digitalise documents.

The inventory showed there are a number of restrictions by legislation for digitalisation in Inland Waterway Transport, mainly based on articles in the 'BinnenvaartPolitie Reglement (BPR) and the Police regulations for the navigation of the Rhine (RPR), article 1.10. Attachment 13 of the RPR gives an overview which documents have to be in paper form on board or can be on board in a digital form (Central Commission for the Navigation of the Rhine - CCNR Regulations (ccr-zkr.org)). As shown in this overview most of the documents may be consulted in an electronic format (pdf as standard) on board. Nevertheless, a pdf is just a digitized copy of an analogue document or an export of a document in e.g. Word without intelligence/ability to process it efficiently.

For supervision and enforcement by the government, some paper documents regarding crew, the vessel and certain goods are required to be on board. During visits on board by governmental people the documents need to be present in a paper form.

The upcoming eFTI (electronic Freight Transport Information) regulation (see chapter 6.8 eFTI) is an opportunity to support further digitalisation of a (large) number of information needs or documents as shown in the inventory. As the exact scope and impact of the eFTI regulation is not clear at the time of writing, it's not clear which information needs will be affected by the regulation.

Working towards a world 'digital by default' means that current laws and regulations will have to be adapted, which will take some time due to the process to adopt new laws. Besides adapting law and regulations, procedures, organisational and supporting systems need to be changed to support the digital transformation. From previous initiatives we have learned that starting at the organizational and procedural level seems the best approach, both from government and business perspective.
One of the objectives of the Masterplan DIWA project is working towards paperless transport, although the digitalisation of individual documents for transport hasn't been assessed in detail. It is therefore recommended that this will be investigated further on an EU-wide basis as e.g. the RPR doesn't cover all EU waterways. (REC 23)

6.8 eFTI

eFTI (electronic Freight Transport Information) is an important European development in the reporting of freight transport information, replacing paper documents and smoothing the exchange of

19 Analyse naar de wettelijke informatiebehoefte van de overheid in het goederenvervoer, 7 Februari 2020, Topsector Logistiek & Ministry of Transport and Infrastructure

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information in the transport chain. eFTI is discussed in detail in the report of DIWA Sub Activity 3.2 – IWT Connectivity Platform and partly in DIWA Sub Activity 3.4 - IWT Data Model & Information Registry.

History: the CMR Convention (CMR = 'Convention Relative au Contrat de Transport International de Marchandises par la Route') was drawn up by the United Nations in 1956 with the aim of providing a uniform legal framework for (inter)national road transport of goods. The treaty has been ratified by most countries in Europe, but also by several countries outside Europe.

In February 2008, **an additional e-protocol** was added to the CMR Convention, which entered into force in June 2011. The **eCMR protocol** provides a legal framework and legal standards for the use of electronic means in recording the CMR consignment note. Many countries have signed the treaty, after which their governments still have to ratify it. After this ratification, the digital consignment note can be used in the relevant country. For Germany, this ratification was not approved before April 2022. Another example of this is Belgium. The eCMR protocol has been signed there, but not yet ratified.

It takes a very long time before all the countries ratify this eCMR protocol, which shows that in this case the "bottom up" approach is not perfect. Therefore, the eFTI-approach (top down via an EU regulation) can enforce standardization and harmonization.

Another advantage of eFTI is that the scope is not limited to waterway traffic alone: It establishes a legal framework for road, rail, maritime, inland waterways and air transport operators to share information with enforcement authorities in an electronic format. This is a crucial step as it entails significant benefits for all transport modes in the EU.

As suggested by SuAc 2.2, "Synchromodality", there is a need for standard (information) interfaces within the various transport modes road, rail and inland waterway (see chapter 4.1). In this sense, the eFTI regulation is a blessing, since it can bring the data models for the different transport modes together and this at a European level.

The power of this data model is also acknowledged by several industry associations, such as CEFIC, the European Chemical Industry Council, founded in 1972, being the voice of large, medium and small chemical companies across Europe. Although eFTI is set up to tackle the harmonized sharing of data in a pure B2A (Business to Authority) context, CEFIC is keen on extending this towards a harmonization of the B2B (Business to Business) context. The latter will not be the responsibility of DG MOVE, but it is an opportunity for the industry associations that are seeking for more harmonization and efficiency in the data sharing over the complete Supply Chain.

As such, it is also an opportunity for IWT to be seamlessly chosen by shippers or their freight forwarders as one of the transport modes for the hinterland transport, without being experienced as "more complex" than other transport modes.
With relation to the topics in this report, the focus should be on this data model of eFTI, which is mainly based on the UN/CEFACT Multi-Modal Transport Reference Data Model (MMT-RDM). At the moment of writing, this eFTI data model is still under construction by the European Commission and recent feedback on the draft version of the data model indicates that several changes may be required before the data model covers the entire scope of eFTI as defined in the EU Regulation.

Despite these uncertainties, it seems logical that there will be significant overlap between the eFTI data set and the information in the ERI messages, and investigating an update of the ERI data set to increase its alignment with the eFTI data set is already on the program of CESNI/TI/ERI. It is expected that the development of a translation service from ERI to eFTI (and vice versa) should be possible, especially since the European Commission has expressed the intention to include the obligation to extract the content of the ERI messages from eFTI certified platforms in the revision of the RIS Directive. Although ERI will not be impacted by eFTI until the aforementioned revision of the RIS Directive (per the latest information from the European Commission), eFTI developments should be followed up closely to ensure, to the highest extent possible, an easy incorporation of eFTI for parties transporting cargo via the inland waterways.

Given that reporting of cargo and voyage information on the inland waterways is already a highly digitalized process, it seems that IWT has an advantageous position regarding the introduction of electronic cargo reporting in other transport modes and could gain a competitive advantage via a swift interconnection with eFTI. Therefore, it is advised that DIWA Ac 5 takes the further developments of eFTI into account (REC 2 and REC 28)).

6.9 Test Standards

Technical standardisation is a process of harmonising features like operational procedures, technical solutions, information exchange, visualisation and portrayal and much more.
Taking into account the above-mentioned aspects, standardisation aims to provide harmonised specifications in order to achieve consistent purpose, compatible procedure, uniform functionalities, interoperability and homogenous presentation.

A technical standard is a commonly agreed specification between different parties, like industry, user groups, standardisation bodies or governmental agencies, developed by a standardisation body. Usually standardisation bodies are dedicated to certain field of applications or technologies.

There are many national and international standardisation bodies developing numerous technical standards. Industry standards or so-called de-facto-standards which are developed within the industry, National standards from national standardisations bodies like ANSI, BSI or DIN and international standards from standardisation bodies like ITU, ISO or IEC. In Europe for example ETSI develops and publishes standards for telecommunication and CESNI is the European committee for drawing up standards in the field of inland navigation.

A technical test standard is intended to ensure the unambiguous interpretation of the required functions and their correct implementation. It ensures a common understanding of the requirements and the intended characteristics of the product by developers, manufacturers, test houses and uses.
A test standard can be part of a technical standard or additional to it.

A test standard is intended to ensure a harmonised implementation between different developers and manufacturers and to ensure interoperability of devices from different manufacturers. It contributes to a high level of quality of the product.

A test standard typically specifies requirements for aspects related to operation, design, documentation, test procedures and required test results of the equipment under test.
The test standard includes a list of applicable normative references, a description of the test environment, the purpose of the test, detailed test plans and the expected behaviour of the equipment under test.

A test standard provides commonly agreed test procedures for manufacturers and test houses.
A test standard is also basis for certification and type approval.

The European committee for drawing up standards in the field of inland navigation (CESNI) has defined test standards for Vessel tracking and tracing system in inland navigation (Inland AIS) and for Electronic chart display and information system in inland navigation (Inland ECDIS), also see 6.4 Standards in the RIS area. Test standards for Electronic ship reporting in inland navigation (ERI) shall be developed for future revisions of CESNI European Standard for River information services (ES-RIS) as the need for an ERI test standard was expressed by several stakeholders (public and private).

There are several other test standards for equipment used in Inland navigation.
Examples are:
- CESNI European Standard laying down Technical Requirements for Inland Navigation vessels (ES-TRIN 2023), Minimum requirements and test conditions for rate-of-turn indicators in inland navigation;
- ETSI EN 303 676 V1.1.1 (2021-07). Navigation radar used on inland waterways; Operational, functional and technical requirements.

It is recommended to develop test standards for international standards that have to be used by multiple parties in inland navigation to support a uniform and harmonised implementation of the appropriate technical services (REC 12 and REC 13).

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6.10 Harmonization of code lists

Enumerations and code lists are essential in standards in order to ensure proper and unambiguous interpretation of the content. Based on used codes, specific items can be addressed and items can be grouped. Code lists also help to reduce the size of exchanged data as only the code has to be included in messages rather than a description of the content.

Depending on the requirements, different code lists have been established in IWT related standards. For example, for the purpose of Electronic Reporting there are different requirements for goods or vessel types compared to statistics. Depending on the application there are different requirements towards granularity and grouping of locations in the different RIS technical services, statistics or other modes of transport.

The code lists have different origins. In the project Platina (platform for the implementation of NAIADES) code lists and their maintenance procedures for RIS related reference data were defined. It is of utmost importance to continue this work (REC 9), as it is also specified in CESNI/TI Task TI-21 (maintenance procedures). Three different categories of reference data were identified, each with their own procedure:

A. References, codes and code tables maintained by an official recognised organisation
B. National and Regional codes and references maintained by member states for usage in a certain area.
C. Standard codes and references, which are part of the published written technical specifications and maintained by CESNI/TI.

Attempts have been made to harmonize code lists, for example in the framework of the ERI Expert Group between 2011 and 2015 for vessel and convoy types comparing the following code lists;

- Definitions in 2006/87/EC and Rhine Inspection Rules
- Definitions in Resolution 61 of UNECE and recommendations of DC
- Un rec. 28 rev. 4 Codes for types of means of Transport
- Definitions in 1365/2006 and No 425/2007 Eurostat

Due to the complexity and different, partly overlapping definitions it was not possible to create an unambiguous conversion table where one can convert a vessel code of one standard to a vessel code used in the other standards which have been compared. Especially for those reporting it is a burden to make proper declarations depending on the application. Users could be supported in applications selecting the proper codes.

In general, it is highly recommended to re-use existing code lists as much as possible by means of cross-references and also, in the course of revision of standards, to harmonize code lists (REC 10).

7 Future situation

Within this SuAc, possibilities of standardisation on the digital transition in the period 2022-2032 and defining the needs and requirements for implementing new or amended standards were assessed.

7.1 Harmonised implementation of the RIS technical services

To aim at a harmonised implementation of RIS technical services, the RIS Directive and Commission Implementing Regulations have been put in force. From a legal point of view the requirements have been formulated. Nevertheless, as RIS services were implemented on national level only without interfaces, users may have experienced difficulties connecting to national data sources, but could hardly reach out to those offering the services.

When the EuRIS Portal was implemented in the RIS COMEX project, deficits became visible in the course of interconnection and integration of national data sources into EuRIS.

Common European Services contribute to proper implementation of RIS technical services as this is a pre-requisite for interconnection and seamless integration of information (REC 31).

To ensure that the efforts made in European Projects can be benefitted from also after projects are concluded, it is to be strived for within the lifetime of European Projects that services and applications developed in these projects are put to sustainable operation after the project is concluded (REC 1).

For new standards, an implementation roadmap should be commonly followed for rolling-out new services.

Faulty and missing information becomes visible on Common European Services thus these services increase the pressure on the authorities to improve data and services (REC 33).

7.2 RIS.net

The RIS Index includes a list of objects of relevance for Inland Navigation. To add specification of the links, the VisuRIS COMEX Reference Network Model was developed in RIS COMEX as this was required for the proper functioning of EuRIS Services. The VisuRIS COMEX Reference Network Model is further explained in chapter 6.6.2.

In order to have a general, project and application independent specification, the RIS.net concept was developed in RIS COMEX. It combines the information from the RIS Index and the VisuRIS COMEX Reference Network model and adds additional capabilities for services which were not realised in EuRIS in the course of RIS COMEX. The RIS.net concept is explained in the DIWA SuAc 3.4 report and also covered in the work programme 2021-2023 of CESNI/TI by the task TI-15. The task TI-15 calls for technical specification for navigation & voyage planning data. RIS.net includes the means to fulfil this task (REC 20).

The RIS.net concept covers entities and attributes required for the implementation of RIS technical services. The concept still needs to be validated from a technical point of view, also maintenance procedures need to be defined. It is therefore recommended to make available sufficient funds in a European project to carry out these tasks (REC 4).

It is of utmost importance to first implement the RIS.net concept prior to bringing it towards standardisation to prove it and to have flexibility for fine-tuning (REC 8). Standardisation could be envisioned in CESNI/TI (ES-RIS) starting with the procedure in 2030 (REC 25).

The generation of RIS waterway network reference data is a complex task requiring technical (GIS) systems, information and workforce. Sufficient time needs to be planned for the transition period towards RIS.net. The RIS Index, and in specific the ISRS Location Code, are implemented in various national systems and services. These systems will not be replaced all at once to include RIS.net capabilities. But whenever a re-design is planned, the RIS.net concept shall be implemented.

The RIS.net concept offers legacy support for the RIS Index. As all the objects and attributes of the RIS Index are part of the RIS.net concept, the RIS Index can be exported without additional manual effort and afterwards imported to legacy applications. This means that a data provider can switch and maintain RIS waterway network reference data by means of the RIS.net concept prior to updating all the national or connected RIS applications.

One of the major issues with the RIS Index is the (non-)interpretation of the (non-)meaningful ISRS Location Code as depicted in chapter 6.6.1. A new generic RIS_ID is part of the RIS.net concept, to reduce the effort for implementation, the ISRS Location Code is still supported and can be assigned to entities wherever required for legacy systems, services and processes. A roadmap for the rolling-out of RIS.net and phasing out of the ISRS Location Code as primary object ID could look like this:

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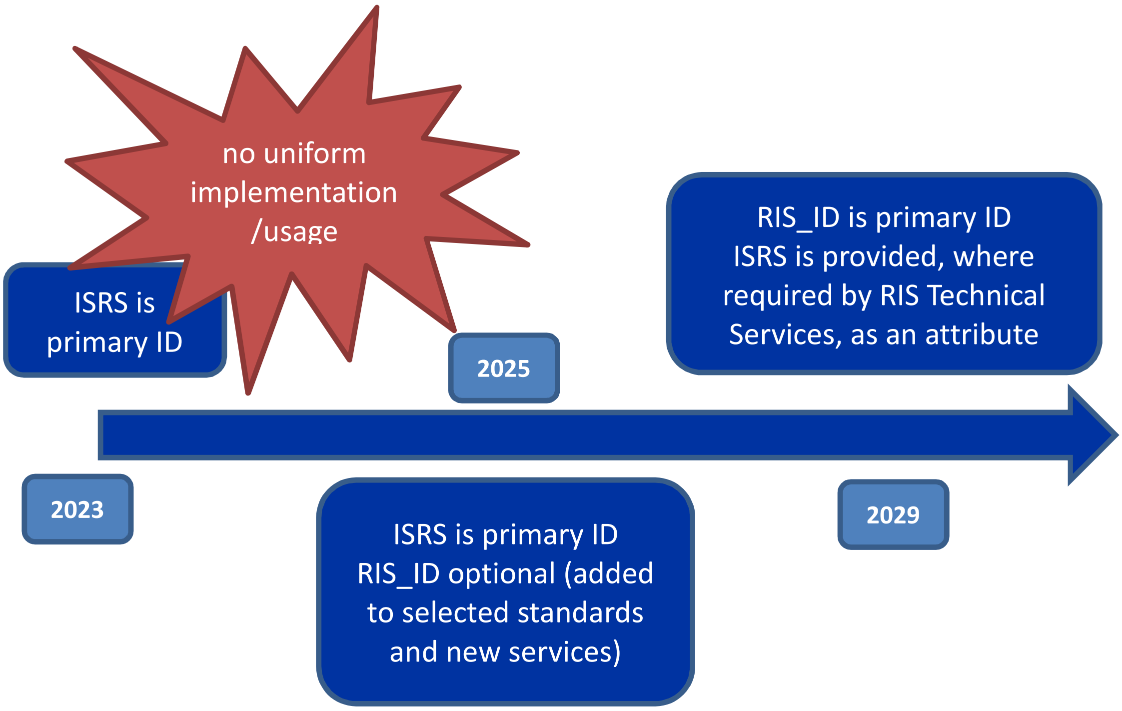

Figure 15 Possible roadmap for the phasing-out of the ISRS Location Code as primary ID

In the framework of CESNI/TI, the potential impact of the introduction of the RIS_ID on the RIS technical services was assessed. For NtS and ERI the effort for adding such new data field was considered low on technical level. As standardization, in general, is a slow process, it is recommended to add this ID as soon as possible, thus in ES-RIS 2025/1 for future use. For Inland ECDIS one could include a RIS_ID as part of the Maritime Resource Name (MRN) in the IHG S-401 and S-402 standards. Inland AIS has a limited amount of bandwidth, in case such a RIS_ID requires a higher number of bits one would have to wait for the next generation AIS called VDES (VHF Data Exchange System). From technical point of view, it is therefore not possible to introduce a new RIS_ID into Inland ECDIS and Inland AIS on short notice, therefore the ISRS Location Code will remain the only object identifier within ES-RIS 2025/1. Depending on the progress of VDES as well as S-401 and S-402, the RIS_ID could be introduced for ES-RIS 2029 for the VTT and Inland ECDIS parts of ES-RIS.

For the RIS_ID the following principles shall apply to avoid inhomogeneous implementation:

- The format shall be agreed upon in the temporary working groups of CESNI/TI.
- The format of the data field (the data type) is strictly to be defined and followed.
- The maintenance procedures for assignment of RIS_IDs have to be defined and strictly followed.

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A roadmap for the rolling-out of the RIS.net concept could look like this:

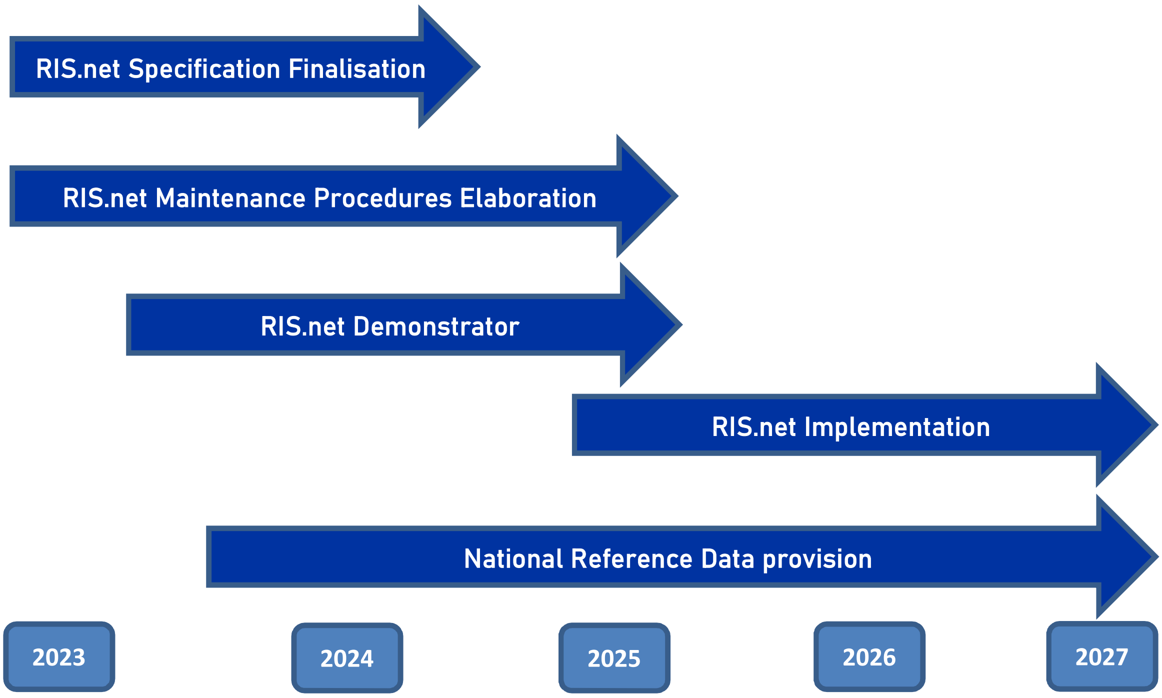

Figure 16 Possible roadmap for rolling-out the RIS.net concept

In 2023 the RIS.net specifications could be finalised from a technical point of view. A RIS.net Demonstrator shall prove the concept by means of selected test data sets by involved partners covering a significant part of the European waterways. For example, a complex area of the network should be encoded. "Lessons learned" will be used to improve the RIS.net concept and Encoding Guide. The general rolling-out of the RIS.net concept should start in 2025, national reference data is being provided to support the implementation throughout the whole process. All the steps could be carried-out in a European project (REC 4).

With a view to standardization, consideration of the RIS.net concept as general structure for provision of digital waterway network reference data (REC 25) could be foreseen for ES-RIS 2029 (input to this standard is to be finalized by July 2027).

7.3 Connecting nodes between different modes

As suggested by SuAc 2.2, "Synchromodality", there is a need for standard (information) interfaces within the various transport modes road, rail and inland waterway (see chapter 4.1), also connection to maritime and aviation needs to be tackled. One of the important aspects to be able to calculate an optimal route at any moment in time during the itinerary of cargo is a link between locations. An automated route calculation over multiple transport modes, demands the knowledge of crossroad-points on the route and the transhipment possibilities on those junctions from one transport mode to another (REC 5). In a first step, these crossroad-points could be limited to hubs like multimodal inland terminals. In a more futuristic world, the crossroad-points could be anywhere where 2 transport routes come together and transhipment is possible in a safe way.

As a consequence, there should be a cross reference between the different location code lists that are used by the different transport modes. Using the geographic coordinates to detect where possible junctions with other transport modes are, is most likely not enough to rely on the possibility to perform a transhipment. Extra attributes are necessary and they should be standardised so that advanced route calculators can advise on a most efficient and sustainable itinerary at each moment in time, based on real time information.

This topic was also investigated by Subgroup 1 of the DTLF (Digital Transport and Logistic Forum). When this forum publishes their final report, this can be an inspiration for the different transport modes. This will be also important for the implementation of eFTI in a multimodal or synchromodal environment.

In case of IWT, the linkage to other transport modes like rail or road should be taken into account when designing and implementing RIS.net.

Any missing data on transhipment points will be experienced by the logistic service providers in the field. They should get a tool where they can easily report faulty or missing data in RIS (REC 33). Also other users of inland waterways would be able to make use of it.

7.4 Waterway status information

In order to support voyage planning and an overall life-status of the infrastructure, information from different sources is to be combined. An object or a section is included in the digital inland waterway network as a baseline. Operating times might be available for e.g. a lock implying that a lock is only available for navigation at specific hours on specific days. In addition, limitations might be published for a lock via NtS narrowing down the availability. Local data sources (e.g. lock management system) could be connected feeding live status information into the system.

The river bed is subject to continuous changes. Sounding results may complement the data available in the digital waterway network for specific sections. On the Danube corridor a so-called 'bottleneck service' was established to provide sounding results by means of a track plot and the minimum actual available depth via Web Services.

To provide actual status information, the data of the services mentioned above is aggregated. A standardized interface is to be specified to exchange processed data (REC 32).

8 Results and conclusions

8.1 Interactions with other Sub-Activities

Smart shipping (SuAc 2.1): concludes that standards are missing for communication between vessels for smart shipping purposes. The RIS technical services as required by the EC and rolled-out in Europe do not meet the requirements for autonomous sailing. It is recommended to enhance the RIS technical services in this respect. Legal provisions are required in order not to block innovation on technical level. New standards and regulations should be drafted in the framework of CESNI. (REC 17and REC 27).
Uniform data exchange requires the standardisation of communication protocols: open standard for real-time, secure data exchange for e.g. intention sharing. But, standards can vary from region to region, which has to be avoided. Standardization efforts shall be aligned among maritime and inland.

Synchromodality (SuAc 2.2): calls for more harmonization between the different modes of transport. Within the IWT domain standards are harmonized to a high level but the interfaces to the other modes are to be improved considering in specific the requirement of logistics. In this respect it is recommended that public parties set-up harmonised standards in the commercial and private platforms of inland waterways, to reach an international harmonised level of synchromodality (REC 5, REC 6 and REC 14).

Port & terminal information service (SuAc 2.3) : calls for standardization in information exchange, training and certification for operators, electronic reporting at required points, and standardized customs notifications using a Fairway Authority platform or community system.

SuAc 2.3 recommends developing API/interface standards for data exchange between various stakeholders, such as local port authority systems, terminal operator systems and navigation devices/onboard systems. It is suggested to create a common interface standard for exchanging barge traffic data and facilitating ERI. Additionally, SuAc 2.3 proposes harmonizing standard messages for reporting purposes and evaluating current business practices for cargo information exchange. The Digital Container Shipping Association's standards related to just-in-time port call, track and trace, and bill of lading could be used to develop solutions for IWT.

SuAc 2.3 also states that the role of reference databases will become more important (RIS Index, ERDMS, EHDB, etc.), therefore, the maintenance of reference data needs to be reliable, and responsibilities for reference data need to be defined (REC 9, REC 29).

RIS enabled corridor management (SuAc 2.4): identifies slow update cycles for standards and different interpretations of standards as risks to the success and adoption of RIS-enabled corridor management. To address this, SuAc 2.4 recommends the evolution of standards through optimized standardization procedures, less room for interpretation, and standardization of interfaces/messages for multimodal data exchange. Central solutions like EuRIS are also recognized as a means to increase standardization (REC 29). Standardization measures should allow IWT to reach the same information/standardization position as road/rail/maritime/aviation. SuAc 4.1 is directed to align and consider RIS-related standardization requirements. This is covered in chapter 6 'Current situation' and 7 'Future situation' of this report. Additionally, SuAc 2.4 recommends standardizing not yet standardized ERI messages based on operational experiences and optimization (REC 18).

ITS, ERTMS, e-Navigation (SuAc 2.5): highlights the importance of standards in the maritime domain (i.e. S-100 framework by IHO, standardisation of bridge layout by IMO) for mixed traffic areas and identifies a gap between rail/maritime and IWT regarding providing path offers/requests. Harmonizing all Inland and Maritime electronic reporting messages is deemed infeasible, and a 'translation service' between the two systems is suggested for automated exchange of ETD/RTA information (REC 19).

SuAc 4.1 investigated the differences and similarities between the HERmes 30 and ERI messages in chapter 6.3.2.2 'HERmes 30 message' of this report (REC 14). Differences and similarities between the S-100 standard and ERI messages (as suggested by SuAc 2.5) will have to be investigated in CESNI/TI (REC 36).

Clear and unambiguous definitions on terms for voyage, trip, path, route, etc. will have to be tackled in CESNI/TI upon revision of ES-RIS (REC 24).

New technologies (SuAc 3.1): emphasizes the need for standardization in digital logistics and waterway management to increase interconnectivity and intermodal solutions. Standards can be created through legal measures, through dedicated harmonisation efforts or through market pull. The latter is deemed especially valuable. Standardization needs are referred to in several requirements but there is not specific requirement resulting from this SuAc in this report.

IWT connectivity platform (SuAc 3.2): identified the lack of a clear standard for a digital IWT network data model for seamless data exchange within RIS and between seaports, customs, terminals, etc; The RIS Index (see chapter 6.6.1), the VisuRIS COMEX Reference Network Model (see chapter 6.6.2) and RIS.net (see chapter 7.2) were investigated and further elaborated on in this report (REC 4). Transhipment locations need a special focus and are included in chapter 7.3 'Connecting nodes between different modes' of this report (REC 5).

Smart sensoring & PNT (SuAc 3.3): calls for development of European (performance) standards containing requirements for evolving sensors and Positioning, Navigation and Timing (PNT) equipment used for automatic/autonomous vessels. Within this SuAc this topic was not tackled but requirements for autonomous sailing are covered in (REC 17).

Information model & data registry (SuAc 3.4): underlines the value of the RIS.net concept as a potential future standard for specification of a digital IWT network, a roadmap is drafted in chapter 7.2 of this report (REC 4 and REC 25).
SuAc 3.4 also recognise EuRIS as an important data registry in CESNI and EU context and suggests evolution of it. In terms of standardization EuRIS highly contributes to Harmonised implementation of the RIS technical services as explained in chapter 7.1 (REC 31). In order to let EuRIS function as a cache/buffer between the RIS authorities and the ERDMS (REC 30) it is required to specify all the

processes and to define the maintenance procedures for data required by RIS technical services (REC 9 and REC 11).

Technology in other transport domains (SuAc 3.5): looks in detail at maritime developments which are covered in chapter 6.2 Standards in maritime sector (e-Navigation) of this report. Some main conclusions are:

- Safety related standards must not conflict in areas of mixed traffic (e.g. Intention sharing, autonomous sailing)
- Create a framework of trust between IWT stakeholders for data sharing
- Study/action on implications of introduction of
  - S-100 world
  - S-101 ECDIS standard
  - S-100 metadata registry
  - S-421 route exchange of route plans
  - S-200 world
- Investigate the two different data modelling approaches of ASM and S-100
- Investigate the definition and the implication of the new IWT architectures for technical standards

8.2 Conclusions

River Information Services have been a key enabler in increasing the safety and efficiency of Inland Waterway Transportation. In Europe the RIS Technical Services are linked under the umbrella of the RIS Directive, enabling a harmonized rollout of RIS all over Europe. RIS has, however, always been focussed on the inland waterways, with limited attention for the other transport modes. To foster intermodal transportation, it is essential to address the lack of connection between different modes of transport. The best link to start with are the transhipment locations. The RIS.net concept is being developed to specify the digital inland waterway network including the waterways and objects of relevance for Inland Navigation. Linking to other modes of transport shall be enabled by RIS.net. To achieve this, a cross reference between different location code lists used by different transport modes is necessary, with standardized attributes for efficient and sustainable itinerary based on real-time information. This was investigated by Subgroup 1 of DTLF and could be important for the implementation of eFTI in a multimodal or synchromodal environment. Faulty or missing data on transhipment points should be reported by logistic service providers through a tool provided in RIS.

To stipulate exchange of information and integration of IWT into multimodal supply chains, reliable interfaces with accurate IWT-related information need to be provided that can be used by third parties to offer intermodal platforms. To promote these interfaces for IWT, users should be able to find and integrate them into their applications easily.

Administrative burdens need to be reduced. To do so, procedures shall be fully digitized. In an intermediate step documents may be digitized, but the overall goal should be to rethink the processes to support provision of required information to authorities efficiently. This will require adapting law and regulations, organisational and supporting systems, and the harmonization of standards specifying the required information for each transport mode.

Smart shipping is an undiscovered country that has the potential to revolutionize the industry. It is important to follow the developments in the maritime world and to ensure that maritime and inland standards are interoperable in mixed traffic areas. Industry standards on smart shipping should be considered to allow for new developments from a legal perspective.
Preconditions for remote/autonomous operation, both legal and technical, need to be defined. Overall, these steps will help facilitate intermodal transportation and make it more efficient, reliable, and safe.

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8.3 Recommendations

Listed below are the recommendations from this Sub-Activity. These can be directed to stakeholders as well as follow-up projects after the DIWA project.
The recommendations are ordered in different categories. Between the categories, the recommendations are listed based on an estimation of the effort required to implement the recommendation.

- Basic: B
- Intermediate: I
- Advanced: A

Possible bodies for suggested actions:

- Future project(s) (European and national)
- CESNI
- Member States
- DG MOVE
- Logistics stakeholders

Priority of suggested actions:

- I (highest priority)
- II (medium priority)
- III (low priority)

REC	Recommendation	B-I-A	Prio	Suggestion Action for
	Organisational			
REC 1	Ensure within the lifetime of European Implementation Projects that services and applications developed in these projects are put into sustainable operation after the project is concluded. This includes organisational, legal and financial aspects.	B	I	Future project(s)
REC 2	Follow-up and contribute to DTLF/eFTI initiative (DTLF/eFTI could provide the framework for harmonised transport documents for ERI, ensure interoperability between standards)	B	I	Future project(s) CESNI
REC 3	Each administration/domain has its own reference codes → more cooperation between standardization bodies and logistics is needed	B	I	CESNI
REC 4	Develop harmonised digital inland waterway network → Make available sufficient funds for the further elaboration and implementation of RIS.net in a future project	B	I	Future project(s) Member States CESNI
REC 5	Link to other modes of transport via the transhipment locations	I	I	CESNI
REC 6	The European rail sector is going to develop a new single platform named 'DP-Rail' for (standardised) data exchange between all involved parties in a rail transport. Some services will be valuable for multimodal transport. IWT should (further) investigate what is the best way to exchange data with this data hub for seamless multimodal (or synchromodal) transport.	A	II	Future project(s)
REC 7	Like the rail sector has agreed to a common procedure of standardisation (V-cycle approach), in the same way Inland Shipping should agree on a clear and efficient procedure to achieve new standards involving all relevant stakeholders.	I	III	CESNI
REC 8	Test-implement new specifications in European Projects to gain experience and to involve technical experts. Standardize proven services and processes.	B	I	Future project(s)
REC 9	Recommend to CESNI/TI to start the task TI-21 (maintenance procedures) as soon as possible as it needs to be clarified from an	B	I	CESNI

	organisational point of view where location codes are maintained and by whom.			
	Redundancy / Overlaps			
REC 10	Harmonization of reference data where feasible, otherwise linking of code tables	A	II	CESNI
	Functional			
REC 11	Maintenance, harmonisation and synchronisation of reference data to be improved → Maintenance and synchronisation procedures for reference data to be further elaborated	B	I	CESNI Future project(s)
REC 12	Recommend to offer test standards, where feasible	B	I	CESNI
REC 13	Quality of standards/implementations to be ensured e.g. by offering test suites	I	II	CESNI
REC 14	With regard to synchromodal transport and new requirements some information as included in the HERmes message should also be considered in the next revision process of the ERI messages. • Technical data of the vehicle (maximum speed, command control system) • information on transport and cargo (last loading location, change of composition) • Information on transport unit • Information on responsibilities for transport and cargo	A	III	CESNI Future project(s)
REC 15	It is recommended to investigate possible standards on intention sharing in other modes of transport as possible input for IWT standards.	I	II	CESNI
REC 16	In order to exchange object status information, recommend to integrate the preliminary standard used in the COMEX project in the RIS standards suite to safeguard further implementation of the TIS.4 RIS service across the European waterways	B	I	CESNI
REC 17	Consider requirements of Smart Shipping and autonomous sailing in future revision of IWT standards. Draft standards including technical requirements for autonomous sailing. (also see REC 27, REC 17).	I	II	CESNI
REC 18	Standardise not yet standardised ERI Messages, if required, and based on operational experiences and optimisation (e.g. WASDIS, CUSCAR/ERIMAN, INVRPT, ERIINFO, BERMAN)	I	II	CESNI
REC 19	Investigate on a translation service to support automated exchange of ETA/RTA information between maritime and inland domain (to support efficient transhipment at terminals)	I	II	Logistics stakeholders
REC 20	Standardisation of RIS.net as part of task CESNI/TI-15 for the elaboration of technical specifications for data for navigation and voyage planning	I	I	CESNI
	Legal			
REC 21	Enforcement of compliance by the Member States with European regulations and standards by the European Commission	B	I	DG MOVE
REC 22	Data models behind the forms and certificates must be harmonized and paperless processes have to be permitted by legislation	I	I	CESNI
REC 23	Digitize procedures in a transformation from paper to digitally available information for routines required by authorities (e.g. inspections)	I	I	CESNI
REC 24	Elaborate clear and unambiguous definitions on terms for voyage, trip, path, route, etc. (in general 'definitions used in RIS and published in ES-RIS')	B	I	CESNI
REC 25	Consider RIS.net as a possible future part of ES-RIS 2029/1 to specify the requirements stipulated in the RIS Directive for Member States to publish data facilitating route- and voyage planning	I	II	CESNI

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REC 26	Strengthen the cooperation with CESNI/TI and for the CESNI Member States to actively engage in the design and development of the CESNI/TI work programme.	B	I	Member States
REC 27	Legal requirements towards Smart Shipping and autonomous sailing are to be formulated and considered in future revision of IWT standards (also see REC 17).	I	I	CESNI
REC 28	Recommend to DG MOVE to ensure that eFTI is considered upon revision of the RIS Directive	B	I	DG MOVE
New services				
REC 29	Service and Procedures for Synchronisation of Reference Data across applications and services involved	I	I	CESNI
REC 30	(Reference) Data Support Service – EuRIS should function as a buffer/cache for Reference Data as suggested by DIWA SuAc 3.4	I	I	Future project(s)
REC 31	Use EuRIS to support compliance with the RIS technical standards	B	I	Future project(s)
REC 32	Standardised Waterway Status Information Service, a service shall offer information on the overall availability of waterway network and objects taking data from different services such as the network, NtS, object status, operation times	B	II	Future project(s)
REC 33	Offer a tool (e.g. standardised API) where users of the inland waterways can easily report faulty or missing data in RIS.	I	I	Future project(s)
REC 34	It is recommended to keep a close eye on developments and standards proposed regarding MASS (e.g. intention sharing)	I	II	Future project(s)
REC 35	Investigate S-421 Route Plan also in conjunction with intention sharing	A	III	CESNI Future project(s)
REC 36	Propose to investigate the S-100 framework in CESNI/TI Work Programme	I	I	CESNI
REC 37	Propose to investigate where in the IWT domain SECOM could make services more secure	I	II	Future project(s)

9 Annex 1

In this Annex the results of the brainstorming at the kick-off meeting are grouped and processed to serve as input for the SuAc 4.1 report.

9.1 Organisational

- Impact assessment is often missing (when in the course of preparing a new standard):
    - Budget/Resource question
    - Recommendation could be formulated on how this could be improved so that new standards don't happen as surprize. Technical experts should be involved at an early stage. To ensure quality standards are published, services could be specified and test-implemented in European Projects and/or Demonstrators. This creates awareness and involves relevant stakeholders at an early stage.
- Maintenance takes a lot of effort (see 6.4 and 6.9)
    - Maintenance procedures to be defined
    - Who, when, what time of Plan-Do-Check Act (PDCA) cycle, required y/n
- Ensure the quality of the standards (see 6.9)
    - Offer a test suite (Test standards) for verification
    - A body that helps to implement and support testing could be implemented.
        - Test standard is needed and then decide upon 3rd party testing
- Faster adoption: (waiting for adoption of standards slows down technical/functional progress)
    - Approach followed now helps, however sometimes it takes years until EC approves → slows down technical progress
    - In CESNI a continuous periodic update cycle is rolled- out
- More flexible standardisation
    - Use good practice of test / reference implementation in order to gain experience and learn from it for improvement of the draft standard (Contradiction using pilot version y/n?)
    - Even if a standard doesn't fit 100% of the requirements, don't hold it back, as a perfect standard doesn't exist. From time to time a new version has to be published including feedback gathered in the meantime → such approach is the idea behind the biannual revision cycle of ES-RIS and ES-TRIN
    - Sometimes it is necessary to accommodate very fast to a lack of data, e.g in the RIS COMEX Project for EuRIS, reference data was required and realised without prior standardisation as it would have lasted far too long to wait for standardisation. Thereafter from the lessons learned, on the longer run standardisation shall be tackled.
        - There are also some de-facto standards (e.g. RIS Index, VisuRIS COMEX Reference Network Model, ERINOT 1.2 XML, Exchange of Object Status Information, ERIVOY) which are not official standards. ERINOT 1.2 XML and ERIVOY will be covered by ES-RIS 2023, nevertheless ES-RIS is not yet legally binding (amendment of the RIS Directive is required).

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    - Some specifications are agreed on a technical level but not in an official standard (see chapter 6.6 Inventory of 'de facto' standards), if feasible, propose incorporation in official standard, e.g. RIS Index not part of a standard.
    - In order to do adjust to the technical advances, the technical innovations should first be implemented and only then should it be investigated how they can be accommodated in a standard, e.g. RIS.net.
    - There could be a need for an independent standardisation body that helps with implementation issues / data quality issues.
- The European Commission does not act in case Regulations and Standards are not implemented properly by the Member States
- Backwards compatibility (for example update of AIS standard requiring new hardware. How to make sure the vessels can still see each other on AIS while there is 'mixed' traffic)
- Developments carried-out in projects often stop after the conclusion of the respective project.
- Clear communication to stakeholders (involvement of real users) needed
- Missing interaction between IW and other modes of transports
    - Missing: which type of standards do we need? what type of information is needed by other transport modes → approach standardisation on INFORMATION level
- Other approach: start with processes and legal provisions instead of technical solution

9.2 Redundancies / Overlaps

- Each administration has its own commercial codes, better cooperation between standardisation bodies and the logistics is required
- Harmonized transport documents will contribute to synchro modality, e.g. eFTI
    - Maritime, Rail and road contain a high amount of similar data, however still are different
- Papers (documents) shall be harmonised, for example as it was done in the Danube Navigation Standard Forms (DAVID forms[20]),
- Underlying regulations shall be harmonised
- Redundancy with different vessel types: barely can't be mapped (statistics)
- Identify links in parallel worlds
    - Issue with standards → who is it a problem for and who will have a benefit? → focus on the bridging elements (not standardize everything, e.g. not every train station needs to have a RIS Index entry → only the ones that have a transhipment location)

9.3 Functional

- Subdivide standardisation landscape:
    - Technical
    - Data exchange standards between different parties: can be influenced

[20] Additional information on DAVID forms can be found here: https://navigation.danube-region.eu/working-groups/wg-6-administrative-processes/

- Preciseness conflicts (Technical need for preciseness conflicts with functional need for flexibility):
    - Handle vagueness with super intelligent solutions (financial issue!)
    - If data is precise, a precise service can be built upon it → in some cases it is sufficient to be less precise as long as users are aware of this
- Clear definition of standards needed
- Required standardisation for interfaces / data exchange
    - If it is not necessary, do not include the interfaces into the standards in order to stay flexible
    - Good specifications are a pre-requisite
- New standard/functionality should make life easier: don't create too many new standards but link them instead
- Gap between different types of modalities:
    - Operators of maritime/inland vessels have the required data, they don't require to close these gaps, but independent terminals are interested in closing this gap
        - EU favours open data exchange
        - Common standard for data exchange needed

9.4 Legal

- Paper-based procedures must be digitized (see chapter 6.7)
- European harmonisation (see chapter 6.4)
- Make an overview of the legal status of standards

9.5 Other

- Pilot version: part of development / pre-version of standard

10 List of abbreviations

Abbreviation	Explanation
ADN	European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways
AI	Artificial Intelligence
AIS	Automatic Identification System
AML	Additional Military Layers
ANSI	American National Standards Institute
API	Application Programming Interface
ASF	Additional Secondary Factors
ASM	Application Specific Message
AV	Autonomous Vehicle or Autonomous
BCSPLTS	ERI Location Tables
BERMAN	Berth management message
BPR	Binnenvaart Politie Reglement
BSI	Bundesamt für Sicherheit in der Informationstechnik
CA	Certification Authority
CCNR	Central Commission for the Navigation of the Rhine
CCS	Common Components System
CDLMR	Conventional Digital Land Mobile Radio
CEERIS	Central & Eastern European Reporting Information System
CEF	Connecting Europe Facility
CEFIC	European Chemical Industry Council
CEMT	Classification of European Inland Waterways
CEN	Comité Européen de Normalisation - European Committee for Standardization
CENELEC	Comité Européen de Normalisation – European Committee for Electrotechnical Standardization
CESNI	European Committee for drawing up Standards in the field of Inland Navigation
CESNI/TI	European Committee for drawing up Standards in the field of Inland Navigation working group on Information Technology
CI	Common Interface
CMR	Convention Relative au Contrat de Transport International de Marchandises par la Route
COMEX	RIS Corridor Management Execution
COPINO	Container pre-notification message
COPRAR	Container discharge/loading order message
CoRISMa	RIS Corridor Management
CRD	Central Reference File Database
CUSCAR	Customs cargo report message
CUV	Règles uniformes concernant les contrats d' utilisation de véhicules en trafic international ferroviaire
DATEX	DATa Exchange
DAVID forms	Danube Navigation Standard Forms
DC	Danube Commission
DCN	Digital Consignment Note
DG MOVE	Directorate-General for Mobility and Transport
DGNSS	Global navigation satellite system

DIN	Deutsches Institut für Normung
DINA	Digital Inland Waterway Area
DIWA	Masterplan Digitalisation of Inland Waterways
DoRIS	Danube River Information Services
DP-Rail	Digital Platform for Rail Freight
DTH	Digital Train Handover
DTLF	Digital Transport and Logistics Forum
EC	European Commission
ECDIS	Electronic Chart Display Information System
ECN	Electronic consignment note
EDI	Electronic data interchange
eFTI	Regulation (EU) 2020/1056 on electronic freight transport information
EHDB	European Hull Database
ELWIS	Elektronischer Wasserstraßen-Informations-Service
EMSA	European Maritime Safety Agency
ENC	Electronic Navigational Chart
ENI	European Number of Identification or European Vessel Identification Number
ERA	European Union Agency for Railways
ERDMS	European Reference Data Management System
ERI	Electronic Reporting International
eRIBa	Electronic reporting for inland barges
ERIINFO	ERI Information Message
ERIMAN	ERI Manifest Message
ERINOT	ERI Notification Message
ERIVOY	ERI Voyage plan notification Message
ERTMS	European Rail Traffic Management System
ESCAP	Economic and Social Commission for Asia and the Pacific
ES-RIS	European Standard River Information Services
ES-TRIN	European Standard laying down Technical Requirements for Inland Navigation vessels
ETA	Estimated Time of Arrival
ETCS	European Train Control System
ETD	Estimated Time of Departure
ETI	Estimated Time of Interchange
ETSI	European Telecommunications Standards
EU	European Union
EuRIS	European River Information Services
FA	Fairway Authority
FEDeRATED	EU project for digital co-operation in logistics
FIS portal	Fairway Information Service Portal
GIS	Geographic information system
GMWG	NATO Geospatial Maritime Working Group
GNSS	Global Navigation Satellite System
H30	HERmes 30 message
HERMES	Handling European Railway Message Exchange System
HEROS	HERmes Open Services

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IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
ICT	Information communications technology
ID	Identity
IDL	IWT Digitalisation Level.
IDP	Intelligent Document Processing
IDS	International Data Spaces
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IEHG	Inland ECDIS Harmonization Group
IEHG	Inland ENC Harmonization Group
IENC	Inland Electronic Navigational Charts
IFTMIN	Instruction Message
IHO	International Hydrographic Organization
IMO	International Maritime Organization
INVRPT	INVentory RePorT message
IOC	Intergovernmental Oceanographic Commission
IRIS Europe	Implementation of River Information Services in Europe
ISO	International Standardization Organization
ISR	Improved Service Reliability
ISRS	International Ship Reporting Standard
ITS	Intelligent Transport System(s)
ITU	International Telecommunication Union
IVI	in-vehicle information
IWT	Inland Waterway Transport
JCOMM	Joint Technical Commission for Oceanography and Marine Meteorology
MASS	Maritime Autonomous Surface Ships
MHDS	Minimum Hull Dataset
MMT-RDM	Multi-Modal Transport Reference Data Model
MRN	Maritime Resource Name
NAIADES	European Inland Waterway Transport Action Plan
NaMIB	Nachfolgeanwendung des bestehenden Melde- und Informationssystems für die Binnenschifffahrt (NaMIB) der WSV
NATO	North Atlantic Treaty Organization
NDLC	Nautical Datalink Communications
NNDS	European Nautical Network Data Service
NSW	National Single Window
NtS	Notices to skippers
OPTIYARD	Optimised Real-time Yard and Network Management
ORFEUS	Open Rail Freight EDI User System
OTIF	Intergovernmental Organisation for International Carriage by Rail
OTN	Operational train number
PAXLST	Passenger List Message
PCS	Port Community System
PDCA	Plan-Do-Check Act
PIANC	World Association for Waterborne Transport Infrastructure
PLATINA	Platform for the Implementation of NAIADES
PMT	Project Management Team

PNT	Position, Navigation, Timing
RDF	Resource Description Framework
REC	Recommendation
RIS	River Information Services
RIS Index	River Information Services Index
RNE	RailNetEurope
ROV	Remotely Operated Vehicle or Remotely
RPN	New Regulation for Rhine Navigation Personnel
RPR	Police regulations for the navigation of the Rhine
RTA	Requested Time of Arrival
RVIR	Rhine vessel inspection regulations
SCOM	Steering Committee
SECOM	SEcure COMmunications protocol as defined in EN IEC 63173-2
SPARQL	Standard query language and protocol for Linked Open Data and RDF databases
TAF TSI	Technical Specifications for Interoperability of Telematics Applications for Freight
TAP TSI	Technical Specifications for Interoperability of Telematics Applications for Passengers
TCM	Train Composition Message
TDS	Telematics Data Sharing
TIS	Traffic Information Service
TOS	Transport Operation Status
TRL	Technology Readiness Level(s)
UIC	International Union of Railways
UKCM	Under Keel Clearance Management
UN	United Nations
UN/CEFACT	United Nations Centre for Trade Facilitation and Electronic Business
UNECE	United Nations Economic Commission
VDES	VHF Data Exchange System
VHF	Very High Frequency
VLC	Visual Light Communications
VMS	Variable Message Sign
VNF	Voies navigables de France
VTS	Vessel Traffic Service
VTT	Vessel Tracking and Tracing
WASDIS	Waste disposal information message
WCO	World Customs Organization
WMO	World Meteorological Organization
WSV	Deutsche Wasserstraßenverwaltung
XML	Extensible Mark-up Language
XSD	XML Schema Definition

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