INLAND WATERWAYS TRANSPORT: ILL CASE

- CASE STUDY -

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1. INTRODUCTION

The main international inland waterway network is the Rhine Danube network, which, with its length of 14,360 km, represents nearly half of the inland waterways of international importance. However, more than one third of the Rhine Danube basin waterways do not meet the standards established for waterways by the European Conference of Ministers of Transport[1] and there are substantial differences in the quality of the infrastructures east and west of the Bavarian watershed (European Court of Auditors, 2015).

Inland Waterways Transport (IWT) offers great potential which today is not entirely harnessed. To fully obtain its benefits connection between RIS and in-house information and management services are needed. RIS date is necessary for transport planning and monitoring. With these services inland navigation companies, ports and logistics service providers can optimize their transport, transhipment and logistics operations and hence provide lower-cost shipping for commodities while offering high quality logistics and supply management services.

Both ILL- Industrie-Logistik Linz GmbH & Co KG demonstration cases for the RISING project show the potential benefits of increasing transparency and information exchange using River Information Services(RIS) solutions to improve transport and supply chain planning, but also the important difficulties that limit this opportunities. These difficulties are mainly related with lack of accessible RIS data, lack of interfaces between RIS and other ITS services and legal agreements to exchange data. Besides this, RIS is not offered in a harmonized way across borders. Acting as demonstrator in this project, ILL had the chance to act as forerunner and to provide others with its experience and know-how in IWT. ILL needs to monitor the whole transport corridor, which makes the tracking of the vessel and the cargo from the port-warehouse of ILL to the end customer possible.

[1] Resolution No 92/2 of the European Conference of Ministers of Transport.

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2. THE IWT DESCRIPTION IN EU

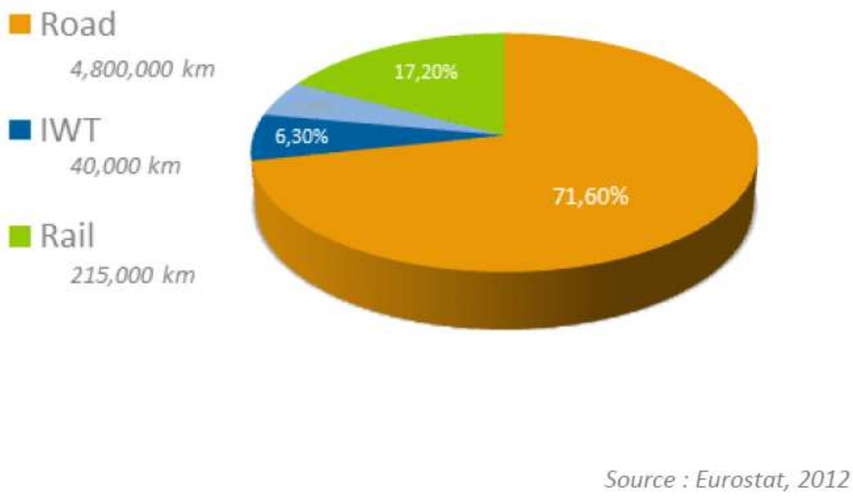
Europe has a considerable network of navigable lakes, canals and rivers that run over a 42,000 km distance connecting hundreds of cities and industrial regions within and outside the European Union. Some 21 out of 28 Member States have inland waterways, 13 of which have an interconnected waterway networks. Inland waterways are especially dense in North-West Europe where they enhance the competitiveness of some major sea ports connecting them with their hinterlands (Figure 1). Although major rivers such as the Rhine and Danube compose the backbone of this network, many canals connect industrial towns and areas being important for regional trade but also having a feeder function to the main network.

FIGURE 1.MAIN INLAND WATERWAYS IN THE EU (TEN-T COMPREHENSIVE AND CORE NETWORK)

Source: European Court of Auditors, 2015.

Carriage of goods by inland waterways transport (IWT) is seen as a reliable, economical and environmentally friendly transport mode that can reduce congestion in the heavily loaded road network and mitigate road externalities contributing significantly to sustainable mobility in Europe. Despite being an incredible opportunity to reduce modal shares unbalance and increase inter-modality, rivers and canals infrastructure are being used clearly below its maximum capacity. According to data provided by Inland Navigation Europe (INE)[2] in its IWT by Numbers report (2015), IWT has a 6.3% share of freight volume in the EU, but this share is considerably higher in countries with good waterway infrastructure (Figure 2).

FIGURE 2. MARKET SHARE OF TRANSPORT MODES IN EU.



Source: INE, 2015.

The potential for increasing the modal share of IWT is significant. Compared to other modes of transport which are often confronted with congestion and capacity problems, IWT is characterized by its reliability, energy efficiency and major capacity for increased exploitation. Some of Europe's largest seaports use inland waterways transport because of increasing congestion & lack of rail capacity (70% of EU trade goes via Europe's seaports). The availability of waterways provides a competitive edge. In Rotterdam for instance this leads to a daily avoidance of 100,000 truck movements. The seaport traffic will quadruple by 2050 (Following INE, 2015).

Unloading an ocean carrier of 18,000 TEU requires on average 9,000 trucks, but only 60 inland ships. Compositions of pushed barges can transport more goods per distance unit (tkm) than any other type of land transport.

[2] http://www.inlandnavigation.eu/home/

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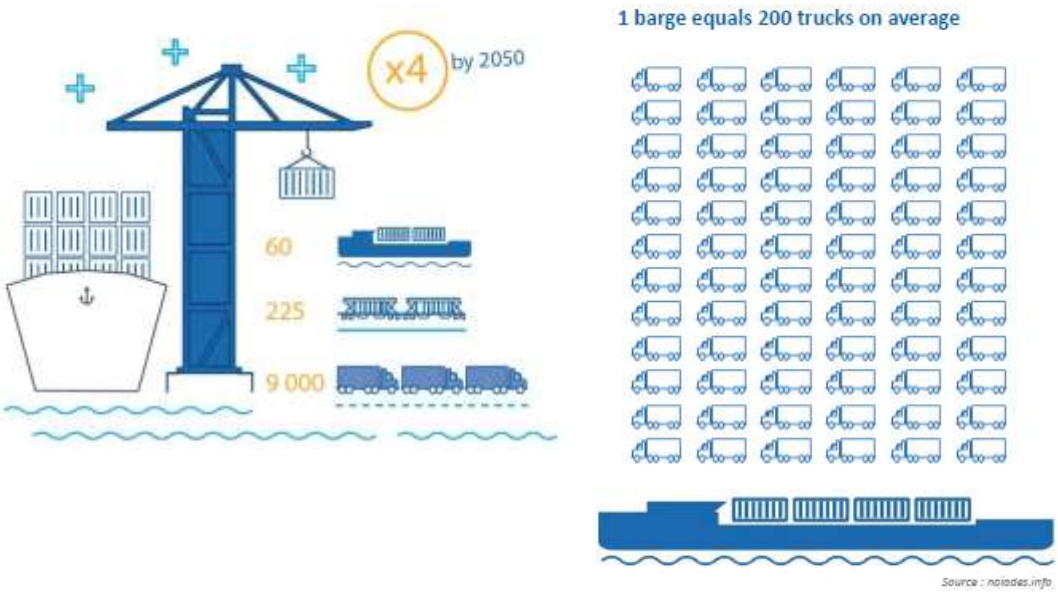
IWT vessels have a loading capacity that is equivalent two hundreds of trucks (Figure 3).

FIGURE 3. BARGE CAPACITY



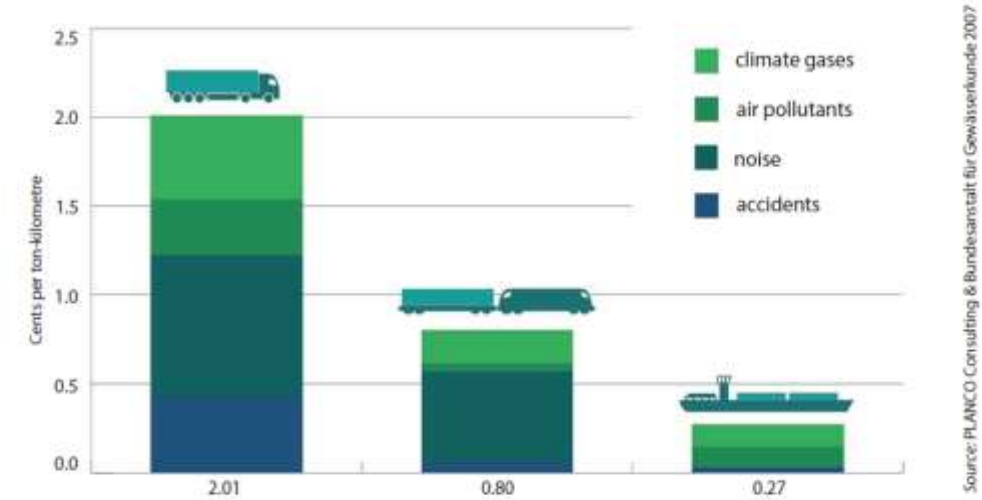
Source: INE, 2015

IWT also contributes to decongesting overloaded road networks in densely populated regions. Particularly within the Danube corridor, the integration of the new EU-Member States has strongly increased close economic interactions and thus also cross-border traffic flows. In this context, road systems have, in some cases, already reached the limit of their capacities (Flavia project, From Truck to Vessel, 2012). Finally, IWT also offers an environment-friendly alternative in terms of energy consumption, noise and gas emissions. Its energy consumption per km/ton of transported goods is approximately 17% of that of road transport and 50% of rail transport[3] . Its noise and gaseous emissions are modest. In addition, IWT ensures a high degree of safety, in particular when it comes to the transportation of dangerous goods.

The total external costs of inland navigation (in terms of accidents, congestion, noise emissions, air pollution and other environmental impacts) are seven times lower than those of road transport (Figure 4).

[3] See http://ec.europa.eu/transport/modes/inland/index_en.htm

FIGURE 4. POTENTIAL ADVANTAGES OF INLAND NAVIGATION IN TERMS OF EXTERNAL COSTS (CENTS PER TONNE-KILOMETRE) AND TRANSPORT CAPACITY



Source: European Court of Auditors, 2015

In terms of cost per distance unit, IWT has very good records, when comparing to other modes of transport (Table 1).

TABLE 1. EXAMPLES OF TRANSPORT COST PER TONNE-KM IN EURO CENTS FOR TRANSPORT DISTANCES OF 200 KM AND 1,000 KM

Freight transport mode	200 km	1 000 km
Road	14.30	8.80
Rail	16.04	7.40
Inland waterway	2.73	1.95

Source: PLANCO Consulting GmbH, *Economical and ecological comparison of transport modes: road, railways and inland waterways*, November 2007.

Source: European Court of Auditors, 2015

The European Commission (EC) has been trying to create favourable conditions for the promotion of the IWT competitive position through different programmes[4] (Appendix 1).

[4] See http://ec.europa.eu/transport/modes/inland/promotion/index_en.htm

Some of the EC initiatives have been focused on the development of the so called River Information Services (RIS). A vast majority of the potential users were not aware of the existence of RIS services, its functions and/or the benefits it could offer and some begun to implement their own proprietary solutions. Besides, barriers to more development of IWT still exist.

There are some natural barriers (problems of low or high water, heavy ice conditions), but also mental ones. Logistic operators and shippers still think that IWT is just useful for bulk goods. Certainly, as inland waterway transport is slower than road transport, it is commonly used for goods that do not require fast delivery times, such as metal ores, agricultural products, coke and refined petroleum products, coal and crude petroleum. Not only bulk goods (cement, ore) but goods like cars, cookers, garages and steel coils are also suitable (Flavia project, 2012). In the last few years there has also been an increase in container transport, especially in the Rhine basin (European Court of Auditors, 2015).

An inadequate infrastructure is as a major obstacle to inland navigation. Four common types of river bottlenecks and missing links are identified (European Court of Auditors, 2015):

Bridges. Bridge clearance and the width of the passages between the supports determine the size of inland vessels and the number of container layers they can transport. The bridges' vertical clearance diminishes with high water levels and increases with low water levels one of the biggest problems is communication coordination.

Fairways. The width and shape of the fairway determine whether vessels navigating upstream and downstream can pass simultaneously and the speed of navigation. The water depths available in the fairway determine how many tonnes of goods may be carried on an inland vessel. The draught loaded has a decisive influence on the cost effectiveness of inland waterway transport.

Locks. Lock capacity can lead to prolonged travel times because of waiting times due to the size of the vessel or convoys that can pass through the chamber(s). Single chamber locks risk blocking inland navigation on the entire river if just one is closed for maintenance.

Missing links. These are parts of the future network of inland waterways of international importance that do not exist at present. An example of a relevant missing link is the Seine

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Scheldt connection between France and Belgium, which is currently being addressed by the Member States concerned and by the TEN T.

Beside these, there are other common coordination and communication problems. For example, the coordination between the terminals and the inland vessels is not optimal. Congestion situations and long waiting times are common in many ports. Solving these problems requires a harmonized set of services for all RIS-Transport-and Terminal-related information.

3. THE ILL CASE

For ILL- Industrie-Logistik Linz GmbH & Co KG inland waterways transport has become an integral part of its intermodal transport chain. ILL is a logistic services provider, with locations in Austria (Linz and Steyr) and Netherland (Moerdijk). The company was founded in 1993, originating of the former dispatch department of Voestalpine Stahl Linz GmbH[5] . It has 250 employees. ILL provides a lot of logistic services and complete handling of all processes involved such as goods receiving, storage, distribution logistics, after sales logistics, waste disposal logistics, packing logistics, transport logistics, production logistics and information logistics.

FIGURE 5. ILL TERMINAL AREA, PORT OF LINZ (AUSTRIA)

Source: RISING Project, http://www.rising.eu

[5] Voestalpine Group is an international Austrian corporation that is headquartered in Linz. Voestalpine holds now 37% of the capital stock of ILL. Source: www.ill.co.at

ILL operates a terminal area for IWT in the Port of Linz (Austria). This terminal area has 16.000 m2 and includes a sheltered port warehouse with a storage capacity for 80.000 tons (Figure 5). The terminal area includes an indoor dock (110 x 21 meters, depth: 2,5m) travelling cranes (36 tons), truck loading area and railway link (Figure 6). The company has a turnover of more than 500.000 tons/year and 600 vessels / year, and those numbers are steadily increasing.

FIGURE 6. INDOOR DOCK, ILL SHELTERED PORT WAREHOUSE, PORT OF LINZ (AUSTRIA)

Source: RISING Project, http://www.rising.eu

3.1 STEEL COILS INLAND WATERWAY TRANSPORT

The company ships 100,000 tons/year of steel coils (equates to 75 barges) on the Danube via barges from Linz to Krems (Austria), a rout of about 130 km. ILL receives the steel coils via rail from the steel plant of Voestalpine. The loading process in Linz as well as the transportation control process is carried out by ILL. The physical transportation of goods via barges to Krems is provided by third party business partners of ILL. In Krems, Voestalpine produces cold-rolled tubes and sections.

The company has its own logistics ICT tools and applications. In order to combine all resources (barges, rail wagons, staff) accurately, a high degree of transparency in the system is needed. If at any given time, location of customer goods and means of transportation are clear, the logistics supply chain can be planed and controlled optimally. Nowadays, the digital mapping of processes is at least as important as the physical delivery of the goods itself. Optimal logistic chains need to be completely transparent and automatically controlled.

The information needs are mainly related with aspects such river traffic, barge's position, water levels and lock status or estimated time of arrival of the barges. Furthermore, the current position of the rail wagons - which deliver the steel coils from the production plant to the port – should also be known. The production program of the customer is linked with the current stock of inventory at Linz and Krems. At ILL the above mentioned information is always available digitally.

Current statuses of all resources are linked online with each other permanently. This enables a frictionless process and improves the planning ability of the whole supply chain. The information distributed by via interface of the RIS Austrian national provider (viadonau) is linked to the in-house system of the company and it is subsequently processed within the ILL system.

The access to this information contributes to improve operations. Some benefits, besides more optimal planning, are related to reducing the vessels that have to be lighted due to low water, reducing the transport of cargo by railway, reducing the waiting times, correct planning and provision of in-house pre-haulage services based on the real-time information of incoming vessels, increasing the handling capacity, increasing the transhipment capacity in limited berthing and port areas and using the barges as a floating stock, which results in a further decrease in inventory costs.

3.2 Steel coils & plates inland waterway transport

The transportation chain from Linz to Krems is only a small part of all ILL's transportation chains on the inland waterways. The company transports cargo (steel coils and plates) by barges from the inland Port of Linz (Austria) to the Port of Moerdijk (Netherland) through the Danube-Rhine connection over a rout near of 1.000 km (Figure 7). Shipments along the corridor are transported by truck, ship and rail. The Port of Moerdijk is an important transhipment node for ILL, which is also the site of an ILL subsidiary. The majority of shipments to overseas is reloaded onto coastal or ocean ships. ILL also leads an ore transport line from the lower Danube to Linz, where inland fleet operators deliver ore to the Voestalpine steel plant in Linz.

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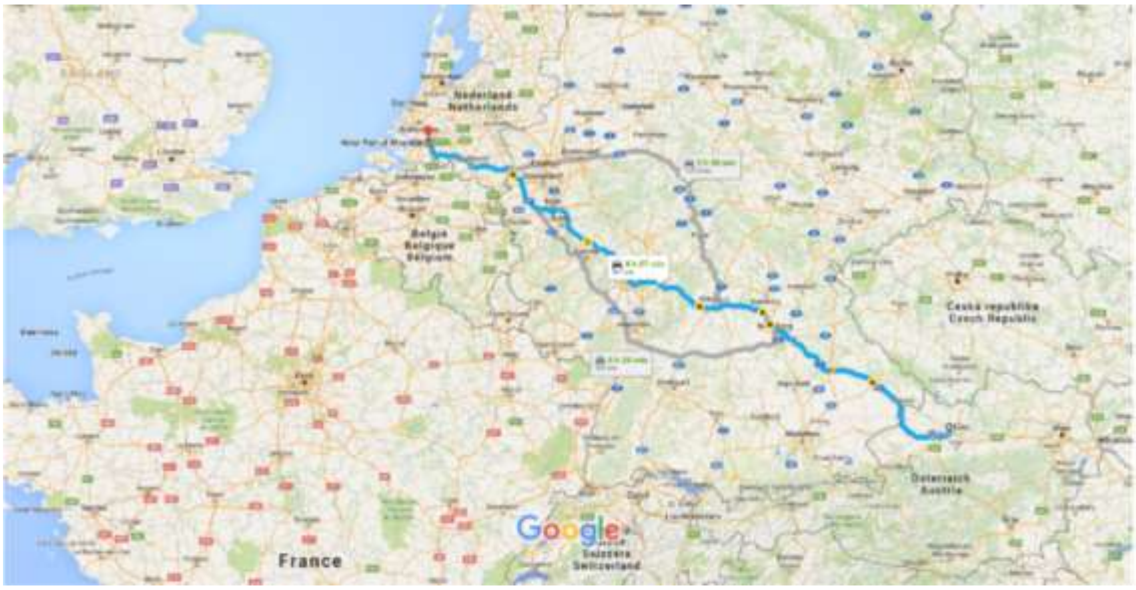
FIGURE 7.THE ROUTE FROM PORT OF LINZ (AUSTRIA) TO THE PORT OF MOERDIJK (NETHERLAND)



ILL is a pioneer in the field of inland water transportation control. The company is usually represented in national and international research projects and consortiums that deal with telematics or the use of information in general. ILL collaborated as a partner in the RISING project, a project co-financed by the European Commission6. This project is precisely aimed at identifying, integrating and further developing River Information Services (RIS) in order to efficiently support IWT and logistics operations. ILL was a central and key collaborator in two demonstrator cases to test and validate RISING solutions. One of them was developed in the Port of Linz- Port of Moerdijk route, the other in the ore route between the lower Danube and Linz. Some of the transport operators of ILL and viadonau, the Austrian national RIS services provider above mentioned also collaborated in these demonstrator cases.

The first demonstrator case has its focus on the Danube/Rhine area, in the route from Linz to Moerdijk. As we have previously stated, a seamless flow of information is needed in order to improve the supply chain management & planning, reducing total supply chain costs. So, transport monitoring solutions similar to those that the company has in use in their IWT routs in Austria are needed to increase transparency and information exchange. These RIS solutions include ESM services for water levels, barges position and lock conditions, an ETA/TOS web service, Notices to Skippers (NtS) web services and event management. Their implementation

[6] See document “RISING Project Overview” for additional information

would offer the benefits above mentioned. However some barriers or problems prevented getting them, particularly the lack of accessible RIS data from Germany and the Netherlands for ILL steel cargo transports, the issues related to not having a standardized legal framework for RIS data exchange between inland fleet/vessel operators, RIS providers and logistics service providers, and the lack of interfaces between RIS and other ITS services hampering seamless electronic data exchange across all transport modes.

3.3 ORE INLAND WATERWAY TRANSPORT

In the ore transport case, the goal was to support logistics through processes related to TES information (transport execution services) and the tracking of cargo via RIS integration of the TES and in-house ERP systems (Figure 8).

FIGURE 8.THE ORE ROUTE FROM THE LOWER DANUBE TO THE PORT OF LINZ.

Source: RISING Project, http://www.rising.eu

TES is not the same as barge Tracking and Tracing because it does not focus on the vessel but on the cargo. The problem here is that, before the implementation of the proposed TES solutions, ILL did not exactly know the type and quantity of cargo (ore) which is loaded on a specific vessel or the Estimated Time of Arrival (ETA) of the ore transport at the inland port. These lacks of information cause inefficiencies related to inventory planning and also berth/terminal planning. A typical TES message contains information about (among other data) cargo, voyage and hull related data (ERINOT), current position of vessel (AIS) - International RIS data exchange is used in case vessel is sailing abroad - and Estimated time of arrival (TOS service).

TES should keep the inland port (Linz) and logistics company (ILL) regularly informed about any changes and updates of transport execution status along this transnational route.

Besides, the case was also aimed to support the concept of floating stock containing the tracking of cargo along the route (“floating warehouses” help to reduce inventories) and the provision of reliable ETA information for this specific ore transport. Other objectives were related to reduce the waiting times of barges in ports, designing a common TES platform instead of having every single inland port developing a separate system and to elaborate the bilateral contracts that need to be closed between data-exchanging partners. The potential benefits here are reduced work due to the connection between the scheduling tool and the ERP system, reduce communication costs for ships, reduce the waiting times for vessels, control of in-house inventories and also the individual transport which are still in transit, reduce the necessary ore stock use the existing infrastructure more efficiently (mainly berth and terminal capacities) and obtain more accurate berthing times (potentially leading to more accurate sailing times and hence increased transport efficiency).

Additional expected positive effects for the longer term are the decrease in transactions cost and in communication costs for tracking and tracing of transported goods by IWT across borders.

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REFERENCES

From Truck to Vessel, Flavia project, 2012.

Inland Waterway Transport in Europe: No significant improvements in modal share and navigability conditions since 2001, European Court of Auditors, 2015.

IWT by Numbers, INE-Inland Navigation Europe, 2015.

RISING project web, links & downloads, http://www.rising.eu

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APPENDIX I - EU PROMOTION OF IWT THROUGH ICT PROGRAMMES

During the late 1990s, several different information systems projects for inland shipping were started in different countries. The European Commission detected the lack of coordination in the development of these projects, which could result in an obstacle for the IWT cross-border competitiveness. Some EU research programmes were devoted to revert this situation playing a significant role in the promotion and the harmonization of RIS1. In this regard, in 1998, the European Union initiated the concept of RIS as a harmonized information services to support traffic and transport management in inland navigation, including interfaces to other modes of transport2.

International organizations like the UNECE, river commissions like Rhine and Danube Commission and the International Association for Navigation (PIANC) also recognized the potential of RIS to make IWT further integrated in the transport chain. In 2002, PIANC organized a working group to develop the Guidelines for RIS that were first published in 2004. The European Commission took in 2003 the initiative for a directive on River Information Services, which came into force in 2005, and that was aimed to establish a set of standards for the technology3. The PIANC guidelines, revision 2004, are one of the basic regulations of this directive. A third edition of RIS Guidelines was released by PIANC in 2012. The dates indicate that, in a very short time span, major changes were introduced in the directives and guidelines, indicating that this is an on-going process.

With the NAIADES programme (2006) and its updated and extended version NAIADES II (2013), the EC aimed at creating the conditions for inland navigation transport to become a quality mode of transport. Actions are taken in the following key areas of intervention: Quality infrastructure, Quality through innovation, smooth functioning of the market, and

[1] Parallel to the legal and technical background a number of implementation programmes have been carried out (IRIS Europe I + II & IRIS Europe 3), which co-funded the implementation of RIS in several member states within the TEN-T Programme. IRIS Europe 3 finished in November 2014.

[2] This concept has been further developed in multiple research projects like INDRIS and COMPRIS.

[3] The legal basis for RIS was established in 2005 with the publication of the RIS Directive (2005/44/EC) and the technical basis was formed in 2007 with the Commission Regulations 414/2007 415/2007 416/2007. In 2010 Commission Regulation 164/2010 and in 2013 Commission Regulation 909/2013 were added.

Environmental quality through low emissions, skilled workforce and quality jobs and Integration of inland navigation into the multimodal logistics chain.

In the context of these programmes and regarding co-modal usage, it was detected that an effective integration into logistics chain required the modernization of IWT through advanced information and communication technologies.

The purposes of promoting the implementation of RIS were the improvement of safety, security and efficiency of inland navigation traffic and also the enhancement of the efficiency of transport operations in general. In the European context the process of development of River Information Services is seen as the example for other transport modes towards a successful implementation of IT related traffic and transport services4.

According to a recent report 5 from the European Court of Auditors, the policy objective of shifting traffic from roads to inland waterway transport and of improving navigability had not been achieved. Between 2001, when this objective was set, and 2012, the year for which the latest statistical information is available, the modal share of inland waterway transport did not increase substantially, fluctuating around 6 %. Thus the Court considers that the EU inland waterway transport strategies have not been effectively implemented

[4] More info about RIS in the e-learning platform INeS Danube (www.inesdanube.info) and the e-learning platform INeS RMS (www.inesrms.info).

[5] *Inland Waterway Transport in Europe: No significant improvements in modal share and navigability conditions since 2001*, European Court of Auditors, 2015.

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