

#IWTS 2.0: “Mobilizing small waterway transport potentials”



SWOT Analysis of Selected #IWTS 2.0 Partner Regions

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Executive Summary

Striving to support Inland Waterway Transportation (IWT), this study seeks to contribute to future regional and EU-wide IWT policies with information derived from a SWOT-Analysis amongst partner regions involved in the Interreg-funded project “#IWTS 2.0” (see Chapter 1, page 1 for details).

Project partners analysed their IWT infrastructure / situation and usage in order to derive current strengths, weaknesses, opportunities and threats of the IWT sector in their respective regions (see Chapter 2, page 2 and beyond for details). We used a partly standardised methodology that left room for individual partner needs whilst allowing for a comparison and merging of results in an at least somewhat objective manner,

The regions that contributed to this analysis were those of North-West Germany, those along the Göta Älv and Trollhättan Canal in Sweden, those in North Great Britain and the region of Friesland in the Netherlands (see Chapters 3 to 6, page 4 and beyond for details).

Partner results were then merged using a participatory approach amongst partners at eye-level (see Chapter 7, page 22 and beyond for details).

Ten policy recommendations (see Chapter 8, page 27 and beyond for details) were thereby jointly derived in descending order of importance:

1. The current political momentum in favour of IWT must be upheld and be boiled down to further concrete action.
2. Environmental policies must make more use of IWT to support their intentions.
3. Target should be set for further development of the IWT sector.
4. Awareness, education and lobbying are central to a promotion of IWT.
5. More business opportunities must be identified, fostered and created in the IWT sector.
6. IWT infrastructure needs attentions and investment.
7. Digitisation, automation and artificial intelligence can help boost the sector and must be supported.
8. The development of emission-free vessels must be supported.
9. Modes of transport other than IWT must be made comparatively less attractive.
10. Uncertainty about regulations has to be approached.

1. Objective of the Study

Inland Waterway Transportation is a transport mode with unique capabilities and a huge potential. Along the River Rhine, IWT competes against rail and road and it achieves outstanding modal splits in the hinterland transport of the Ports of Antwerp, Rotterdam and Amsterdam of up to 45 %. In other regions of Europe, IWT usage can drop to single-digit percentages, not because there is no natural waterway or canal to navigate, but because challenging infrastructure conditions, lack of awareness amongst shippers and forwarders, insufficient allocation of external costs to other transport modes and other reasons.

All this contributes to a demanding competitive position of the sector. However, the Interreg-funded project #IWTS 2.0 developed and disseminated innovative solutions to mobilise waterway transport potentials, in particular for smaller waterways, which prove particular challenging in times where economies of scale are of the essence. This study capitalises the results and offers future perspectives for the sector.

Core of the study is an analysis of the strengths, weaknesses, opportunities and threats of IWT (SWOT-analysis), offering a course for the future and contributing to future regional and EU IWT policies. Four #IWTS 2.0-partners reviewed their regional projects for strengths and weaknesses. They also involved regional stakeholders to validate and expand their findings. Regional masterplans or development plans provided the basis for formulating “ideal” IWT-scenarios from which opportunities and threats have been concluded.

The SWOT-analysis in IWTS partner regions will focus on potentials for larger role of IWT, i.e. future modal shifts, alternative propulsion systems, growing automation. Including regional and transnational approaches, developed with regional IWT players.

Results will be communicated to decision makers, policy makers, politicians in IWTS, participating regions, relevant members of the EU parliament and DG Move



Picture 1: A barge leaving the Bremen lock at Hemelingen upriver. The lock is a vital gateway to the River Weser (bremenports, 2020).

2. Approach and Methodology

This report is based on the findings and lessons learned from partner activities within #IWTS 2.0 as well as particularities of the regional IWT-networks.

Structurally, it introduces each of the regions that contributed to the analysis, to then present the relevant SWOTs of each partner. This is followed by a combined SWOT-analysis across all regions, to derive overall conclusions for EU-policy makers.

The partners/regions that contributed are:

-  bremenports GmbH & Co. KG (BP/ North-West Germany)
-  SSPA (Sweden)
-  Canal and River Trust (CRT, North Great Britain))
-  Maritieme Academie Harlingen/Provincie Friesland (MAH/PoF)

The perspectives of a SWOT-analysis are both to reflect the current situation and to outline assumed future developments. As such, there are strengths and weaknesses representing the current situation, as well as opportunities and threats outlining future developments.

Approach and Methodology

The SWOT-analysis performed followed a four-step approach. The first three steps derived from input provided by the contributing partners. The last step was then compiled on high-level, #IWTS 2.0 level (see Figure 1). Details of the four-step approach are provided below.

A. "Introduction of regional IWT- infrastructure"

Step A describes the status quo regarding the current situation of IWT in the respective region with a focus on physical and economic geography, legislation, political willingness / sense of urgency, economical weight, share in mobility mix, etc.

It comes in the form of a short introduction to the regional IWT-infrastructure in order to provide a context for the following. Focus was on available waterway infrastructure, its classification, the ports as well as the current usage in terms of commodities, supply chains and volumes.

B. Current strengths and weaknesses

Step B addresses the respective current strengths and weaknesses, derived from brainstorming sessions with regional partners, such as governmental bodies, ports,

shippers, freight movers and other institutions. When applicable, a capitalisation of results was achieved by extracting lessons learned from individual regional projects and concluding strengths and weaknesses from these across a number of thematic areas. Lessons learned were further complemented with stakeholder interviews along the same thematic areas, equally contributing to a catalogue of strengths and weaknesses with regards to the current situation.

C. Opportunities and threats

Step C describes opportunities and threats based on an 'ideal IWT scenario' and thus accounts for future perspectives, outlines potential future scenarios of intended IWT usage/performance in the respective regions to derive policy recommendations.

D. Combined output

Step D then combines previous results in a joint undertaking. Regional SWOTs are combined to compile them into a single analysis including concrete of policy recommendations.

In order to reduce complexity and to combine partner contributions, we introduced categories to which contributions were allocated / coded by. Per contribution, two key-words were assigned, and subsequently clustered along eleven categories.

The categories / codes used were:

- Commercial
- Digitisation
- Environment
- Geography
- Infrastructure
- Intermodality
- Logistics operations
- Politics
- Regulation
- Spatial planning
- Training/Awareness

In the Appendix we attach the original tables for a detailed review.

This categorisation allowed for quantification, ranking of the contributions and resulting clusters respectively.

Ranking is thus based on the number of contributions allocated per cluster within each SWOT-element. Short headlines/statements were then jointly developed to describe each cluster. The report will illustrate the results in tabular as well as graphical form.

SWOT-Analysis: Joint Approach

A. Introduction of the regional IWT-infrastructure and usage

B. Addressing current strengths and weaknesses based on regional #IWTs 2.0 activities and stakeholder involvement

C. Opportunities and threats based on an „ideal“ IWT-scenario

D. Shared challenges/ gap analysis

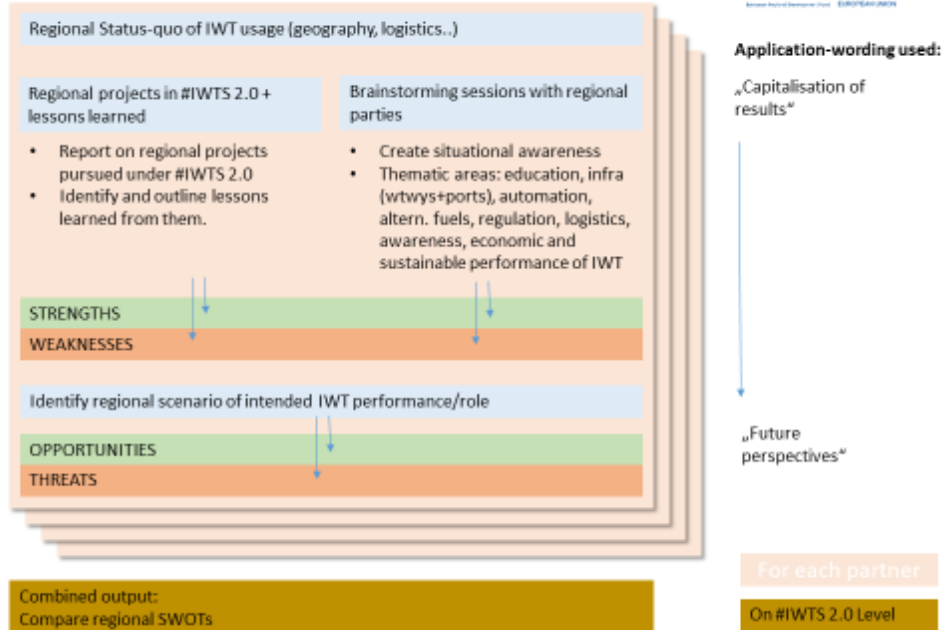


Figure 1: Approach and methodology of SWOT-analysis (bremenports, 2021).



Picture 2: Bullhorne Lock along the Aire-and-Calder Waterway - a good example of a revitalised small inland waterway (Canal and River Trust, 2020).

3. North-West Germany – bremenports GmbH & Co. KG

Regional IWT-infrastructure and usage

Germany's inland water way transportation network is primarily structured by rivers draining into the North and Baltic Sea. Of outstanding importance for IWT overall are the rivers Rhine, Elbe, Weser (and Ems) and the Danube with their respective tributaries or confluences.

The network is complemented by several canals; the Mittelland Canal (MLK) providing the principal East-West inland connection across the North German Plain, the Rhine-Main-Danube-Canal, allowing connections between the South-East and North-West of the Germany, the Kiel Canal ("Nord-Ostsee-Kanal"/NOK, strictly speaking, an international waterway for IMO vessels), connecting the Elbe and thereby the North with the Baltic Sea, and the Elbe-Havel Canal (EHK), connecting the Elbe and the MLK eastwards towards Poland.

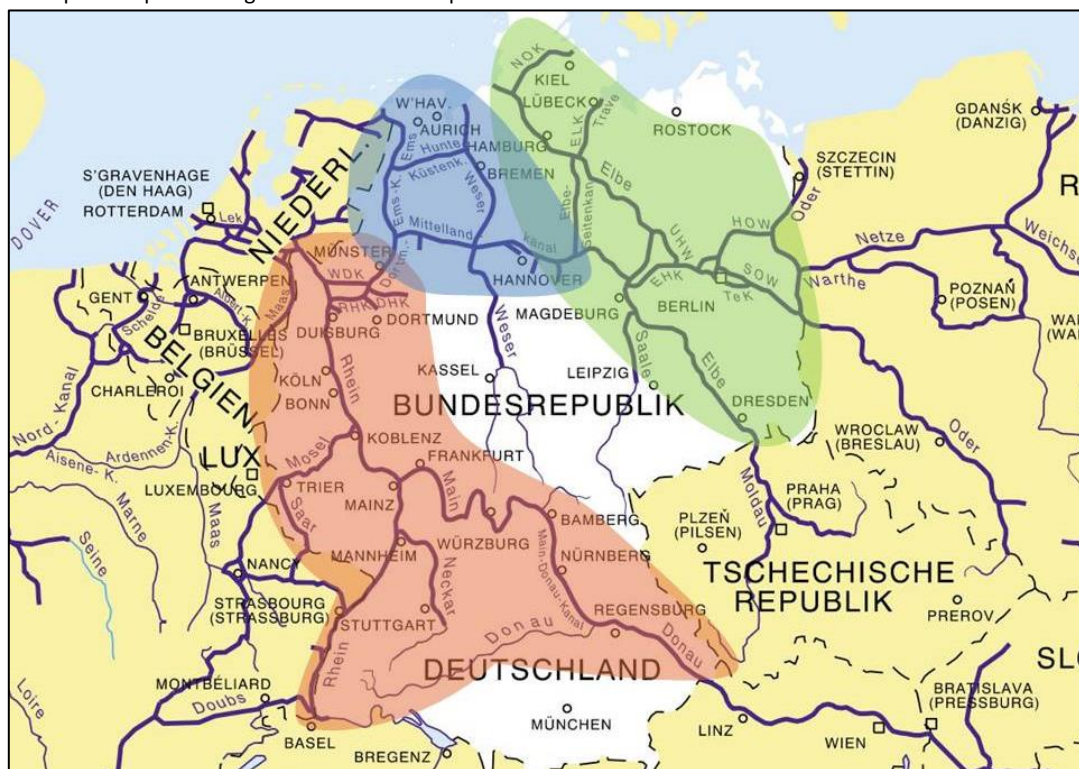
Overall and as a result of national waterway transport geography, i.e. federal waterways with their rivers, canals and significant ports, IWT in Germany is somewhat regionalised and one can principally distinguish three major competing regions:

1. A West to South region (in red, see Map 1), allowing transport from the Danube, between south-eastern European countries, nationally important ports along the Rhine and sea ports

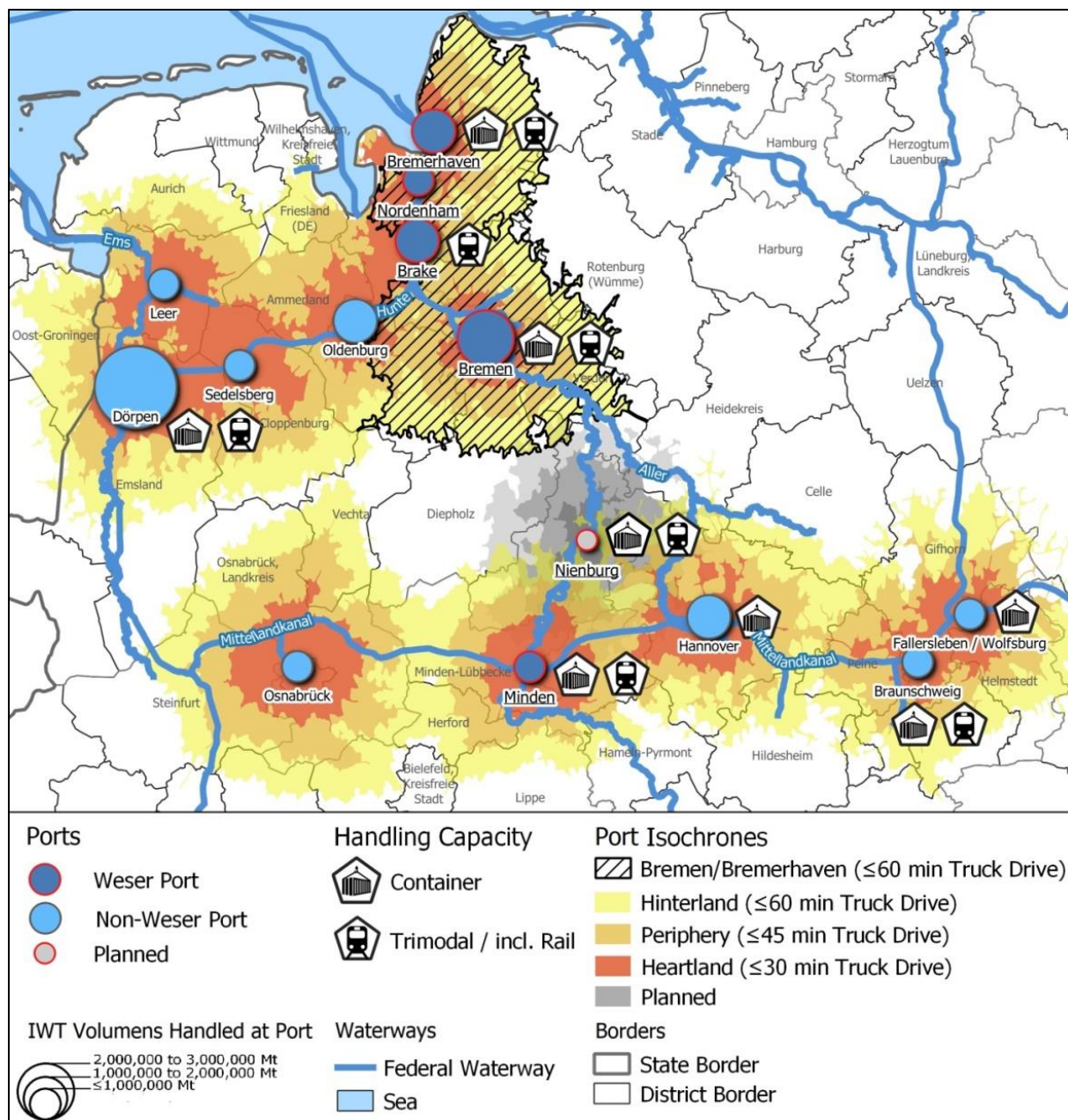
of at least European if not world-wide significance in the Benelux, thereby constituting the biggest and economically most important region,

2. A north to East region (in green), allowing transport via the Elbe, between eastern Germany and eastern European countries with the most important German sea port in Hamburg,
3. A North-Western region (in blue), allowing transport via the Weser and Ems, somewhat connecting the two afore mentioned areas and including Bremerhaven, Germany's second most important seaport, aside serving as an IWT hub of nationwide importance through the port of Bremen (as deducted from BMWi, 2021; BMVI, 2017).

General focus here is on the last mentioned, the north-western region, in detail defined as "hinterland", "periphery" and "heartland" catchment or isochrones-area of ports along the Weser, including primary tributaries or confluences and canals (see Map 2, also for definitions of catchment areas in detail). More specific emphasis will be put on ports only along the Weser and those of Bremen/Bremerhaven managed by bremenports GmbH & Co. KG.



Map 1: Map section of significant European waterways with principle IWT regions in Germany (own mapping, 2021, based on BMVI, 2017).



Map 2: Selected features of the IWT geography along the Weser and its primary tributaries/confluences and canals in north-west Germany (own mapping, 2021, based on stakeholderinterviews and BMVI, 2017; Niedersächsisches Ministerium für Wirtschaft, Arbeit und Verkehr, 2020; bremenports, 2020; eurostat, 2020; Studiengesellschaft für den Kombinierten Verkehr e.V., 2020; openrouteservice, 2020; QGIS Development Team, 2019; OpenStreetMap, 2021)

The road-covered hinterland area as a whole is estimated to expand over more than 3,200 km² and hosts a total of 13 well established IWT-capable ports including matching services.

Economically, the greatest shares of the area are catered for by bremenports, most prominently when only looking at places along the Weser itself. Between 2010 and 2018, constantly more than 55% of all annual GDP generated in the districts at least within the hinterland of only Weser harbours, have been generated with the catchment areas of bremenports.

Nevertheless, in terms of IWT volumes handled, bremenports was often outrun by the port of Dörpen. The latter is, however, extremely mono-structured in the sense that the goods it handles consist almost entirely of paper for local production, which is why the port can thus be somewhat neglected with regards to overall economic impact. In terms of volumes, the ports of Hannover, Brake, Oldenburg, Nordenham, Braunschweig, Leer, Osnabrück, Minden, Sedelsberg and Fallersleben then followed in descending order (own calculations, 2021, based on own mappings and Niedersächsisches Ministerium für Wirtschaft, Arbeit

und Verkehr, 2020; bremenports, 2020; GDP data based on eurostat, 2021).

As already partly indicated ports compete in different ways within the north-western region. Taking into account road accessibility, bimodal (road-water) and bulk transport as done in Map 2, spatial competition is highest in its northern parts, namely between bremenports and Brake, Nordenham and Oldenburg, but also in the north-west, where catchments collide or overlap most. Leaving aside the traditional international competitors in the Benelux and Hamburg, only domestic contestants exist mostly with regards to bulk and are situated most prominently in Brake and Nordenham (see also ISL, 2020a, pp. 3, 7, 30-32).

Regional competition is attenuated when considering further modes of transport and port handling capabilities, i.e. trimodal logistics (road-water-rail) and containers. Since there are no further facilities to handle containers aside those in ports, some vast regional coverage gaps can be attested, most significantly in the north- and south-west. Additional trimodal and container handling facilities, as planned alongside the establishment of a terminal in Nienburg, are therefore a meaningful to approach to the issue. In this sense, Bremen furthermore profits from a freight village near its main IWT port. In total, bremenports thereby presently constitutes the single most important player in regional IWT overall.

In 2018, more than 8,300 inland barges went through the Ports of Bremen and Bremerhaven (bremenports, 2020, p. 36). Aside outstanding amounts of containers, bulk feedstuffs, gravel and sand, machinery, diesel and heating were of importance. In the past coal was also of prominence, but has decreased significantly over recent years (own calculations based on bremenports data, 2021).

Table 1 shows major IWT-services in the Ports of Bremen and Bremerhaven segmented into container and bulk. Container transports are liner services to and from various terminals in Bremen and Bremerhaven. Bulk services fall into spot and regular services for agricultural and energy bulk as well as construction materials, scrap metal and steel.

Regular services serve a dedicated customer base along a fixed schedule, but without the general availability of a liner-type of service.

Though, in terms of only containers at bremenports, IWT enjoyed a modal split of just 3.1% in 2018 which is about half of the European average (bremenports, 2020, p. 40; eurostat, 2020a), a closer look at the underlying numbers taking into account relative economic importance reveals that for certain areas, amongst them German industry clusters of nation-, if not world-wide

importance, are much dependent on inland shipping via Bremen and Bremerhaven.

In 2018 for example, 20,000 TEU and numerous bulk cargo was shipped from Bremen to areas such as Lower Saxony, aside serving Bremen itself and minor amounts going to the State of North Rhine-Westphalia, another German federal state. With regards to the just former destination, IWT thereby held 13% of total modal split at the ports of Bremen (own calculations based on ISL, 2020, p. 3) and thus actively catered for regions that host some of the world's most important and innovative hubs of the automotive and transport industry or metallurgy, steel manufacturing and processing, often through the port of Braunschweig.

Amongst the companies of relevance are global players such as VW AG, Continental AG, Siemens, Alstom, Bombardier, Bosch or Salzgitter AG, to name but a few in the metropolitan region of Hannover, Braunschweig, Göttingen, Wolfsburg (Kegel, 2003; Metropolregion Hannover, 2015; ISL, 2020a, p. 8; Stemmler, 2020, p. 7). Also, container transport prospers, since the ports of Bremen were able to increase their container traffic with the German hinterland over recent years (ISL, 2020, p. 3).

For the ports of Bremen and their hinterland and to further increase modal split in favour of IWT, the Weser, its general characteristics and the level of its infrastructural development are key points.

General development is favourable since the Weser is capable of handling large motor cargo ships (length 110 m, draft 2.80 m, width 11.40 m, carrying capacity approx. 2100 t). Yet, due to a tidal range of about 3.8m in those parts of the river within the sphere of influence of the North Sea, ships may have to stick to a tidal window depending on water depth, tidal forecast and required under keel clearance whilst the river still lacks further dredging.

Furthermore, due to tidal range as much as due to having to overcome severe height differences upstream, locks at Bremen's and Bremerhaven's ports as well as many passages along the river exist. Each of these, mostly single locks, limit the maximum size of vessels usable and cause go delays for IWT along the stream with sailors having to wait for others to be processed (see Figure 2).

Delays are further amplified by various passages where encounters between larger vessels are inhibited. Further restrictions result from bridge clearance heights, allowing only two-layer container transport despite exiting and potentially further river and lock adjustments (bremenports, 2008, pp. 17-18; ECOPORTS, 2020, p. 29; BMVI, 2012; BMVI, 2019).

Table 1: Typology of logistics services of IWT in the Ports of Bremen/Bremerhaven (bremenports, 2021)

Overall, these shortcomings have been recognised and political willingness and sense of urgency for advancements are great. The senate of the Free and Hanseatic City of Bremen has dedicated itself to a continuation of port investment projects and assures their financial backing.

Amongst those projects are further dredging activities along the Weser, an extension lock capacities and further container facilities aside emission-free port initiatives and a supply of shore power for ships (Binnenschifffahrt, 2019; Binnenschifffahrt, 2020; Süddeutsche Zeitung, 2021; Weser-Kurier, 2020; Weser-Kurier, 2020a).

Since large-scale infrastructural hurdles are not only cost but also time-consuming to alleviate, because IWT at bremenports and along the Weser still shows a comparatively low level of digitisation, digitalisation and automation and to further increase efficiency, means of intelligent optimisation, such as through traffic flow management and digitalisation of port processes, are meanwhile being explored in a number of research projects (Bamler, 2021, pp. 10-11).

Lessons-learned from bremenports activities within #IWTS 2.0




Within the scope of #IWTS 2.0 bremenports focused on raising awareness for IWT amongst logistics decision makers. Together with MAH, we promoted IWT under the heading of “modal shift is mind shift” by bringing the topic onto the curricula of logistics students as well as young professionals. For this, the Innovation Challenge provided the showcase event for students to promote their ideas about a future-proof IWT-system.

We approached several regional higher education institutions to offer lecturers and students alike a participation in this event. In parallel, the website (see <http://project-iwts20.eu>) provided introductory-level information about the sector to raise interest in the topic and to lower the threshold to participate in the Innovation Challenge.

Although the event was well attended, and although Professor Bodewig as a high-level representative from the European Commission gave a key-note, student participation was limited to two groups.

This outcome clearly shows that IWT needs to go a long way to be recognised as an innovative sector worth dealing with as a young professional.

The good attendance from amongst the regional logistics community encouraged us to organise several additional events:

-  An online “transport school lab” with students of the JADE Hochschule showcasing an IWT-case study (together with University of Applied Science Upper-Austria), and
-  An online “Best-practice-event” outlining four innovative modal shifts from amongst #IWTS 2.0 project partners, and
-  An online discussion event with other IWT-partners from industry and academia.

Although the turnout to those events was – again – surprisingly high, we noted that participation from shippers was rather limited. In addition to the perceived need for more awareness amongst future logistics decision makers; we feel there is a need for more direct match-making between IWT-players and their potential clients from freight forwarding and industry.

Ideal situation

Bremenports, together with the competent authority, developed the Port Development Concept 2025¹. It provides clues towards an ideal port and a related role of IWT. Economic, ecological as well as social perspectives of sustainability form the basis of the descriptions:

- efficient port operations;
- transparent information flows;
- “green” infrastructure, CO₂-free port operations;
- Waterways considered a valuable ecosystem;
- IWT contributes to competitiveness of the port system by friction-less accessibility for 110m-vessels (so-called “Großmotorgüterschiffe”/GMS);
- Port community as a provider of secure, future-proof and social-insurance covered employment.

In a number of ways, bremenports contributes towards this ideal situation. These contributions come in the form of research and other collaborative projects or fall under the regular tasks of bremenports of developing and maintaining the Ports of Bremen and Bremerhaven:

- Support to the federal transport ministry making the River Weser GMS-ready;
- Equipping all IWT-berths in Bremen with onshore power-supply systems;
- Contributing towards efficient IWT traffic in the Port of Bremen through digitisation of lock operations and traffic flow management along the River Weser;
- Development of an IWT-app as a “one-stop-shop” for all relevant public or private services related to a barge call at the Ports of Bremen and Bremerhaven, including but not limited to vessel identification and

¹ Freie Hansestadt Bremen, Hafenkonzept 2025

reporting, port access management, berth booking and allocation, lock announcements, onshore power socket unlocking, monitoring and account settlement;

- Port tariff review, introducing a simpler lump-sum-fare for inland vessels.

Participation in #IWTS 2.0 provided bremenports with an opportunity to raise the awareness for IWT amongst shippers and logistics operators, by focusing on future decision makers and their contribution to almost all aspects of what is understood as an ideal situation.

However, a well-developed infrastructure and awareness for the sector need to go with commercial opportunities for IWT. In logistics terms, an ideal situation would clearly be one where there are no empty hauls, or ballast voyages of ships, or no partly laden voyages, or both.

An ideal situation would include tools for match-making in order to identify potential cargoes that are IWT-oriented, but which is not yet on a vessel.

Current SWOTs

The analysis of the current regional IWT-situation together with the lessons learned from project activities lead to following strengths, weaknesses, opportunities and threats concerning regional waterways (Table 2):

Strengths	Weaknesses
<ul style="list-style-type: none"> • Established IWT-services in the ports • River Weser GMS-ready • Double-digit IWT-modal share on selected port-to-port relations indicates a reasonably accepted competitive position of IWT. 	<ul style="list-style-type: none"> • Decreasing coal-volumes need to be replaced in the near future due to changes in national energy regulations. • Not yet full digitisation of traffic management and port calls for IWT. • Double-digit IWT-modal share on selected port-to-port relations dependant on a limited number of shippers.
Opportunities	Threats
<ul style="list-style-type: none"> • Bremen with 40 km of city area bordering the river optimal for urban-IWT logistics with small vessels. • Ongoing project (see "Contribution towards ideal situation") increase efficiency of IWT and raising competitiveness of sector 	<ul style="list-style-type: none"> • Heavily IWT-reliant port areas are encircled by urban conurbations triggering conflicts of interest/usage. • Rail as major competitor to IWT very strong in the ports.

Table 2: Strengths and weaknesses of current IWT-infrastructure and usage in the Ports of Bremen/Bremerhaven (: bremenports, 2021).

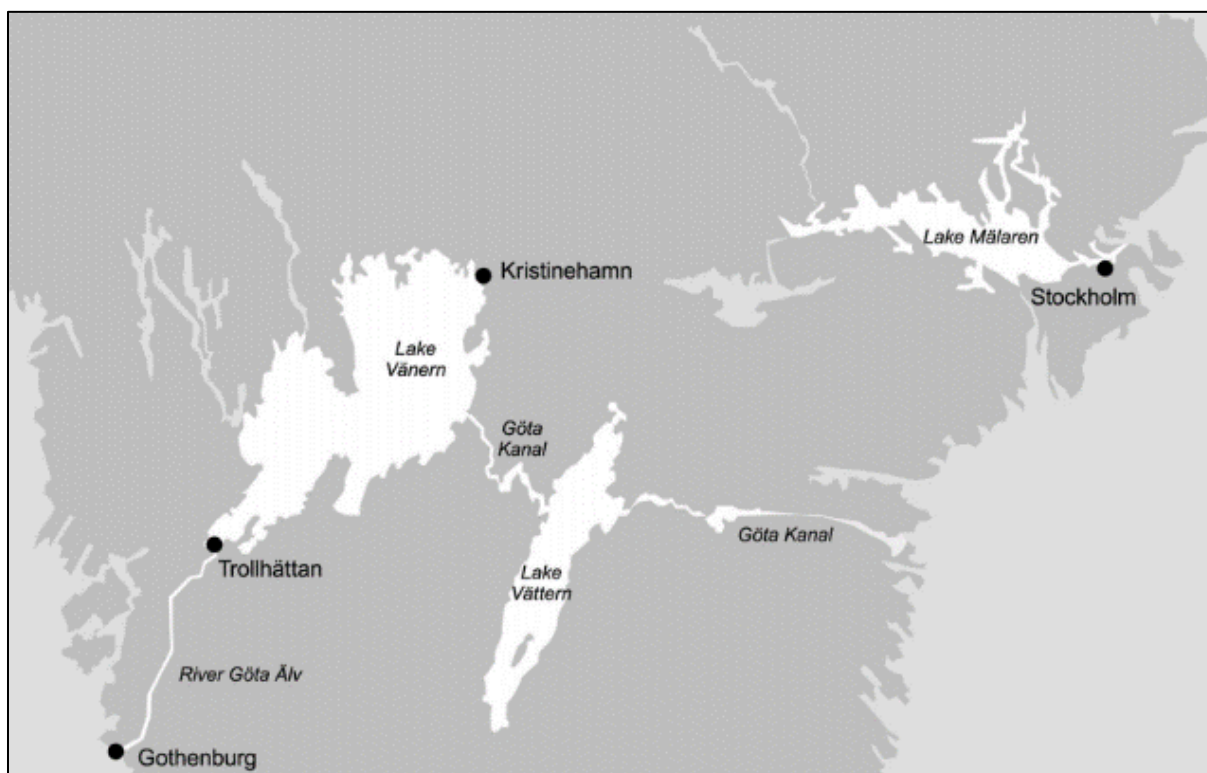
4. Göta Älv and Trollhättan Canal, Sweden – SSPA

Regional IWT-Situation and Usage

In Sweden inland waterways connect the sea with two large lakes (see Map 3). On the west-coast of Sweden, the sea port in Gothenburg is connected to Lake Vänern, the largest lake in the EU, by the River Göta. On the east-coast of Sweden, Stockholm is connected further inland with Lake Mälaren. The conditions for IWT on the lakes differ from that on rivers, for example, high waves and icy conditions are possible. This affects the set-up of IWT. Currently, the vessels transporting goods from Lake Vänern bypass Gothenburg and continue out to sea towards their destinations. Meanwhile the port of Gothenburg is the main container port in Sweden. Ports along inland waterways do not operate services for container shipping, and the status of equipment, such as container cranes, was unsure at the start of the IWTS 2.0 project.

It should be noted that the share of IWT in Sweden is very low. Only 3% of the domestic goods volume was transported by sea transport, 0.7% of which was IWT (Trafikanalys, 2016). The majority of small volume IWT consists of sand, stone, soil and gravel (Trafikanalys, 2018). Even so, there is potential to increase the use of existing inland waterways (Garberg, 2016), waterways that could be used for IWT do exist. There used to be maritime services balancing export containers with forest products from the inland and oil products to the inland, but rail took over the contracts in the 1990s (Rogerson, Santén, Svanberg, Williamsson, & Woxenius, 2020).

During the time period of the IWTS 2.0 project, two initiatives existed where entrepreneurs aimed to initiate IWT services for containers between the Port of Gothenburg and its hinterland.



Map 3: Big lakes in Sweden (Rogerson, Santén, Svanberg, Williamsson, & Woxenius, 2020)

Table 3: Overview of intended IWT services (Rogerson, Santén, Svanberg, Williamsson, & Woxenius, 2020)

	Case Feeder	Case Barge
Goods type	Containers	Containers
Route	Gothenburg-Kristinehamn-Gothenburg	Gothenburg-Trollhättan- Gothenburg
Waterways	River and lake	River
Locks	6	5
Distance	Approx. 500 km (round trip)	Approx. 160 km (round trip)
Vessel type	IMO vessel (maritime)	Barge (inland waterway vessel)

Avatar Logistics, financed by three shipping companies, started its activities in 2016 with an aim to show that it was possible to use standard EU motor barges to operate IWT in Sweden. A proof-of-concept, showing barge transport of a few containers from Gothenburg to Vänersborg (located close to Trollhättan) including the transfer of containers from the barge onto a lorry, was carried out in March 2017 (see Table 3).

Initially, there was interest to transfer goods from road to IWT from one shipper with large goods flows from Trollhättan to Gothenburg and another shipper with large goods flows in the opposite direction. A partnership with a vessel owner was established to provide an EU motor barge to lower the entrepreneur's investment. Avatar Logistics has during the time of IWTS spent much effort on preparation for the start-up of a container service. Much effort has gone into contacts with the various stakeholders involved, e.g. the ports, exporters/importers, and authorities. Lobbying has been important since there has not been enough knowledge regarding IWT. At the moment the barriers for starting up a container barge as anticipated have unfortunately still been too difficult to succeed. However, Avatar Logistics are operating IWT on the east-coast of Sweden, although not transporting containers.

Seadvise, started its initiative in 2017 and aimed at feeder transport between the port of Gothenburg and Kristinehamn. The idea was to consolidate goods to and from many shippers in the region around Kristinehamn with a frequency of two departures per week, replacing transports currently conducted by road or rail. Use of an IMO vessel, that is able to operate open sea, was selected. Some of the reasons for this decision were the stricter rules regarding vessels on Lake Vänern (compared to the river Göta Älv), that it provided the possibility of continuing past Gothenburg, and also reduced the risk-taking since the vessel could be used on another route.

The start-up work was intensified in 2018, when Seadvise joined forces with a large shipping company. A serious attempt was made, with much promotion and efforts to secure goods volumes. Unfortunately, later the same year, the decision was made to pause the attempt to initiate the container shuttle. One of the main reasons was that the government announced further support of rail transport, which made it difficult to compete with IWT.

Current SWOTs

As part of the IWTS 2.0 project several activities have been performed to assess but also address strengths and

weaknesses. Promotion of the development of IWT has been performed and dialogue amongst important stakeholders has increased awareness and knowledge level. Key activities include discussions amongst stakeholders of relevant topics for IWT development. Researchers from SSPA have described the barriers facing the Swedish entrepreneurs aiming at IWT development in the journal article "Modal shift to inland waterways: dealing with barriers in two Swedish cases". Ways forward have been suggested in the journal article "Business models for dedicated container freight on Swedish inland waterways" (Rogerson, Santén, Svanberg, Williamsson, & Woxenius, 2020). Further, SSPA have supervised several master theses, in which students have addressed topics to help understand how barriers to IWT can be overcome. One master thesis focused on how Sweden could learn from modal shift examples in the Netherlands and Belgium (Abrahamsson & Engström, 2018), a second master thesis focused on operational requirements and vessel characteristics (Bakhshian & Mohammadpour Kachlami, 2019) and finally a third master thesis focused on goods flow mapping to investigate the potential in the region around lake Vänern and river Göta Älv (Ekberg & Wedberg, 2019). All three master theses pinpoint strengths and weaknesses of the situation for the river Göta Älv, Lake Vänern and Trollhättan Canal, from the respective perspectives.

At one of the earlier meetings in the project key stakeholders participated in a workshop where three questions of relevance for strengths and weaknesses were discussed, namely: Why are you interested in increasing IWT? Why is so little happening? What would be needed to increase IWT?

Using the material compiled within the IWTS 2.0 project the following overview of strengths and weaknesses are presented in Table 4.

As described earlier in the report, SSPA has conducted and participated in several activities aimed at understanding possibilities and challenges involved in increasing use of IWT in the specific Swedish situation. In addition to the strengths and weaknesses earlier presented, a lot of focus has been on ways forward. A long list of opportunities identified is found in the table below. These opportunities pinpoint that there is potential but that much still needs to happen. A table presenting threats is also listed (see Table 5).

Table 4: Sweden's regional strengths and weaknesses (SSPA, 2021).

STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> • Environmental impact much better than for truck • High standard river conditions • Capacity available on waterways • Capacity available in ports • Inland navigation vessels are modern, safe and have high capacity • Issues with truck use (congestion near port). Use of IWT can reduce congestion on roads. • Government wish to shift from road transport • Safe to transport by boat. Expertly trained pilots. Much safer than truck. Good working conditions compared to foreign truckers. • Some goods flows exist • Works for abnormal load (e.g. heavy, pre-fab elements) • Haulage direct to port of reception (not via hub port) possible • No tax on fuel for ships • Vessels available to charter • Politicians want modal shift 	<ul style="list-style-type: none"> • Cost <ul style="list-style-type: none"> ○ Port charges ○ Piloting fees ○ Fairway dues ○ Cost of pre/post-haulage ○ Additional handling costs ○ Fee structures of other modes ○ Personnel costs • Scale of investment • Regulations for other modes • Stevedore agreements • Condition of waterways (ice, height of bridges) • Conditions and locations of ports/quays, • Time <ul style="list-style-type: none"> ○ Time for loading/unloading ○ Matching schedules with crane availability ○ Working hours ○ Alignment of lock planning and quay handling • Frequency <ul style="list-style-type: none"> ○ Vessel size • Reliability <ul style="list-style-type: none"> ○ Prioritization of loading/unloading in ports • Last mile • Resistance to change • Prioritisation between traffic on land and water at bridges • Inflexibility of specialised vessels • Bottlenecks with bridges and locks • Seaport invested in rail connections

Table 5: Sweden's regional opportunities and threats(SSPA, 2021).

OPPORTUNITIES	THREATS
<p>Opportunities provided by increased use of IWT:</p> <ul style="list-style-type: none"> • Improve utilization of waterway infrastructure (incl. locks) • Opportunity to reduce road traffic, e.g. through cities • Employment opportunities, create new jobs (e.g. on-board) • Opportunities for ports to get additional cargo (increase throughput) • Opportunity for municipality to increase employment, attract companies and inhabitants. • Opportunity for inland port to be logistics hotspot <p>Issues that would improve conditions for IWT and thereby facilitate increased use of IWT:</p> <ul style="list-style-type: none"> • Change fee structure for IWW vessels <ul style="list-style-type: none"> ○ Exemption from piloting or reductions in piloting fee ○ Exemption from other fees/administrative burden • Financial support possibilities (e.g. eco-bonus or start-up) • Possibility that road will get increased fees • Pricing adapted to be comparative to rail and road (in ports) • Open book discussions between transport operators and ports • Containerisation • Use of standardised containers – possible to load/offload faster • Targets on national and municipality level, e.g. x% of transports should be on water. For example, when Swedish Transport Administration makes investments connected to the ports or infrastructure, can set demands that the port has to have X % of transshipments by inland waterways. For planning permission regarding plots that have water connection, could include investigation of possibility to use water transport or set goals, x% of transport should be on water. • Owners of ports set goals for IWT development • Educate students regarding IWT • Reduce road permits for odd-sized loads • Shortage in truck and rail capacity. Shortage of truck drivers. • Public attention to public safety and air quality • Inland promotion centre <p>Opportunities to mitigate barriers/weaknesses:</p>	<ul style="list-style-type: none"> • Not attract enough volume • Goods that can carry extra cost of handling • Customers reluctance to change • No improvement in competitive situation versus other modes. E.g. subsidies to rail • Potential locations of inland ports may vanish • Low awareness of IWT as a possibility, e.g. lack of promotion initiatives • Environmental concerns that other transport modes will improve faster and be better • Uncertainty regarding regulations • Cabotage • Personnel requirements • Insurance related to ice • Financial risk associated with start-up • Locks not sustainably constructed for future (e.g. suitable vessel sizes)

OPPORTUNITIES	THREATS
<ul style="list-style-type: none"> • IMO-classed vessel to allow flexibility of where it can be used • Possibility to have crane on-board or in port • Innovative handling equipment and processes (trans-shipment) • Use existing vessels from Benelux to show how it works in Swedish setting • Use simulator for training crew • Shift without the customer knowing (forwarder) <p>Opportunities to leverage strengths of IWT:</p> <ul style="list-style-type: none"> • Potential to develop innovative vessels • Fossil-free transport. Use emission-free vessel. Use electricity • Calculate what it would cost to not use IWT (environmental benefits) • Establish depot for containers near inland ports • Smaller terminals along waterway could be used to load/unload <p>Steps towards increased use of IWT:</p> <ul style="list-style-type: none"> • Identify suitable goods flows: certain segments, e.g. construction material • Identify key ports for IWT • Collaboration between actors in region to e.g. support investments • Ability to offer last/first mile solutions from/to port. E.g. terminal operator includes first/last mile in offer. 	

5. North Great Britain – Canal and River Trust

Regional IWT-Infrastructure and Usage

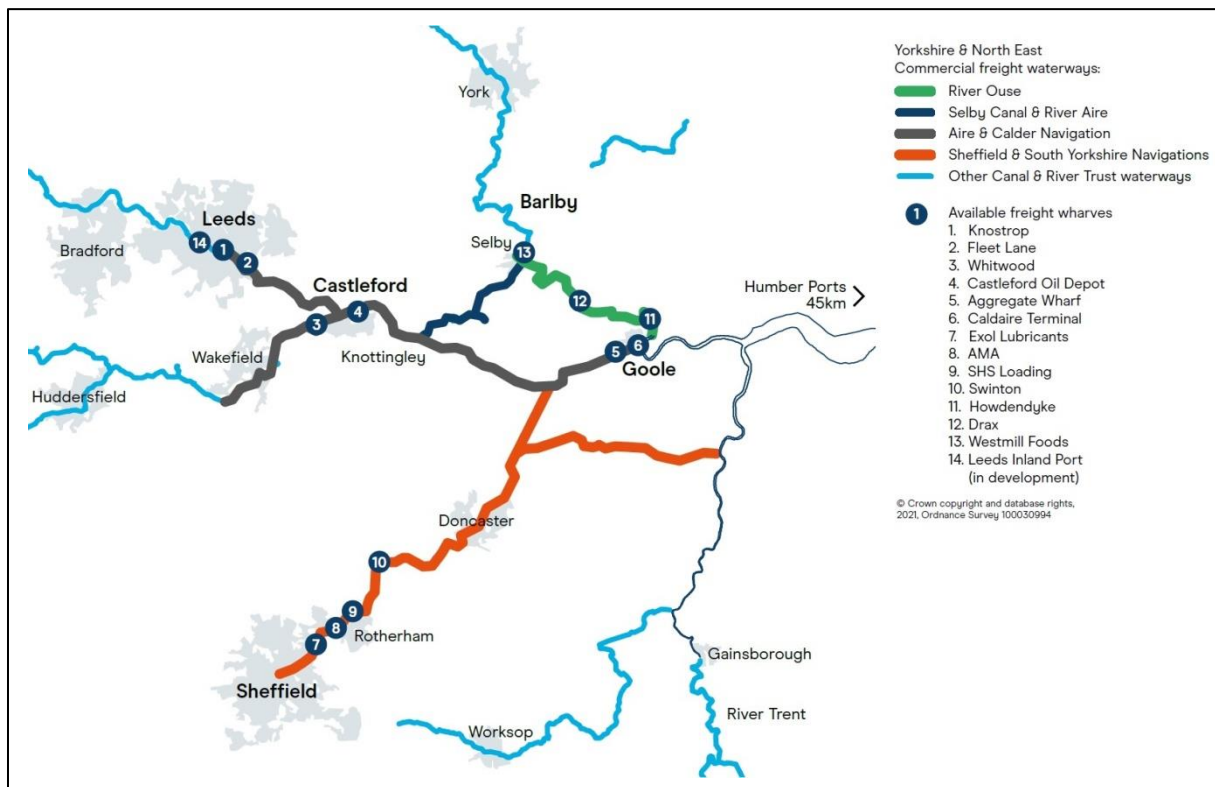
The Canal & River Trust maintains c2,000 miles of inland waterways. Much of this network is now used for recreational activity, but some of these waterways are still designated as ‘commercial waterways’ by the 1962 Transport Act.

Today, freight transportation on the Trust’s assets is limited, and is less than 500,000t per annum, but there is an appetite to grow this after years of decline. The Aire & Calder Navigation has been deemed by the Trust to be a priority waterway on which waterborne transport can grow. Running from the Humber estuary into the city of Leeds, the Aire & Calder once carried 8m tonnes of goods per annum. Although it is unlikely we will get to these levels again, the waterway has the potential to increase the amount of cargoes carried, and also increase the size of vessels it can facilitate to Euro Class II (c500-600t capacity) with the removal of some pre-

identified ‘bottlenecks’, primarily the construction of a new inland port in the city centre, and the adaptation of Bullholme Lock (see also Map 4 and Picture 3).

The Trust has undertaken a lot of feasibility work on the potential of the Aire & Calder for waterborne freight transportation. We have data on what cargoes are arriving at the ports in the Humber Estuary (Hull, Goole, Immingham) and we have a strong sense of what proportion of these goods can continue their journey from the Humber Ports into Leeds. We have undertaken a demand analysis of what commodities are required to support the construction industry in Leeds itself, and finally, we have undertaken enough consultation with local business to understand the appetite for such an offer. Political support is limited, but growing.

Through this deliverable, we can further understand the challenges and outstanding requirements to make freight on water a success in the north east of England.



Map 4: Commercial freight waterways and wharves in Yorkshire & North East (Canal & River Trust, 2021).



Picture 3: Last barges to run on Aire & Calder Navigation in 2013 (Canal & River Trust, 2019).

Current SWOTs

CRT identifies the following strengths, weaknesses, opportunities and threats concerning inland navigation on the Aire and Calder waterway:

STRENGTHS

- There is existing capacity on the A&C alone for 1m t/a plus more
- Environmental benefits of freight by water
- Costs competitiveness (compared to road transport)
- Can move large quantities of goods – 600 tonnes per barge or 24 lorry loads
- Direct links to Humber Ports and the other Yorkshire & NE freight waterways
- Strong connections to Scandinavia, Baltic States, Northern Europe, east coast ports
- Reduced road congestion on surrounding road network, particularly the M62 motorway and Leeds city centre.

WEAKNESSES

- Limited qualified helmsman to navigate the freight barges / skills shortage / pipeline of young resources coming through
- Lack of barges
- Infrastructure is failing, note recent breach
- Dependency on third-party funding, i.e. public money, to improve/modernize the asset
- Lack of wharf facilities.
- Lack of national policy
- Limited profile of waterway freight lobby
- Private sector interest is limited.
- Lack of automation along the navigation (which can stifle efficiency)
- General lack of understanding in the freight logistics world of inland waterway freight

OPPORTUNITIES

- The Aire & Calder Navigation is vastly underused from a commercial perspective recent freight flow mapping exercise demonstrates the volumes of goods arriving at the Humber Ports that can be forwarded into Leeds using the A&C
- With investment there is potential for container barge traffic (32 TEU) and adoption of EuroClass II vessels
- Domestic railways are at capacity. Waterways can offer an alternative.

- Jobs, skills and training growth to support the sector.
- Demand analysis of certain cargos for Leeds is known – e.g. we know the city of Leeds is growing rapidly and there is a need for building materials to support construction industry.
- Local planning authorities could do more to encourage & incentivize waterside development
- Shift away from land gained aggregates to marine gained aggregates is well suited to water transport.
- Waterways are suitable for movement of ‘abnormal loads’, reducing need for road closure and disruption.
- To help local authorities achieve air improvement targets

THREATS

- High maintenance budgets to modernize and maintain the waterway to improve resilience and make fit for purpose (thinking here of infrastructure resilience plus mechanical & electrical improvement)
- Dredging costs for maintenance work and capital projects can be high especially where contamination levels are high
- Lack of financial resources from the Trust
- Conflict of interest with leisure boaters, particularly the rowing clubs on the waterway.
- Large numbers of road haulage contractors provide flexibility and alternative options that water freight cannot.
- Other competitive transport modes are constantly developing environmentally beneficial transport modes i.e. improved fuel types

6. Friesland, the Netherlands – Maritieme Academy Harlingen, Province of Friesland

Regional IWT-infrastructure and usage

The Province of Friesland in the very northwest of the Kingdom of the Netherlands is an important player in the European IWT landscape. Not only due to the number of vessels that are operated by Frisian owners, but also due to the developed supporting sector. There are about 600 IWT companies registered in Friesland as of 2021, a bit less than half of them in the freight sector (Registered at the Kamer van Koophandel, see drimble, 2021).

The waterway network of the Netherlands is the by far best developed within the European Union. Nearly every village is connected to a river or a channel or is located not far away from one. Furthermore, the transport costs on the inland waterway system are, per transported ton and kilometre, unbeatably cheap when compared to the transport on the rail or on the road. The Dutch are to some extent “naturally blessed” by their opportunities for the transport on water, due to their country’s geographical situation. In a widespread river delta three large seaports provide barges the opportunity for large amounts of freight to be transported easily and cheaply to the industrial centres along the Rhine. The inland shipping sector in Friesland is considerable. Out of the 14,000 commercial inland vessels in Europe, 8,000 have their homeport in the Netherlands and the majority of these come from the northern three provinces of the Netherlands, Groningen, Drenthe and Friesland.

Friesland is big in European inland shipping, there is a long inland shipping tradition, many ships sail and there is an intricate waterway network with a lot of potential. A large part of the crews in European inland shipping come from the Netherlands. Friesland, the Maritieme Academy Harlingen, distinguishes itself internationally with modern training, applied knowledge and expertise. Inland shipping and its supply companies offer a lot of employment opportunities.

The province as such is characterized by its very dense network of small and medium waterways. These are predominately used for the regional water management, which is of utmost importance for the province, as most of its parts are located beneath the sea level. Another important usage of these waterways is recreational navigation. The area is a hotspot for sailing and house-boat tourism from all over Europe.

Historically, all these small waterways were used for freight transport, but since they are not even classified as a CEMT class I waterway, there is no noteworthy freight traffic happening as of now. However, there are a few selected routes through the province which are of significance for IWT freight transport.

The main axis for IWT runs through the north of the Netherlands, the “Hoofdvaarweg Lemmer-Delfzijl”, a class Va waterway is crossing the province from east to west and is, apart from the river Rhine, the only navigable route for IWT vessels from the Netherlands to Germany. This waterway is part of the TEN T main network and is under the supervision of the national infrastructure agency “Rijkswaterstaat”. Other main class IV waterways are the “Van Harinxmakanaal”, which connects the main axis of the “Hoofdvaarweg Lemmer-Delfzijl” with the seaport of Harlingen (which is of some importance for short sea traffic in the North Sea and Baltic region) and grants access to the provincial capital of Leeuwarden. Moreover, there are links to the main waterways to the industrial ports of the Frisian towns of Sneek, Heeg, Drachten and Heerenveen. Lastly, the fairways on the lake IJssel and the Frisian Wadden Sea are considered as inland navigation routes as well. These are open waters, suitable for class Va vessels (see Map 5).

Most of the freight traffic is only passing through, and some of the main ports within the province are in a fear of a “reversed modal shift”, whereas freight flows currently using the waterways are shifted back towards road transport due to the inaccessibility of these ports by larger and more economical vessels. The port of Drachten for instance is fighting this issue by proposing not only the improvement of its waterway link to the main network, but also by looking into ways to improve the use of the vessels which are calling for the port regularly by pooling smaller amounts of freight destined outbound towards the seaports of Amsterdam and Rotterdam (Gemeente Smallingerland, 2019). This limits the traffic of empty vessels and improves the degree of utilization for these vessels.

Other issues to be tackled are the fleet and its operators. The innovation capacity is limited, knowledge and expertise are fragmented, and little is done to really innovate. The sector is also vulnerable - it consists for a large part still out of many small companies with one or two ships and owner-operators, who own the barge they work on. The investment- and innovation potential of these types of operation is rather low through the small scale and limited financial capabilities in the business.

Furthermore, the lack of attention for the 'greening potential' of the Friesian inland shipping sector ultimately fosters the potential of a reverse modal shift from water to road. This is coupled with numerous ill effects like increased emissions per ton kilometre and traffic density, but also the decline of a valuable sector with a long standing tradition and track record that also has the potential to positively distinguish itself from others in Europe.



Map 5: Main waterways in the Province of Friesland (Heerenveense Courant, 2019).



Picture 4: Simulation of a vessel passing a drawbridge on the "Wilde Greuns" waterway in the city of Leeuwarden (IWT simulator MAH for the Interreg NSR project # IWTS 2.0, 2019).



Picture 5: Container shipping in the Province of Friesland (Province of Friesland, 2020).

Current SWOTs

Maritieme Academy Harlingen and the Province of Friesland identify the following strengths, weaknesses, opportunities and threats concerning inland navigation on regional waterways:

Strengths:

- Geography is favourable for building waterways compared to more undulating or mountainous terrain
- Extensive network of small and medium waterways connecting various local inland ports and terminals in the region
- The local waterway network grants seamless access to the European TEN-T core network
- Prinses Margriet Kanaal is spanning through the Province and is a part of the TEN-T core network of waterways
- The Frisian IWT sector is large. 8.000 of the 14.000 IWT vessels registered in Europe are based out of the Netherlands – the majority of these are owned by Frisian companies
- There is an innovative and very proactive supplying industry around the IWT sector in the region

- The region is a focal point of the IWT knowledge/educational institutions in the Netherlands
- The Frisian regional government is currently undertaking an ambitious investment scheme into the main waterway links of the region
- Projected updating of the main provincial and national waterways (Van Harinxmakanaal and Prinses Margrietkanaal) towards CEMT classes Va and Vb respectively
- Very strong IWT related SME's having a leading role in their niches on a European or even global level
- Large portion of bridges are remotely controlled with advanced techniques.

Weaknesses:

- Water levels of the main rivers in The Netherlands are on average lower
- Waterways are multi-functional, resulting in a conflict of interests concerning agriculture
- Vision of IWT, both infrastructure and sector, is not entirely shared; from the user's perspective the sense of urgency to address the theme is not the same as from the managing authority.
- The lobby of the IWT sector is not as strong as the lobby of other sectors in transport and logistics (e.g. road transport)
- Relatively low innovation potential due to the ownership structure of the sector (mainly small SME's)
- Low visibility of the sector in the general public in relation to its economic importance
- Low awareness of the potential of IWT within the freight forwarding/logistics community at the decision-making level (e.g. freight flow planners do not instinctively take the possibility of water transport into account)
- Low organisation capacity amongst local, regional IWT stakeholders.

Opportunities:

- Use the opportunity of the strong IWT related SME's to build alliances for innovation in the sector (green shipping, ship building, etc.).
- There is currently a momentum for IWT as a green mode of transport fuelled by the EU Green Deal and other EU and national subsidy and stimulus programs
- The Green Deal is also an opportunity for Frisian companies to deliver innovative and economically viable solutions for the energy transition of the IWT sector as a whole
- Waterway upgrades in the region are relatively easy to realize due to the geography of the region - Realizing a better connectivity towards the TEN-T core network is therefore much easier than in other parts of Europe
- Digitalization can be supportive for freight flow decision makers to choose their means of transport more objectively, therefore choosing IWT more frequently
- Alliance of the sector and managing authority to become a frontrunner in the field of automation in IWT (remote controlling infrastructure, and sailing itself)
- Freight flows are becoming more unpredictable than they used to be, offering opportunities for IWT in the spot market

Threats:

- Climate change resulting in more fluctuation in water heights and thus less reliability for the sector as a whole in times of drought
- Freight flows are becoming more unpredictable than they used to be, threatening the longstanding business model of current SME's in the charter market
- Aquatics is an important theme in the Frisian leisure industry, there is a conflict of interests with IWT where the two share inland waterways
- Lobby for road transport is stronger than IWT-lobby
- Shortage of labour due to outflow of professionals and aging labour force in general
- Aging IWT fleet making it less cost-effective to innovate in greener and more digitalized ships
- Conflicting interests between local and regional interests (Municipalities vs. Region)
- Structure of ownership creates a situation where the majority of companies is small (1 ship = 1 company), limiting the financial possibilities to respond to technological progress (alternative fuels, battery cells, automatic propulsion, etc.)
- Lack of coherence in the maritime sector (IWT, yacht building, logistics, etc.) leaving individual gems (SME's, leading in their niche) with a sub-par network.
- Regulation and legislation can slow down or complicate innovation in the sector

7. Common SWOTs

Though certainly not strategically representative, as a matter of the methodology used in the course of the SWOT-analysis, one can principally state that the contribution partners attest an overall positive potential for IWT. They, for example, see significantly more opportunities than threats. On the downside, strengths are principally perceived as being in balance with weaknesses, at least when comparing sheer numbers.

Core strengths are believed to be found in factors like logistics operations (in association with commercial aspects), geography and / together with infrastructure. This, however, generally also goes for weaknesses. Together with the fact that opportunities equally point at logistics operations as a main factor, shows that here overall IWT-potentials are seemingly underutilised in total.

Overall, strengths and opportunities are also pinned down to fewer factors than weaknesses and threats. The prior are thus more clearly definable to partners whilst the latter are generally more diverse (see Table 6).

Table 6: Overall counts of SWOTs mentioned according to category (bremenports, 2021)

	Strengths	Weaknesses	Opportunities	Threats	Sum
Commercial	0	6	0	8	14
Digitisation	1	2	3	2	8
Environment	2	0	4	3	9
Geography	10	7	6	1	24
Infrastructure	7	7	3	5	22
Intermodality	1	0	0	1	2
Logistics operations	13	6	25	0	44
Politics	3	5	10	0	18
Regulation	1	2	0	2	5
Spatial planning	0	0	0	5	5
Training/Awareness	2	6	9	6	23
Sum	40	41	60	33	174

As previously indicated, these SWOT-codings were further transformed into headlines/statements agreeable to all contributing partners. The core messages thereby derived are scrutinised in the following.

Strengths

The most important strength is the perceived logistics benefits of IWT followed by infrastructural coverage and links as well as infrastructure capacity.

Logistics benefits: IWT has distinct logistical benefits, but they are appreciated differently in each partner region:

- A typical IW-vessel can move large quantities of goods – 600 tonnes per barge or 24 lorry loads
- [There are] established IWT-services in the ports
- [There is] cost competitiveness (compared to road transport)
- The Frisian IWT sector is large. 8,000 of the 14,000 IWT vessels registered in Europe are based out of the Netherlands – the majority of these are owned by Frisian companies
- There is an innovative and very proactive supplying industry around the IWT sector in the region
- Very strong IWT related SME's having a leading role in their niches on a European or even global level
- Inland navigation vessels are modern, safe and have high capacity
- [IWT] works for abnormal load (e.g. heavy, pre-fab elements)
- Haulage direct to port of reception (not via hub port) possible
- [There are] vessels available to charter
- [There are] issues with truck use (congestion near port). Use of IWT can reduce congestion on roads.

Coverage and links: The regions which are represented in IWTS 2.0 benefit from a reasonable geographical coverage of IW which provides good links to other regions

- Strong connections to Scandinavia, Baltic States, Northern Europe, east coast ports
- IWTS provides geographical coverage of all major urban conurbations in North-Western Germany within 60 min driving range.
- East-West connectivity to reach Dutch seaports as well as Berlin region

- Direct links to Humber Ports and the other Yorkshire & NE freight waterways
- Geography is favourable for building waterways compared to more undulating or mountainous terrain
- Extensive network of small and medium waterways connecting various local inland ports and terminals in the region
- The local waterway network grants seamless access to the European TEN-T core network
- Prinses Margriet Kanaal is spanning through the Province and is a part of the TEN-T core network of waterways

Infrastructure capacity: Infrastructural capacity exists, but there are regional differences

- River Weser GMS-ready
- There is existing capacity on the A&C alone for 1m t/p/a plus more
- Capacity available on waterways
- Capacity available in ports
- High standard river conditions
- The Frisian regional government is currently undertaking an ambitious investment scheme into the main waterway links of the region
- Projected updating of the main provincial and national waterways (Van Harinxmakanaal and Prinses Margrietkanaal) towards CEMT classes Va and Vb respectively

Weaknesses

Whereas strengths are dominated by rather hard facts, weaknesses predominantly related to political issues. There are weaknesses, which we describe with limited political support, the design of transport chains, policy and lobby as well as the influence of competing modes.

Political support: Political support of waterway infrastructure maintenance and expansion is limited:

- Infrastructure is failing, note recent breach
- Lack of wharf facilities.
- Infrastructure maintenance
- Condition of waterways (ice, water levels, height of bridges)
- Conditions and locations of ports/quays,
- Bottlenecks with bridges and locks

Policy and lobby: IWT lacks a national policy and a lobby to support it:

- [A] lack of national policy
- Limited profile of waterway freight lobby
- The lobby of the IWT sector is not as strong as the lobby of other sectors in transport and logistics (e.g. road transport)
- Low visibility of the sector in the general public in relation to its economic importance
- Low organisation capacity amongst local, regional IWT stakeholders.

Design of transport chains: Capabilities of IWT and the design of logistics chains do not always match:

- [Need to cover the] last mile
- Time (Time for loading/unloading, Matching schedules with crane availability, Working hours, Alignment of lock planning and quay handling)
- Frequency (Vessel size)
- Reliability (Prioritisation of loading/unloading in ports)
- Inflexibility of specialised vessels

In terms of **competing modes**, apparently full coverage of regions by IWT-services are to be qualified in terms of competing modes, commodities handled and structural changes in the freight market. This means that

- [There is an] overlap of catchment areas of ports also applies to road freight
- There is a principal geographical coverage of IWT for the region. However, not all ports can handle all commodity groups with comparable efficiency.
- Overlaps of port hinterlands must be assessed on a commodity-by-commodity basis, on an overall handling volume-basis they suggest strong competition which is not necessarily the case in practice
- Decreasing coal-volumes need to be replaced in the near future due to changes in national energy regulations.

Opportunities

Contributing partners see opportunities for IWT predominantly related to logistics solutions, spatial planning as well to politics, fees and administration.

There are numbers of **logistics solutions** can be explored to facilitate IWT-usage:

- Use of existing base loads to limit marginal costs for additional cargoes
- Ongoing project (see “Contribution towards ideal situation”) increase efficiency of IWT and raising competitiveness of sector
- Shift away from land gained aggregates to marine gained aggregates is well suited to water transport.
- Freight flows are becoming more unpredictable than they used to be, offering opportunities for IWT in the spot market
- Open book discussions between transport operators and ports
- Possibility to have crane on-board or in port
- Use existing vessels from Benelux to show how it works in Swedish setting
- Calculate what it would cost to not use IWT (environmental benefits)
- Establish depot for containers near inland ports
- Ability to offer last/first mile solutions from/to port. E.g. terminal operator includes first/last mile in offer.
- Shift without the customer knowing (forwarder)
- Opportunities for ports to get additional cargo (increase throughput)

Supportive spatial planning can help tap modal shift potential and improve infrastructure:

- Bremen with 40 km of city area bordering the river optimal for urban-IWT logistics with small vessels.
- Continuous review of inter-/trimodal facilities along the major inland waterways in the region led to the recent commissioning of the RegioPort at Minden and the projection of an additional terminal at Nienburg. The latter would close the gap between Bremen and Hannover.
- Demand analysis of certain cargos for Leeds is known – e.g. we know the city of Leeds is growing rapidly and there is a need for building materials to support construction industry.
- Local planning authorities could do more to encourage & incentivise waterside development
- Smaller terminals along waterway could be used to load/unload
- Opportunity to reduce road traffic, e.g. through cities

Politics, fees and administration can add to the competitiveness of IWT by reviewing transport-specific statutory fees and regulations:

- To help local authorities achieve air improvement targets
- Possibility that road will get increased fees
- Exemption from piloting or reductions in piloting fee
- Owners of ports set goals for IWT development
- Targets on national and municipality level, e.g. x% of transports should be on water.
- Reduce road permits for odd-sized loads

Threats

From the partners’ perspective exploiting IWT requires managing conflicts of interest as well as cost drivers and address resistance to change, or at least to mind-shifts.

Conflicts of interest between IWT, cities, industry, agribusiness and leisure are to be addressed by spatial planning:

- Conflicting interests between local and regional interests (Municipalities vs. Region)
- Heavily IWT-reliant port areas are encircled by urban conurbations triggering conflicts of interest/usage.
- Conflict of interest with leisure boaters, particularly the rowing clubs on the waterway.
- Aquatics is an important theme in the Frisian leisure industry, there is a conflict of interests with IWT where the two share inland waterways
- Potential locations of inland ports may vanish

There are **logistics-related cost drivers** that limit usage of IWT, such as unpredictability, lack of volume, flexibility of competitors etc.:

- Freight flows are becoming more unpredictable than they used to be, threatening the longstanding business model of current SME's in the charter market
- Insurance related to ice
- Large numbers of road haulage contractors provide flexibility and alternative options that water freight cannot.
- Not attract enough volume: Goods that can carry extra cost of handling

Overcoming any **resistance for mind-shift for modal shift** can be hampered by:

- Lack of coherence in the maritime sector (IWT, yacht building, logistics, etc.) leaving individual gems (SME's, leading in their niche) with a sub-par network.
- Lobby for road transport is stronger than IWT-lobby
- Low awareness of IWT as a possibility, e.g. lack of promotion initiatives
- Not attractive enough volume: Customers reluctance to change.

Figure 3 gives an impression of the overall perceived, relative importance of the aforementioned strengths, weaknesses, opportunities and threats.

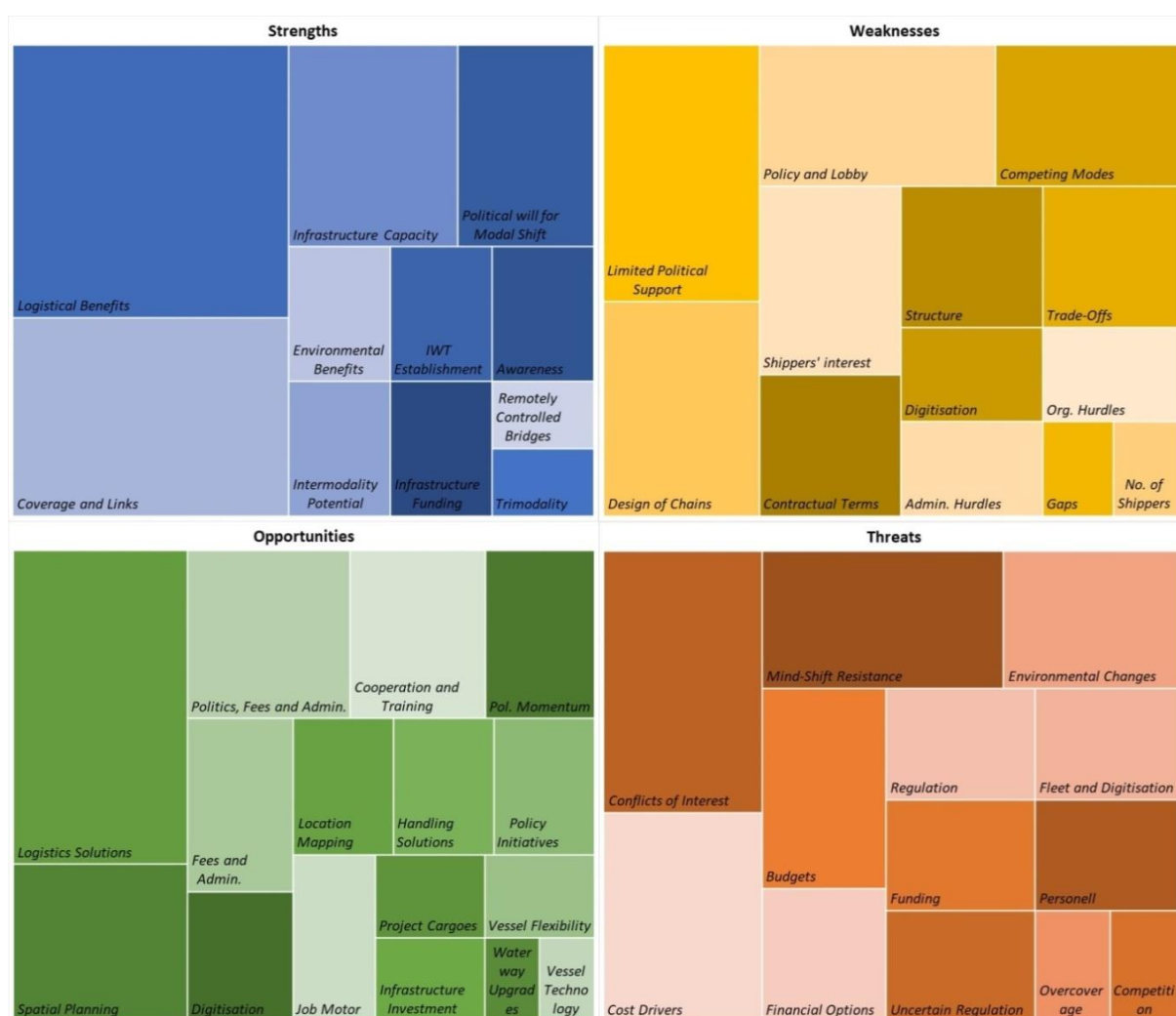


Figure 3: Tree map indicating relative importance of combined SWOT headlines/statements (bremenports, 2021).

Conclusions

Strengths underpin existing logistics benefits of IWT, focussing on available capacity of vessels and waterways, logistics services and geographical coverage of regional IW-networks. Those networks link regions to European and global markets, tapping into established supply chains with IWT-usage. This is supported by favourable topo-/geography that might facilitate waterway expansion and construction over a longer time horizon.

Although there are established inland-waterway supply chains, capabilities of IWT do not always match shippers' requirements. Competition is strong, both between transport modes and between inland ports within a region.

This rather positive picture is further contrasted by a perception that political support towards waterway maintenance and expansion is somewhat limited. **Weaknesses** focus on insufficient bridge clearances, water depths and maintenance, which are essential features of well-functioning waterways. Partners bemoan a missing political lobby that pushes for those matters, and that also raises the sector's profile with industry and the general public.

A particular challenge is to address declining bulk volumes due to phase-outs of fossil fuels (coal) and a trend towards small, but frequent shipments that favour road freight. Declining volumes in one sector might be replaced with volumes of another. Innovative logistics solutions combining cargoes of various shippers, deeper integration between shippers and vessel-owners, offering last-mile transport and increasing vessel flexibility by adding handling gears have been flagged as **opportunities**. However, political support has to flank those measures in terms of an encouraging economic and regulatory environment for IWT.

Spatial planning measures to address usage conflicts along waterways and commercial cost management keep **threats** at bay. Of particular concern are fluctuating or even insufficient freight volumes and competition from road freight.

It seems that intelligent combinations of reliable public infrastructure provision, development and maintenance plus a favourable regulatory framework can encourage IWT usage. Awareness raising needs to flank this framework to ensure a level playing field for IWT, not only in terms of costs, but also in terms of lobbyism.

8. Policy Recommendations

Based on the foregoing analysis, the following **ten policy recommendations** are made by all partners involved (in bold), with *specificities laid out according to views of individual partners* (in italic) in descending order of importance:

1. **The current momentum of a stronger political will for a support of a modal shift towards IWT must be upheld in the long run, be perpetuated, by accompanying policies characterised by long-term commitment.**
2. **Support of IWT must be made a central part of all national and European efforts that aim at modal shift and a reduction of emissions of the transport sector in the course of environmental and infrastructural policies as a matter of valuating IWT's credentials and to create an overall robust and green economy.**

From the view of all partners, research programmes should also be directed at support of IWT and modal shift.

3. **Concrete targets should be set with regards to the share of IWT in overall modal split. Equally, ports must be approached and enabled to set and achieve goals for IWT development.**

Specifically from the view of the Maritieme Academy Harlingen (Netherlands), authorities should be encouraged to consider smaller waterways in their specific region as an alternative transport routes again - even if they are smaller and cannot to be considered a CEMT Class Va route. #IWTS 2.0 has proven that waterborne transport on smaller and previously neglected waterways as well as in urban last mile transport can be a feasible and greener alternative to road transport.

Specifically from the view of SSPA (Sweden) and bremenports (Germany), a certain share of transshipment by IWT should, for example, be set as a goal. Owners of ports, for example municipalities, should set specific IWT goals. To follow development IWT use should be measured as a key performance indicator (KPI) that is continuously evaluated. Authorities should require the use of IWT in construction projects where feasible.

4. **IWT requires awareness raising and education amongst present and future decision makers in the sector, thereby also a stronger lobby specifically in comparison to other modes of transport. Exiting and new initiatives in IWT promotion should be continued, further fostered and strengthened to increase their organisational capacity, visibility and political influence and ultimately political and economic power.**

Specifically from the view of SSPA (Sweden) and bremenports (Germany), new and existing promotion centres could be supported to facilitate efforts in awareness raising and education. It is seen as important to disseminate knowledge regarding research results, existing initiatives, demonstrations and the like. To increase knowledge, information about success factors and short-comings thus needs to be collected. International collaboration and sharing of experiences are regarded as fruitful approaches in this.

5. **Specific, existing and future market potentials for IWT must be identified and fostered to create business opportunities and to thereby allow for a more robust and green economy overall. Support is mostly required with regards to creating linkages amongst large-scale industrial players, but also by fostering SMEs and start-ups, the latter in the form of entrepreneur incubators that are linked to existing players to increase innovativeness, and generally with regards to intra-urban and rural-urban logistics. Alike, businesses already established in IWT require financial support to be made more competitive on an international scale.**

Specifically from the view of SSPA (Sweden) and bremenports (Germany), it is regarded as important to create opportunities for networks of actors. Additionally, governmental financial support, such as eco-bonus, aimed at transferring goods from road, should include IWT to a larger extent.

6. **IWT infrastructure needs not only more attention but concrete investments with regards to overall funding, maintenance of infrastructure to inhibit further decline, an expansion of waterways, specifically with regards to ports/quays, wharf facilities and bottlenecks such as bridges and locks.**

Specifically from the view of SSPA (Sweden), inland waterways need to be navigable to a greater extent. In addition, future use and innovations of IWT should be considered in infrastructure decisions. Several authorities, at a local, regional and national level should be consulted to allow thorough consideration of IWT in the competition between different usages of the waterways to understand future consequences of decisions. This holds especially true, for example for spatial planning regarding new housing areas that may interfere with quay usage.

- 7. Efforts in the realm of digitisation, automatization and artificial intelligence must be increased to allow for a technological catch-up of the sector, to assure a robust and green economy and to serve as interim solutions are to the aforementioned, infrastructural deficits.**

Specifically from the view of SSPA (Sweden) and bremenports (Germany), digitisation holds much potential to reduce administrative activities related to IWT and allow sharing of data that can increase efficiency.

- 8. Financial support is required to foster the development and usage emission-free vessels, to further help local authorities achieve air improvement targets.**

Specifically from the view of SSPA (Sweden), support to IWT operators regarding knowledge of investment alternatives can be helpful. Short-period exemption from certain fees could make the emission-free solution more competitive.

- 9. Especially road, but partly also train based transport must be made comparatively less attractive than IWT, such as through fees on road and train transport, by reducing piloting and port fees for IWT and by limiting the number of road permits for odd-sized loads.**

Specifically from the view of SSPA (Sweden) limiting road permits for odd-sized loads where it is possible to use IWT will have a big impact. Fees specific to IWT, such as piloting and port fees, need to be reduced to make IWT competitive compared to road. For example, in Sweden piloting regulations makes it virtually impossible to compete on short distances. Alternatively, fees on the other transport modes could be increased or added. Knowledge needs to be increased regarding the consequences of fees and regulations on modal choice.

- 10. Uncertainty about regulations that limit and slow down private incentives to invest has to be approached.**

Specifically from the view of the Maritieme Academy Harlingen (Netherlands), the certification procedures for shipborne power installation (main and auxiliary engines) running on alternative fuels and/or battery systems must be streamlined and eased in order to facilitate the successful implementation of such power systems into the sector.

Specifically from the view of SSPA (Sweden) uncertainty needs to be clarified, regulations simplified, and knowledge level improved regarding classification of IWT vessels, harmonised with the EU. This would allow entrepreneurs to evaluate potential business case.

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Appendices

Appendix A: List of strengths, their categorisation and headlines/statements

Strength	Identified by	Category (↓)	Sub-category	Scope	Headline/Statement	Headline/Statement Short
Large portion of bridges are remotely controlled with advanced techniques.	PoF/MAH	Digitisation	Infrastructure	National	Large portion of bridges are remotely controlled with advanced techniques.	Remotely Controlled Bridges
Environmental benefits of freight by water	CRT	Environment	Politics	Europe-wide	IWT has distinct environmental benefits (over other modes of transport)	Environmental Benefits
Environmental impact much better than for truck	SSPA	Environment	Politics	Europe-wide	IWT has distinct environmental benefits (over other modes of transport)	Environmental Benefits
Strong connections to Scandinavia, Baltic States, Northern Europe, east coast ports	CRT	Geography	Infrastructure	Regional	The regions which are represented in IWTS 2.0 benefit from a reasonable geographical coverage of IW which provides good links to other regions	Coverage and Links
IWTS provides geographical coverage of all major urban conurbations in North-Western Germany within 60 min driving range.	bremenports	Geography	Infrastructure	Regional	The regions which are represented in IWTS 2.0 benefit from a reasonable geographical coverage of IW which provides good links to other regions	Coverage and Links
East-West connectivity to reach Dutch seaports as well as Berlin region	bremenports	Geography	Infrastructure	Regional	The regions which are represented in IWTS 2.0 benefit from a reasonable geographical coverage of IW which provides good links to other regions	Coverage and Links
Direct links to Humber Ports and the other Yorkshire & NE freight waterways	CRT	Geography	Infrastructure	Regional	The regions which are represented in IWTS 2.0 benefit from a reasonable geographical coverage of IW which provides good links to other regions	Coverage and Links
Geography is favorable for building waterways compared to more undulating or mountainous terrain	PoF/MAH	Geography	Infrastructure	Regional	The regions which are represented in IWTS 2.0 benefit from a reasonable geographical coverage of IW which provides good links to other regions	Coverage and Links
Extensive network of small and medium waterways connecting various local inland ports and terminals in the region	PoF/MAH	Geography	Infrastructure	Regional	The regions which are represented in IWTS 2.0 benefit from a reasonable geographical coverage of IW which provides good links to other regions	Coverage and Links
The local waterway network grants seamless access to the European TEN-T core network	PoF/MAH	Geography	Infrastructure	Regional	The regions which are represented in IWTS 2.0 benefit from a reasonable geographical coverage of IW which provides good links to other regions	Coverage and Links
Prinses Margriet Kanaal is spanning through the Province and is a part of the TEN-T core network of waterways	PoF/MAH	Geography	Infrastructure	Regional	The regions which are represented in IWTS 2.0 benefit from a reasonable geographical coverage of IW which provides good links to other regions	Coverage and Links
Reduced road congestion on surrounding road network, particularly the M62 motorway and Leeds city centre	CRT	Geography	Intermodality	Regional	The geographical coverage of IWT provides for opportunities for intermodality.	Intermodality Potential
Some goods flows exist	SSPA	Geography	Intermodality	Regional	The geographical coverage of IWT provides for opportunities for intermodality.	Intermodality Potential
River Weser GMS-ready	bremenports	Infrastructure	Commercial	Regional	Infrastructural capacity exists, but there are regional differences	Infrastructure Capacity
There is existing capacity on the A&C alone for 1m t/p/a plus more	CRT	Infrastructure	Commercial	Regional	Infrastructural capacity exists, but there are regional differences	Infrastructure Capacity
Capacity available on waterways	SSPA	Infrastructure	Commercial	Regional	Infrastructural capacity exists, but there are regional differences	Infrastructure Capacity
Capacity available in ports	SSPA	Infrastructure	Commercial	Regional	Infrastructural capacity exists, but there are regional differences	Infrastructure Capacity
High standard river conditions	SSPA	Infrastructure	Commercial	Regional	Infrastructural capacity exists, but there are regional differences	Infrastructure Capacity
The Frisian regional government is currently undertaking an ambitious investment scheme into the main waterway links of the region	PoF/MAH	Infrastructure	Politics	Regional	Development/extension of infrastructural capacity is being addressed in terms of public funding	Infrastructure Funding
Projected updating of the main provincial and national waterways (Van Harinxmakanaal and Prinses Margrietkanaal) towards CEMT classes Va and Vb respectively	PoF/MAH	Infrastructure	Politics	Regional	Development/extension of infrastructural capacity is being addressed in terms of public funding	Infrastructure Funding
Of 13 inland ports six offer trimodal terminals for container handling between IWT, rail and road.	bremenports	Intermodality	Logistics operations	Regional	Ports and terminals offer trimodal services to shipping almost throughout the whole region	Trimodality
A typical IW-vessel can move large quantities of goods – 600 tonnes per barge or 24 lorry loads	CRT	Logistics operations	Commercial	Europe-wide	IWT has distinct logistical benefits, but they are appreciated differently in each partner region.	Logistical Benefits
Established IWT-services in the ports	bremenports	Logistics operations	Commercial	Regional	IWT has distinct logistical benefits, but they are appreciated differently in each partner region.	Logistical Benefits
Costs competitiveness (compared to road transport)	CRT	Logistics operations	Commercial	Regional	IWT has distinct logistical benefits, but they are appreciated differently in each partner region.	Logistical Benefits
The Frisian IWT sector is large. 8.000 of the 14.000 IWT vessels registered in Europe are based out of the Netherlands – the majority of these are owned by Frisian companies	PoF/MAH	Logistics operations	Commercial	Regional	IWT has distinct logistical benefits, but they are appreciated differently in each partner region.	Logistical Benefits
There is an innovative and very proactive supplying industry around the IWT sector in the region	PoF/MAH	Logistics operations	Commercial	Regional	IWT has distinct logistical benefits, but they are appreciated differently in each partner region.	Logistical Benefits

Strength	Identified by	Category (↓)	Sub-category	Scope	Headline/Statement	Headline/Statement Short
Very strong IWT related SME's having a leading role in their niches on a European or even global level	PoF/MAH	Logistics operations	Commercial	Regional	IWT has distinct logistical benefits, but they are appreciated differently in each partner region.	Logistical Benefits
Inland navigation vessels are modern, safe and have high capacity	SSPA	Logistics operations	Commercial	Regional	IWT has distinct logistical benefits, but they are appreciated differently in each partner region.	Logistical Benefits
Works for abnormal load (e.g. heavy, pre-fab elements)	SSPA	Logistics operations	Commercial	Regional	IWT has distinct logistical benefits, but they are appreciated differently in each partner region.	Logistical Benefits
Haulage direct to port of reception (not via hub port) possible	SSPA	Logistics operations	Commercial	Regional	IWT has distinct logistical benefits, but they are appreciated differently in each partner region.	Logistical Benefits
Vessels available to charter	SSPA	Logistics operations	Commercial	Regional	IWT has distinct logistical benefits, but they are appreciated differently in each partner region.	Logistical Benefits
Issues with truck use (congestion near port). Use of IWT can reduce congestion on roads.	SSPA	Logistics operations	Commercial	Regional	IWT has distinct logistical benefits, but they are appreciated differently in each partner region.	Logistical Benefits
Safe to transport by boat. Expertly trained pilots. Much safer than truck. Good working conditions compared to foreign truckers.	SSPA	Logistics operations	Environment	Europe-wide	IWT as an established component of successful logistics systems has beneficial impacts on the environment and on communities	IWT Establishment
Double-digit IWT-modal share on selected port-to-port relations indicates a reasonably accepted competitive position of IWT.	bremenports	Logistics operations	Intermodality	Regional	IWT is an established component of successful regional logistics systems with distinct beneficial characteristics	IWT Establishment
Politicians want modal shift	SSPA	Politics	Intermodality	Europe-wide	There is a political will for more modal shift	Political will for Modal Shift
Government wish to shift from road transport	SSPA	Politics	Intermodality	Europe-wide	There is a political will for more modal shift	Political will for Modal Shift
IWT enjoys regional political backing	bremenports	Politics	Intermodality	Regional	There is a political will for more modal shift	Political will for Modal Shift
No tax on fuel for ships	SSPA	Regulation	Commercial	National	There is a political will for more modal shift	Political will for Modal Shift
IWT an established mode of transport in the region	bremenports	Training/Awareness	Politics	Regional	There is IWT-awareness in the region	Awareness
The region is a focal point of the IWT knowledge/educational institutions in the Netherlands	PoF/MAH	Training/Awareness	Politics	Regional	There is IWT-awareness in the region	Awareness

Appendix B: List of weaknesses, their categorisation and headlines/statements

Weakness	Identified by	Category (↓)	Sub-category	Scope	Headline/Statement	Headline/Statement Short
Lack of barges	CRT	Commercial	Logistics operations	Regional	Contractual terms and/or costs prohibit development of reasonable IWT concepts	Contractual Terms
Cost (Port charges, Piloting fees, Fairway dues, Cost of pre/post-haulage, Additional handling costs, Fee structures of other modes, Personnel costs)	SSPA	Commercial	Logistics operations	Regional	Contractual terms and/or costs prohibit development of reasonable IWT concepts	Contractual Terms
Stevedore agreements	SSPA	Commercial	Logistics operations	Regional	Contractual terms and/or costs prohibit development of reasonable IWT concepts	Contractual Terms
Relatively low innovation potential due to the ownership structure of the sector (mainly small SME's)	PoF/MAH	Commercial	Politics	National	The structure of IWT limits own innovation potential and requires external funding	Structure
Dependency on third-party funding, i.e. public money, to improve/modernise the asset	CRT	Commercial	Politics	Regional	The structure of IWT limits own innovation potential and requires external funding	Structure
Scale of investment	SSPA	Commercial	Politics	Regional	The structure of IWT limits own innovation potential and requires external funding	Structure
Not yet full digitisation of traffic management and port calls for IWT.	bremenports	Digitisation	Infrastructure	Regional	Digitisation potential of vessels, waterways and IWT-supply chains not yet fully developed	Digitisation
Lack of automation along the navigation (which can stifle efficiency)	CRT	Digitisation	Infrastructure	Regional	Digitisation potential of vessels, waterways and IWT-supply chains not yet fully developed	Digitisation
Overlap of catchment areas of ports also applies to road freight	bremenports	Geography	Logistics operations	Regional	Apparently full coverage of regions by IWT-services to be qualified in terms of competing modes, commodities handled and structural changes in the freight market.	Competing Modes
The map indicates a principal geographical coverage of IWT for the region. However, not all ports can handle all commodity groups with comparable efficiency.	bremenports	Geography	Logistics operations	Regional	Apparently full coverage of regions by IWT-services to be qualified in terms of competing modes, commodities handled and structural changes in the freight market.	Competing Modes
Overlaps of port hinterlands must be assessed on a commodity-by-commodity basis, on an overall handling volume-basis they suggest strong competition which is not necessarily the case in practice	bremenports	Geography	Logistics operations	Regional	Apparently full coverage of regions by IWT-services to be qualified in terms of competing modes, commodities handled and structural changes in the freight market.	Competing Modes
Decreasing coal-volumes need to be replaced in the near future due to changes in national energy regulations.	bremenports	Geography	Logistics operations	Regional	Apparently full coverage of regions by IWT-services to be qualified in terms of competing modes, commodities handled and structural changes in the freight market.	Competing Modes
Water levels of the main rivers in The Netherlands are on average lower	PoF/MAH	Geography	Spatial planning	National	Competing uses of waterways and waterlevels cause trade-offs in waterway management which do not benefit IWT	Trade-Offs
Waterways are multi-functional, resulting in a conflict of interests concerning agriculture	PoF/MAH	Geography	Spatial planning	Regional	Competing uses of waterways and waterlevels cause trade-offs in waterway management which do not benefit IWT	Trade-Offs
Prioritisation between traffic on land and water at bridges	SSPA	Geography	Spatial planning	Regional	Competing uses of waterways and waterlevels cause trade-offs in waterway management which do not benefit IWT	Trade-Offs
Bremen freight village is only indirectly connected to an inland shipping terminal	bremenports	Infrastructure	Intermodality	Regional	Gaps in trimodal logistics infrastructure remain that would boots IWT	Gaps
Infrastructure is failing, note recent breach	CRT	Infrastructure	Politics	National	Political support of waterway infrastructure maintenance and expansion is limited	Limited Political Support
Lack of wharf facilities.	CRT	Infrastructure	Politics	Regional	Political support of waterway infrastructure maintenance and expansion is limited	Limited Political Support
Infrastructure maintenance	SSPA	Infrastructure	Politics	Regional	Political support of waterway infrastructure maintenance and expansion is limited	Limited Political Support
Condition of waterways (ice, height of bridges)	SSPA	Infrastructure	Politics	Regional	Political support of waterway infrastructure maintenance and expansion is limited	Limited Political Support
Conditions and locations of ports/quays,	SSPA	Infrastructure	Politics	Regional	Political support of waterway infrastructure maintenance and expansion is limited	Limited Political Support
Bottlenecks with bridges and locks	SSPA	Infrastructure	Politics	Regional	Political support of waterway infrastructure maintenance and expansion is limited	Limited Political Support
Last mile	SSPA	Logistics operations	Commercial	Regional	Capabilities of IWT and the design of logistics chains do not always match.	Design of Chains
Time (Time for loading/unloading, Matching schedules with crane availability, Working hours, Alignment of lock planning and quay handling)	SSPA	Logistics operations	Commercial	Regional	Capabilities of IWT and the design of logistics chains do not always match.	Design of Chains
Frequency (Vessel size)	SSPA	Logistics operations	Commercial	Regional	Capabilities of IWT and the design of logistics chains do not always match.	Design of Chains
Reliability (Prioritisation of loading/unloading in ports)	SSPA	Logistics operations	Commercial	Regional	Capabilities of IWT and the design of logistics chains do not always match.	Design of Chains
Inflexibility of specialised vessels	SSPA	Logistics operations	Commercial	Regional	Capabilities of IWT and the design of logistics chains do not always match.	Design of Chains

Weakness	Identified by	Category (↓)	Sub-category	Scope	Headline/Statement	Headline/Statement Short
Double-digit IWT-modal share on selected port-to-port relations dependant on a limited number of shippers.	bremenports	Logistics operations	Intermodality	Regional	IWT usage depends on a limited number of shippers	No. of Shippers
Lack of national policy	CRT	Politics	Training/Awareness	National	IWT lacks a national policy and a lobby to support it.	Policy and Lobby
Limited profile of waterway freight lobby	CRT	Politics	Training/Awareness	National	IWT lacks a national policy and a lobby to support it.	Policy and Lobby
The lobby of the IWT sector is not as strong as the lobby of other sectors in transport and logistics (e.g. road transport)	PoF/MAH	Politics	Training/Awareness	Regional	IWT lacks a national policy and a lobby to support it.	Policy and Lobby
Low visibility of the sector in the general public in relation to its economic importance	PoF/MAH	Politics	Training/Awareness	Regional	IWT lacks a national policy and a lobby to support it.	Policy and Lobby
Low organisation capacity amongst local, regional IWT stakeholders.	PoF/MAH	Politics	Training/Awareness	Regional	IWT lacks a national policy and a lobby to support it.	Policy and Lobby
Regulations for other modes	SSPA	Regulation	Politics	National	IWT suffers from administrative and regulatory hurdles.	Admin. Hurdles
Administration	SSPA	Regulation	Politics	National	IWT suffers from administrative and regulatory hurdles.	Admin. Hurdles
Private sector interest is limited.	CRT	Training/Awareness	Intermodality	Regional	IWT suffers from shippers' lack of understanding and lack of interest.	Shippers' interest
General lack of understanding in the freight logistics world of inland waterway freight	CRT	Training/Awareness	Intermodality	Regional	IWT suffers from shippers' lack of understanding and lack of interest.	Shippers' interest
Vision of IWT, both infrastructure and sector, is not entirely shared; from the user's perspective the sense of urgency to address the theme is not the same as from the managing authority.	PoF/MAH	Training/Awareness	Intermodality	Regional	IWT suffers from shippers' lack of understanding and lack of interest.	Shippers' interest
Low awareness of the potential of IWT within the freight forwarding/logistics community at the decision-making level (e.g. freight flow planners do not instinctively take the possibility of water transport into account)	PoF/MAH	Training/Awareness	Intermodality	Regional	IWT suffers from shippers' lack of understanding and lack of interest.	Shippers' interest
Limited qualified helmsman to navigate the freight barges / skills shortage / pipeline of young resources coming through	CRT	Training/Awareness	Logistics operations	Regional	Organisational hurdles limit development of IWT	Org. Hurdles
Resistance to change	SSPA	Training/Awareness	Logistics operations	Regional	Organisational hurdles limit development of IWT	Org. Hurdles

Appendix C: List of opportunities, their categorisation and headlines/statements

Opportunity	Identified by	Category (↓)	Sub-category	Scope	Headline/Statemen	Headline/Statement Short
Improvement of level of digitisation in IWT processes (port approach,	bremenports	Digitisation	Infrastructure	National	Digitisation can be supportive for freight flow decision making and traffic management, including automation	Digitisation
Digitalization can be supportive for freight flow decisionmakers to choose their means of transport more objectively, therefore choosing IWT more frequently	PoF/MAH	Digitisation	Infrastructure	National	Digitisation can be supportive for freight flow decision making and traffic management, including automation	Digitisation
Alliance of the sector and managing authority to become a frontrunner in the field of automation in IWT (remote controlling infrastructure, and sailing itself)	PoF/MAH	Digitisation	Infrastructure	National	Digitisation can be supportive for freight flow decision making and traffic management, including automation	Digitisation
Hydrogen-based fuels to make IWT a more acceptable mode of transport	bremenports	Environment	Politics	National	The current momentum in environmental politics could be used to emphasize IWT’s credentials and its potential for emission-free vessels	Pol. Momentum
There is currently a momentum for IWT as a green mode of transport fueled by the EU Green Deal and other EU and national subsidy and stimulus programs	PoF/MAH	Environment	Politics	National	The current momentum in environmental politics could be used to emphasize IWT’s credentials and its potential for emission-free vessels	Pol. Momentum
Public attention to public safety and air quality	SSPA	Environment	Politics	National	The current momentum in environmental politics could be used to emphasize IWT’s credentials and its potential for emission-free vessels	Pol. Momentum
Fossile-free transport. Use emission-free vessel. Use electricity	SSPA	Environment	Politics	National	The current momentum in environmental politics could be used to emphasize IWT’s credentials and its potential for emission-free vessels	Pol. Momentum
Bremen with 40 km of city area bordering the river optimal for urban-IWT logistics with small vessels.	bremenports	Geography	Spatial planning	National	Supportive spatial planning can help tap modal shift potential and improve infrastructure	Spatial Planning
Continuous review of inter-/trimodal facilities along the major inland waterways in the region led to the recent commissioning of the RegioPort at Minden and the projection of an additional terminal at Nienburg. The latter would close the gap between Bremen and Hannover.	bremenports	Geography	Spatial planning	National	Supportive spatial planning can help tap modal shift potential and improve infrastructure	Spatial Planning
Demand analysis of certain cargos for Leeds is known – e.g. we know the city of Leeds is growing rapidly and there is a need for building materials to support construction industry.	CRT	Geography	Spatial planning	National	Supportive spatial planning can help tap modal shift potential and improve infrastructure	Spatial Planning
Local planning authorities could do more to encourage & incentivise waterside development	CRT	Geography	Spatial planning	National	Supportive spatial planning can help tap modal shift potential and improve infrastructure	Spatial Planning
Smaller terminals along waterway could be used to load/unload	SSPA	Geography	Spatial planning	National	Supportive spatial planning can help tap modal shift potential and improve infrastructure	Spatial Planning
Opportunity to reduce road traffic, e.g. through cities	SSPA	Geography	Spatial planning	Regional	Supportive spatial planning can help tap modal shift potential and improve infrastructure	Spatial Planning
Waterway upgrades in the region are relatively easy to realize due to the geography of the region - Realizing a better connectivity towards the TEN-T core network is therefore much easier than in other parts of Europe	PoF/MAH	Infrastructure	Geography	Regional	Waterway upgrades in the region are relatively easy to realize due to the geography of the region - Realizing a better connectivity towards the TEN-T core network is therefore much easier than in other parts of Europe	Waterway Upgrades
Waterways are suitable for movement of ‘abnormal loads’, reducing need for road closure and disruption.	CRT	Infrastructure	Logistics operations	National	IWT is ideal for large loads/project cargoes provided infrastructure is improved	Project Cargoes
Improve utilization of waterway infrastructure (incl. locks)	SSPA	Infrastructure	Logistics operations	National	IWT is ideal for large loads/project cargoes provided infrastructure is improved	Project Cargoes
Use of existing base loads to limit marginal costs for additional cargoes	bremenports	Logistics operations	Commercial	National	A vast number of logistics solutions can be explored to facilitate IWT-usage	Logistics Solutions
Ongoing project (see “Contribution towards ideal situation”) increase efficiency of IWT and raising competitiveness of sector	bremenports	Logistics operations	Commercial	National	A vast number of logistics solutions can be explored to facilitate IWT-usage	Logistics Solutions
Shift away from land gained aggregates to marine gained aggregates is well suited to water transport.	CRT	Logistics operations	Commercial	National	A vast number of logistics solutions can be explored to facilitate IWT-usage	Logistics Solutions
Freight flows are becoming more unpredictable than they used to be, offering opportunities for IWT in the spot market	PoF/MAH	Logistics operations	Commercial	National	A vast number of logistics solutions can be explored to facilitate IWT-usage	Logistics Solutions
Open book discussions between transport operators and ports	SSPA	Logistics operations	Commercial	National	A vast number of logistics solutions can be explored to facilitate IWT-usage	Logistics Solutions
Possibility to have crane on-board or in port	SSPA	Logistics operations	Commercial	National	A vast number of logistics solutions can be explored to facilitate IWT-usage	Logistics Solutions
Use existing vessels from BeNeLux to show how it works in Swedish setting	SSPA	Logistics operations	Commercial	National	A vast number of logistics solutions can be explored to facilitate IWT-usage	Logistics Solutions
Calculate what it would cost to not use IWT (environmental benefits)	SSPA	Logistics operations	Commercial	National	A vast number of logistics solutions can be explored to facilitate IWT-usage	Logistics Solutions
Establish depot for containers near inland ports	SSPA	Logistics operations	Commercial	National	A vast number of logistics solutions can be explored to facilitate IWT-usage	Logistics Solutions

Opportunity	Identified by	Category (↓)	Sub-category	Scope	Headline/Statemen	Headline/Statement Short
Ability to offer last/first mile solutions from/to port. E.g. terminal operator includes first/last mile in offer.	SSPA	Logistics operations	Commercial	National	A vast number of logistics solutions can be explored to facilitate IWT-usage	Logistics Solutions
Shift without the customer knowing (forwarder)	SSPA	Logistics operations	Commercial	National	A vast number of logistics solutions can be explored to facilitate IWT-usage	Logistics Solutions
Opportunities for ports to get additional cargo (increase throughput)	SSPA	Logistics operations	Commercial	Regional	A vast number of logistics solutions can be explored to facilitate IWT-usage	Logistics Solutions
The Aire & Calder Navigation is vastly underused from a commercial perspective recent freight flow mapping exercise demonstrates the volumes of goods arriving at the Humber Ports that can be forwarded into Leeds using the A&C	CRT	Logistics operations	Geography	National	IWT-usage can be supported by freight flow mapping and development of appropriate port locations	Location Mapping
Identify key ports for IWT	SSPA	Logistics operations	Geography	National	IWT-usage can be supported by freight flow mapping and development of appropriate port locations	Location Mapping
Identify suitable goods flows: certain segments, e.g. construction material	SSPA	Logistics operations	Geography	National	IWT-usage can be supported by freight flow mapping and development of appropriate port locations	Location Mapping
With investment there is potential for container barge traffic (32 TEU) and adoption of EuroClassII vessels	CRT	Logistics operations	Infrastructure	National	Public investment into infrastructure extension and upgrading	Infrastructure Investment
Domestic railways are at capacity. Waterways can offer an alternative.	CRT	Logistics operations	Infrastructure	National	Public investment into infrastructure extension and upgrading	Infrastructure Investment
Containerisation	SSPA	Logistics operations	Intermodality	National	Address standardised and efficient handling solutions to reduce costs of transshipment	Handling Solutions
Use of standardised containers – possible to load/offload faster	SSPA	Logistics operations	Intermodality	National	Address standardised and efficient handling solutions to reduce costs of transshipment	Handling Solutions
Innovative handling equipment and processes (trans-shipment)	SSPA	Logistics operations	Intermodality	National	Address standardised and efficient handling solutions to reduce costs of transshipment	Handling Solutions
The Green Deal is also an opportunity for Frisian companies to deliver innovative and economically viable solutions for the energy transition of the IWT sector as a whole	PoF/MAH	Logistics operations	Politics	Regional	Regional, economic and environmental policy initiatives on EU-, national and regional level offer scope for IWT-support	Policy Initiatives
Opportunity for municipality to increase employment, attract companies and inhabitants.	SSPA	Logistics operations	Politics	Regional	Regional, economic and environmental policy initiatives on EU-, national and regional level offer scope for IWT-support	Policy Initiatives
Opportunity for inland port to be logistics hotspot	SSPA	Logistics operations	Politics	Regional	Regional, economic and environmental policy initiatives on EU-, national and regional level offer scope for IWT-support	Policy Initiatives
Relaxation of legal areas of operations & bridge clearances would close gaps in IWT network (Bremerhaven-Wilhelmshaven, Dollart: Emden-Delfzijl)	bremenports	Logistics operations	Regulation	National	Allow for more flexibility of IWT- vs. IMO-vessel usage in coastal/lake areas	Vessel Flexibility
IMO-classed vessel to allow flexibility of where it can be used	SSPA	Logistics operations	Regulation	National	Allow for more flexibility of IWT- vs. IMO-vessel usage in coastal/lake areas	Vessel Flexibility
Change fee structure for IWW vessels	SSPA	Politics	Commercial	National	Changes in fee structures and administrative processes could greatly facilitate IWT	Fees and Admin.
Financial support possibilities (e.g. eco-bonus or start-up)	SSPA	Politics	Commercial	National	Changes in fee structures and administrative processes could greatly facilitate IWT	Fees and Admin.
Pricing adapted to be comparative to rail and road (in ports)	SSPA	Politics	Commercial	National	Changes in fee structures and administrative processes could greatly facilitate IWT	Fees and Admin.
Exemption from other fees/administrative burden	SSPA	Politics	Commercial	Regional	Changes in fee structures and administrative processes could greatly facilitate IWT	Fees and Admin.
To help local authorities achieve air improvement targets	CRT	Politics	Regulation	National	Politics can add to the competitiveness of IWT by reviewing transport-specific statutory fees and regulations	Politics, Fees and Admin.
Possibility that road will get increased fees	SSPA	Politics	Regulation	National	Politics can add to the competitiveness of IWT by reviewing transport-specific statutory fees and regulations	Politics, Fees and Admin.
Exemption from piloting or reductions in piloting fee	SSPA	Politics	Regulation	Regional	Politics can add to the competitiveness of IWT by reviewing transport-specific statutory fees and regulations	Politics, Fees and Admin.
Owners of ports set goals for IWT development	SSPA	Politics	Regulation	Regional	Politics can add to the competitiveness of IWT by reviewing transport-specific statutory fees and regulations	Politics, Fees and Admin.
Targets on national and municipality level, e.g. x% of transports should be on water. For example, when Swedish Transport Administration makes investments connected to the ports or infrastructure, can set demands that the port has to have X % by inland waterways. For planning permission regarding plots that have water connection, include investigation of possibility to use water, X% of transport by water.	SSPA	Politics	Regulation	National	Politics can add to the competitiveness of IWT by reviewing transport-specific statutory fees and regulations	Politics, Fees and Admin.
Reduce road permits for odd-sized loads	SSPA	Politics	Regulation	National	Politics can add to the competitiveness of IWT by reviewing transport-specific statutory fees and regulations	Politics, Fees and Admin.
Potential to develop innovative vessels	SSPA	Training/Awareness	Commercial	National	IWT-vessel technology has plenty of untapped innovative potential	Vessel Technology

Opportunity	Identified by	Category (↓)	Sub-category	Scope	Headline/Statemen	Headline/Statement Short
Shortage in truck and rail capacity. Shortage of truck drivers.	SSPA	Training/Awareness	Logistics operations	National	IWT can be a source of jobs given better employment conditions than in other sectors and modern education methods (simulators)	Job Motor
Use simulator for training crew	SSPA	Training/Awareness	Logistics operations	National	IWT can be a source of jobs given better employment conditions than in other sectors and modern education methods (simulators)	Job Motor
Employment opportunities, create new jobs (e.g. onboard)	SSPA	Training/Awareness	Logistics operations	Regional	IWT can be a source of jobs given better employment conditions than in other sectors and modern education methods (simulators)	Job Motor
Jobs, skills and training growth to support the sector.	CRT	Training/Awareness	Politics	National	Co-operation and training efforts can improve the innovative capability of the sector, and with it its competitiveness.	Cooperation and Training
Use the opportunity of the strong IWT related SME's to build alliances for innovation in the sector (green shipping, ship building, etc.).	PoF/MAH	Training/Awareness	Politics	National	Co-operation and training efforts can improve the innovative capability of the sector, and with it its competitiveness.	Cooperation and Training
Educate students regarding IWT	SSPA	Training/Awareness	Politics	National	Co-operation and training efforts can improve the innovative capability of the sector, and with it its competitiveness.	Cooperation and Training
Inland promotion centre	SSPA	Training/Awareness	Politics	National	Co-operation and training efforts can improve the innovative capability of the sector, and with it its competitiveness.	Cooperation and Training
Collaboration between actors in region to e.g. support investments	SSPA	Training/Awareness	Politics	Regional	Co-operation and training efforts can improve the innovative capability of the sector, and with it its competitiveness.	Cooperation and Training

Appendix D: List of threats, their categorisation and headlines/statements

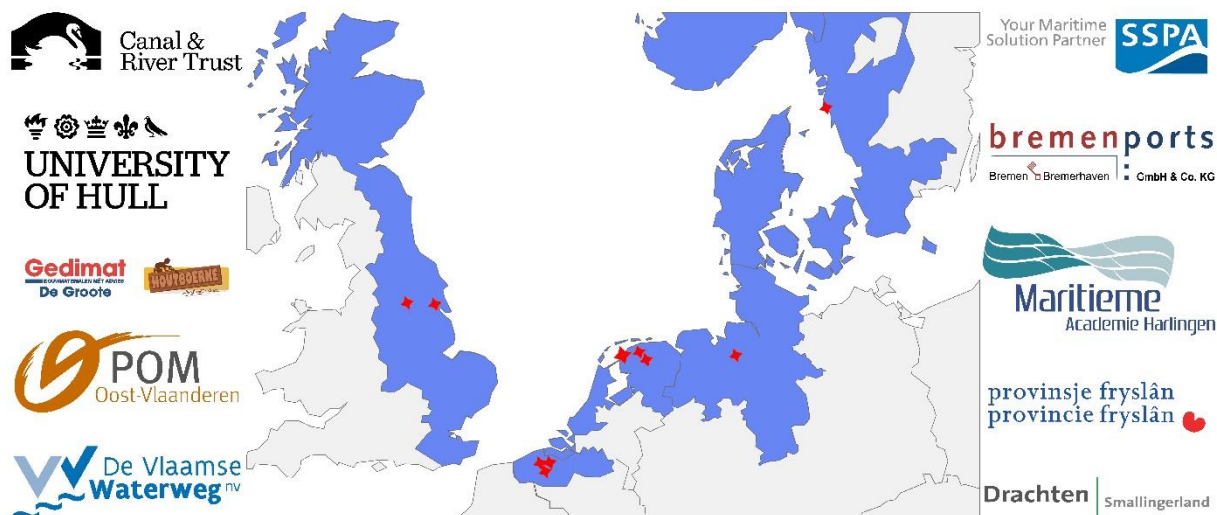
Threat	Identified by	Category (↓)	Sub-category	Scope	Headline/Statement	Headline/Statement Short
Freight flows are becoming more unpredictable than they used to be, threatening the longstanding business model of current SME's in the charter market	PoF/MAH	Commercial	Logistics operations	Europe-wide	There are logistics-related cost drivers that limit usage of IWT, such as unpredictability, lack of volume, flexibility of competitors etc.	Cost Drivers
Insurance related to ice	SSPA	Commercial	Logistics operations	National	There are logistics-related cost drivers that limit usage of IWT, such as unpredictability, lack of volume, flexibility of competitors etc.	Cost Drivers
Large number of road haulage contractors provide flexibility and alternative options that water freight cannot.	CRT	Commercial	Logistics operations	Regional	There are logistics-related cost drivers that limit usage of IWT, such as unpredictability, lack of volume, flexibility of competitors etc.	Cost Drivers
Not attract enough volume: Goods that can carry extra cost of handling	SSPA	Commercial	Logistics operations	Regional	There are logistics-related cost drivers that limit usage of IWT, such as unpredictability, lack of volume, flexibility of competitors etc.	Cost Drivers
Structure of ownership creates a situation where the majority of companies is small (1 ship = 1 company), limiting the financial possibilities to respond to technological progress (alternative fuels, battery cells, automatic propulsion, etc.)	PoF/MAH	Commercial	Politics	National	Financial options limited for IWT innovations, e.g. due to organizational factors	Financial Options
Financial risk associated with start-up	SSPA	Commercial	Politics	National	Financial options limited for IWT innovations, e.g. due to organizational factors	Financial Options
Cabotage	SSPA	Commercial	Regulation	National	Adverse regulation limits IWT competitiveness.	Regulation
No improvement in competitive situation versus other modes. E.g. subsidies to rail	SSPA	Commercial	Regulation	Regional	Adverse regulation limits IWT competitiveness.	Regulation
Aging IWT fleet making it less cost-effective to innovate in greener and more digitalized ships	PoF/MAH	Digitisation	Commercial	National	Fleet structure and age as well as quicker uptake of digital tools by competing modes limit digitalisation of IWT.	Fleet and Digitisation
Automatisation achieves more reliable results in other transport modes in shorter time further limiting the competitiveness of IWT	bremenports	Digitisation	Commercial	Regional	Fleet structure and age as well as quicker uptake of digital tools by competing modes limit digitalisation of IWT.	Fleet and Digitisation
Climate change resulting in more fluctuation in water heights and thus less reliability for the sector as a whole in times of drought	PoF/MAH	Environment	Intermodality	National	Environmental changes both work for and against IWT, such as more fluctuating water levels vs. an increased public concern about climate change.	Environmental Changes
Environmental concerns that other transport modes will improve faster and be better	SSPA	Environment	Intermodality	National	Environmental changes both work for and against IWT, such as more fluctuating water levels vs. an increased public concern about climate change.	Environmental Changes
Other competitive transport modes are constantly developing environmentally beneficial transport modes i.e. improved fuel types	CRT	Environment	Intermodality	Regional	Environmental changes both work for and against IWT, such as more fluctuating water levels vs. an increased public concern about climate change.	Environmental Changes
Geographical competition amongst terminals due to overlap of hinterlands, or periphery, limits co-operation	bremenports	Geography	Infrastructure	Regional	Too good a regional coverage of IWT-ports limits scope for co-operation amongst them.	Overcoverage
High maintenance budgets to modernise and maintain the waterway to improve resilience and make fit for purpose (thinking here of infrastructure resilience plus mechanical & electrical improvement)	CRT	Infrastructure	Politics	Regional	Unmet budgets and lack of (public) funding limit infrastructrue maintenance/upgrades	Budgets
Dredging costs for maintenance work and capital projects can be high especially where contamination levels are high	CRT	Infrastructure	Politics	Regional	Unmet budgets and lack of (public) funding limit infrastructrue maintenance/upgrades	Budgets
Lack of financial resources from the Trust	CRT	Infrastructure	Politics	Regional	Unmet budgets and lack of (public) funding limit infrastructrue maintenance/upgrades	Budgets
Gap of trimodal handling capability along middle stretch of Weser River would further increase accessibility of IWT	bremenports	Infrastructure	Spatial planning	Regional	Lack of (public) funding limit upgrades of intrastructure bottlenecks	Funding
Locks not sustainably constructed for future (e.g. suitable vessel sizes)	SSPA	Infrastructure	Spatial planning	Regional	Lack of (public) funding limit upgrades of intrastructure bottlenecks	Funding
Rail as major competitor to IWT very strong in the ports.	bremenports	Intermodality	Commercial	Regional	High market share of other environmental friendly modes limit scope for IWT	Competition
Regulation and legislation can slow down or complicate innovation in the sector	PoF/MAH	Regulation	Commercial	National	Uncertainty about regulations limits/slows down private incentives to invest	Uncertain Regulation
Uncertainty regarding regulations	SSPA	Regulation	Commercial	National	Uncertainty about regulations limits/slows down private incentives to invest	Uncertain Regulation
Conflicting interests between local and regional interests (Municipalities vs. Region)	PoF/MAH	Spatial planning	Politics	National	Conflicts of interest between IWT, cities, industry, agribusiness and leasure to be addressed by spatial planning	Conflicts of Interest
Heavily IWT-reliant port areas are encircled by urban conurbations triggering conflicts of interest/usage.	bremenports	Spatial planning	Politics	Regional	Conflicts of interest between IWT, cities, industry, agribusiness and leasure to be addressed by spatial planning	Conflicts of Interest
Conflict of interest with leisure boaters, particularly the rowing clubs on the waterway.	CRT	Spatial planning	Politics	Regional	Conflicts of interest between IWT, cities, industry, agribusiness and leasure to be addressed by spatial planning	Conflicts of Interest

Threat	Identified by	Category (↓)	Sub-category	Scope	Headline/Statement	Headline/Statement Short
Aquatics is an important theme in the Frisian leisure industry, there is a conflict of interests with IWT where the two share inland waterways	PoF/MAH	Spatial planning	Politics	Regional	Conflicts of interest between IWT, cities, industry, agribusiness and leasure to be addressed by spatial planning	Conflicts of Interest
Potential locations of inland ports may vanish	SSPA	Spatial planning	Politics	Regional	Conflicts of interest between IWT, cities, industry, agribusiness and leasure to be addressed by spatial planning	Conflicts of Interest
Personnel requirements	SSPA	Training/Awareness	Commercial	National	Availability of personnel limits development of IWT	Personell
Shortage of labor due to outflow of professionals and aging labor force in general	PoF/MAH	Training/Awareness	Commercial	Regional	Availability of personnel limits development of IWT	Personell
Lack of coherence in the maritime sector (IWT, yacht building, logistics, etc.) leaving individual gems (SME's, leading in their niche) with a sub-par network.	PoF/MAH	Training/Awareness	Politics	National	Overcoming any resistance for mind-shift for modal shift	Mind-Shift Resistance
Lobby for road transport is stronger than IWT-lobby	PoF/MAH	Training/Awareness	Politics	National	Overcoming any resistance for mind-shift for modal shift	Mind-Shift Resistance
Low awareness of IWT as a possibility, e.g. lack of promotion initiatives	SSPA	Training/Awareness	Politics	National	Overcoming any resistance for mind-shift for modal shift	Mind-Shift Resistance
Not attract enough volume: Customers reluctance to change	SSPA	Training/Awareness	Politics	Regional	Overcoming any resistance for mind-shift for modal shift	Mind-Shift Resistance

About #IWTS 2.0

This case study has been prepared as part of the EU-funded project #IWTS 2.0. IWTS stands for Inland Waterway Transportation System. This project includes ten partners in the North Sea Region with one goal: mobilising inland waterway solutions. Solutions include infrastructure upgrades of waterways, new vessel concepts and innovative business models. bremenports GmbH & Co. KG, the infrastructure manager of the Ports of Bremen and Bremerhaven, is the German partner in #IWTS 2.0.

For more information see here: <https://northsearegion.eu/iwts20>



bremenports GmbH & Co. KG at a glance



bremenports GmbH & Co. KG are the public infrastructure managers of the Ports of Bremen and Bremerhaven.

With 400 staff, we ensure port availability on 365 days a year, 24/7. Further, we develop the ports to meet future needs, balancing ecological, economic and social requirements.

Our role in #IWTS 2.0 is to bring inland shipping onto the mental radarscreens of students and logistics decision makers.

<https://www.bremenports.de>





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