#IWTS 2.0: “Mobilizing small waterway transport potentials”

Of Containers and Feedstuff - Inland Shipping in Northern Germany: Two Case Studies

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This document is published within the #IWTS 2.0 project, click here, an INTERREG Vb project of the North Sea Region as one of the material for WP 5.

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Version: 1.0 of 28.04.2020
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"Talking about Inland Waterway Transportation I tend to think about the River Rhine only", muses Sabrina, a student in her last year of a Bachelor-course in transportation and logistics. "Sure, the River Rhine is one of the longest rivers in Europe and it takes approximately 80% of the transport volume on inland waterways in this region", was the quick answer of Frank, her fellow student. “Although this river just makes up 10% of the navigable waterways”, he added.

This fictive conversation is a good starting point to investigate what Inland Waterway Transportation (IWT) can offer in other regions of Europe. Let’s take to North-Western Germany. The following two cases will illustrate how IWT can make a difference in transport chains. And this both for traditional bulk goods as well as for containers, and both over long as well as short distances.

The River Rhine with its large seaports at its mouth acts like natural cargo consolidators, the river virtually channels the cargoes to and from those ports. In North-Western Germany the geography is a bit different: various canals and rivers criss-cross the region. Several ports of different sizes offer maritime logistics services for the region. The River Weser links those ports to upstream regions of Germany.

Let’s accompany Sabrina and Frank venturing out to discover the region’s potential for IWT. Each case starts with a description of the underlying supply chain, and it includes a fact-sheet covering major highlights of each case. Review questions guide you to wrap up the texts.
“Look, what I found here!”, Frank was very excited about his research on IWT-usage in North-Western Germany. “It is only grain in bulk”, countered Sabrina. “Sure, it is a no-frills commodity for inland shipping, but it ensures that we have enough to eat at the end of the day”, countered Frank. “Moreover, it showcases how IWT can be competitive over short distances. Let me explain!”

The supply chain

Frank and Sabrina take you to the Port of Oldenburg (53°09' N 8°14' E) along the River Hunte, a tributary to the River Weser, the largest river in the region. There, the AGRAVIS Raiffeisen AG operates a plant to produce compounded feedstuffs for regional livestock farming. This plant receives part of its raw material by barge via the seaport of Brake (53°20' N 8°29' E), some 40 km downstream.

Across the AGRAVIS Group all own plants produce about 3 million t of feedstuff per year. The company’s modal split is 63 % in favour of inland shipping, the remaining 37 % are accounted for by trucks. Of all raw material, 70 % is sourced nation-wide, 12 % within the European Union (EU) and 18 % non-EU.

The AGRAVIS plant has a daily capacity of approximately 1,700 tonnes (t), so there is plenty of transport demand, both inbound and outbound. Inbound, overseas imports of raw material are delivered to the Port of Brake first. The local terminal operator, J. Müller AG, takes care of discharging large bulk carriers with grain or other ingredients of feedstuff. Large silos with a total capacity of 650,000 t provide ample storage capacity, until barges of around 1,000 t payload capacity and 85 meter (m) in length transport the cargoes upriver, for example to Oldenburg.

The role of inland shipping

Loading of a barge takes about 2 hours, the trip upstream depending on the tide another 2 to 3 hours. At the AGRAVIS plant at Oldenburg two berths with a discharge capacity of 100 t/hour each ensure a continuous supply to the inbound storage of the plant. The load of each vessel is thoroughly quality-checked before discharging is allowed to commence.

Figure 1: AGRAVIS plant at Oldenburg. Source: AGRAVIS
Although distance between the Port of Brake and the AGRAVIS plant is 32 km over land only, AGRAVIS counts on inland shipping, despite an only slightly longer route (34 km) and longer transit times.

Another alternative – apart from trucking – would be by rail as source and destination are linked up to the national railway network, although this would involve a change in travel direction en route.

After loading in Brake, the route takes the barges 9 km upstream of the River Weser to the mouth of the River Hunte. For the remaining part of the trip, the vessels to Oldenburg follow this river. They might make use of the tidal current as its impact reaches as far inland as Oldenburg. Here, shipping traffic can continue via “Küstenkanal” further westwards. This artificial waterway provides for a link to the Rhine-Ruhr area of Germany.

The lower reaches of the River Weser is classified as a waterway class VI (in accordance with the European classification scheme), the River Hunte as class Va, allowing for ships of up to 110 m in length to navigate the waterway. Up to Oldenburg, the vessels have to pass a tidal barrier with a beam of 25.8 m, two movable bridges and a motorway bridge with a clearing of 26.9 m.

Review questions

“Ok, simple, but impressive story“, although Sabrina seems still not yet convinced. Could you help her figuring out the key advantages of using inland shipping for this supply chain?

1. For this, first figure out the locations of the ports of Brake and Oldenburg on a map and follow the route of the vessel.
2. From the information in the text, drew up with a vessel schedule for a given voyage from Brake to Oldenburg and return. Make appropriate assumptions if required.
3. Comment on the advantages of employing inland vessels for companies, such as AGRAVIS, on this exemplary route.
Hardworking like a Weaver’s Shuttle: Containers by Barge into the Hinterland of the Ports of Bremen and Bremerhaven

In the previous case, Sabrina and Frank have discussed inland shipping over short distances and for bulk commodities. Now they turn to containers. “Have you ever wondered why the ports – if they have access to canal and rivers in the hinterland – see different modal splits when it comes to inland shipping?” asks Sabrina. “You have in mind the ports of Rotterdam, Antwerp, Amsterdam and others, sure?” responds Frank. “Tell me the story!”

All about geography?

Those ports sit at the mouth of the River Rhine, which the Dutch call River Waal. This is one reason why inland shipping enjoys a hinterland modal split of c. 50 % in the port. From the port, inland shipping can venture almost freely into Western Europe along this waterway stretching 1,000 km to the South right into Switzerland. Other ports, which do not benefit from this geographical advantage, but nonetheless have access to Western Europe’s river and canal network, aim to emulate this prominent affinity towards an environmentally friendly transport mode. But what are the challenges?

For this, let’s focus on the Ports of Bremen and Bremerhaven.

133 km and seven locks separate Bremen from Minden, the connecting point towards the inland waterway vessels handled in Bremen and Bremerhaven in 2018 was 8,301 – and thus exceeded 8,000 again for the first time after 2012.

In Bremen, a freight village generates containerised imports of fast moving consumer goods (FMCG) via the terminals in Bremerhaven. Around the port, there are several companies offering container-related services such as stuffing/stripping as well as empty container management provisions.
Eastern and Western stretches of the Mittellandkanal, linking Germany’s Rhine-Ruhr-area with Berlin. Here, at Minden, as in Hannover and Braunschweig, which are also accessible via Mittellandkanal, there is an established inland port with a full range of services as can be expected from a trimodal logistics facility.

On board the MV “Esmee”

Let’s join the ship’s crew of MV “Esmee” on their way from Bremen upriver to Minden: No trace of rust - the 45-year-old “Esmee” is in prime condition and well looked-after. And you should not let the sweet-sounding name chosen by owner and skipper Bert Bos fool you: the 1,200 horse-powered inland vessel has enough power to complete a variety of transport tasks. For this trip, 30 empty 20-foot containers are already on board. They were loaded in Bremerhaven the previous day, normally a five-hour trip away. Now “Esmee” – measuring almost 85 metres in length – is sitting at the quay in the Kalihafen in Bremen, a harbour basin, and waiting for 24 additional containers to be loaded.

<table>
<thead>
<tr>
<th>Service</th>
<th>Operator</th>
<th>Frequency</th>
<th>Vessel capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bremerhaven – Bremen v.v.</td>
<td>Trimodal GmbH (Norddeutsche Wasserweg Logistik GmbH)</td>
<td>Departure from Bremen: Monday, Wednesday, Friday Bremerhaven: Tuesday, Thursday, Saturday</td>
<td>Barge + lighter, total 384 TEU</td>
</tr>
<tr>
<td>Bremerhaven / Bremen – Minden / Hannover / Braunschweig v.v.</td>
<td>Weser-Mittelland-Container-Service (Norddeutsche Wasserweg Logistik GmbH)</td>
<td>Twice per week</td>
<td>Two vessels with 60 TEU each</td>
</tr>
<tr>
<td>Bremerhaven / Bremen – Minden / Hannover / Braunschweig v.v.</td>
<td>Weser Container Xpress GmbH</td>
<td>Once per week</td>
<td>One vessel with 60 TEU</td>
</tr>
<tr>
<td>Bremerhaven – Fallersleben – Haldensleben – Magdeburg v.v.</td>
<td>Modal 3 GmbH</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1: Container liner services along the lower and middle reaches of the River Weser. Source: Author
The “Esmee” has been operating for a subsidiary of medium-sized container group Rhein-Umschlag of Oldenburg – WCX Weser Container Xpress – since 2017. It is one of three shipping services between Bremerhaven/Bremen and Minden/Hannover and Braunschweig. There is a dedicated service connecting the terminals in Bremerhaven to Bremen (see table) and three lines serving the upstream ports right into the Mittellandkanal.

Container shipping services along the River Weser

Contrary to what is often assumed, on some routes inland vessels are just as quick as lorries, for example between Bremen and Bremerhaven. “We can travel up to 30 kilometres an hour,” explains Bos. “But the average speed is around ten kilometres an hour.” In turn, the permitted working time on inland vessels with a captain on board is up to 14 hours a day. That is generally six – or at least four – hours more than for lorry drivers. In addition, not all container transit is time-critical, and the idle time in terminals is considerably less for transport by inland vessel.

Further, using rail or inland shipping in combination with road for the last mile in hinterland access allows shippers to increase the payload of a shipment by 4 tonnes (increase of maximum payload of a truck from 40 t to 44 t).

An example: The advertised schedule for a service twice a week from Minden to Bremerhaven runs as follows:

- **Friday, 22.00 hrs departure for Bremerhaven**, arrival at Bremerhaven on Tuesdays, 06.00 h, departure again at 09.00 h for southbound trip, arrival at Minden on Wednesdays, 09.00 h;
- **Departure from Minden on Wednesday, 09.00 h northbound**, arrival at...
Bremerhaven on Thursdays, 14.00 h for southbound departure after loading the same day on 17.00 h with a planned arrival at Minden on Fridays, 17.00 h.

The „Esmee“ is a ship of the so-called „Europe-class“, a standardised vessel size-type for European waterways. Her payload is limited to 60 TEU. Although she replaces up to 30 trucks, the competitiveness of inland shipping could greatly be increased if operators were able to deploy larger vessels. Such vessels have a standard length of either 110 m or 135 m. According to the operators, there was sufficient demand to fill those larger vessels.

The locks along the Mittelweser allow such vessels to pass. However, vessel-encountering restrictions still apply along the route. Some stretches of the river are not wide enough to let two vessel pass each other. The larger the vessels the longer those stretches which are limited to 20% of the route in accordance with an agreement between the Federal State of Bremen and the Federal Ministry of Transportation as operator of the waterway.

Nevertheless, another restricting element are insufficient bridge clearances for 110 m-vessels. Structurally, those vessels are 40 cm higher than their smaller, 85 m-cousins. Although both can stow containers in two layers, those additional 40 cm can make a difference when negotiating shallow bridges. Compounding, the trend towards so-called “high-cube” containers makes this problem even worse. Each high-cube box adds another 30 cm in height. Calculating two layers, skippers need an additional meter of bridge clearance. And this on a waterway that is normally blessed with sustainable water levels rather than with low water.

However, the attractiveness of IWT is not all dependant on infrastructure:

- **Rail** has similar characteristics in terms of volume requirements (a train can take approx. 80 TEU) and frequency. Also, there is regularly the need for second handlings, as the “final mile” most probably needs to be mastered by truck.
- **Road** offers very short lead-times when asked making transport available; plus it offers excellent geographical coverage.

**Review questions**

1. Validate the vessel sailing schedule as presented in the text. Add detail when needed. Use a path-time-diagram for this task and make own assumptions if required.
   a) When do the north- and south-bound vessels meet each other?
   b) How much time does the schedule allow for lock passing in total? What happens to the schedule if this time allowances increases?

2. What are the key success factors for containerised port hinterland transport. Start with defining the logistics requirements for such transports.

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Figure 9: Port of Bremen. Source: bremenports
The Mittelweser: locks and distances between locks

<table>
<thead>
<tr>
<th>Lock</th>
<th>Distance to next lock upstream (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bremen- Hemelingen</td>
<td>25,9</td>
</tr>
<tr>
<td>Langwedel</td>
<td>18,5</td>
</tr>
<tr>
<td>Dörverden</td>
<td>24,4</td>
</tr>
<tr>
<td>Drakenburg</td>
<td>24,4</td>
</tr>
<tr>
<td>Landesbergen</td>
<td>13,9</td>
</tr>
<tr>
<td>Schlüsselburg</td>
<td>11,1</td>
</tr>
<tr>
<td>Landesbergen</td>
<td>14,8</td>
</tr>
<tr>
<td>Minden</td>
<td>0,0</td>
</tr>
</tbody>
</table>

**Total distance 133,2**

The locks on the Middle Weser and the coastal canal are scheduled to operate in a two-shift system and are open Monday to Saturday from 6 a.m. to 10 p.m., but only from 8 a.m. to 4 p.m. on Sundays and not at all on public holidays.

Figure 10: Aerial view of the Ports of Bremen. Photo: Bremen

Table 2: The middle stretches of the River Weser - locks and distances between locks. Source: WCX, Wikipedia, GD WSV
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

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