SMART REMOTE NODES DEVELOPMENT REPORT

Activity: WP 4
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Conducted by
GEMBA Seafood Consulting
Business Vordingborg

BASELINE STUDY

An analysis of the relevance of sustainability in the new Fehrmarn Belt Corridor

Activity: WP 4, Pilot 3
Version: Final

Date: 22/02/2023

Conducted by
GEMBA Seafood Consulting
Business Vordingborg

Content

1 SUMMARY

The report analyses users view on sustainable energy and infrastructure that may support the development of the Fehmarn Belt corridor. The findings are discussed against other studies and reports that put focus on the regional development caused by the fixed Fehmarn link.

The Fehmarn Belt tunnel is expected to have a significant impact on the Zealand region. It is projected that the tunnel will change traffic dynamics between Denmark and Germany, leading road, and rail traffic over Zealand to the German side of the link. The Fehmarn connection will not only decrease the transport time from Denmark but has impacts on the entire Scandinavian access to Europe. The improved electrified rail connection, travel time and distance are expected to lead to a reduction in total emissions.

Greater economic activity and a deeper integration between Denmark and Germany are expected outcomes of the link. With approx. one hour decreased transportation time the dynamics will be seen in large parts of Zealand but the closer to the fixed link, the larger are the benefits expected to be. With a travel time of e.g., eight hours as it is from Gothenburg to Hamburg, the fixed link will only have a reduction of 12% travel time, while the journey from Vordingborg to Hamburg will be reduced by 26%.

The Zealand region has a potential to become part a more integrated part of the megaregion consisting of the cities of Hamburg, Copenhagen, Gothenburg, and Oslo, creating a green hub for sustainable infrastructure, transport, and technologies.

Sixteen Danish and three German companies and organisations participated in the study. The main results from the study show:

- Environmental awareness is high on the agenda and most of the companies in the study believe that sustainability is important for future competitiveness.

- Most companies have the opinion that the Danish and German governments have the greatest responsibility for developing a green and sustainable Fehmarn corridor, but collaboration between companies and local municipalities is considered to be important.

- Most surveyed companies use green transportation alternatives and have implemented those within the past few years. It is stated that green energy will become more important for companies in the future, and that they are willing to embrace these opportunities.

- Important barriers that prevent companies from integrating more sustainable business models include that most companies perceive green alternatives to be too expensive. Some companies mention budget restrictions and that electric vehicles do not have a big enough range. Only a few companies indicate they are willing to pay a higher price for fuels from sustainable sources.

- Several improvements are listed for the Fehmarn Corridor. One important improvement includes more/better opportunities to refuel “green fuels”, including increased supply of sustainable alternatives or increasing number of e-charging facilities.

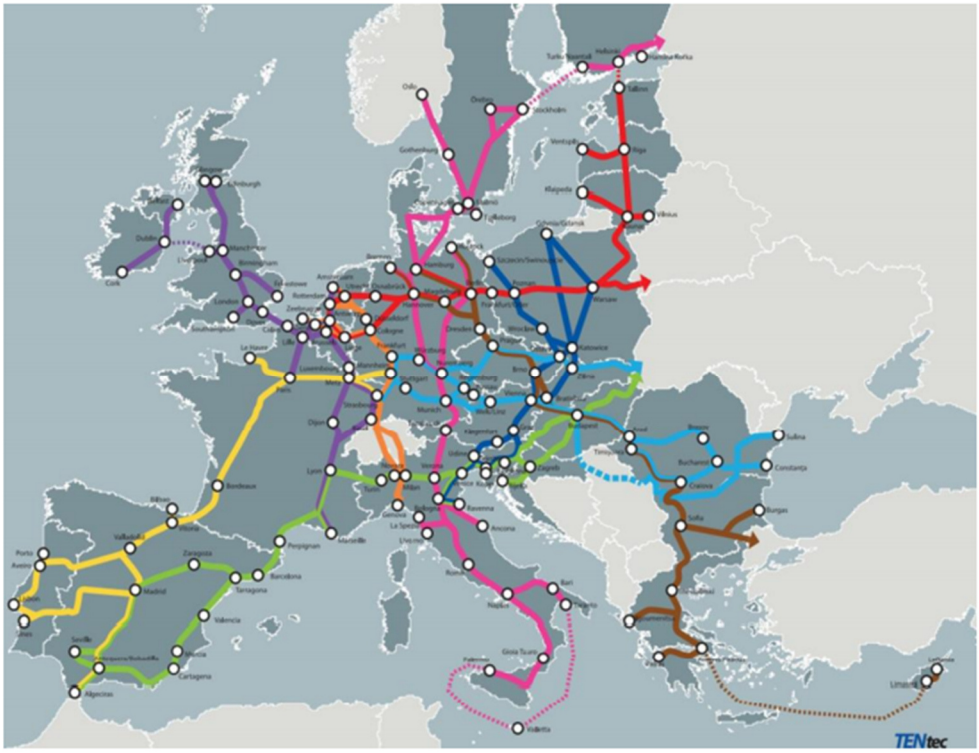
2 INTRODUCTION

As part of the EU Interreg, North Sea Region, North Sea CONNECT project, The Municipality of Vordingborg has been identified as a remote node, which seeks to be integrated deeper into the Trans-European Network-Transport system, see figure 1 below.

The new Fehmarn Belt tunnel, which will be constructed in the following years and is expected to open in 2029, will facilitate an improved connection to the TEN-T system and create advantages in the Fehmarn Belt-corridor.

In this way the new Fehmarn Belt tunnel will be a potential stepstone for a more sustainable and green development of the whole transport corridor from Hamburg to Copenhagen, Gothenburg, and Oslo.

Figure 1: European TEN-T system



Source: Tentacle Guidance Paper “How to use the Fehmarn belt Fixed Link as impulse for regional growth” (2018)

The Municipality of Vordingborg has two ports, a railway track, and a highway, which are used by vehicles, commercial and freight transport and there is currently a new Storstrøms Bridge under construction, which is expected to open for road traffic in 2023 and rail in 2024, see figure 2 below. Renewable energy from wind farms, bio-district heating is produced in the area, with biogas and solar coming.

Due to these sustainable energy initiatives and potentials Vordingborg Erhverv is interested in attracting logistics and export companies to the region, which will benefit from the green energy supply and enjoy the growth potential in the region.

2.1 Objective

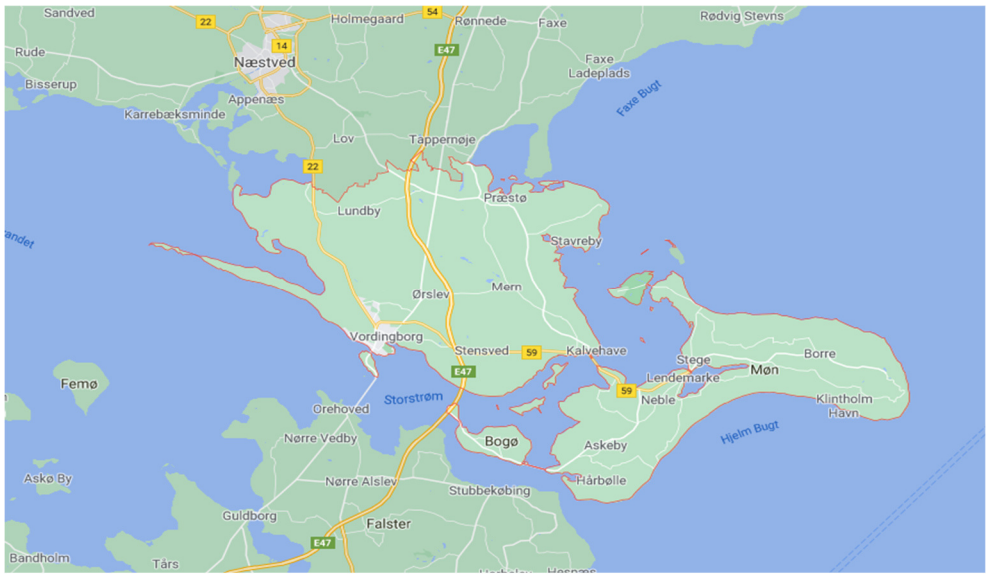
As part of creating a greener transportation network in the new Fehmarn Corridor and a decarbonisation of regional activities, Vordingborg Erhverv seeks to gain more knowledge on the importance and potentials of sustainable and green energies in the logistics and export sectors.

Vordingborg Erhverv is interested in investigating whether the provision of sustainable alternatives to fossil fuels will increase the attractiveness for companies to establish or increase business activity in the region.

Vordingborg Erhverv would also like to acquire a deeper understanding of what improvements are desired by relevant logistics and export companies for the new Fehmarn Corridor. The objective of this work is to create a baseline study of the relevance of introducing sustainable solutions in the new Fehmarn Belt Corridor for companies using the corridor today.

The study will be based on interviews with regional companies, including manufacturing, logistics and export companies. Existing literature with research on transportation dynamics, green energies and regional development will be include in the study.

Figure 2: Map of Vordingborg municipality



Source: Google maps (2021)

2.2 Traffic dynamics / forecast

Research has shown that the construction of the tunnel will lead to changes in the transport and traffic dynamics between Germany and Denmark (Fehmarn Corridor), including in southern Zealand.

Figure 3: The new Fehmarn Belt tunnel - construction data

Construction company: Femern A/S

Opening year: 2029

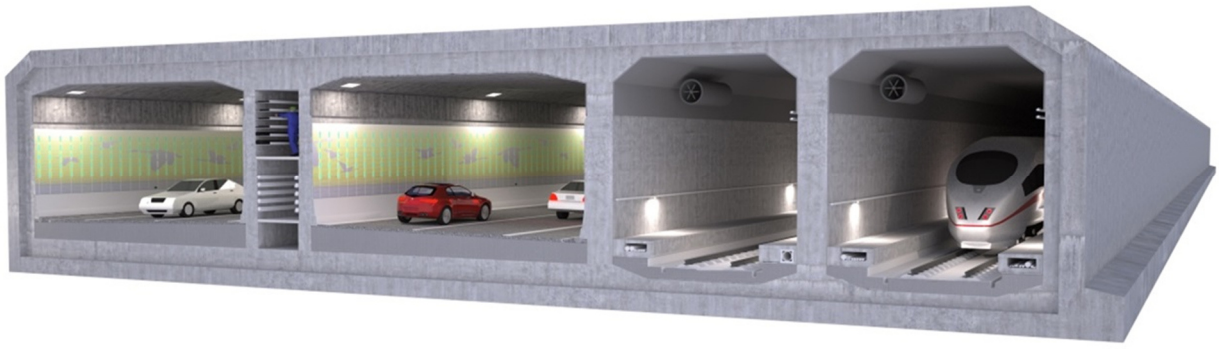
Features: Two-way highway with four lanes & two way electrified high speed train

Length: 18km

Financing: Financed by EU subsidies & fees paid by future users of the tunnel

Travel duration: 10 minutes by car/bus/truck, 7 minutes by train

Energy supply: From renewable energies



Source (and photo credits): Femern A/S, https://femern.com/da/Tunnel/Facts-on-the-tunnel

As such, the new Fehmarn Belt Link is forecasted to increase rail freight traffic between Hamburg and Ringsted as well as road traffic between Hamburg and Copenhagen, which will be diverted from traveling through Jutland and the Great Belt Bridge. This is due to reduced travel time for road and rail resulting from the opening of the tunnel. The 45 minutes of ferry travel time is reduced to 10 minutes road or rail through the tunnel.

However, it is predicted that the changes in traffic will depend on the price requested for the usage of the tunnel. Depending on what the fee for the tunnel will be, there may be variations in the traffic dynamic forecasts (Tentacle 2018 October).

In figure 4, the future expected travel dynamic changes for 2035 are pictured. Green routes suggest an increase in traffic, while routes marked in red indicate a decrease in traffic load.

Figure 4: 2035 predicted travel dynamics.

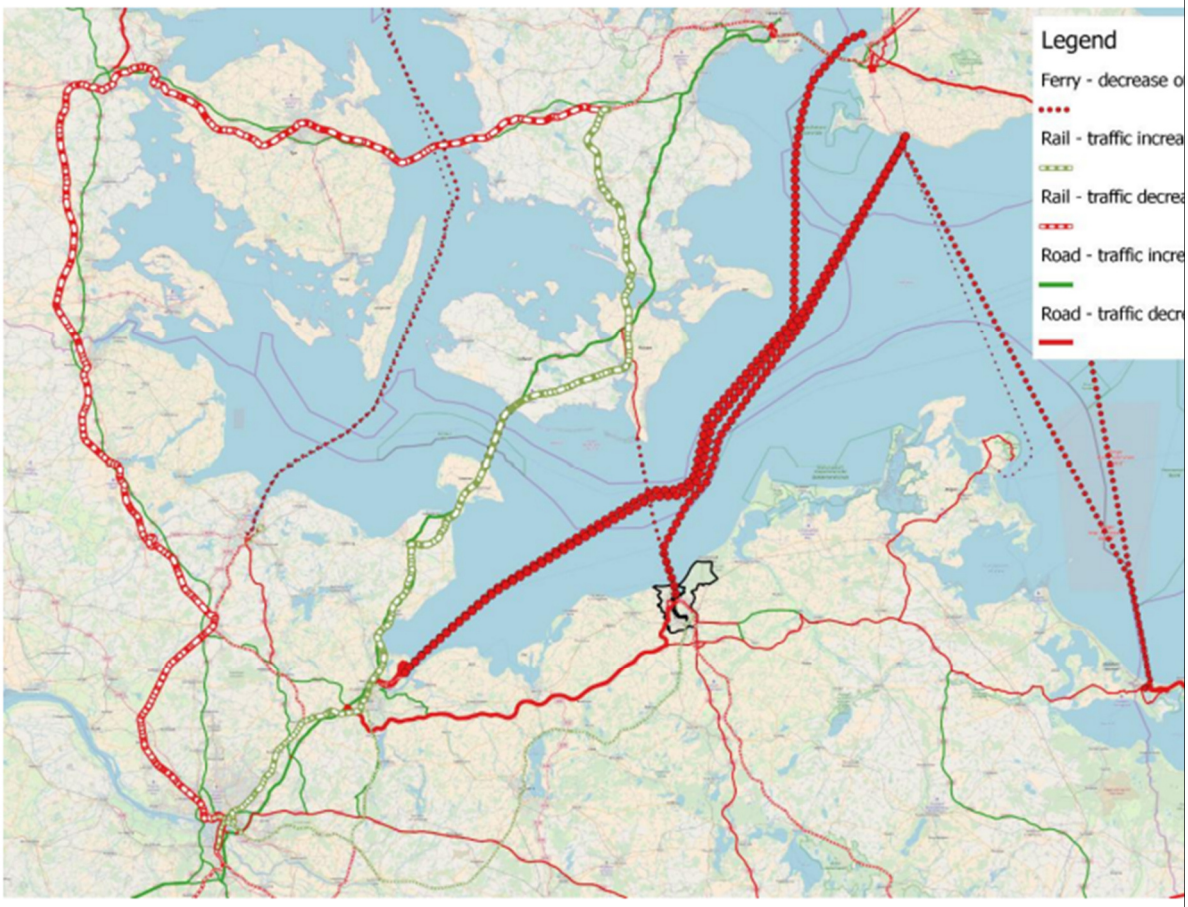


Figure 6 – Changes induced by the FBFL in Rostock (2035 model results)
Source: ISL transport cost model; map: OpenStreetMap contributors

Source: Tentacle (2018 October), p. 18

In figure 4, it can be noted that ferry travel (red dots) will be significantly reduced between Puttgarden and Rødby, Rostock and Gedser and between Lübeck and Malmö & Trelleborg.

Rail traffic is predicted to increase (green-white dots) between Hamburg to Ringsted via southern Zealand and decrease between Hamburg through Jutland and the Great Belt Bridge (red-white dots).

Road traffic is expected to increase between Hamburg and Copenhagen (green line), both via Jutland and the Great Belt Bridge and via southern Zealand.

As stated in the Tentacle report, the reduction of ferry traffic between Puttgarden and Rødby, eliminates the break time for truck drivers and, therefore, will likely lead to more time spent taking breaks either in Germany or in Denmark.

The fixed link will have a positive impact on the total rail freight and improve lead to increased rail goods from Scandinavia to the rest of Europe and in the other direction. Looking at what benefits the future tunnel may bring to companies, the Tentacle report found that transport will be more convenient and flexible, and that there are better/more market opportunities.

Generally, the EU countries are important trade partners of Denmark, with Germany on the top list of Denmark's most important trading partners. Trade to the Netherlands and/or France may also be facilitated through the future Fehmarn Belt tunnel.

2.3 Emissions savings from the new traffic dynamics

Research has shown that the opening of the tunnel will lead to emissions reductions.

This is because of two predictions. Firstly, diverted traffic from Jutland and the Great Belt Bridge to the Fehmarn Belt tunnel will lead some trucks to drive fewer kilometres around 140 km less and thereby save fuel. Secondly, it is expected that more freight will be transferred from trucks to rail, which is expected to operate on some parts of renewable energies.

Furthermore, rail freight that is in transit in Denmark will also save 160 km in transport, when taking the tunnel route instead of the route through Jutland and the Great Belt Bridge. On top of the above mentioned, there are expectations that the supply of biofuels will increase and that there will be an increase of electric vehicles on the road in the future.

Denmark’s climate and emissions reductions targets for 2030 are likely to have an influence on the transport sectors in the coming years. Especially as Denmark has ambitious goals to be climate neutral by 2050. This will need changes towards more environmentally friendly company processes (such as sustainable transport methods, etc.) and behaviour changes from people.

2.4 Regional development

Another report conducted in 2021 (HBS Economics 2021), reveals that the Fehmarn Belt tunnel and the improved electrified railway will lead to increased economic activity in the Zealand region.

Their analysis is conducted for the year 2030. It finds that those commuting between Denmark and Germany will save many hours travelling, but also that many more Germans and Danes will cross the borders to the other country (a total of 5 million). There may also be an increase in people moving to the region. It is expected that more companies will relocate or establish a company in the region and that new businesses will be started.

Concerning traffic dynamics in 2030, the analysis predicts an increase of 58% passengers travelling via this route (a total of 13.6 million passengers travelling between Rødby and Puttgarden). This includes especially people travelling by car and train. Most of this increase is, as already mentioned above, due to the diversion of traffic from routes in Jutland to routes in Zealand.

Commuters and workers going on business trips are expected to save many travel hours, with 20% of those calculated to be saved within the regions on Zealand and 80% of those to be hours saved when traveling between Germany and Denmark. This means that these commuters will especially benefit from

the faster railway connection as well as the possibility to travel through the tunnel to and from Germany. These savings in commuting time add up to have the economic value of 691 m DKK.

It is also expected that there will be benefits occurring for businesses in the region. Through the fixed link between Germany and Denmark a deeper connection between Schleswig Holstein, the Zealand region and Greater Copenhagen is expected. The integration is expected to lead to more economic activity in the area through more knowledge sharing between the regions, an increase in competencies and better/more partnerships between companies. This is predicted to increase productivity and competitiveness, creating an overall value of over 300 m DKK per year in the Zealand region.

The integration of the regions (including knowledge sharing and partnership creation) is likely to lead to the strongest economic benefits for the Vordingborg municipality (of 21 m DKK per year), due its favourable position and proximity to the future electrified railway and the tunnel to Germany. Productivity is predicted to increase most in the business service sector. Value creation is expected to be highest for the service sectors while it is lowest for the construction sector, see table 1.

Table 1: Calculated increase in productivity and value from the electrified railway and future tunnel in 2030 in Vordingborg municipality

	Industry	Construction	Consumer service	Business s
Increase in value creation	+2.7 m DKK	+2.9 m DKK	+7.9 m DKK	+7.3 m DK
Increase in productivity	+0.2 %	+0.4 %	+0.3 %	+1.1 %

Source: HBS Economics 2021, taken from tables on p. 14

Due to quicker transportation/commuting opportunities it also suggested that there may be more labour opportunities, as the shorter commuting/travel times allow workers to commute faster to other regions, between regions and to/from Germany. It is estimated that around 1500 extra workers would be available to work in the Vordingborg municipality, also attracting more “permanent” workers from Germany. In 2019, almost 60% of Vordingborg locals/citizens also worked in the municipality, while around 40% commuted to another. This dynamic may change in the future due to shorter distances by train to other Danish regions.

Sectors that are already strong in the Zealand region are expected potentially to achieve even more growth (for southern Zealand this would especially include the construction and food sectors). Exports may increase as access to the German (and European) market is going to be facilitated (HBS Economics 2021).

A recent report published by String Network and the OECD (2020) suggests that a green hub can be further explored and strengthened in the “String megaregion” (currently consisting of five cities and eight regions, including the region Zealand). Sustainable companies are predicted to benefit from their position in the region and achieve economies of scale, especially so if cities, regions, and companies work together.

The green hub incorporates sustainable city planning, renewable energies, green infrastructure/transport opportunities, as well as technological opportunities.

3 METHODS

To gain knowledge on the opinions and ambitions of companies in municipality of Vordingborg, telephone interviews were conducted with several companies and an online survey was sent out to another group of relevant companies.

To structure these interviews, a survey outline was developed which was read to the interviewees while the interviewer was inserting their responses. It was intended to have more of a conversation with interviewees allowing to elaborate more on the answers to the survey questions. This additional information was then noted by the interviewer.

The online survey consists of both open-ended as well as closed-ended questions. Every question included the possibility of including other answers and additional information, if needed.

Telephone interviews were conducted with 7 companies based in The Municipality of Vordingborg or operating in Denmark. The online survey obtained responses from 9 companies from the Region of Zealand and operating in Denmark.

The survey was structured in the following way:

- Introduction
- Former and current use of the Fehmarn Corridor
- Future opportunities of the development of the Fehmarn corridor
- Environmental awareness in company and in the Fehmarn corridor
- Attractiveness of the Vordingborg region

The survey structure can be seen in the appendix.

4 INTERVIEW RESULTS

This section summarises the results obtained from telephone interviews with 7 companies, as well as 9 companies who took the survey (a total of 16 companies). The interviews and survey responses were gathered in the period of June to July 2021. The companies interviewed include (see listed in table 2) two transport companies, one port, one production company and two technology companies. All respondents are discission makers in the companies. Half the companies are placed in the Municipality of Vordingborg, while the other half is spread across different locations in Denmark.

Table 2: List of companies that participated in an interview

Company	**Sector**
Port of Vordingborg	Port activities
Danske Fragtmænd	Transport
Blue Water Shipping	Transport
Nordic Sugar	Production
Vilofoss / DLG	Animal feed
Ucomposites	Technology
Corning Optical Communications	Technology

The companies that took part in the online survey are listed in table 3:

Table 3: List of companies that participated in survey

Company	**Sector**
Insatech	Technology
IONITY	Energy
Flex Gødning	Production
Liselund Fontænen	Investment and holding company
Cibicom	Technology
DSB	Transport
Zenvo Automotive	Vehicle Manufacturing
Transport Møn	Transport
Lauridsen Group	Production

4.1 Use of Fehmarn Corridor and potential improvements

Eight companies currently use the Fehmarn Corridor, while two companies indirectly use the corridor by hiring other companies to do their logistics. Five companies state that they don't use the Fehmarn Corridor with one other company saying that it does not use the Fehmarn Corridor but is in the region.

The companies that use the Fehmarn Corridor do so mainly for export and import of goods and services, as well as for meetings and sales activities as frequently as every day or every week. The transport modes used the most are trucks (8) and personal cars (4) and vans (2) and the train (1). One respondent mentioned using the Fehmarn corridor for business trips, which could increase in the future once the tunnel is built and it becomes easier to take the train.

Two companies that previously used the Fehmarn Corridor (and don't anymore) did so for export and import activities and sales activities and used trucks for these activities.

Improvements that are suggested that should be made in the corridor are the following (from most often to least often):

1. More/better opportunities to refuel sustainable fuels (9)
2. More safe parks or resting stops (8)
3. More accommodation opportunities (hotels etc.) (3)
4. More restaurants/cafés in the corridor (3)
5. More opportunities to stock products (2)

Improving the supply of sustainable fuel sources will help some companies and increase the usage frequency. Increasing the number of safe parks or resting stops was mentioned to potentially lead to higher optimisation, more comfort, and a faster delivery of products.

Two respondents mentioned that it must be made sure that the current highway can handle future capacities of traffic (should it increase). Another improvement named was that it would be desirable to have a transport hub in the area, where accommodation would be improved/expanded, and more conference centres would be desirable to have.

One respondent mentioned that tunnel between Denmark and Germany would lead to a higher turnover for their company. Looking at more environmentally sustainable transport opportunities and aspects of the Fehmarn Corridor, the following actions were named that could potentially help with the sustainable development:

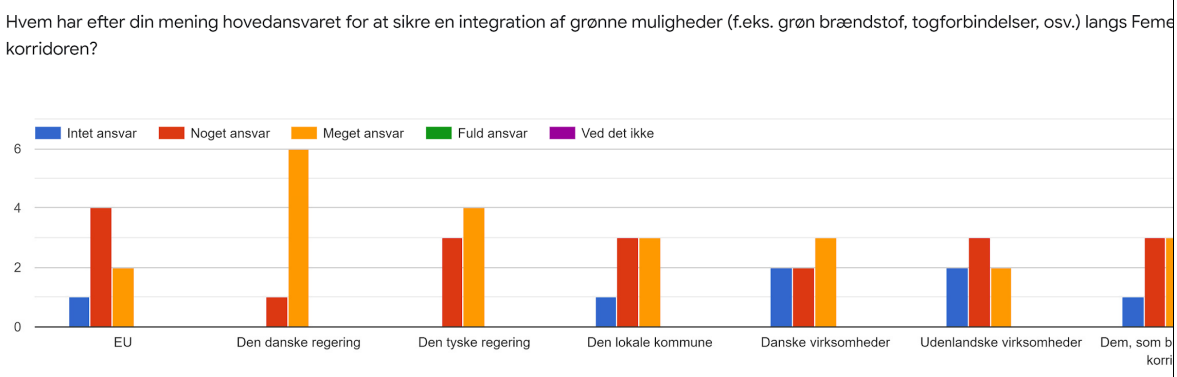
1. Availability of sustainable fuel sources such as electricity, LBG/LNG (liquified biogas/liquified natural gas), hydrogen, biodiesel, etc. (10 reply)
2. More electric car charging facilities (9 reply)
3. Increase speed limit on roads in the Fehmarn corridor (8 reply)
4. More/better public transportation possibilities (bus/train) (3 reply)
5. Changes to the environment in the area along the motorway (e.g., planting trees) (1 reply)

Here the availability of sustainable fuels was regarded as most important, as many transportation trucks use diesel, and the port could benefit from sustainable fuels for its port activities. Another action mentioned was faster trains needed in the corridor (which is already planned to happen in the region in the coming years).

4.2 Responsibility of development in the Fehmarn Corridor

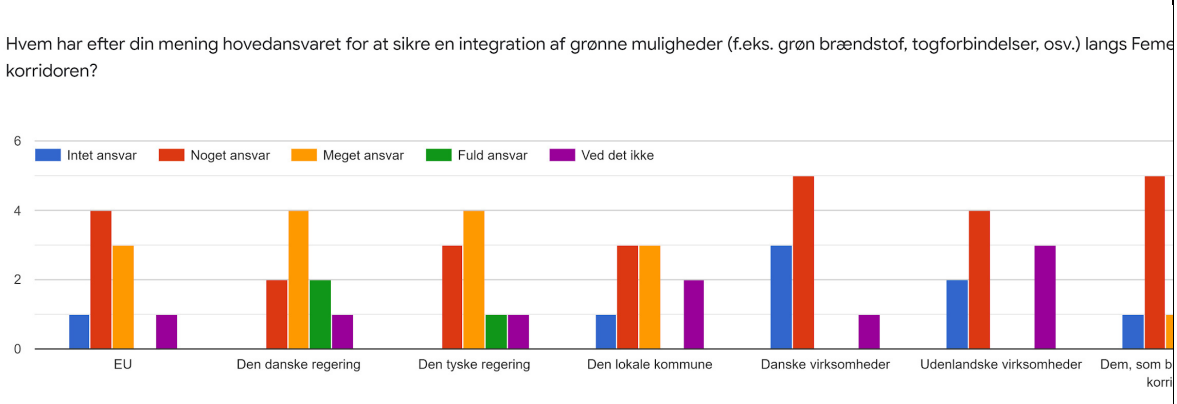
The Danish government was identified as being the most responsible for implementing green and sustainable infrastructures/changes in the corridor, closely followed by the German government. The local municipality and the EU can be placed thereafter. Those who use the Fehmarn Corridor, and (Danish and foreign) companies were allocated with some responsibility (figures 5 and 6).

Figure 5: Interview responses on: Who has the most responsibility for a successful development of green solutions in the Fehmarn Corridor?



(Blue = no responsibility, Red = some responsibility, Yellow = a lot of responsibility, Green = Full responsibility)

Figure 6: Survey responses on: Who has the most responsibility for a successful development of green solutions in the Fehmarn Corridor?



(Blue = no responsibility, Red = some responsibility, Yellow = a lot of responsibility, Green = Full responsibility)

Interviewees stressed that development in the area is based on political decisions therefore the responsibility is on the governments. As such, it is mentioned that the different governments and municipalities must work together with companies in the area perhaps through help of public/private investments. Also, political decisions vary across municipality borders and country borders, therefore they should be aligned to be more effective.

Actions recommended for the governments and municipalities are the following:

1. Increase supply of sustainable fuels (9 responses)
2. Create incentives (to reduce emissions, integrate green energy, give subsidies) (6 response)
3. Reduce prices for sustainable transport forms in the Fehmarn corridor (5 responses)

A few interviewees had the opinion that green energies and fuels should be made more attractive for companies to use. Now sustainable alternatives are more expensive than the unsustainable products. It was mentioned it may be made obligatory for logistics companies to use green fuels, to have a bigger effect. It is also mentioned that possible substitutes could be given to logistics companies to accelerate the change to more climate action. This would possibly give more incentive to the companies to create the change. In this regard, it could be the responsibility of the EU to provide rules.

However, it is also suggested that the focus should not just lie on making the transport sector more sustainable, but that the Fehmarn corridor should be used as a place to promote sustainable solutions.

4.3 Impacts of Fehmarn Belt tunnel

The list below shows how the participants in the interviews and survey ranked different statements about the future Fehmarn Belt Tunnel:

Statements ranked as very important:

1. Quicker transport across the Fehmarn belt (time savings) (7)
2. Easier/more convenient transport (no stopping at the ferry) (7)
3. New or improved market opportunities (3)
4. Better connection to other cities, regions, and markets (3)
5. Better networking opportunities with partners in Germany (1)

Statements ranked as important:

1. Better connection to other cities, regions, and markets (10)
2. Quicker transport (time savings) (9)
3. New or increased market opportunities (9)
4. Better networking opportunities with partners in Germany (9)
5. Easier/more convenient transport (no stop at the ferry) (7)

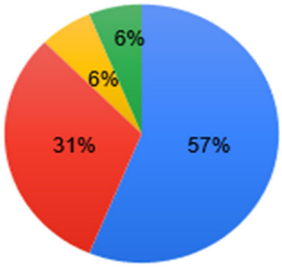
Opportunities for a more competitive and qualified labour market for the company were selected as being important 7 times, but also selected as not being important 8 times.

4.4 Environmental attitudes and sustainability in companies

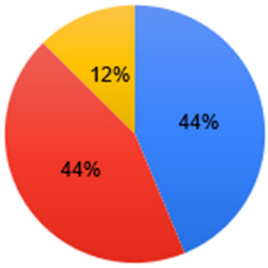
The companies were given a series of statements investigating their environmental attitudes, on whether companies have the power to contribute to the fight against climate change. The responses (the degree to which the companies agree or disagree) are given in the following charts in figure 7.

Figure 7: Statement responses by 16 participants (all) on importance of company action on sustainability

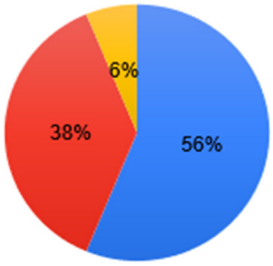
1. A sustainable transition of private companies is important to help fight climate change.



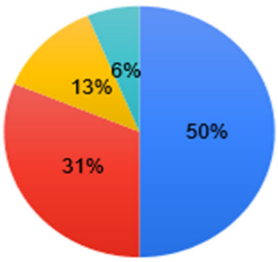
2. A sustainable transition of private companies is important to stay competitive in the future.



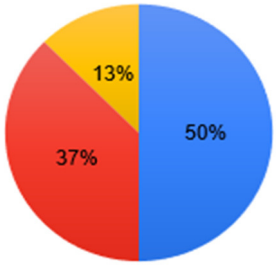
3. Transport companies should have a special focus on a sustainable transition to help fight climate change.

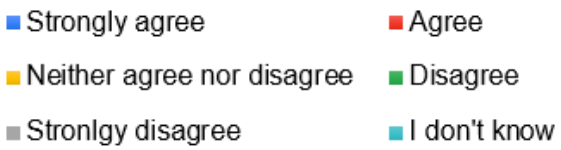


4. A sustainable transition of transport companies is important to stay competitive in the future.



5. A sustainable transition of export/import companies is important to stay competitive in the future.





Looking only at the 4 companies from the transport sector, the patterns are very similar. Two companies **strongly agree** to the first statement but then **agree** to the third statement, stating that transport companies should have a special focus on a sustainable transition. One transport company strongly agreed to all the statements, while the last transport company stated to neither agree nor disagree with all five statements. As for the importance of sustainability in the companies, most of the company's state that they have already included sustainability goals and values in the company goal and results and want to keep those in the future. Two of the companies are currently not doing much but would like to improve in the future. A single company states to not act on sustainability in the present and believes they will not do so in the future.

The actions that the companies currently focus on include:

- Use recycled materials
- Use green electricity
- Improve circularity
- For product packaging: choose options that are less harmful
- When making changes in the company, try to consider green alternatives
- Implement a sustainability strategy
- Green/sustainable investments
- Clear goals for sustainability working with KPIs
- Development of technologies that are better for the environment
- Demand greener transport from transport companies utilised

4.5 Sustainable energy in companies

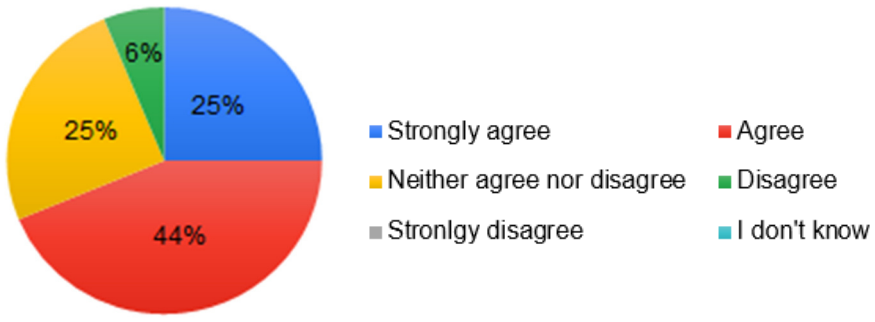
The question asking whether sustainable energy plays a significant role in the company's decision making, can be seen to be more varied. Eight companies only consider green sustainable energy in some decisions (more than in others). Five companies say that they consider it in every decision.

However, fifteen companies state that green energy will be important or even very important, for them in the future. One company (in the transport sector) states that green energy will not be important in the future.

Many companies already use green alternatives (green electricity, electric cars, biodiesel, etc.), and have implemented those within the past few years. Other actions mentioned include integrating heat pumps for heating and using alternative green fuels (from windmills or biogas).

Considering the statement "A sustainable transition of my company can be achieved through the integration of green energies." obtains 4 strongly agrees, 7 agrees and 4 neither agree nor disagree and one disagree (see figure 8).

Figure 8: A sustainable transition of my company can be achieved through the integration of green energies



One respondent noted that he neither agrees nor disagrees, explained that the company must think about its finance and that it would be helpful if green energy became more accessible and there was more help from the government to implement green energy options in the company. It would also be interesting if the Fehmarn corridor became a kind of hub for green energy solutions. Considering the barriers toward integrating green energy it was mentioned most often that the investment and switching costs are too high and that green energy is too expensive. The reasons that the companies do not have the budget to invest in green energy and that the range of electric cars is too short, were also named, however not as often.

The fact that a large budget is needed to make impactful changes within the company is seen as a critical aspect/barrier towards implementing green energy by one respondent. It is stated that the high costs associated with the transition would lead to financial problems and competitive disadvantages for the company therefore, it is not currently feasible. Furthermore, making these changes is time consuming taking 10-15 years. It is also stated that one must make sure that the green energy is capable to be used. In terms of technological development, it is also questionable which energy source will become more important in the future and how this will be decided from the political side. Also mentioned is the fact that customers are not yet demanding green alternatives. Customers of transport companies are seeking the cheapest option, which very often is not the green option. Several green energy access points would make the biggest difference to the companies using electrical vehicles, as well as the ability to refuel green fuels. Biodiesel, biogas, and Power to X are also mentioned to be useful in the future, with one company reminding that it would be important to know which energy source will become more important in the future.

Access to green electricity is mentioned several times. The option/supply of trucks driving on green fuels or even electrified trucks is also mentioned. It should be noted that hydrogen was not directly mentioned by any respondent. Whether the companies are willing to pay a higher price for sustainable fuel alternatives, is both agreed to and disagreed with. Some companies find this question difficult and say that they would be willing to some extent. Those who agree (5 companies) are willing to pay 5% or even 10% more. Those who are not willing to pay a higher price (the majority), also point to the fact that if the company’s energy cost is 10%, then it would lead to very high costs for the company and possible financial problems if it would have to pay a higher price.

4.6 Attractiveness of the Vordingborg and South Zealand

The last part of the interview focused on the Region Zealand and its attractiveness for companies.

Several improvements were named for the Municipality of Vordingborg:

- Improved sustainable transport possibilities.
- Better accommodation opportunities and conference locations
- Increased focus on small companies to establish their business in a competitive way
- Improved business strategy which attracts investors and companies
- The possibility to receive assistance for families to move to the area for jobs, including better school, better public transport, and higher level of education.
- Competent people in areas of decision making.
- Increased access to sustainable energy and more proactive view on alternative energies, as e.g., solar and wind.

Referring to what others (the local government, companies, regions) can do to improve the South Zealand, the following improvements were suggested:

- Government could consider integrating green energy and sustainability more into the region, e.g. by developing a hub
- Improve sustainable infrastructure, be open for businesses to come to the area
- Attract more jobs to the region and create incentives for companies to move out of big city regions
- Create more jobs
- Attract more businesses/business customers to the area, to make it more attractive for other companies to move to the area
- Move companies to increase number of commuters
- Open the tunnel
- Be professional

Characteristics that were seen as important indicators for a company's consideration of where to place the company office, were (ranking from highest to lowest):

1. Proximity to qualified labour
2. Competitive prices for office spaces
3. Connection to international (German) markets
4. Access to office spaces / big stock opportunities
5. Proximity to cities
6. Proximity to public transport
7. Proximity to ports
8. Proximity to nature

4.7 Survey results from German companies

This section looks at the survey responses obtained from German companies. Here it should be noted that some formulations were slightly changed to adapt to the German perspective. Also, it is likely that the German companies, when clicking through the questions on the Fehmarn Corridor, are likely to mostly consider the area on the German side.

Decision makers from three northern Germany logistics companies mainly operating on the German side of the corridor took the online survey. The companies are listed in table 4, below.

Table 4: German logistics companies participating in the study
European Cargo Logistics GmbH
Gödecke Eurotrans GmbH
HaGe Logistik GmbH

The usage of the Fehmarn Corridor is mostly used for import and export of goods and for meetings and sales activities etc., where the companies mainly use trucks and cars and either every day or a few times per year.

Two companies do not have any improvements that they would suggest for the Fehmarn Corridor, while one company mentions more safe parks/resting spaces and more/better possibilities for refuelling green fuels. However, to achieve the ambition of a green corridor, the respondents see a need for the availability of green fuels/energies and electric-charging stations/plug-ins and perhaps changes in the environment such as planting trees.

Responsibility of the development of the Corridor is, by the respondents, mainly allocated to the Danish government and to a lesser degree to the German government. The EU is also allocated full responsibility by one respondent, while the other options mentioned are ascribed little or no responsibility. One explanation given, is that political frameworks set the course for climate-friendly and economic action, therefore giving the state most responsibility.

The main responsibility holders can, according to the respondents of the survey, create incentives to reduce emissions, give subsidies or to integrate green electricity, as well as increase the supply of green energies and fuels in the area, or reduce transport prices based on climate-friendly alternatives.

The following aspects of future the tunnel is seen as very important and important:

Very important:

1. Quicker transport (time savings) (2)
2. Easier/more convenient transport (no stop at the ferry) (2)
3. New or increased market opportunities (2)
4. Better connection to other cities, regions, and markets (2)
5. Better networking opportunities with partners in Denmark (1)

Important:

1. Possibilities to get qualified labour for the company (2)
2. New or increased market opportunities (1)
3. Better networking opportunities with partners in Germany (1)
4. Better connection to other cities, regions, and markets (1)

Giving the five statements on climate action and sustainability in companies, the German respondents agreed or strongly agreed to all the statements giving a very similar result as the one obtained from the Danish side or the analysis. The first statement was strongly agreed to by all three respondents, while for the rest of the statements the majority agreed (two out of three).

As for current environmental action in the companies, one company mentions that it uses some electric trucks and is also closely following the technical development of environmentally friendly transport options (trucks). It is also planning to install solar panels on the roofs of stock buildings. They are also separating waste. The respondent also mentions that the company is not convinced about CO2-compensation schemes. Another company states to reduce amount of fuel used, optimizing routes, and including sustainability in different company processes/decisions.

The other company states not to currently care about sustainability, but plan to do so more in the future, by seeing it as a future goal with concrete actions.

It is stated that hydrogen is seen as the only true green fuel. Here, the high starting costs are seen as a kind of barrier with no immediate return of investment, where this energy source must be encouraged from state side. As such, this company sees sustainably produced hydrogen as the fuel of greatest importance, which eventually must be produced in an environmentally friendly way.

It is also mentioned that as soon as alternative fuels are made economically viable/feasible, it is more likely that the company will integrate them. The company is discussing green energy alternatives, however, currently is not able to use these in an economical way. As such, the company wants to see how the hydrogen production will develop in the future, and until then, they will stick with using diesel trucks.

Two companies have already as early as 2004 and in 2019 integrated green energies (electric trucks, changing transportation from trucks to rail) and state that they will become important in the future. All companies agrees that a sustainable transition of the company can be achieved through the integration of green energies.

Barriers towards investing in green alternatives are the fact that electric vehicles have too short a range, which switching costs or investment costs are too high and that the company does not have the budget for it. Interestingly, none of the companies say that green energy is too expensive, which was also often chosen by Danish companies.

Asked which green energy sources would make the biggest difference for the companies, the reply was: fuel stations with a supply of green fuels and charge stations for electric vehicles and sustainable hydrogen would make the biggest difference for the companies.

One company is willing to pay a higher price for green alternatives, around 5% more was mentioned.

As for the attractiveness of the Vordingborg and South Zealand region, the German companies state to not have a real relationship to the area, and therefore cannot think of anything. One respondent mentions that demand for their service coming from the area would be the decisive factor to expand to and develop its business in the region.

Factors that are important for the positioning of company offices/stock facilities are mentioned to be (ranking from highest to lowest):

1. Proximity to qualified labour
2. Proximity to public transport
3. Access to office spaces / big stock opportunities
4. Proximity to ports
5. Competitive prices for office spaces
6. Green energy supply
7. Connection to international (Danish) markets
8. Proximity to cities
9. Proximity to nature

Access to rail and road/transportation network are mentioned as additional factors. Proximity to nature is (again) not seen as important.

5 SUPPLEMENTING INFORMATION

In other studies, and reports, sustainability has also been found to be an important component among Danish companies that they are working towards in recent years.

A study conducted on the relevance of Sustainable Development Goals (SDGs) in Danish companies (Teknologisk Institut/Via Ritzau, 2020) found that many companies have implemented sustainability measures to a certain extent in their company. Some of those companies have done so due to economic benefits. Furthermore, most companies in the analysis have plans for participating in sustainable initiatives. Some actions that are taken or planned to be taken, are within reducing energy consumption or integrating more renewable energies/green transport.

Another study shows that sustainability will be more relevant in the future, as companies will work with it in their strategy, with environmental sustainability or with social sustainability (DI, n.d.)

From an analysis conducted in 2017 on the potentials of a business park in the region Falster - Tentacle report - following was found:

- More parking opportunities for trucks may be needed.
- Safe parks may become more important in the future.
- Facilities for safe storage for trucks
- More service-stations
- More accommodation opportunities
- Potentially warehouse facilities.
- Potentially freight collection hub

As this analysis was conducted for the Municipality of Guldborgsund in 2017, it should be kept in mind that they may have already acted on the above-mentioned needs. The municipality of Vordingborg should take inspiration from this study and use it better understand the potential issues and be prepares to react to these when the tunnel is built.

6 CONCLUSION

The research and analysis in this study discovered that companies in the Municipality of Vordingborg and other Danish companies are aware of the importance of sustainability in their operations.

Many have already implemented measures and integrated sustainable solutions. The importance of sustainable solutions is also seen to increase in the future, with companies naming renewable energies or green fuels to be of interest.

Several improvements/proposals have been listed for the new Fehmarn Corridor and Southern Zealand. An important one includes improved opportunities sustainable fuels supply, including an increase supply of green alternatives and number of e-charging facilities.

The literature review showed that the future tunnel will bring many changes to the area.

These changes include different traffic dynamics with increased traffic in the Zealand region, reduced greenhouse gas emissions from the transport sector due to diverted traffic with shorter travel distances and an electrified railway, and a deeper integration of the Danish and German markets through increased partnership opportunities and cross-border labour possibilities.

According to conducted surveys, the main responsibility of a successful development of the Fehmarn Corridor is allocated to the Danish government, while it is suggested that is important that different actors work together. This indicates that while some of the surveyed companies are aware of their own role and contribution towards a green transition, they are somewhat reluctant to drive this development forward.

More responsibility is put on the Danish and to a lesser extent, German government to ensure this green transition, and when new requirements and regulations are in place, the companies are ready to invest in green technologies.

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8 APPENDIX: INTERVIEW/SURVEY QUESTIONS

Introduction:

Thank you for participating in this survey.

This study is carried out by Vordingborg Erhverv, as part of the North Sea Connect project, which is part of the Interreg North Sea Region program.

You can read more about the project here: https://northsearegion.eu/north-sea-connect

The purpose of this study is to gather information on how the use of green and sustainable technology can come into focus in the Fehmarn corridor (motorway and railway stretch between Hamburg and Copenhagen).

The data collected will be used exclusively in the North Sea Connect project and complies with current policies on protection of personal data.

It will take you approx. 10-15 minutes to participate in the survey.

Yours sincerely,

Business Vordingborg

Information of respondent: Name, company, position in company, city/area of company/office and sector

Survey questions: Former and current use of the Fehmarn corridor

Question	Response
Does your company currently make use of the Fehmarn corridor (transport network between Fehmarn and Copenhagen, e.g. for a business trip between Vordingborg and Rødby or Køge)?	-Yes -No -Don't know -Other
If yes, in what ways does your company currently use the Fehmarn Belt link? (You can choose several answers)	-For import & export of goods and services -For business meetings and sales activities -For office/tasks in Germany -Other
Also choose the mode of transport that your company uses. (You can choose several answers)	-Truck/lorry -Van -Car -Train -Bus -Other

If yes, how often?	-Every day -Every week -A few times a month -A few times a year -Other
If no, has your company used the Fehmarn corridor in the past?	-Yes -No -Don't know -Other
In what way has your company used the Fehmarn Belt Link in the past? (You can choose several answers)	-For import & export of goods and services -For business meetings and sales activities -For office/tasks in Germany -Other
Also choose the mode of transport that your company has used in the past. (You can choose several answers)	-Truck/lorry -Van -Car -Train -Bus -Other

Survey questions: Future opportunities of the development of the Fehmarn corridor

Question	**Response**
What improvements do you believe are necessary for a successful development in the Fehmarn corridor? (You can choose several answers)	-More restaurants/cafés in the corridor -More accommodation opportunities (hotels etc.) -More safe parks or resting stops -More opportunities to stock products -More/better opportunities to refuel green fuels -No improvements -Other
What effect would these improvements have on your company's usage of the Fehmarn corridor?	Describe:

There is an ambition to integrate greener and environmentally friendly transportation possibilities in the future Fehmarn corridor.	
What actions do you believe are necessary to achieve this ambition? (You can choose several answers)	-Availability of green fuel (such as electricity, LBG/LNG (liquified biogas/liquified natural gas), hydrogen, biodiesel, etc.) -More e-car charging facilities -More/better public transportation possibilities (bus/train) -Changes to the environment in the area (e.g. planting trees) -Increase speed limit on roads in the Fehmarn corridor -Other
In your opinion, who has the main responsibility for ensuring the integration of green opportunities in the Fehmarn corridor? 1. No responsibility 2. Some responsibility 3. A lot of responsibility 4. Complete responsibility 5. Don't know	-The EU -The Danish government -The German government -The local municipality -Danish companies -Foreign companies -Those who use the Fehmarn corridor
Elaborate on why you consider the above chosen institution(s)/company(ies) to be the main responsibility holder(s)?	Describe:
What can the main responsibility holder(s) do to achieve the ambition of a more sustainable and green development? (You can choose several answers)	-Create incentives (to reduce emissions, integrate green energy, give subsidies) -Reduce prices for green transport (electricity, LBG/LNG, hydrogen, biodiesel, etc.) in the Fehmarn corridor -Increase supply of green energies and fuels -Other

The new Fehmarn Belt tunnel will open in 2029, thereby connecting Fehmarn with Lolland. The tunnel will be a significant new element in the Fehmarn corridor between Denmark and Germany, as it will bring an increased integration of Northern Europe with Germany and the rest of central Europe.	
What do you expect will be the most important impacts of the new tunnel on your company? 1. Not important at all 2. Not important 3. Neutral 4. Important 5. Very important	-Quicker transport (time savings) -Easier/more convenient transport (no stop at the ferry) -Opportunities for qualified labour for your company -Opportunities for cheaper labour for your company -Better networking opportunities with partners in Germany -Better connection to other cities, regions and markets -New or increased market opportunities

Survey questions: Environmental awareness in company and in the Fehmarn corridor

Question	**Response**
Please specify to what extent you agree or disagree: A sustainable transition of private companies is important to help fight climate change.	Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree Don’t know
Please specify to what extent you agree or disagree: A sustainable transition of private companies is important to stay competitive in the future.	Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree Don’t know
Please specify to what extent you agree or disagree:	Strongly agree Agree Neither agree nor disagree Disagree

Transport companies should have a special focus on a sustainable transition to help fight climate change.	Strongly disagree Don't know
Please specify to what extent you agree or disagree: A sustainable transition of transport companies is important to stay competitive in the future.	Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree Don't know
Please specify to what extent you agree or disagree: A sustainable transition of export/import companies is important to stay competitive in the future.	Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree Don't know
What role does sustainability (e.g. climate action, increased circularity, or reduced CO2 emissions) have in your company?	-It is in the company's values and goals to be sustainable and become more so in the future -The company wants to integrate more sustainable goals and values in the future, but is currently not including sustainability in the company's values and goals -The company does not consider sustainability at the moment and won't do so in the future -Other
If your company's values and goals currently include sustainability, how is this displayed in your company's activities?	Describe:
If sustainability will become more important in the future, how will this be displayed in your company's future activities?	Describe:
Is green energy (electricity, LBG/LNG, hydrogen, biodiesel, etc.) of importance in your company's decision-making?	-The company considers green energy in every decision by seeking out the most sustainable option -The company considers green energy in some decisions more than in others -The company does not consider green energy in its decision-making

	-Other
If yes, which energies/fuels have the biggest importance for your company?	
Please specify to what extent you agree or disagree: A sustainable transition of my company can be achieved through the integration of green energies.	Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree Don't know
How important will the integration of green energy in your company be in the future?	Very important Important Not very Important Not important at all Don't know
Has your company already integrated green energy (green electricity, electric cars/transport, etc.)?	Yes No Not relevant for my company Don't know
If yes, when did your company integrate green energy?	
If yes, how has your company integrated green energy (e.g. uses green electricity, LBG/LNG, biodiesel, etc.)?	Describe:
What barriers prevent your company from investing in green energy? (You can choose several answers)	-Green energy is too expensive -Too high investment & switching costs -Electric cars have a too short reach -Don't have the budget to invest in green energy -None -Other
Which green energy sources would make the biggest difference for your company (e.g. access	Describe:

to petrol stations supplying green fuels, plug-ins for electric vehicles)?	
Is your company willing to pay a higher price for green energy/fuels compared to conventional energy/fuels?	Yes No Don't know Other
If yes, how much higher may these costs be for the green alternatives?	5 % 10 % 20% 50 % More than 50% Other

Survey questions: Attractiveness of the Vordingborg region

The Vordingborg municipality is located in south Sealand. The region will produce renewable energy from wind farms (and potentially hydrogen) in the future and has a lot of knowledge of green energies and is currently developing further expertise on the topic. Surplus energy from the wind park will potentially provide the region, its companies and ports with green energy. Other attributes, which make this region attractive for companies include competitive prices on land / rents, space for expansion, close proximity to rail, highway and port network, availability of qualified labour, direct routes to big cities such as Copenhagen, Køge, Hamburg, Lübeck or Kiel, and close proximity to nature and cultural attractions.

Question	**Response**
What would make the Vordingborg municipality more attractive for your company?	Describe:
What can others (governments, municipalities, companies) do to make south Sealand more attractive for your company?	Describe:
If your company were to relocate/be placed somewhere else, what factors would be important for this consideration? Choose from 1-5 1 Not important at all 2 Not important 3 Neutral 4 Important 5 Very important 6 Not relevant for my company	Proximity to cities Proximity to nature Proximity to public transport Proximity to international ports Proximity to skilled labour Access to office spaces / big stock opportunities Competitive prices for office spaces Provision of green energy Connection to international (German) markets If other reason, please specify
Is there anything else you would like to say?	

Thank you very much for participating in this survey. If you have any questions please contact lw@gemba.dk.

If you would like to hear more about how Vordingborg Erhverv is working on different projects in the Fehmarn corridor you are welcome to write to bj@vordingborgerhverv.dk or add your email below:

_____

Are we allowed to contact you if we have any further questions? If yes, please write your email below:

_____

Interreg North Sea Region North Sea CONNECT
European Regional Development Fund

EUROPEAN UNION

BUSINESS VORDINGBORG

EMBA SEAFOOD CONSULTING

ROAD MAP

Potential of inland waterways for the Port of Vordingborg

Activity: WP 4

Version: Final (Dec 2022)

Preamble:

This road map is developed as a part of the Interreg North Sea project North Sea Connect. North Sea Connect is co-funded by the Interreg North Sea Region Programme under priority 4: Promoting green transport and mobility.

This road map should be seen in connection with the results from the two reports; "Business Case" and "Baseline study" made as a part of the North Sea Connect project. The road map is done in cooperation between Business Vordingborg and GEMBA Seafood Consulting A/S in the period from January 2022 to December 2022.

Main inland waterways in Northern Europe and area of Vordingborg

The green arrows show potential seaways between Port of Vordingborg and the three main entrance/exit ports.

The yellow line indicates the upgraded connection between Hamburg and Copenhagen with the Fehmarn fixed link.

Executive Summary

A central part of the North Sea Connect project is to investigate how remote nodes can create new, smart, and efficient connections to the TEN-T (Trans-European Transport Network). How can remote nodes develop business concepts that interact with the TEN-T to support local development and local value creation. One element of this is to create new connections to the TEN-T network via the European inland waterways.

This road map shows the possibilities for the Port of Vordingborg to become integrated into the TEN-T system and into the European inland waterways and to provide a green development. This road map should be seen in connection with the results from the two reports; "Business Case – Dry Port Vordingborg" and "Baseline study" made as a part of the North Sea Connect project.

Summary:

The road map shows:

- The Port of Vordingborg and the area of Vordingborg - seen as a remote node - have a potential based on its geographical location to connect to the TEN-T - as a hub to connect motorway, seaport, and dry port.
- The maritime gateways to the Baltics from the Northern European inland waterways are a natural position to the Port of Vordingborg – maritime restrictions and traditions in the inland waterways may reduce this potential to be activated. A mapping of potential local companies and shipping companies with ships that can sail to the Port of Vordingborg should be made to illuminate the potential further.
- If the Port of Vordingborg should be seen as a potential northern part of the European inland waterways, the development in relation to the ongoing digitalisation must be recognized and the eFTI-rules must be addressed to enable the port to fulfil the obligations in this domain.
- The developed road map shows four main steps to be taken:

  Involve the Port of Vordingborg in a dedicated marketing organization.

  Attract relevant customers to the port and the ports hinterland.

  Make a clear link between the Port of Vordingborg and the potential dry port in Vordingborg.

  Interact with the digitalization process in the European inland waterways.

Objectives

This road map is conducted as a part of the Interreg North Sea project North Sea Connect. North Sea Connect is a project co-funded by the Interreg North Sea Region Programme and belongs to priority 4, Promoting green transport and mobility. The project is led by Port of Hamburg Marketing and the current road map is conducted by Business Vordingborg in cooperation with GEMBA Seafood Consulting A/S.

The objective of the road map is to assess the opportunities for the Port of Vordingborg to improve its position for goods transport in the European inland waterways. This will illustrate the development opportunities for a remote node on the TEN-T corridor and be supportive of a sustainable development in the region.

The area of Vordingborg has a potential for developing into a green remote node in Northern Europe connecting:

- inland waterways,
- seaport,
- dry port,
- motorway and
- the new fixed Fehmarn connection

The road map outlines and highlight the opportunities connected to entering and benefiting from the inland waterways. It does so by providing an overview of the structure of the inland waterways focussing on ports, waterways, vessel types, access between sea and inland waterways. The location, business, and goods structure of the Port of Vordingborg is relevant and valuable to benefit from the opportunities there are connected to shipping on the inland waterways.

The focus for this analysis is the German market as it is the most obvious entrance point for the Port of Vordingborg. However, references to other inland waterways are included.

The Baltic Sea have three main entrance ports to the central European network with the ports of Kiel, Travemünde/Lubeck, and Świnoujście/Szczecin.

Background

The TEN-T is an EU policy that seeks to support the development of a Europe-wide network of railway lines, roads, inland waterways, maritime shipping routes, ports, airports, and railroad terminals.

The ultimate objective is to close gaps, remove bottlenecks and technical barriers as well as strengthen social, economic, and territorial cohesion in the EU. With this policy the EU supports infrastructure projects and other development projects along this network. Ports that are designated as either a core or comprehensive port can receive funding for infrastructure projects through the EU Connecting Europe Facility (CEF). Ports that are located at the corridor but is not designated as either core or comprehensive port do not have the opportunities to achieve this type of funding and may in some instances be overtaken by the development in other ports that has access to better funding opportunities. There is a total of nine corridors that connect European infrastructure in north to south and east to west. The corridor that is of specific interest to the area of Vordingborg is the Scandinavian – Mediterranean (scan-med) corridor that is being further strengthened with the Fehmarn fixed link in 2029. The Port of Vordingborg is located very close to the road corridor and with the rail corridor almost running through the port area. Figure 1 shows the location of the port in relation to the scan-med corridor.

Figure 1: The Scandinavian Mediterranean TEN-T corridor that goes through Vordingborg

Source: EU Commission, 2022

In a recent (April 13, 2022) press release[1], the EU commission argues that the inland waterways should be tributed with an even more important role in the TEN-T system and hence serve as a support to the EU Green-Deal with an objective of moving more transportation from the road to the sea and the inland waterways. The location of the Port of Vordingborg close to the TEN-T corridor and well-connected waterways possess an opportunity to play a role as a potential green northern node that connects inland waterways, seaport, dry port, motorway, and the new fixed Fehmarn connection.

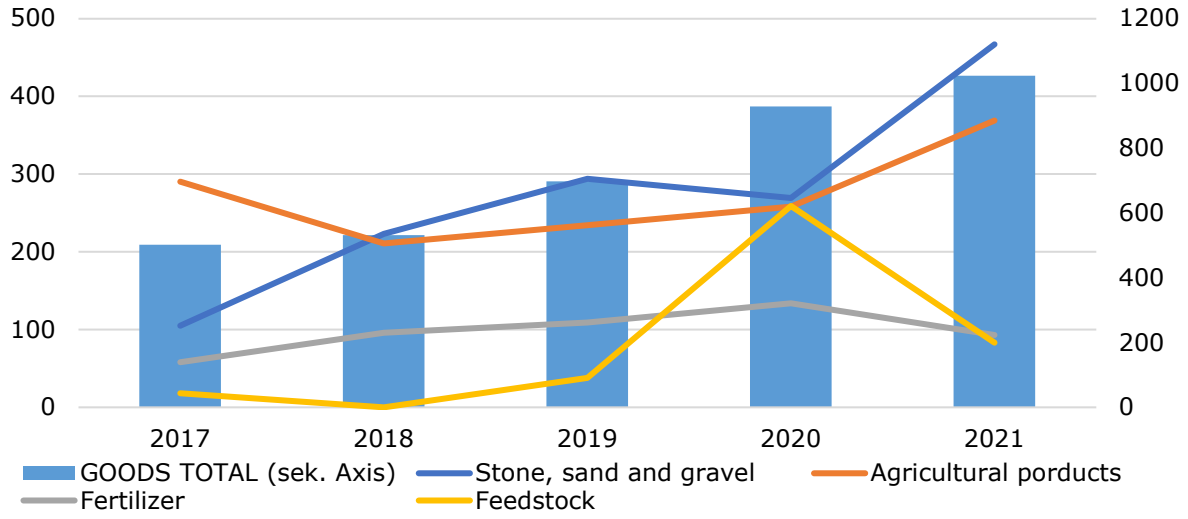
[1] https://www.eesc.europa.eu/en/news-media/news/new-ten-t-regulation-key-europes-sustainability-and-smart-mobility

The Port of Vordingborg

To understand how the Port of Vordingborg can benefit of the European inland waterways a profile of the Port of Vordingborg is conducted.

The profile illustrates the types of goods, goods volumes, and business structure of the port and thereby enable an assessment of how and which ports and markets that the Port of Vordingborg could work with from a starting point. Figure 2 shows the types and volume of goods handled at the Port of Vordingborg.

Figure 2: Types of goods (1,000 tonnes) and total volume (sec. axis) in the period from 2017 to 2021 in Port of Vordingborg.



Source: Statistics Denmark

The blue bars in figure 2 shows the development in total goods in 1,000 tonnes over the Port of Vordingborg and shows a development from approx. 500,000 tonnes in 2017 to more than 1 million tonnes in 2021.

Almost all goods at the Port of Vordingborg is dry bulk with focus on stone and sand, agricultural products, feed stock and fertilizer. There are variations in the throughput of the various types of goods, but the chart illustrates that there is expertise in handling of dry bulk while handling of liquid bulk, containers and general cargo is absent.

The large increase in stone, sand, and gravel over the period is mainly ascribed to the building of the new Storstrøm Bridge where the Port of Vordingborg is the construction site for the concrete elements that make up the bridge. The bridge is planned to be finished in 2025 and the stone, sand and gravel category is expected to decrease in the coming years. The spike in feedstock in 2020 is due to changes in delivery patterns at Zealand and dynamics between the different providers.

At the Port of Vordingborg there are a great mix of potential companies that is relevant in relation to a potential shipping of goods into the inland waterways. The port is home to both companies that imports and export various bulk products, shipping and stevedore companies that can secure the loading, unloading and freight.

Table 1 highlight a few of these local companies of relevance.

Table 1: overview of some relevant companies with potential support activities in the inland waterways.	
	The DLG Group is one of Europe's largest agribusiness companies with 6,000 employees and activities in 18 countries. At the Port of Vordingborg, DLG operates a grain terminal with room for 150.000 tonnes. The terminal was inaugurated in 2019 and is the largest and most modern terminal that DLG operates. The international business of DLG and existing import and export activities is central to a potential operation towards the European market through the inland waterways. The terminal is operated under the name Masnedø Bulk Terminal (MBT) and is a joint venture between DLG and Copenhagen Merchants Group (CMG). CMG is one of the largest grain brokers in Europe and has an extended network of terminals Denmark, Sweden, Poland, and Latvia.
	Yara Danmark A/S serves the Danish market from the head office in Fredericia and has terminals, warehouses and production facilities located around Denmark. At the Port of Vordingborg, Yara has a capacity to handle 150.000 tonnes fertilizer per year. The fertilizer is shipped in bulk and put in big bags and other packaging at the port. The fertilizer is mainly intended for the Danish market, but the position as a large importer of fertilizer could be utilized to serve customers in e.g., the German market.
	Over the past 15 years, Dansk Natursten A/S has imported, sold, and delivered granite chips for the concrete and asphalt industry, track chips for railways, water building stones for coastal protection and chips for garden plants. At the Port of Vordingborg, Dansk Natursten has a branch with an area of approx. 30.000 m^2 where gravel and sand is imported, stored, and sold to local production companies. The expansion of the port building of both the Fehmarn tunnel and the Storstrøms bridge has been positive for Dansk Natursten, but other large infrastructure projects will also be seen in the future. In relation to the European market, there could be opportunities for Dansk Natursten to develop a position as a hub for certain gravel and sand products for the Northern part of the European inland waterway.
	Baltic Shipping Company A/S covers the entire region for Zealand & Lolland-Falster with offices. Since 2017, BSC A/S has been located at the Port of Vordingborg with office and weighbridge to service the port's customers with clearance, stevedore total transport solutions incl. ship freight from A-B. Baltic Shipping has 37 coasters in the size 1450-4400 dwt, which primarily sail in Northern Europe. Baltic shipping is one of those central companies that has bulk carriers that can operate in the inland waterways and at the open sea and could become a highly relevant partner to realize a potential of entering inland waterways.
	Vordingborg Shipping was established in 1948 and has its head office at the Port of Vordingborg. Vordingborg Shipping is a part of Krinak A/Sand operates from all ports on Lolland-Falster and the Southern part of Zealand. Vordingborg Shipping has modern park of stevedore equipment among including wheel loaders, conveyor belts and mobile cranes. The main activity of Vordingborg Shipping is agency and stevedoring but also offers chartering, forwarding, weighing and other relevant port activities. In relation to an activity in the inland waterways, Vordingborg shipping could be seen as a relevant shipping agent for vessels that either go into the waterways from the Port of Vordingborg, or in the other direction.

The list of companies that today has business at the Port of Vordingborg could be seen as a relevant starting point for the development into the inland waterways. They are already located at the port, has import and or export activities and are handling goods at the port and hence has some of those prerequisites that are needed to initiate transportation to the inland waterways. By starting with the existing companies which all are relevant in relation to the European market the building block for developing the access to the inland waterways could is seen as an easier first step than attracting new customers to the port area or finding new companies in the port hinterland that could start trading to the European mainland through the inland waterways.

A first step to investigate the and hopefully realize the potential of shipping goods to and from the European market through the inland waterways could be a further understanding of the trade network of the existing companies at the port, i.e., where is the goods going today, how can the companies use their trade network to open these new routes, and how may the local shipping companies be able to support this development.

There are also companies in the hinterland that could become relevant to such shipping. The most relevant of such companies is Viking Malt that is described in table 2.

Table 2: Description of Viking Malt a potential shipper of goods at the inland waterways.	
VIKING MALT	Viking Malt is among the world's leading company of special malts. The barley for the malts comes from Northern Europe, malted in the facilities in Vordingborg and are shipped all over the world to brewers. Viking Malt has production sites in Sweden, Finland, Lithuania, Poland and in Vordingborg. From the Port of Vordingborg, the main recipients of Viking malt are the Turkish market where the malt is shipped as bulk. As of today, the European market is mainly served by road transport, but the bulk type does suit the European market, and could be served by vessel.

The Port of Vordingborg also has agreements with two power-to-x companies that are developing activities at the port area. These two companies are bringing in a new business to the port and needs both raw material for the production as well as a market for their outputs. The output will be liquid petrochemicals and pressurized gas and there are requirements of dedicates vessels to carry such goods. Table 3 therefore describes the two power-to-x companies that is planning to open business at the Port of Vordingborg and a potential shipping operator that could fit into the new supply chain of power-to-x products.

The Arcadia eFuels company will be dependent on deliveries of liquid CO_2 as a part of the production. This component can be shipped to Vordingborg. A point of delivery could be the future CO_2 capture facility planned at Ålborg Portland.

Table 3: Relevant companies that if everything goes as planned, will open production at the Port of Vordingborg and a relevant shipping company that can transport the production input and output.	
Arcadia eFuels	Arcadia eFuels is a Danish company with a large ambition to produce green eFuels (eDiesel and eJet fuel) using renewable electricity, liquid CO_2, and water to produce green hydrogen that will be combined with captured carbon. Arcadia has made an intention agreement with the Port of Vordingborg and is in the planning phase of building a large plant that may cost as much as 1 billion euro. Arcadia expect to start production in 2024 and will when in full operation be able to produce approximately 55,000 MT of eJet Fuel (eKerosene). As a byproduct, the plant will produce approx. 25,000 MT of eNaphtha that may be used in plastic production. For the production Arcadia will use green electricity, CO_2, and water. Of relevance to the inland waterways, is it that the CO_2 could come from the German market and reach the Port of Vordingborg via vessel transport, and though the eJet Fuel is mainly intended for the Danish inland flight operations, there could eventually be export to other markets. The eNaphta that is used in the plastic industry could also be considered as an export goods that could reach the inland waterways.
VORDINGBORG BIOFUEL	Vordingborg Biofuel was founded in March 2020 and will produce bioethanol as a green fuel. This means that the fuel is extracted from biomass, which in this case will be crop residues such as wheat straw. The straw is supplied by the area's grain producers and the straw's nutrients can be sent back in the form of fertilizer after converting the straw into biofuel. The bioresource for the production will initially originate from local resources, but there may arise opportunities to also import additional resources in bulk from other parts of Denmark, or other countries nearby. To ensure this transport, bulk shipping companies such as e.g., Baltic Shipping could be a relevant operator. In relation to the inland waterways, there is a production of bioethanol that could reach the European markets, but also several byproducts from the production could be of relevance.
chemgas	Chemgas is market leader in transportation of pressurized LPG and is offering both inland and seagoing freight. The seagoing vessels of Chemgas are active in Northwest Europe and the sea/river-going vessels are suitable on the inland waterways. This fleet allows Chemgas to do door to door transportation between seaports and inland ports without having to perform any transshipment. In relation to the Port of Vordingborg, the Power-to-x and the inland waterways, shipping companies such as Chemgas are relevant partners.

Inland waterways

The Trans-European Inland Waterway network is a part of the TEN-T of the European Union. The inland waterways are governed by a set of EU guidelines for its development. The European Inland waterway network is made up of rivers and canals, and the various branches and links which connect them. The main objective of the inland waterways is to create opportunities for interconnection between industrial regions and major conurbations and link them to ports.

The minimum requirements for a waterway to be classified as "European Inland Waterways" is to be "class IV waterway" in the classification. The class IV allows the passage of a vessel of up to 85m in length and 9.50-metre-wide. Waterways that are modernized or constructed should correspond at least to class IV and make satisfactory provision for the passage of vessels used for combined transport. Many of the inland waterways are much wider and ready to handle larger vessels.

The European inland waterways consist of more than 40,000 km of waterways that can be accessed by freight vessels. This entire waterway network is fed and circulated around approx. 250 inland ports. In total approx. 550 million tonnes of different goods are transported on this network. An average EU lorry carries 14.3 tonnes of goods, and the 550 million tonnes thereby corresponds to approx. 38.5 million lorry loads.

Figure 3 illustrates the European inland waterways.

Figure 3: Overview of the European inland waterways.

Source: AGN Network EU Commission available through the TENtec Interactive Map Viewer at: https://ec.europa.eu/transport/infrastructure/tentec/tentec-portal/map/maps.html accessed in November 2022

As it can be seen from figure 3 most of the inland waterways are in western Europe with large inland waterway transport in the Netherlands, Belgium, Germany, and northern France. In 2020 Germany accounted for 34% of the total European inland waterways transport, while the Netherlands accounted for 33%, Romania 10%, and Belgium and France with each 5%.

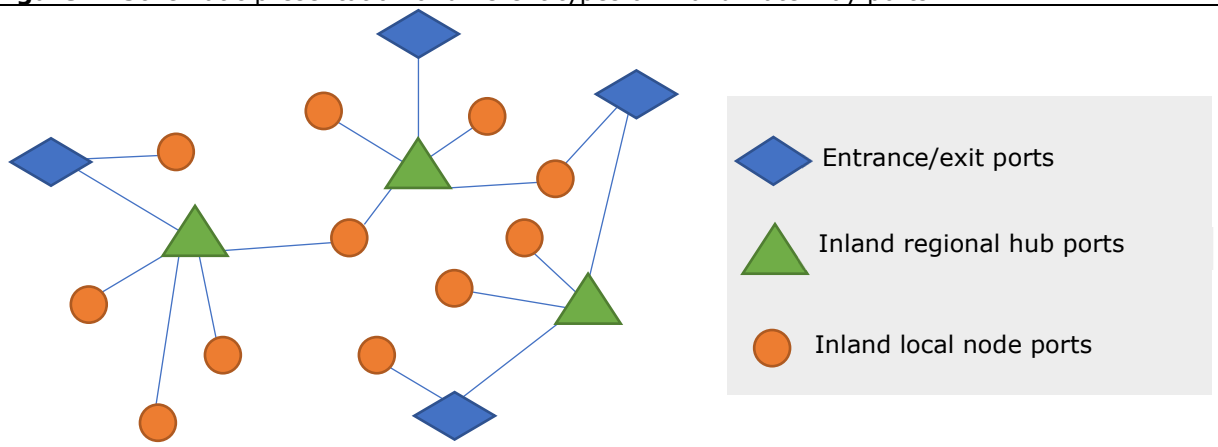
From the Baltic Sea, there are three main entrance ports to the central European network with the ports of Kiel, Travemünde/Lubeck, and Świnoujście/Szczecin (Stettin) as seen from figure 3.

Once in the inland waterway system there are a lot of smaller node ports that either receives or send goods forward and there are a few larger regional hub ports where goods are consolidated and forwarded. This means that there are three generic types of port:

- Entrance/exit ports
- Inland regional hub ports
- Inland node ports

The model in figure 4 illustrates the connections in an inland waterway network and is a schematic representation of the interconnection between the ports. Outside of the inland waterways are traditional maritime ports such as the Port of Vordingborg that is not directly connected to the inland waterways.

Figure 4: Schematic presentation of different types of inland waterway ports

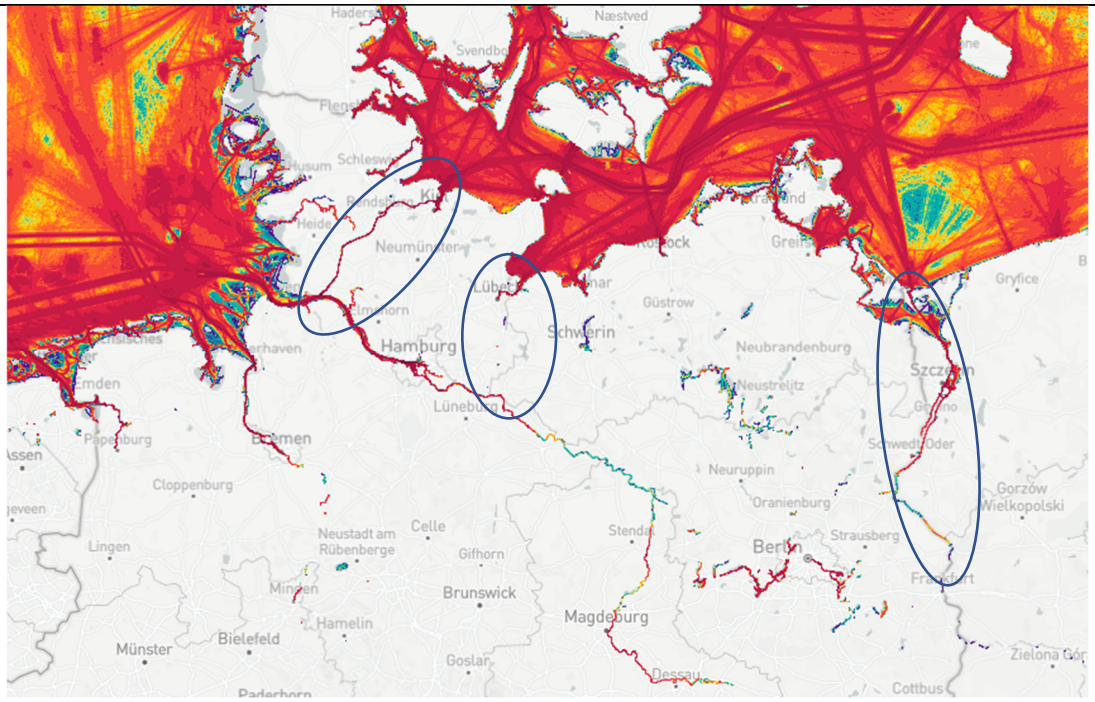


Own development based on: https://www.emerald.com/insight/content/doi/10.1108/MABR-02-2017-0007/full/html

While there are three entrance ways to the European inland waterways of relevance to the Port of Vordingborg, there are differences in the degree to which these waterways are used for commercial transport. Figure 5, shows a density map of northern Europe, including the three entrance ports and most northern German waterways. On the density map the red lines and areas illustrates where there is most traffic, and green and blue indicates less traffic.

The map indicates that there is very little transportation from Lübeck in a southern direction, while transportation on the Kiel canal and from Świnoujście/Szczecin is more intense.

Figure 5: Density map showing where traffic has been in 2021. The three corridors from the entrance ports are indicated.



Source: Marine traffic available at: www.marinetraffic.com/ accessed in October 2022.

The inland waterways are on many aspects very different from oceans, and inland ports are on many aspects different to seaports. One very important difference is the depth of the waterways that is usually much shallower than that of the seaports and the fact that waterways have much calmer water, where waves never become an issue for transportation. Because of the calm water, waterway transportation can be done in dedicated vessels that does not need keel and large drought. However, vessels that sail in the ocean need a keel and has in general larger draught.

On top of the differences there are in relation to depths/draught, the rivers and inland waterways are challenged by many bridges and locks that set requirements for the vessel height.

The vessel requirements means that there are specific vessels that sail the inland waterways, and only few of these vessel types can sail in open sea as well.

Typical inland vessel:

ALBATROS is a Dutch registered inland waterway vessel with a length of 81.30 m, beam of 9.50 m and draught of 3.62 m it has a loading capacity of 1,728 tonnes.

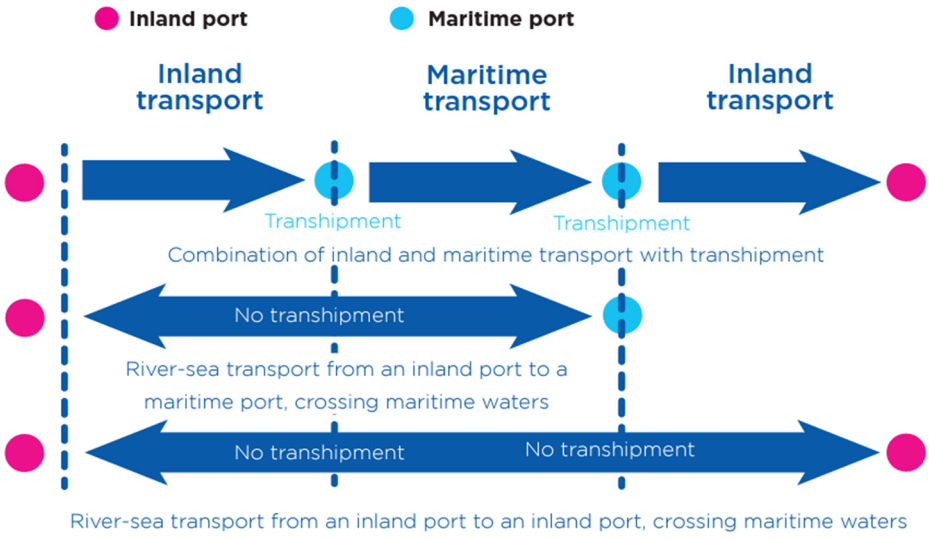
The vessel is an IV class and can access all navigable EU inland waterways system.

The transportation at the inland waterways is highly segregated and marked by a lot of smaller transport and logistics companies with several persons being self-employed. This is in great contrast to the maritime transportation where a large share of the transportation is carried out by few but larger operators. The large majority of inland navigation companies in western Europe are small barge companies with only one vessel. On average in the EU, there are five persons employed per inland waterway transport company. This number is largely influenced by Germany and the Netherlands where, in 2017, respectively 82% and 97% of the companies had fewer than 10 persons employed[2]. This means that the market for inland waterway transport is based on direct contact to the transporter and networking between the goods owner and transporter.

River-sea transport

River-sea shipping (RSS) is a special form of short sea shipping and inland navigation. The special feature of RSS is that it involves transport through both marine and internal waterways. This means that this type of shipping includes vessel journeys that goes on both inland waterways and into the sea on the same route with no transshipment, see figure 6 describing difference between river – sea and combined transport.

Figure 6: Difference between river-sea transport and combined inland and maritime transport.



Source: The Central Commission for the Navigation of the Rhine (CCNR), 2021.

The European inland waterways are highly developed and there are many opportunities for vessels to go from sea and into the waterways. This access and tradition for entering the inland waterways from the sea is mainly pronounced in the North Sea with entrance ports such as Amsterdam, Rotterdam, Ghent, Antwerp, and Le Havre. However, in the Baltic Sea, there is less tradition for this transport and goods are often being transshipped in the entrance and exit ports.

The RSS is of specific interest to a port like the Port of Vordingborg because an entrance into the European inland waterways from Vordingborg requires a journey in open sea

[2] Thematic report the European inland navigation sector labour market published in February 2021, European commission and CCNR

that has other requirements to the vessel type than shipping in the inland waterways. To achieve further knowledge of this shipping traditions where vessels have short routes in the open water, there are knowledge to be gained in northwestern Europe and especially in the Netherlands and Belgium. The map in figure 7 illustrates the main river-sea axis in the northwestern Europe.

Figure 7: Main river-sea routes in Northwestern Europe.

Source: The Central Commission for the Navigation of the Rhine (CCNR), 2021

The transshipment of goods has a high extra cost on the total cost of the goods and should therefore be avoided when possible. As the port of Vordingborg is located approx. 220 km from the entrance through Świnoujście/Szczecin, 160 km from the entrance at Lübeck and 150 to the entrance at the Kiel canal need to cover this distance in open water, specific vessels are required.

The river-sea transport is mainly performed by small seagoing vessels (known as river-sea ships). Contrary to sailing in the inland waterways, seagoing vessels are required to have an International Maritime Organisation (IMO) number and be able to navigate both on inland waterways and at sea. An example of such vessels is shown in the box below. With an IMO registration comes of requirements to ship design, performance, emission, security etc. that is not required to operate in the inland waterways.

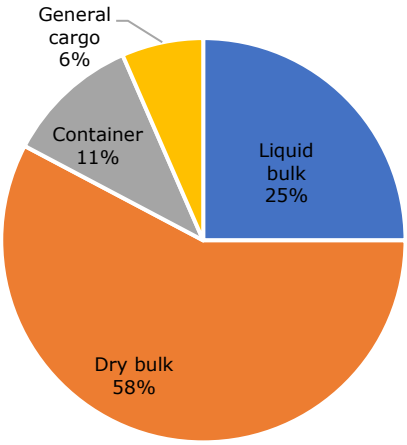
Typical river-sea ship:

RMS GOOLE is an Antigua Barbuda registered river-sea ship with a length of 80.1 m, beam of 12.5 m and draught of 4.48 m it has a loading capacity of 2,550 tonnes.

Type of goods in the inland waterway

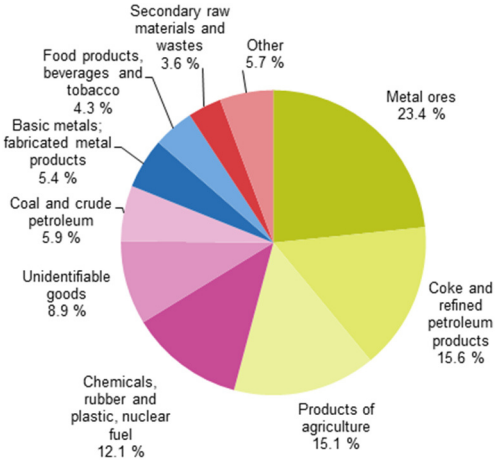
The inland waterways are used for several different purposes, but transport of bulk is by far the largest goods type. The chart in figure 8 shows the distribution in the German inland waterways available from Eurostat and hence available for all years and the most recent year, i.e., 2021 is used here. A more detailed breakdown of the total European inland waterways is available in "The Central Commission for the Navigation of the Rhine" study from 2021 with numbers from 2020 and is presented in figure 9. Though the numbers are not from the same year, they are based on large quantities of goods and the distribution between different types does not change much over one year.

Figure 8: Goods type distribution in the German inland waterways in 2021.



Source: Eurostat accessed in September 2022.

Figure 9: Inland waterways freight by main types of goods in 2020 (%, based on tonnes-km)

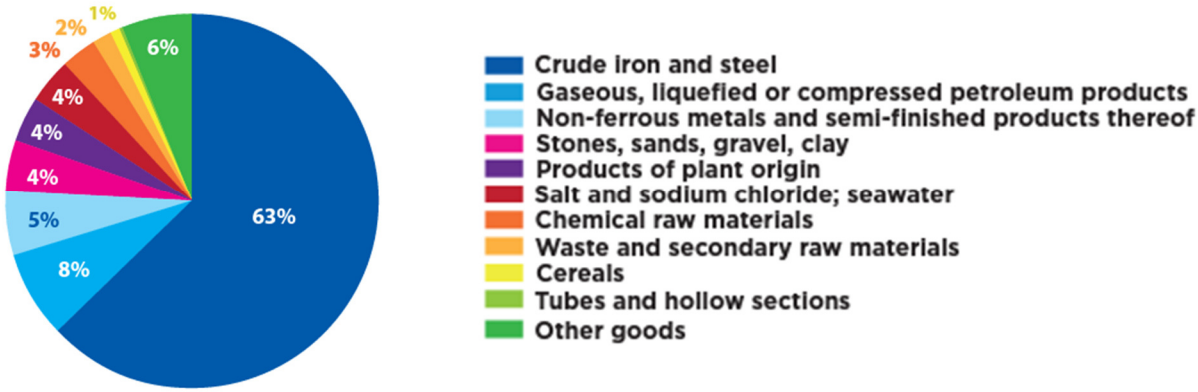


Source: The Central Commission for the Navigation of the Rhine (CCNR), 2021.

As indicated by figure 8 and figure 9 the types of goods that is transported at the inland waterways are mainly dry bulk and the third most transported goods type is products of agriculture, where the Port of Vordingborg has a large expertise and experience.

Figure 10 illustrates the different types of goods that arrive to Germany by River-sea transport. As it can be seen from figure 10, most of the river-sea transported goods are crude iron and steel and only 4% is stone, sand etc. and 4% of plant origin.

Figure 10: Types of good via River-sea to Germany in 2020.



Source: The Central Commission for the Navigation of the Rhine (CCNR), 2021

Inland waterway ports

The distinctive character of the ports in the inland waterways are of importance to understand as they are the gates for the shipping activity. To provide an understanding of the port structure in the inland waterways three ports from the three different categories are described. In the map in figure 11, the described ports are highlighted: Entrance/exit ports (blue), Inland regional hub ports (green) and Inland node ports (orange).

The entrance/exit ports are selected because they are the three most obvious entrances for the Port of Vordingborg to enter the inland waterways, the three inland regional hub ports and the three inland node ports are selected to give an impression about the types of ports that are located at the inland waterways. This presentation of different ports should give an impression about the characteristics of the inland waterways.

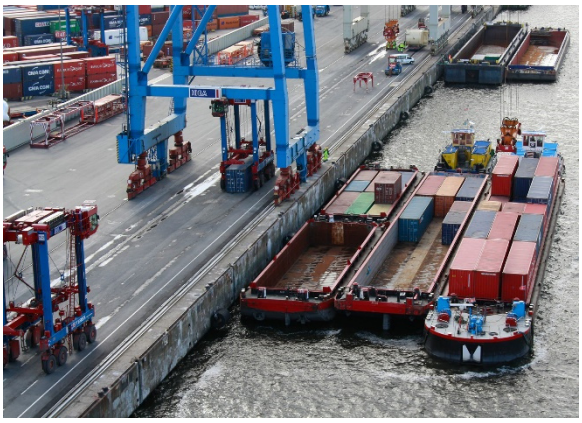
Figure 11: Map of nine ports that are further described for further the understanding of the port structure in the inland waterway.

Source: AGN Network EU Commission available through the TENtec Interactive Map Viewer at: https://ec.europa.eu/transport/infrastructure/tentec/tentec-portal/map/maps.html accessed in November 2022. Addition of marks indicating the various ports – own contribution.

Entrance/exit ports:

PORT OF KIEL  https://www.portofkiel.com	**The Port of Kiel** (DE: Kieler Hafen) is a significant port for passenger and cargo shipping located. It occupies the inner part of the Baltic Sea inlet Kieler Förde and includes the locks at the eastern end of Kiel Canal. Its geographic location, permanent depth for seagoing vessels and the direct link to the national rail and road network make the port very attractive for cargo and passenger traffic alike. The main attribute in relation to the current study is its location at the entrance of the artificial waterway, the Kiel Canal. The Kiel Canal is a 98-kilometre-long canal in Schleswig-Holstein. The canal was finished in 1895 and links the North Sea at Brunsbüttel to the Baltic Sea at Kiel. An average of 460 km is saved by using the Kiel Canal instead of going around the Jutland Peninsula. The Kiel Canal is the world's most frequented artificial waterway with an annual average of 32,000 ships (90 daily), transporting approximately 100 million tonnes of goods. Besides its two sea entrances, the Kiel Canal is linked, at Oldenbüttel, to the navigable River Eider by the short Gieselau Canal.
LPA Lübeck Port Authority  https://www.lhg.com	**The Port of Lübeck** is the central logistics hub connecting the Baltic region with continental Europe. Scandinavia, Finland, and the Baltic are interlinked here with Europe's major economic centres. Located in the Baltic, the Port of Lübeck offers optimal sea transport routes combined with the shortest link to many metropolitan regions. Ensuring that inbound and outbound cargo flows to their destinations. The Port of Lübeck possesses efficient connections to the inland waterways: For bulk goods along with project and heavy cargoes, the Elbe-Lübeck Canal plays an important part as a link to the Elbe, Hamburg and with the European inland waterway network.
PORT SZCZECIN-ŚWINOUJŚCIE  https://www.port.szczecin.pl/	**Ports of Szczecin and Swinoujscie** are managed by the joint company: Szczecin and Świnoujście Seaports Authority and is in north-west Poland at the mouth of the Oder River. The port complex has some of the largest port facilities in the Baltic Sea region with dense direct traffic to/from Scandinavian and Baltic countries. Szczecin-Świnoujście seaports are connected to inland waterways, enabling barge shipments (e.g., to the Berlin and Brandenburg regions). The port has a great focus on developing the connection and application of the inland waterways and has plans on modernization of the Oder Water System and eliminating barriers for inland shipping. There is further a development of a project that will connect Oder and Danube through the Danube–Oder Canal.

Inland regional hub ports



www.hafen-hamburg.de

The Port of Hamburg is located on the river Elbe in Hamburg, 110 kilometers from its mouth on the North Sea. The Port is known as Germany's "Gateway to the World" and is the country's largest seaport by volume. The port is a deep-water port and can handle the largest seagoing container vessels and has access to the inland waterways. In terms of TEU throughput, Hamburg is the third-busiest port in Europe (after Rotterdam and Antwerp) and 15th-largest worldwide. In 2021, after the recovery from corona, the port had a total of 128.7 million tons throughput and 8.7 million TEU.

Port of Hamburg is deeply anchored in the European inland waterways and a highly important node port. In 2021 approximately 11,000 inland waterway vessels called on of the approx. 100 berths especially designated for inland vessels and transported around 7 million tons of cargo.

Cargo leaves Hamburg on the River Elbe and the canals into the hinterland. There are regular services on the middle and upper Elbe in the direction of Magdeburg, Aken, Torgau, Riesa, Dresden and Czech Republic. Along the Lower Elbe Brunsbüttel, Cuxhaven and Glückstadt, among others can be served. In the Elbe Lateral Canal the link to the Mittellandkanal is also the connection to Braunschweig, Fallersleben, Haldensleben, Hanover and Minden as well as to the Ruhr region and the inland ports of the Rhein, Main, Mosel and Neckar. Cargo also finds it way to Berlin via the inland waterways.

https://www.duisburg.de/

Duisburg-Ruhrorter Häfen is the largest inland port in the world and is officially regarded as a "seaport" because seagoing river vessels go to ports in Europe, Africa, and the Middle East. Docks are mostly located at the mouth of the Ruhr where it joins the Rhine.

Each year more than 40 million tonnes of various goods are handled with more than 20,000 ships calling at the port.

The Port of Duisburg lies at the junction of the Ruhr and Rhine rivers about 190 kilometers from the North Sea in western Germany just 37 kilometers east of the country's border with The Netherlands. From the port there are connections to the German North Sea ports through the Rhine-Herne Canal and the Dortmund-Ems Canal

Hafen Mannheim

https://www.hafen-mannheim.de/

Mannheim Harbour, named Rhein-Neckar-Hafen Mannheim, is a river port on the Rhine in Mannheim, at the confluence of the Rhine and the Neckar in Baden-Wurttemberg.

It is one of the most important inland ports in Europe. The port covers 3.42 km² of water (2.83 km² Rhine, 0.59 km² Neckar) and 8.635 km² of dockland. The total land area covered from the harbor is about 11.31 km² and it is the biggest inland port in Germany based on this measure.

The Rhein-Neckar-Hafen Mannheim reflects a trimodal transport node at the junction of road and rail links and two national waterways and offers various transshipment facilities. The port has rail connections to all German and many important European commercial centers, and it can be accessed by road via several main motorways.

The port provides 1,527 storage silos and bunkers for grain, coal, gravel, cement, fruit, feed, and other bulk goods with a total capacity of over 385,000 tonnes and 1,078 tanks for liquid products like mineral and edible oils, with a total capacity of almost 1.5 million tonnes.

Inland node ports

T-Port Logistic Campus XL Businesspark Twente https://www.tportcampus.com/	**Almelo 'port'** is a part of a larger business park in the Twente region in the Netherlands called XL Businesspark Twente. The Almelo 'port' is rather considered a logistics hub with the intermodal option of also moving goods from road and to sea and vice versa. The port operation is managed in a collaboration between Combi Terminal Twente (CTT) and the Port of Rotterdam and offers an inland terminal on site of T-Port Logistic Campus. CTT mainly provides container shipments and reaches large parts of the German hinterland and many other European final destinations.
HAFEN Hildesheim  http://www.hafen-hildesheim.de/	**The port of Hildesheim** started operating in 1928 and mainly served the 'Stichkanal Hildesheim' (branch canal Hildesheim) via the Bolzum lock. The port of Hildesheim lies in southern Lower Saxony and is a transshipment point for different goods and products and a throughput of more than 600,000 tons per year. The port has modern equipment with cranes with a lifting capacity of 12.5 tons, grain loading systems and unloading heads for tankers. The depth of the canal and harbor is 2.30 meters and has a width of 61 meters.
ČESKÉ PŘÍSTAVY, a.s.  https://www.czechports.cz	**The port of Miřejovice,** or rather the Transhipment centre Miřejovice is a very small ship loading and unloading quay on the river Elbe in the Bohemia, Czech Republic. The transhipment centre is operated by České přístavy that deals with port and transportation operations in severel Czech ports and storage and warehouse operations.

Digitalization of Inland waterways DINA and DIWA

Digitalization in the shipping industry plays an increasing role and there are several different attempts from various actors in the inland waterway to implement a solution that smoothens the loading, unloading, and calling of ports. To make a more uniform implementation of the different attempts, the two European projects Digital Inland Waterway Area (DINA) and Digitalization of Inland Waterways (DIWA) have investigated different solutions and created plans for how to implement digitalization in the inland waterways in northern Europe. The objective of DINA was to Identify the potential solutions and analyze the data requirements and thereby define a concept for the entire inland waterways. The DINA project was concluded in 2017 with the formulation of a roadmap with two main foci:

> *"Standardization and governance: providing adequate governance mechanisms to develop and maintain the standards used in DINA. This can provide the necessary economies of scale. In addition, this is needed to align with developments in other modalities.*
>
> *Public-private collaboration and shared innovation programmes to develop the various components of DINA and to encourage the development of new digital service as part of it."*

To elaborate on the results of DINA, the DIWA projects was established to develop a masterplan for digitalization of inland waterways.

> *"The Masterplan will consider the adaptation to the evolution of the policy, and it will be based on (inter)national business developments related to the inland waterways traffic and transport domain, as well as on the game-changing technological developments of recent and coming years."*

The DINA and DIWA projects show that the digitalization efforts of the inland waterways are rather dispersed, but that it is something that the EU and other governing bodies seeks to streamline and encourage the development of. A central first step is to incorporate the existing Electronic Freight Transport Information (eFTI) that is used in road and rail transportation in Europe today to share freight information of goods in the inland waterways as well. A better integration of the eFTI will develop a secure and harmonized regulation and data sharing of cargo information and enables logistics operators to enrich the transport information with vessel positioning, track and trace and a reliable estimated time of arrival to actor of the supply chain. The new EU Regulation 2020/1056 eFTI on Electronic Freight Transport Information is expected to come into force in August 2024.

Such initiatives as digitalizing the freight transport information is different from the system that is known in overseas shipping between seaports. For the most part handling of documents and freight transport information is handled by shippers and ship agents and do not necessary place great responsibility on the port administrations, however, there could be a need for additional data sharing and shipping information that is required from the Port of Vordingborg, if they succeed, together with shippers, to have logistics operations at the inland waterway.

Additional information on DINA, DIWA and digitalization of the inland waterways may be found through the links below.

https://www.masterplandiwa.eu/
https://www.inlandnavigation.eu/eu-topic/digitalisation/
https://www.inlandwaterwaytransport.eu/digital-inland-waterway-area-towards-a-digital-inland-waterway-area-and-digital-multimodal-nodes/
https://hhla.de/en/magazine/inland-waterway-ships-in-the-port-of-hamburgs-digital-network

Marketing organizations

Many German logistic companies are organized in marketing organizations that are organized as a network that bring cargo owners together with logistics operators. This enables a contact point between those that wish transport of goods and those that can carry out the transport assignment. Such organizations could be a relevant meeting point for the Port of Vordingborg to both meet logistics operators that could have an interest in using the ports' location and infrastructure.

The logistics operations in the European inland waterways are different from traditional shipping at sea and road transportation. These marketing organizations collects partners from both road, sea and inland waterways and bring them together in a forum where they benefit from each other's presence, capabilities and needs and demands. If the Port of Vordingborg wish to enter the inland waterways, it would make sense to join such an organization. During the North Sea Connect project partners have established connection to some relevant organizations that may be of relevance to collaborate with.

Below is a small description of two relevant organizations that could be of interest to the Port of Vordingborg and to Business Vordingborg.

Hafen Hamburg MARKETING

Hafen Hamburg Marketing (HHM) or 'Port of Hamburg Marketing' is a member-based marketing organization that helps companies and organizations to interact with the port of Hamburg and the Port of Hamburg to interact with its customers.

The Port of Hamburg is the largest port in Germany and a port of international importance to many countries in the EU. Along with its members HHM is active worldwide to further strengthen its market position.

HHM was founded in 1985, the Association has been campaigning with success for thirty-five years for Hamburg as a port and logistics region. The Port of Hamburg now enjoys a positive image all over the world, with focus on professionalism, efficiency, and innovation.

HHM is soundly based both nationally and internationally. At a total of twelve locations, the staff at headquarters and the representative offices champion the interests of Hamburg and the region's industry. Experts in the market regions cultivate contacts with companies in trade and industry, the transport and logistics sector, trade associations and political decision-makers.

HHM has other ports as member organisations that benefits from the interaction with the Port of Hamburg through this membership. Some of the port members in the HHM is Port of Gothenburg, Rendsburg Port, Rostock Port, Port of Kiel etc. while examples of shipping companies are Mærsk, Samskib and Karl Gross. Apart from shippers and ports there are members from various tourist organisations, goods owners, shipping organisations etc. In total, HHM has approx. 250 members.

The HHM could be a relevant organization for the Port of Vordingborg to be member of. With a membership of HHM the Port of Vordingborg would benefit from participating in large international trade fairs where the Port of Hamburg is present. A co-location on such trade events would attract potential customers that the Port of Vordingborg could attract either as customers for shipment at the inland waterways of potentially to establish business on their port.

Another organization of interest to either the Port of Vordingborg or Business Vordingborg is the Logistik-Initiative Hamburg (LIH).

Logistik-Initiative Hamburg (LIH) is a public private partnership with more than 550 member companies and institutions from the Hamburg metropolitan region and beyond. The Public-private partnership is the largest location network in the logistics industry in Europe with a network of logistics service providers, industry & trade, research & development, start-ups, numerous public institutions, and industry-related companies.

LIH works as initiator, and manager of projects at regional, national, and international level, to create benefit for the logistics industry and the logistics location Hamburg. LIH works with relevant issues at an early stage, coordinate the initialization of projects and mobilize its members to implement joint activities. LILH support logistics-related companies and institutions and transfer of knowledge between business, science, politics, and administration.

Logistik-Initiative Hamburg has members from several logistics companies and production companies with activities in Northern Germany and LIH hence organize several companies that has logistics operations that also reach a Danish customers and recipients of goods from Germany. Becoming member at LIH will ease the opportunities for the Port of Vordingborg to get in dialogue with logistics operators that could support a development of a greater goods transport to the inland waterways.

Road map and four steps

To be able to utilize the opportunities as a smart remote node forwarding a sustainable development in logistic and tap into the market for goods transport and the inland waterways market - the port of Vordingborg, together with Business Vordingborg based on this road map need to initiate some initiatives.

These initiatives have been included in a four-step road map.

Step 1: *Become member of marketing organizations*

There are several marketing organizations that gathers actors that has operations in the European inland waterways. In the northern Germany the two most obvious organizations are Hamburg Hafen Marketing and Logistik Initiative Hamburg that both have many members in the inland waterways market and in the maritime industry.

- As a member of such marketing organizations, the Port of Vordingborg will be presented to potential transporters and gods owners that could be of relevance to the inland waterway market and the location and position of Vordingborg.

Step 2: *Attract relevant customers to the port and the ports hinterland*

The port of Vordingborg in collaboration with Business Vordingborg and the municipality of Vordingborg should focus on defining, attracting, and selecting companies that could be of relevance in relation to the European inland waterways. The port already has a set of highly relevant companies at the port and there are more to come within the growing power-to-x industry. Such companies should be either buyers and/or sellers of mainly bulk products, and they should consist of both existing companies, but also new companies that could import/export and consolidate commodities at the port.

- This step should be initiated with a network meeting with relevant partners that could see a potential in the inland waterways. This includes local companies (some are described in this analysis) that has export to other parts of Europe, and European companies that has export to Denmark. The port of Vordingborg is undergoing several development stages and should develop a strategy to attract the most valuable customers.

Step 3: Link with dry port in Vordingborg

The Port of Vordingborg is concentrated around dry bulk and especially stone, gravel, and agricultural products. However, the types of goods that are transported at the inland waterways is to a large degree iron and steel products, but also a great share of agricultural products. Container logistic is a typical cornerstone in a dry port so an attempt to move into this market should be investigated.

- The port of Vordingborg build on its existing company base within the dry bulk but also investigate the opportunities of the container segment to support a development of a dry port.

Step 4: Digitalisation of inland waterways

For the Port of Vordingborg to be seen as a potential northern part of the European inland waterways - the development of the digitalization requirements must be recognized as an important development.

- The eFTI-rules must be addressed to ensure that the port will fulfill the obligations and needs from the coming development on digitalization of the inland waterways.

Conclusion

The study has shown that there is a potential for the Port of Vordingborg to position the port toward the European inland waterways. Large volumes of different types of goods are transported along the waterways. However, the transport that comes from sea to river/canal is highly based on transport of iron and steel and not an area of expertise nor obvious business segment for the Port of Vordingborg. The large amounts of goods transport on the inland waterways do, however, also have a potential for the central business areas that are present today at the port of Vordingborg.

The analysis shows that there is a relevant group of companies at the Port of Vordingborg today that could be of relevance to realizing the potential of shipping in the inland waterways. The success of attracting companies within the power-to-x industry to the Port of Vordingborg adds additional relevance to this potential.

If everything goes as planned there will be two larger green fuel production companies at the port in 2024 and it is expected that these companies will need raw material for its production and a market for the product and a share of this could be of relevance to the European market. While the Fehmarn fixed link will ease the transportation at road there are still some types of goods, mainly bulk, that are relevant to transport by sea and the Port of Vordingborg has some potentials in that direction.

Transportation at the inland waterways is, to a larger degree than maritime transport, based on smaller transport companies where networking and 'knowing the right persons' is of great importance. There are habits and traditional shipping patterns that needs to be broken down for the Port of Vordingborg to be able to enter the market.

Sea going shipment is based on much larger loads in much larger vessels, whereas the inland water transportation consists of smaller vessels and hence smaller loads per vessel. Inland waterway operations are to a much greater extent involving smaller companies that need to be approached in a different way than the traditional maritime shipping companies.

The sea-river transport is of importance in the most of western Europe with transport on and to the Rhine as the route with greatest importance. However, some sea-river transportation also takes place through the Danube–Oder Canal and Kiel canal. The clear advantages of sea-river transportation are that there is need for one less loading/unloading or transshipment of the goods and hence an opportunity to bring down the total cost of the products.

The relatively short distance that need to cover at sea between one of the entrance ports to the inland waterways and the Port of Vordingborg could entail that the Port of Vordingborg could become a potential northern partner in the European inland waterways. The port can handle larger vessels and secure a transshipment into smaller vessels at the port that then could be sent into the inland waterways.

Due to the current development of the digitalization efforts of the inland waterways the eFTI-rules must be addressed to make the Port of Vordingborg able to follow the ongoing digitalization trends that takes place at the inland waterway.

The road map suggests four steps that could be followed by the Port of Vordingborg to get started with activities that could get the port to operate in the inland waterways.

The Port of Vordingborg has showed great achievements in expanding the port area and attracting activities to these areas both due to the location of the port in the Baltic Sea and because of a support and dedicated management. These attributes should also play a large and decisive role for the development of the market that is concerned with shipping in the inland waterways. Some of the traditional seaport behavior is different from the behavior that is seen among inland waterway shipping and these barriers need to be broken down for the port of Vordingborg to succeed with this business potential.

In total, there is a potential for the Port of Vordingborg to realize the potential of achieving some transportation to the European market through the inland waterways, however, this potential is not achieved without a dedicated focus.

BUSINESS CASE – VORDINGBORG DRY PORT

Preparing the business for the Fehmarn fixed link

Activity: WP 4, Pilot 3
Version: Final
Date: 23/03/2023

Conducted by
GEMBA Seafood Consulting
for

Business Vordingborg

Preamble:

This business case is developed as a part of the Interreg North Sea project North Sea Connect. North Sea Connect is co-funded by the Interreg North Sea Region Programme under priority 4: Promoting green transport and mobility.

This business case should be seen in connection with the results from the two reports; "Inland waterways" and "Baseline study" made as a part of the North Sea Connect project. This Business case is produced in cooperation between Business Vordingborg and GEMBA Seafood Consulting A/S in the period January 2022 to December 2022.

Definitions:

Industrial parks:
An industrial park is in this report defined as an area or settlement of typical production companies in the outskirt of a city/village – these parks do normally not have more than 4-5 km. to the nearest motorway exit.

Business parks:
A business park is defined as an area or settlement of often mixed business as service companies, shops, restaurants and in some cases companies with production.

Logistics center:
A logistics center has a close connection to motorway exits and typical have an advanced/diverse business structure with different types of companies, fuel stations, restaurants/café/shops and other service functions connected to the logistic operations and freight companies.

Dry port:
A dry port has the same facilities as a logistic center but also utilizes the synergies due to intermodality between motorway, sea logistics, a seaport or inland port and to some extend also train connection. The dry port includes a strong position on containers based on land or sea logistic.

Vordingborg area:
In this study the term "Vordingborg area" is used as common description of the Business Park Vordingborg (BPV) at exit 41 on E47 and the Industrial Park Ørslev (IPØ) at exit 40 on E47. Business Park Vordingborg is located directly to the motorway exit 41 and Industrial Park Ørslev is located 4 km from the motorway exit 40.

1 EXECUTIVE SUMMARY

DRY PORT IN VORDINGBORG AREA

The business case shows a potential for a dry port in the Vordingborg area, and the location with the greatest potential is at Business Park Vordingborg due to its proximity to the motorway.

The positive business case is based on two external and one internal argument. External: The increased transport in the area and the reduced travel time to Germany. Internal: The potential of a dedicated management to fulfill the plans for a future dry port in the Vordingborg area.

The three arguments for a positive business case are elaborated below.

The Fehmarn Belt fixed link will increase transport in the TEN-T corridor:

- The increased traffic triggered by the Fehmarn fixed link will make the area of Vordingborg to a relevant location for a future dry port, combining the easy access between motorway and sealogistic via the Port of Vordingborg.
- The greening of the future logistic infrastructure will give a dry port with a sustainable profile unique selling points - especially in connection with the power-to-x strategy in the Port of Vordingborg.
- The development of dry port in the Vordingborg area will give potential to new business and companies from Germany and in this way be supportive to the development plans of the Municipality of Vordingborg.
- The calculations based on the estimation of economic impacts shows a fully developed dry port in the Vordingborg area will create new workplaces and positive turn over.

The Fehmarn Belt fixed link will reduce travel time to Germany and Europe:

- The reduction in travel time by truck to less than three hours from Vordingborg to Hamburg will create new business opportunities in Vordingborg area if the locale infrastructure is in line.
- The coherence between the Northern German region and the southern Zealand will be stronger and more integrated in the future with new business opportunities as an output. The access to open/free business areas is central for utilizing this coherence.

Redeeming these potentials in realty - requires:

- A dedicated management of the dry port to - identify potential (German) companies, attract logistic providers with a green profile and a capacity to see and operate the development of the new dry port.
- A masterplan with a business-oriented development strategy combined with accessible municipal development plans and regulation that are supportive of the development of a dry port in the Vordingborg area.
- A focus on identification and planning of the potential synergies that are existing between the Port of Vordingborg, and a new dry port combined with an efficient modality function.

2 OBJECTIVES

This business case is conducted as a part of the Interreg North Sea project North Sea Connect. North Sea Connect is a project co-funded by the Interreg North Sea Region Programme and belongs to priority 4, Promoting green transport and mobility. The project is led by Port of Hamburg Marketing and the business case is conducted by Business Vordingborg in cooperation with GEMBA Seafood Consulting A/S.

This business case will investigate how a new dry port in the Vordingborg area can utilize the expected logistic impacts from the new Fehmarn fixed link.

A dry port in the Vordingborg area should be based on a stronger integration between the Port of Vordingborg, the Business Park Vordingborg (BPV) at exit 41 on E47 and the Industrial Park Ørslev (IPØ) at exit 40 on E47. In this study it is assumed that both areas have potential to be developed into a future dry port.

In this context it is central to see the expected changes on the logistics patterns between Germany and Sweden - on ferry routes - as a part of the future picture for a dry port in Vordingborg. This integration of a dry port in the Vordingborg area should be seen in connection with the potential of the Port of Vordingborg to utilize its position close to the mid-European inland waterways as described in the report “Road Map – potential of inland waterways for the Port of Vordingborg” made as part of this project.

Themes to be analyzed in this business case include the competitive landscape for a potential new dry port in the Vordingborg area, locations and available areas, reasons for the establishment of a dry port, estimated potential economic impacts and a brief SWOT analysis. Finally, recommendations are made for the next steps of fulfilling the idea of a new dry port in Vordingborg area

This study is structured with a business case approach and can be seen as the first investigations for the decision makers in the Vordingborg area to establish a dry port.

The study should give the decisions makers in the Vordingborg area – Port of Vordingborg, Business Vordingborg and the Municipality of Vordingborg a greater insight into the potentials from a new dry port in the Vordingborg area.

3 BACKGROUND AND SET UP FOR A DRY PORT IN VORDINGBORG

There are several reasons for why it is of relevance to investigate the development of the Fehmarn Fixed Link and identify the potential of a dry port in the Vordingborg area. In this business case the ambition is to see the impacts from a full development of a dry port in the areas in the business parks IPØ at Exit 40 or BVP at Exit 41 on E47.

The background and framework around a potential dry port in the area of Vordingborg are illustrated in the points below:

- The Fehmarn fixed link is planned to open in 2029 and due to this there will be large increases in road traffic passing through the Municipality of Vordingborg. Even though this increase in road traffic is some years ahead it is of great importance to be ready to utilize this opportunity and to identify the potentials for a dry port connected to the Port of Vordingborg.

- Over the last years the Port of Vordingborg has seen a large increase in goods throughput, port expansions and new activities on the port. In this way a dry port will have a function as a connection point between highway, seaport and potentially train. A new dry port will serve as an extra support to the developments on the Port of Vordingborg position and the business structure in area of Vordingborg

- The green transition in the logistic sector will in the future be an important driving force. In this way a development and positioning of a new dry port with a green profile combining a new green fuel infrastructure will have interest for the logistic sector and the users of logistic as documented in the earlier Baseline report. The ambition of reducing the emission from land transportation is in line with the strategies of the power-to-x production taking place in the Port of Vordingborg already.

- It is expected a developed and well-integrated dry port in Vordingborg area will result in positive socio-economic impacts in the municipality and hence be supportive of the Vordingborg Municipal plan 2018 that set up the following goals for business areas:

    - Laying out of areas for business purposes must ensure that Vordingborg Municipality is an attractive municipality to attract, start up and develop companies in.

    - New areas must support the urban pattern and must primarily be in connection with existing cities, as well as business areas near the overall infrastructure. Laying out of areas and frameworks for business purposes must ensure that significant nuisances from business areas to the environment and the rest of the urban community are avoided.

The new Fehmarn fixed link provides the Vordingborg area with a unique opportunity to use its geographical position to develop a dry port. The advantage of a dry port in Vordingborg is further supported by the connection between motorway, sea/port, available business areas.

3.1 The Fehmarn fixed link

The Fehmarn fixed link is expected to be ready by 2029 and a substantial volume of goods transportation by road is expected to be directed in that direction.

The new link will reduce travel time between Denmark and Germany and bring the Vordingborg area closer to the European logistics network. New logistic patterns will be created in the transportation routes to and through Denmark. From a logistics perspective, it is important to be ready for the opportunities that will arise. Figure 1 below illustrates the Fehmarn fixed link and green spot indicates the position of the Vordingborg area and the blue spot the new Fehmarn fixed link.

Figure 1: Indication of the Fehmarn fixed link

The fixed link will shorten the travel time from approximately one and a half hour including waiting time at the ferry to approximately ten minutes by car. The ferry crossing of today gives passengers a break from driving and has by many lorry transporters been used as the required brake that secures the travel safety of lorry transportation. With a distance in time of three hours to Hamburg and one and a half hours to Copenhagen after the Fehmarn fixed link is constructed the Vordingborg area will see more lorry traffic at the highway than before the fixed link. This development provides the Vordingborg area with an improved position to develop logistics services such as repair shops, fueling stations, and rest areas for the passing. The increased traffic also provides the Vordingborg area with an improved foundation to develop a dry port that connects the port of Vordingborg to the motorway system.

It is expected that an increase in traffic is going to happen quickly as soon as the tunnel is completed, and plans should therefore be in place well before that time. The risks of not being ready for the Fehmarn fixed link is to be left behind when the development starts and to miss the opportunity to utilize the geographical advantage of the Vordingborg area.

The info box below provides a technical insight in the capacity of the Fehmarn Belt Tunnel.

Info box: Fehmarn Belt tunnel

The Fehmarn Belt Tunnel is an immersed tunnel that is under construction and will connect Puttgarden in Germany to Rødby in Denmark. The tunnel will replace the current ferry that makes the crossing, and is intended to improve the E47 between Denmark and Germany. With a length of 18km, and a budget of 55 billion DKK, it will be the largest infrastructure project in Denmark's history, surpassing the Øresund bridge. Construction of the tunnel started in 2020 and is expected to be completed in 2029.

When the construction of the tunnel is completed, travel time between Puttgarden and Rødbyhavn will be cut with one hour compared to the ferry, with a train ride of 7 minutes and car ride of 10 minutes. The journey time between Copenhagen and Hamburg will also be cut significantly, from four and a half hours to two and a half. This substantial reduction in time will make it easier to commute between Germany and Denmark, allowing for better international collaboration and for work abroad. The tunnel will be open 24/7 regardless of weather conditions.

The tunnel will also result in greener transportation. The contruction of the Fehmarnbelt tunnel means that international trains and lorries passing through Denmark will be saved a 160km detour, thus significantly reducing their CO2 emissions. Switching the transport of freight from lorries to environmental-friendly electric trains will also be attractive. Additionally, a faster route and more freight transported by trains will free up capacity on the roads, resulting in less queing.

3.2 Consolidation of goods and the potential of a dry port

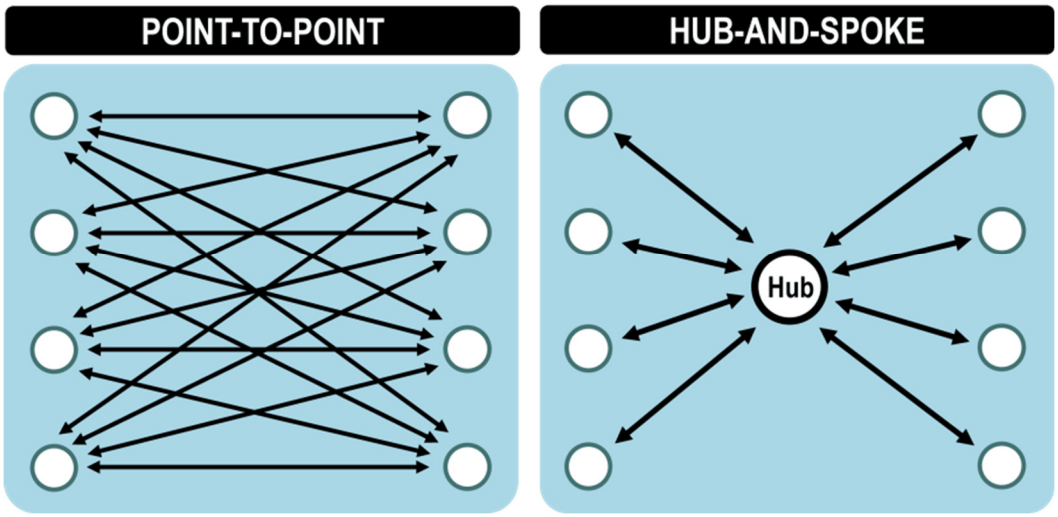
The rationale of a dry port is to be able to consolidate goods in one location and forward the goods in specific quantities and volumes to specific locations, including a level of modality between different form of logistic.

One of the central elements in this consolidation is the “hub-and-spoke system”. The location of Vordingborg in relation to the Fehmarnbelt and to the hinterland makes it well-suited to be a hub in a hub-and-spoke system. A hub-and-spoke system functions by having a central hub where all the goods is transported to, unloaded, and reloaded in to another vehicle. Contrary to the point-to-point system where goods is transported from point to point, the hub-and-spoke system functions by all goods being transported to the same hub. The system reduces unnecessary transportation time and improves capacity utilization, hence making transport more efficient.

For the case of Vordingborg, the dry port as a hub in a hub-and-spoke system would be fitting in the light of the transportation routes and the Fehmarnbelt. Vordingborg is located such that containers from the German side of the Fehmarnbelt tunnel naturally will pass by the municipality. From the Danish side of the tunnel, trucks from Jutland, Funen and the western part of Zealand will arrive Vordingborg through route 22.

Trucks from the eastern part of Zealand, Copenhagen, and Sweden will reach Vordingborg by route E47. Vordingborg is hence the first location where these trucks will meet, and is therefore optimal for a hub-and-spoke system. A truck coming from Malmö can thereby drive to Vordingborg, unload, and reload with efficient capacity utilization, instead of driving the whole way to e.g., Hamburg, and then drive back with only half the capacity utilized. Figure 2 illustrate the impact from a hub-and-spoke system.

Figure 2: An illustration of the differences between point-to-point and hub-and-spoke.



Source: The Geography of Transport Systems[1]

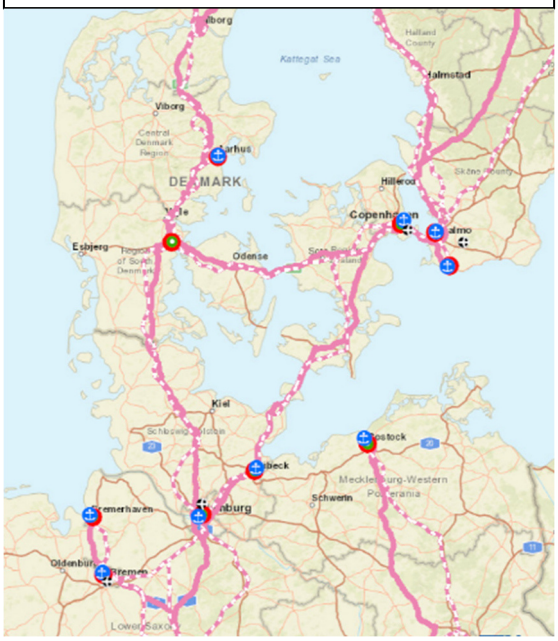
[1] https://transportgeography.org/contents/chapter2/geography-of-transportation-networks/point-to-point-versus-hub-and-spoke-network/

4 COMPETITIVE LANDSCAPE FOR A DRY PORT IN VORDINGBORG AREA

The competitive landscape for a dry port in Vordingborg will consist of other dry ports and logistic centers. To understand the competitive landscape, it is of relevance to define what a dry port is.

Dry ports, based on the German definition used by Deutsche GVZ-Gesellschaft (DGG), are located several places in Denmark and the northern part of Germany - see figure 3. DGG refers to dry ports as "freight villages," and the German definition appears in the textbox in figure 3.

Figure 3: Dry ports in northern Europe



Textbox: GVZ

DGG gives the following definition of dry ports (freight villages):

Freight village can be defined as:

a. Settlement of transport-oriented (independent) companies, logistics service providers and logistics-intensive trade and production enterprises in a commercial area.

b. Freight villages should contain an intermodal road/rail or inland waterway/road/rail terminal with open access to every potential user.

c. Locations with commercial and non-commercial synergy potentials for the tenants, including the establishment of suitable organizational structures (i.e., FV development company is recommended).

In Germany, GVZ (Cargo Distribution Centre) refers to larger logistic centers with connection to road and rail. Several GVZ's have sea connection to seaports or inland ports. German GVZ's has all three transportation modes.

Different dry ports and logistic centers may also serve as inspiration for a future dry port in Vordingborg and may be competing with a dry port in Vordingborg for the same increased transportation.

Below is a list of dry ports and logistic centers that either are close to Vordingborg or for other reasons may be considered relevant in this relation. There are other dry ports and logistics centers that could also be of interest, but these eight examples can be seen as examples that has a somewhat similar operation as it is expected that a dry port in the Vordingborg area will have.

The investigated list of competitors below is not total list of competitors around a new dry port in Vordingborg.

4.1 Local/short distance competitors:

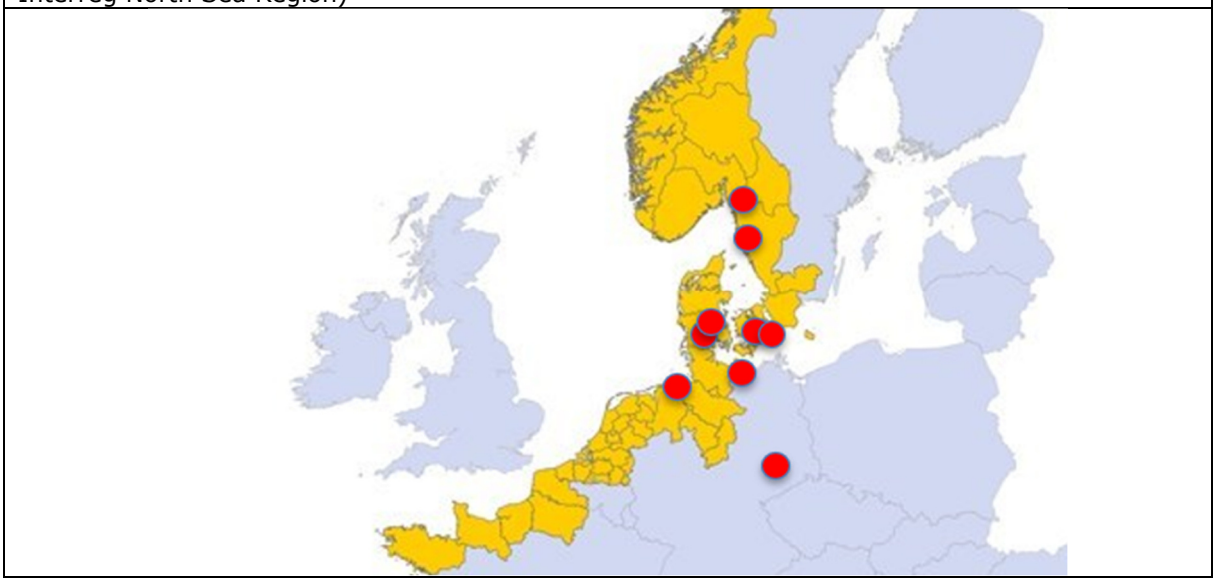
- **STC Køge – Denmark**
  - STC Køge is selected to show how a local port (Køge Havn) in an active way over a period on 20 years in a managed way can develop an efficient dry port and business area with approximately 3.000 employed. STC is and will be a competitor for container transfer to a potential dry port in Vordingborg. A potential dry port in Vordingborg should not copy the business structure/functions of STC.
- **Taulov Dry Port – Denmark**
  - Taulov Dry Port is selected to show how a location in a crossway between two motorways and a port area can develop a dry port with international potential and position. The Taulov Dry port will be a competitor for container transfer from the northwestern part of Germany.
- **E20 Park Copenhagen - DK**
  - E20 Park is selected to show how a private entrepreneur can develop a business park with a coming dry port function without a seaport position nearby. The E20 Park is under construction and will be new competitor able to take away container from both STC (due to overload) and a potential new dry port in Vordingborg.
- **Nord Logistik – Lübeck – Travemunde - DE**
  - Nord Logistik is selected to show how a private logistic operator can develop a position as a provider of more than just logistics - playing a central role for the traffic between mid-Germany and Scandinavia. Nord Logistik might be seen more as a potential collaborator with a new dry port in Vordingborg able to supplement the goods through put.

4.2 International-Global/Long distance competitors:

- **Gothenburg Logistik – Port of Gothenburg Logistics Park - SV**
  - Gothenburg Logistik is selected to show how a global oriented seaport can develop a strong dry port function. The function is based on narrow connection between an efficient train, sea, and motorway modality. Gothenburg Logistik is a long-range competitor to a new dry port in Vordingborg due to emptying impact from a logistic node.
- **Moss Dry Port – NO**
  - Moss Dry Port is selected to show how a local port (Moss Havn) can develop a dry port function based on the modality between motorway and sea only. The design and planning of Moss dry port have been developed by the Port of Moss. Moss Dry Port may not be seen as direct competitor to a potential dry port in Vordingborg but has similarities in relation to distance to the port and the metropolitan area.
- **GVZ Bremen – DE**
  - GVZ Bremen is selected to show how a well-developed dry port with an advanced business structure gathering a workforce of more than 10.000 employed. The GVZ in Bremen is branded and promoted in relevant medias and in this way well know area. The GVZ in Bremen is a long-haul competitor to a potential dry in Vordingborg due to its emptying impact on a remote node as the Vordingborg area.
- **GVZ Berlin West – DE**
  - GVZ Berlin is selected to show how a new developed dry port will play a role in the coming new structure due to the fixed Fehmarn belt connection. The position near to the metropole Berlin is decisive for the development. GVZ Berlin can be seen as direct and strong competitor on the east-Europe transfer for a potential dry port in Vordingborg.

Figure 4 shows the location of the investigated dry ports and logistics centers.

Figure 4: Location of investigated dry ports/logistics centers (the yellow area indicates the Interreg North Sea Region)



The structure of the eight logistics centers and dry ports are summed up in table 1. Some of the logistics centers and dry ports is already fully finished and under operation, while other dry ports and logistics centers are under development. The business types varies in the centers and dry ports.

Table 1: Logistic centers/Dry ports – Local competitors and Long-range competitors

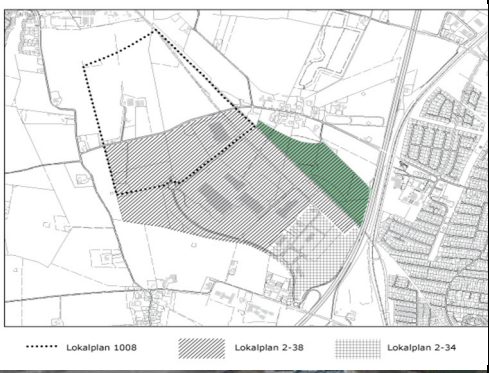
Logistics center/dry port	Capacity/ha	Established	Business types represented
STC Køge	2500	2001	Logistics and service
Taulov Dry Port	900	2016	Logistics
Gothenburg Logistik	270	Fully finished in 2025	Multiple businesses
Nord-Logistik - Lübeck	30	2016	Logistics
Moss Dry Port	45	2018	Logistics
GVZ Bremen	4750	1985	Multiple businesses
GVZ Wustermark - Berlin	2260	1995	Mutiple businesses
E20 Park Copenhagen	380	2022	Under development

Through an analysis of the logistics centers and dry ports it is evident that the combination of road, sea and rail plays an important role as backbone for the ability to function as a dry ports. This means that adding a dry port function into one of the two existing business parks in Vordingborg appears to create a solid foundation for a new stronger logistic structure in the Vordingborg area.

In the following section, the selected logistic centers and dry ports are described and should be seen as a description of the competitor landscape but also serve as inspiration for the work with establishing a dry port in Vordingborg.

STC Køge – Denmark

Skandinavisk Transport Center (STC) in Køge is one of Zealand's biggest coherent business and transport areas. The area of STC is (1.800 ha).



Port of Køge and the STC are owned by the municipality of Køge and run as a single company. STC is experiencing new growth since the municipality of Køge has approved a new local plan allows construction of warehouses up to 30 meters in height. STC wished to increase the maximum height because our costumers' inquired areas with the possibility of higher ceilings since there are automated warehouse systems and other storage equipment that are adapted to this exact height.

The local plan for STC marks a part of the business policies of Køge municipality. One of the primary goals is to maintain the position of the municipality as a regional and national center for transport and logistics. A step in this direction is the planned development of STC.

Taulov Dry Port – ADP – Denmark

Taulov Dry Port is a 900-ha large multimodal transport and logistic center, located within an easy reach of the motorway network (E20/E45), a railway, the Port of Fredericia as well as Billund Airport. The central location, providing easy access to both customers and local markets.

The central location in the European transport hub enables Taulov Dry Port to offer the Danish transport and logistics sector new opportunities for optimizing their transport value chains. The Port of Fredericia link via Taulov Dry Port an 887-ha hinterland area where modern storage and logistics facilities and possibilities for handling and transshipping goods between port, railway, and road.

The Port of Fredericia give access to areas near the quay right next to 15 meters of water and newly built storage facilities in Taulov Dry Port. Taulov Dry Port offers customized and scalable storage solutions in the intersection of motorways, a railway, and a port. A total of 95-ha storage and logistics properties is used of several companies.

In the beginning of 2023, further 60-ha storage and logistics premises will be ready to meet customers demand for modern warehouse facilities with a central location.

E20 Park Copenhagen – Denmark

Located 25 minutes south of Copenhagen city centre, the 38 ha sita has capacity for up to 150-ha of modern warehousing that can meet the needs of the customers. The business park is attended to address the issue of the lack of logistics space in the Greater Copenhagen region.

The business park is located by the main highway connecting Denmark with Germany and Sweden, hence a strategically good location for logistics. The highway, called E20, is also where the business park has gotten its name and is one of the key reasons why it was establish in this location.

There is great public transportation by the business park, with several bus stops and train stations for the S-Train in walking distance. Moreover, over 40% of the danish population lives within an hour's drive of the site.

The business park is developed in collaboration between Verdion and Aviva Investors. It is currently under construction and is expected to be completed in 2022.

Gothenburg Logistik – Port of Gothenburg Logistics Park - Sweden

Port of Gothenburg runs a one million square meter logistics park emerging directly beside the port. The area offers opportunity for companies seeking to establish warehousing operations in the heart of Scandinavia. A location for storage and logistics services with proximity to the port and automotive cluster.

Highway:
Several European highways meet in Gothenburg – E6, E20 and E45 Oslo, Stockholm, Malmö, and Copenhagen are all within 3-5 hours gives opportunity to establish warehousing operations at the largest port in the Nordic Region.
Expansion of highway 155 the route leading to the port have been improved.

Rail:
The Port Line is one of the most important rail links in Sweden and allows freight from all over Scandinavia to reach the port in Gothenburg. Some 60-70 freight trains use the line every day of which 25 are part of the intermodal system. With double tracks across the Göta River, the vulnerability of train traffic has decreased markedly.

Sea intramodality:
Investment in road and rail access will be done soon major to ensure easy access to the port by road and rail. The Port Line is the 10 km railway that links the Port of Gothenburg to the rest of the Swedish rail network.

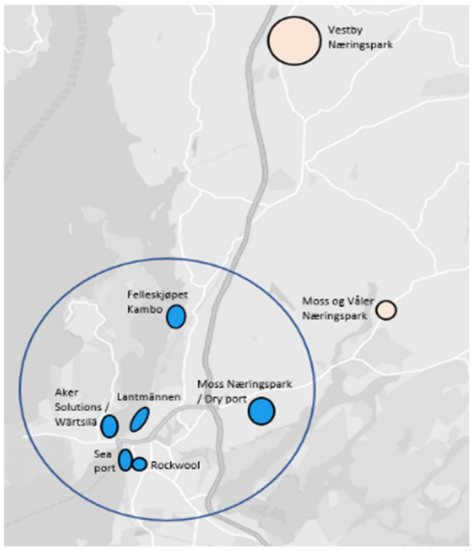
Moss Dry Port – Norway

The central and urban location of the port areas and quays of the Port of Moss means that there is an upper limit for companies to expand at the central areas.

This has been solved by the development of a dry port in 2018. The dry port enlarged Port of Moss by 45 ha and enabled an opportunity for the port to develop its position on container handling. With approximately 5 km to the container port, the dry port is located conveniently for transport of containers between the two areas.

Additionally, proximity to the E6 highway allows for efficient import and export. With its location at the eastern side of the Oslo fjord, Port of Moss has become a central logistics hub in the southeastern part of Norway. The southeastern part of Norway has approximately 2 million inhabitants and thereby approximately half of the Norwegian population.

The establishment of the dry port that neighbor the Moss Næringspark strengthens the Moss-region's ability to be a center for logistics and reinforces the position of the Port of Moss in the logistics system.



Nord Logistik – Lübeck – Travemunde – Germany

Lübeck based freight forwarding company, founded in Lübeck in 1984. Nord Logistik is a successful German SME providing logistics service throughout the Baltic Regions and Continental Europe.

Warehouse logistics with gap seals and cross-Docking lay-out. Cargo control, data processing and related services. New warehouse extension of 5,000 sqm opened in 2018, equipped with high-rack storage system.

50 departures daily to:
Sweden: Greater Malmö, Helsingborg, Trelleborg, Kalmar
Denmark: Kolding, Fredericia, Odense, Svendborg, Holstebro, Køge, Brøndby, Copenhagen
Benelux: Gendt, Antwerp, Rotterdam, Utrecht, Venlo, Zwolle Southern
Germany: Nurnberg, Würzburg, Augsburg, Karlsruhe, Stuttgart, Kempten, and the Ruhr Area: Gütersloh, Düsseldorf, Mönchengladbach, Krefeld, Grevenbroich.

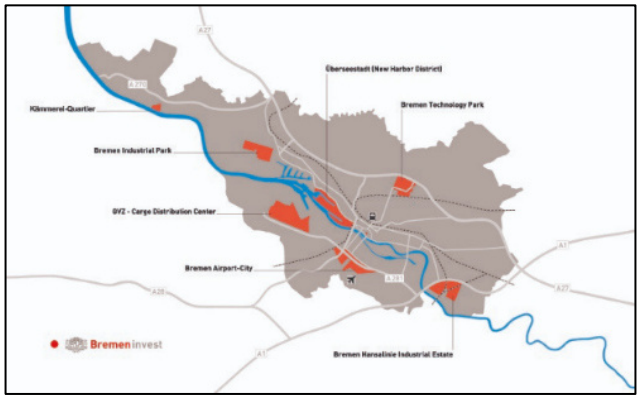
GVZ – Bremen – Germany

The Cargo Distribution Center Bremen is the number one in Germany and in Europe. Recently, the amount of logistics space that it offers exceeded 1.3 million square meters for the very first time.

The companies that are based at the center benefit from the outstanding infrastructure and the pooling of industry expertise and offer high-quality services in every segment. Because of all these positive aspects, there is constant demand for the logistics premises at this site.

Currently, around 22 ha of this is ready for development

Area: 4750-ha
Ca. 160 companies with ca. 8.700 employed.
Biggest high-level storage in Europe
Integrated train, truck, port terminal
Ferry service inside port area

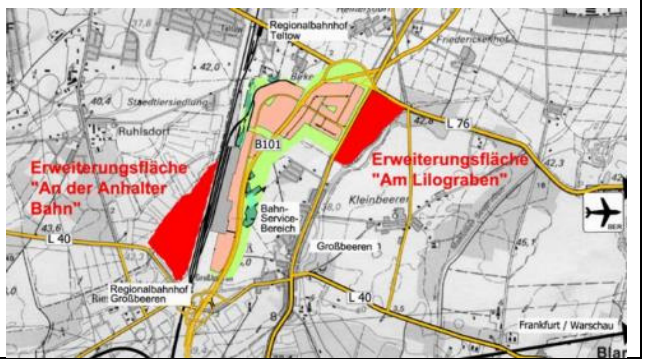


GVZ – Berlin West Wustermark - Germany

The location is characterized by its trimodal connection to national transport axes. The main railway lines from Berlin to Hanover and Hamburg and its own rail/road transshipment terminal, the Berlin ring road with its own junction and the four-lane federal highway B5 to Berlin and a public inland port with a connection to the German overseas ports.

The GVZ Wustermark is accessible by water via the public port operated by HavelPort Berlin GmbH.

Area: 2260-ha



5 ORGANISATION - OWNERSHIP STRUCTURE OF DRY PORTS

The study of the various dry ports and logistics centers reveales great variations in their organisational set-up and ownership structure. In the following some perspectives of these variations are provided.

- If the dry port is in close connection to, and initialized by a sea port it is often under full ownership of the sea port. This is the case with Moss Dry Port and STC Køge. However, Taulov Dry Port, which has a close collaboration with the Port of Fredericia, has no ownership relation to the sea port. Taulov Dry Port is owned by two private companies and as such ownership structure shows that a close collaboration with a sea port does not necessarily mean that the sea port needs to be an owner of the dry port.

- Another approach to the ownership structure can be seen with Gothenburg Logistik. The owenrship of Gothenburg Logisitik is shared between the public Port of Gothenburg, and the private property developer Castellum. This partnership suggests that a shared ownership between private and public partners is another feasibile way to structure ownership of a dry port.

- The private logistics centers with little connection to a sea port is often owned by private companies. This can be seen by the ownership of E20 Park Copenhagen and Nord-Logistik – Lübeck. In the case of E20 Copenhagen, the ownership is shared between Verdion and Aviva, while Nord-Logistik – Lübeck is solely owned by Nord-Logistik.

The organization at owner level and at management level will play a crucial role for the ambitions and success of a dry port in Vordingborg. The management of the dry port can with advantage be placed in a “private” holding company owned by the municipality – this construction should include the authority to sell the land areas and property and attract new business to the area.

The management of the dry port should be given the opportunity to manage and develop new customer relationships and an ability to make quick decisions based on the market development and give an expected flexibility in the price setting structure. Of importance in an administration view for the new companies is also the “single table” approach between the municipality and new companies entering the dry port.

The various perspectives of the organizational structure and ownership of the studies dry ports and logistics centers shows that in some of the cases there are actors such as property developers and investors that has an important role on the dry port and logistics centers. Below is a presentation of four companies that can serv as a source of inspiration for further contact or that may be of relevance to the potential development in the Vordingborg area.

LOGICENTERS INTELLIGENT LOGISTICS FACILITIES BY NREP	**Logicenters** is a provider of modern logistics properties. The company develops, re-develops, and owns logistic properties in key locations in the Nordics. More specifically, the company is present in Sweden, Denmark, Norway, Poland, and Finland. It has its expertise in modern logistics and offer state-of-the-art logistics solutions. The company is the leading provider of logistics properties in the Nordics, where it manages 2 million square meters of space. Over the last decade, Logicenters has completed more than 25 projects.
Verdion	**Verdion** is a real estate investor, developer, and asset manager, specializing in the industrial and logistics sector and operating across Europe. The company has its expertise in developing and funding logistics hubs and is currently a partner in the development of the E20 logistics hub in Copenhagen. Verdion has its headquarters in London, with offices in Düsseldorf, Frankfurt, Copenhagen, and Gothenburg.
DGG Deutsche GVZ-Gesellschaft mbH	One of the organizations with the most experience and expertise within dry ports/ freight villages is **DGG**. DGG acts as an umbrella organization for the German freight villages, GVZ. The organization promotes and facilitates for communication and cooperation among the German freight villages. DGG is active in research and consulting projects and assists in the development of freight villages in the European Union.
Logistik-Initiative Hamburg	**Logistik-Initiative Hamburg** is a network consisting of more than 550 members within logistics. The initiative focuses on promoting the Hamburg metropolitan region for logistics solutions. The network operates as an initiator, catalyst and manager of projects and solutions. Although the emphasis is in Hamburg, the initiative also has operations outside of Hamburg.

6 CASE VORDINGBORG

Locating a future business operation in Vordingborg provides businesses with a competitive position in terms of logistical opportunities.

The travel time to Germany and the European mainland will be reduced by the future Fehmarn fixed link. The strong infrastructure supports the companies' needs of an easy access to the Øresund Region and the rest of Scandinavia with less than one hour to Copenhagen and three hours to Hamburg.

Based on the analyses above and the accessibility of vacant land areas two sites in the Vordingborg area has been selected for a further investigation for the potential to be a future dry port:

- Industrial Park Ørslev (IPØ) at exit 41 on E47.
- Business Park Vordingborg (BPV) at exit 41 on E 47.

The two red circles in figure 5 below show the location of the two parks in relation to road and rail.

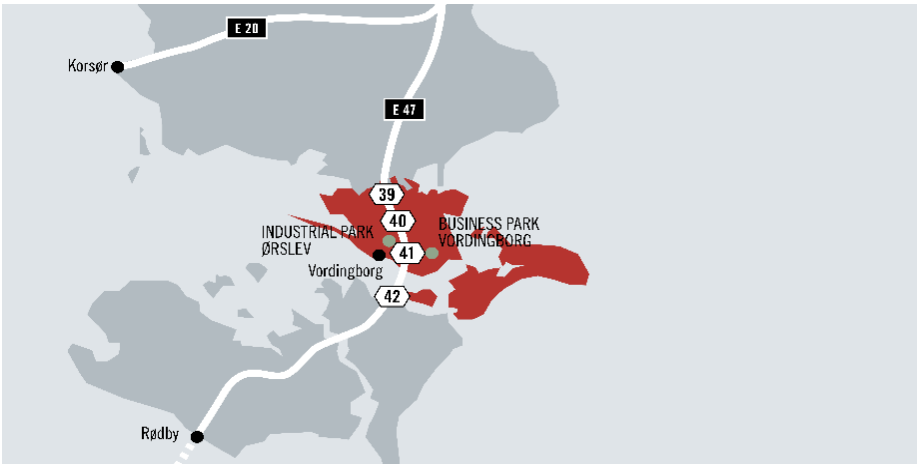
Figure 5: Location of Industrial Park Ørslev and Business Park Vordingborg – motorway/rail

Both locations are close to the motorway, a modern commercial port and railway. The commercial port in Vordingborg and the railway also offer transport options close to the two parks.

6.1 IPØ - Industrial Park Ørslev

Industrial Park Ørslev is located 4 km to the southern highway Exit 40 at Udby and the location is indicated at figure 6.

Figure 6: Highway exits to Industrial Park Ørslev and Business Park Vordingborg



The industrial area is approximately 48 ha, with vacant areas of approximately 15 ha. The Municipality of Vordingborg has a large residual volume in connection to what is expected to be utilized over the municipality's 12-year plan period (2018-2030). The area provides development opportunities for companies and commercial properties. The area is relevant for businesses with special transport needs. The vacant areas in IPØ are illustrated in figure 7.

Figure 7: Vacant areas (yellow) in the Industrial Park Ørslev – August 2022

6.2 BPV - Business Park Vordingborg

Business Park Vordingborg is located directly at exit 41 on the E47 motorway and near the city of Vordingborg a location with strong infrastructure and easy access offering commuting opportunities to attract employees. From BPV the companies can reach a combination of road, rails, and water. A road of 5 km leads directly to the commercial port of Vordingborg. With the new Storstrøm Bridge and the Fehmarn belt Tunnel the infrastructure around Vordingborg is further optimized.

The Municipality of Vordingborg has prepared a district plan for BPV for business purposes. Several companies have located their businesses in BPV.

Spatial planning:

Across the entire local plan area, a maximum building percentage of 40 applies, and the maximum building heights vary between 8.5 meters, 12 meters and 18 meters.

With building heights of up to 18 meters, it is essential to ensure a satisfactory visual experience along the primary thoroughfare through the area which is also one of the local area's primary thoroughfares (connecting Vordingborg with Kalvehave).

A total of 30 ha of commercial land has been laid out along the E47 motorway at exit 41, with vacant areas of approximately 20 ha.

A future expansion of the business park will, when the national plan directive is finally adopted, be expanded by 41ha.

According to the urban management plan for the area next to exit 41, it is possible to build commercial buildings for companies with a special transport need within the following business areas: transport, warehousing, logistics, manufacturing, wholesale, and service activities, including electricity and gas charging stations as well as petrol stations, restaurants adjacent to a gas station or a transport center.

The area may also be used for restaurants, administration, offices and for retail trade with larger space-consuming product groups in the form of timber trade, construction market, car sales and other motorized machine sales. A retail store can also be established in connection with a petrol station. A map and arial photo of BPV is seen in figure 8.

Figure 8: Business Park Vordingborg – August 2022

6.3 Experience from other dry ports and logistics center

To support the case of developing a dry port in the region of Vordingborg, two interviews with two dry port initiatives has been conducted. The interviews are used to provide additional perspectives on the rational of developing a dry port in the region and include some learnings from these two existing initiatives. The interviewees were asked about the main reasons for a successful implementation of the dry port and logistics center and what learnings that are central for the initiative in Vordingborg. The two interviewees are Thomas Kampmann CEO from Skandinavisk Transport Center (STC) and CEO of Port of Køge and Øystein Høsteland Sundby, CEO of the Port of Moss and their dry port.

Based on the case of developing a dry port in the Vordingborg region, Thomas Kampmann highlighted following relevant experience from a more than the 20-years long development of STC:

- Local political agreement and support by the city council (100 percent) throughout the process has been a prerequisite for success.
- The local support from the city council combined with a flexible local plan that can deal with the need of building in height in the area.
- One point of entry for users and land tenants - marketing and sale function must be separated from municipal level and ensured that the relationship between responsibility and competence is correct.
- The location close to the motorway is central, plus the advantage of a motorway junction to the south and west. Close to 1.8 million consumers to the north (Greater Copenhagen and the Øresund Region).
- The connection to the port is central - however, there has been less synergy between the port and the transport center than expected. Logistics consolidation combined with business development has created the foundation for transporters to have easy access to a return load - which gives a competitive advantage for logistics operators.
- The design of a service area was central from the start and the focus has been on developing all functions associated with logistics such as workshops gas stations etc.
- Access to potential additional areas that can be used to expand the existing business has shown important for the area. More and more areas got quickly sold after the first areas were sold, indicating that there were synergies between the companies that established there.

The new logistic pattern between Germany, through Denmark to Sweden due to the new Fehmarn Belt connection was confirmed to be a potential opportunity for a dry port in Vordingborg area – especially due to the situation with fully developed centers in Køge and Ringsted.

Another interview with Øystein Høsteland Sundby was made to get additional insight on the development process in a more recent, though successful development of a dry port. The main challenge for the Port of Moss was the lack of new business areas at the port. The ambition was to create a dry port along the motorway and connect the seaport to this.

The most relevant points are:

- A strong core company (i.e., the Port of Moss) in the new structure has together with an estate developer played a central role in the successful implementation of a of dry port in Moss.
- The location next to the E6 and a strong focus on the container segment are central elements in the realization of the dry port.
- There was a local collaboration with the municipality that secured that there was support for the initiative from the administrative and regulatory perspective.
- The dry port opened in 2019 with 250-300 employees and it is expected that by 2023 the area will be developed and serving up to 700 employees.

Some of the central learnings from these interviews are that first, there needs to be a potential for the initiative – i.e., there must be some companies that sees a potential in operating based on the chosen location. The demand for using the location for logistics services should be present and may be able to attract additional activity when first established (synergies). On this matter, a dry port in the Vordingborg area is of great relevance. The increased transport in the region due to the Fehmarn fixed link, means that more lorries will be passing the area and there will be an increased need for logistics services. However, this is an established circumstance and a fact that is also observed by other actors in the region.

Both interviewees highlighted the need for local political support for the success of a dry port. In both cases the municipal showed support and were able to provide a flexible approach to the local plan to ensure that those needs that the operators had could be accommodated. These statements are in support of ensuring that the area is ready for the dry port in the sense that the municipality can secure the right frames for the tenant. In the Vordingborg case this is a subject that also needs consideration and that Business Vordingborg is already working on. It may be considered a prerequisite for a successful implementation and operation of the dry port that there is this form of support from a local administrative and regulative perspective.

In the Moss and Køge cases the administration and development of the area was put in the hands of the local port administration, i.e., the Port of Moss and the Port of Køge. This independent administration has shown to be of great importance to the development of the areas. The municipality has provided the frames and it has been up to the two port administrations to fill these frames with relevant companies. A similar approach should be followed in the Vordingborg case, whether the administration should be hosted by the port is not the most relevant issue, but the Vordingborg port administration could be an obvious partner for such an endeavor. However, the Port of Vordingborg also need to able to see some synergies and potentials that may can be supportive of the existing business in the port.

The Port of Moss had a collaboration with an estate developer (Skolt Eiendom AS) that backed the actual development of the area to become leased to tenants. An intermediate land developer and supporter like this could be of relevance in the Vordingborg case.

During the North Sea Connect project, Business Vordingborg, together with the Port of Vordingborg and GEMBA Seafood Consulting went on a study visit to see and talk to potential partners in Northern

Germany. The objective of the study visit was to meet potential logistics operators who may be interested in setting up business in Vordingborg and learn about their way of thinking and doing business.

During the study trip, two logistics operators with relevance for this business case were visited Nord-Logistik in Lübeck and China Logistics Center in Itzehoe. Below is a description of these two companies and the learnings that were generated from that visit.

SERVICE-ORGANISATION NORD-LOGISTIK GMBH Nord-Logistik is a relevant company because they are located where they are with easy access to the Nordic market and especially due to their close collaboration with PostNord. Nord-Logistik's operations are built around the possibility of reaching back and forth to their logistics center with their trucks in 24 hours. This means that each truck has an action radius of approx. 6 hours, which incl. breaks, unloading / loading, return journey, and potential challenges, allow them to return to their base within 24 hours. With the base at Lubeck Port, Nord-Logistik can reach e.g., Malmö, Copenhagen, and Aarhus, where the wagon is either placed and driven on by another driver, or the goods are brought to another warehouse. Nord Logistik's business model is to run a warehouse, office, driver, trucks, etc. They operate exclusively for PostNord and receive packages from e.g., Zalando warehouse in southern Germany, and bring it to the customer who has ordered clothes / shoes in the Nordic market.
CLC CHINA LOGISTIC CENTER China Logistics Center (CLC) in Itzehoe is owned by Tietje Group which is a family-owned business that is specialized in e-commerce solutions (B2B/B2C) The Group is currently leading three locations in Germany (Soltau, Itzehoe and Boostedt). The business is not only an interesting company due to their long history but also because it is a very opportunity driven and transformative company that was initially specialized in the coal trade and now work with logistics and e-commerce. The new Fehmarn Belt connection may create new opportunities for the Group in terms of the reach to Scandinavia, creating new possibilities for business development opportunities along the Fehmarn corridor. CLC expressed interest in operating at new locations and are well aware of the opportunities that the Fehmarn connection will create.

The study visit to the two logistics operators showed that there are operators in Northern Germany that are also realizing the potential that the Fehmarn connection brings. Nord-Logistik saw the fixed link as an opportunity to reach additional destinations and be back at the base in Lübeck at the same time. CLC on the other hand was interested in operating logistics operation from other destinations which could also include Danish locations.

The two logistics operators gave a relevant insight into the logistics operations and the great variation there are between such companies. The two visited companies could serve as further inspiration to an understanding of logistics in the German market and could be seen as potential operators on the potential dry port in the Vordingborg area. The nexts steps in such directions should be taken soon to secure the identified potential.

6.4 Economic impacts from potential dry port:

Locating and developing a dry port will lead to positive local socio-economic impacts in terms of local job generation, value creation and increased municipal taxes. It is possible to assess the degree of socio-economic gains through an Economic Impact Assessment (EIA). An EIA takes point of departure in the employment in a specific area by looking at what type of employment there is and adds to that a multiplicator.

There are great variations in the multiplicator that should be added to an industry based on the number of suppliers, need for technical assistance etc. For instance, a public office that has very few suppliers and sub deliveries do not have a large impact on the hinterland. On the contrary, a production company with many suppliers and need for servicing technical equipment etc. has a larger indirect impact on the hinterland. The direct employment and indirect employment create additional activity in increased household consumption.

This means that the EIA evaluates the socio-economic impact on three levels:

- **Direct impacts** are the impact created by the defined activity in the measure region.
- **Indirect impacts** are determined by the direct activity's use of supplies (including purchase from other businesses), services, and labor in the region.
- **Induced impacts** represent the economic activity and jobs created in all local industries due to consumers' consumption from the new household incomes that are generated by the direct and indirect effects of the final demand changes.

These three impacts may be summarized to the 'total economic impacts' that hence includes the direct impacts, indirect impacts, and induced impacts. The multiplier that has been used for this study is the total multiplier including impacts from direct activities on both indirect and induced activities.

The foundation for the calculation of potential socio-economic impacts of the dry port is based on empirical examples from tree studies with similarities to the Vordingborg case.

The Port of Moss has from 2016 developed a dry port in the hinterland to the seaport and its economic impacts were assessed in 2020. The port of Moss is centered around very autonomous container handling and transport, which is different from the port of Vordingborg and is expected to have less employment multiplier than the Vordingborg case.

The analysis of Port of Køge (Køge Havn) and Skandinavisk Transport Center have some similarities to the potential case of Vordingborg. The Port of Køge and Skandinavisk Transport Center is organized under one organizational unit and has been propelled by the dedication of the management team that, apart from having a great location, also have been able to find and close contracts with relevant business partners.

The final study, "Vejgodstransportens økonomiske fodaftryk", has a broad national approach on the multiplier effects within road transport. The study does not provide an estimate of revenue per employee but assess an employment multiplier that is expected to have similarities to the potential dry port in the area of Vordingborg.

The employment multiplier that is used in the following analysis is set to 1.56 and hence in the middle of the two Danish studies above and a little higher than the Norwegian study of Moss. The economic ratio of revenue per employee (measured as Full Time Equivalent FTE), (DKK million/FTE) is in the Norwegian study assessed to 1.16 and in the analysis of Køge Havn and Skandinavisk Transport Center, to 1.20. The increase in inflation and ongoing automation and digitalization in the logistics chain may lead to an increase in productivity and hence a higher ratio of revenue per employee. The exact ratio cannot be calculated - but is assessed to be 20% percentage higher than the Køge study that is most similar to that of Vordingborg, and the applied ratio is therefore 1.44 million DKK/FTE.

Table 2 has an overview of the studies and the employment multiplier that has been used in these studies.

Table 2: Studies and the multiplier that has been used in similar studies and those that will be applied in this study

Selected studies for the assessment of the multiplier:	Employment multiplier	Revenue per employee (DKK million/FTE)
GEMBA 2020: Port of Moss – ringvirkningsanalyse	1.50	1.16
GEMBA 2014: Køge Havn & Skandinavisk Transport Center – oplandsanalyse	1.58	1.20
Dansk erhverv 2019: Vejgodstransportens økonomiske fodaftryk	1.54	N/A
Applied multiplier in this study	**1.56**	**1.44**

As seen in table 2, the multiplier that has been used for the current study is 1,56. This means that for every full-time employee at the logistics center another 0.56 FTE is created. With the settled multiplier an estimation of the employment impacts on the current lay-out of the business park and industrial parks may be conducted. Table 3 creates an overview that supports the calculation of the economic impacts of the business park and the industrial park.

Table 3: Overview of the structure of the two current potential locations		
Area	**IPØ**	**BPV**
Established	1975	2018
Number of companies	8	13
Type of companies	Production companies, recycling site, material site, printing shop, plumbing, Fitness.	Construction, gas stations, car dealer, car wash, fast food, rental agency.
Estimated number (FTE)	199	84
Area under operation (ha)	157	57
FTE/1,000 m^2 in operation	1.27	1,47
Available area –short-run (ha)	156	63
Available area – long-run (ha)	314	76 (+300 for additional purchase)
Energy supply	District heating	District heating
Ownership and owner plans	Municipality of Vordingborg	Municipality of Vordingborg
Price (DKK/ha)	69.000	85.000

Table 3 shows that there are 199 employees in IPØ and 84 in BPV. These employees are spread out at 157 ha in IPØ and 57 ha at BPV and by using the employment multiplier of 1.56 the total employment effect may be calculated – see table 4.

Table 4: Current employment (FTE) in the two parks, indirect and induced and the total employment.		
	IPØ	**BPV**
Direct employment 2022	199	84
Indirect and induced 2022	111	47
Total 2022	**310**	**131**

As it may be seen from table 4 the 199 direct FTE in IPØ and 84 direct FTE in BPV gives rise to additionally 111 FTE in IPØ and 47 in BPV in total

If the two parks manage to rent out the land that is available in the short run (i.e., additionally 156 ha in IPØ and 63 ha in BPV) and it is assumed that the developed area has a similar employment rate per sqm it could give rise to the employment impacts that are seen in table 5.

Table 5: Additional employment (FTE) potential in the short run of the two parks, including indirect and induced and the total employment with both parks.		
	IPØ	**BPV**
Direct employment developed	198	93
Indirect and induced developed	111	52
Total developed	**309**	**145**

As seen from table 5 the rent-out of the area available in the short run gives rise in the employment of extra 309 FTE in IPØ and 145 in BPV.

On a longer run, it could be possible to include additional areas that could become available for renting out or selling. In IPØ this could lead to an additional 31 ha and in BPV there is an option of purchasing another 30 ha on top of the 76 ha that is available in the short run, meaning that it could be possible to

rent out 376 ha in the long run. Table 6 shows the potential additional employment impact that this additional land may give rise to.

Table 6: Additional employment (FTE) potential in the long run of the two parks, including indirect and induced and the total employment with both parks and including both

Area	**IPØ**	**BPV**
Direct employment developed	381	552
Indirect and induced developed	213	310
Total developed	**594**	**862**

Table 6 show that by selling the entire area to companies that will have a similar take-up of land per FTE an additional 594 FTE could be added to IPØ and an additional 862 FTE could be added to BPV.

The numbers in table 5 and 6 relate to a high degree of uncertainty depending on what type of companies that will purchase the land. There are great differences in how much employee there is required to operate a large warehouse with a high degree of automation and digitalization and more manual business such as specific production companies, auto shops etc. Some trading activities of e.g., oil or gas can generate a very high revenue per employee as there is not much manual activity involved in the process compared to other economic activities.

The numbers in the two tables, however, indicate that the two areas possess a room for adding valuable employment to the region and should be seen in that perspective. This means that as there is a great potential for creating additional employment at the two areas the potential needs to be unlocked and the business need to be attracted and established before the potential impacts may be realized.

Whether the potentials will be achieved and whether they will be achieved in both areas at the same time is also connected with uncertainty and will be heavily dependent on the degree to which an operator will be able to attract the right customers to the parks.

From table 2 the revenue per employee is assessed to 1.44 million DKK pr FTE. This means that the total employment in the area as of today, the short run developed, and the long run developed can be summarized as in table 7.

Table 7: Total revenue million DKK today, short run and long run

	IPØ	**BPV**
Revenue today	446	189
Additional revenue - short run	445	209
Additional revenue - long run	855	1,241
Total revenue	**1,746**	**1,639**

As shown in table 7, the additional revenue that may be generated in the to two parks is substantial and give rise to increased value creation and municipal tax in the region. These benefits are, as it is the case with the employment impacts also prone to the same uncertainties in relation to what type of business that will be attracted and the degree to which they will become developed.

Besides the socio-economic impacts that are described above, the development of a dry port will improve the development opportunities for a lot of existing companies in the region. With an improved

transport network and opportunities to consolidate and distribute goods and cargo at the center, new business opportunities will be established. Such additional positive impacts are referred to as dynamic impacts or wider economic benefits.

The Economic Impact Analysis done on the IPØ and the BPV show a potential for creation of new workplaces and even if the decision is to only to develop one area further - the economic revenue and impact on tax and value creation is big. From this EIA point of view, a focused effort to enhance and attract new companies to the business parks is obvious and should be a pathway parallel with the coming development of the Fehmarn fixed link.

7 SWOT ANALYSIS – DRY PORT VORDINGBORG

A SWOT analysis can be used to assess the potential of new business. The analysis evaluates the strength and weaknesses of the organization, as well as the opportunity and weaknesses in external influences. The analysis hence considers both internal and external factors to make an overall assessment.

The **strengths** of a dry port in Vordingborg are to a large extent connected and based on the new Fehmarn Belt connection and the potential of modality between land transport and sea transport.

- **Location:**
  The Vordingborg area has a possibility to take advantage of the goods that will come with the completion of the Fehmarn fixed link. With the establishment of new transportation routes in Denmark and Europe, Vordingborg may be able to put itself in a key position for future logistics with available free areas.

- **Infrastructure and logistic:**
  The Vordingborg area is characterized by a strong infrastructure with road E47 and the Port of Vordingborg as a potential for intermodal transport. The proximity of the Port of Vordingborg also gives access to transportation to e.g., the Baltics.

- **Position:**
  The Vordingborg area is close to the German market and the vast German logistics network. Hence, the location and infrastructure of the Vordingborg area gives access to large parts of Europe and other destinations.

Looking at the **weaknesses** of the Vordingborg area as the host of a dry port, following must be mentioned:

- **Lack of container route:**
  Port of Vordingborg does not as of today have any container transport over the quays. Most activities at dry ports are typically based on container handling and modality between sea and land transportation. Developing a container ability may be relevant as future step as highlighted in the Hub and Spoke section. A container strategy is a this point missing in Port of Vordingborg.

- **Lack of rail connection:**
  The railway is running through the Vordingborg Area close to the Port of Vordingborg. An easy access to the railway system from the port area is today a shortage in the establishment of an efficient and attractive dry port.

- **Lack of market position:**

In the logistic value chain the Vordingborg Area do not have a strong market position compared to other dry ports and logistic centers alongside the motorway system. The lack of market position may be hindring a natural utilization of the potentialls. A clear responsibility for the positioning of the Vordingborg Area in direction as a part of the logistic value chain is missing at this point.

Looking at the **opportunities** of the Vordingborg area as the host of a dry port, following must be mentioned:

- **Increased transport and rail connection**
  The Fehmarn fixed link will increase the traffic in the region and there will be a larger need for logistic and services to the transportation sector. Furthermore, the ongoing increase in e-trading requires a higher logistics capacity in general. Vordingborg has a good location (this information is based on interview) to benefit from this development and should embrace it in one way or the other. A new central stronghold in a potential dry port in Vordingborg could be the modality between seaport, road, and rail in the future. Driving time regulation for trucks will give options for creating a natural stop/over or shift place.

- **Local socio-economic benefits**
  By establishing a logistic center/dry port in the Vordingborg area, the value caused by the increase in goods volume from the Fehmarn belt can be captured by Vordingborg and the local community having a highly positive socio-economic impact on the local society.

- **Selecting the right companies and available area**
  By a coordinated marketing effort of the dry port there are opportunities to attract German companies to locate in the Vordingborg area. The available areas in BPV and IPØ to relevant prices will be of interest for German companies looking into expansion to the Nordic area.

Looking at the **threats** of the Vordingborg area as the host of a dry port, following must be mentioned:

- **Proximity**
  A main threat is that the increased traffic is also on the agenda among other municipalities in the region and there will be a strong competition on attracting the traffic to a logistics center in Vordingborg.

- **Awareness and local objection**
  A missing awareness of the potentials from a dry port together with local objections against the logistic activity may be relevant and seen as a potential obstacle for the development of a dry port in the Vordingborg area.

- **Driving by**
  The Fehmarn fixed link have a potential risk of a "passing-by-effect." The connection between the large metropolitan areas of Copenhagen, Hamburg and to some extend Berlin may lead to a situation where 'areas in between' will be neglected and not participate in the benefits that the Fehmarn Belt link will create, and remote node role will be even more fixed in the future.

This brief SWOT analysis shows that there are opportunities for a dry port in Vordingborg to pursue with its strengths. The combination of substantial goods volume from the Fehmarn belt and a strategic good location with a strong route network and important infrastructure, makes the prospect of a dry port attractive. It is important, though, to be aware of the weaknesses of the dry port and the threats from external factors. A sum up of the SWOT is presented in figure 9.

Figure 9: Sum up of SWOT for location of a dry port in Vordingborg area.

STRENGHT Location Infrastructure Position	**WEAKNESS** Lack of container route Lacking rail connection Lack of market position
OPPORTUNITIES Increased transport Local socio-economic benefits Selecting the right companies	**THREATS** Proximity Awareness and objection Driving by

Based on the opportunities and strengths there are some attributes that makes the location more favorable than other potential locations, and these should be used to attract relevant companies and investors. The study has therefore identified a set of unique selling points (USP), that should be used in the marketing of the dry port.

As part of the business case the unique selling points for the dry port can be identified and activated:

- Close to the German market and new relevant position for German companies
- Close to infrastructure (E47)
- Port of Vordingborg and the ability of intermodality
- A TEN-T transport corridor in growth
- Large expansion opportunities and attractive spatial planning
- Competitive prices
- Strong connection to the Baltic Sea area

Special attributes:

- A central ambition in the dry port of Vordingborg is to create a hub with a sustainable green solution in fuel and management.
- Vordingborg is a logistical hub in a labor market with access to international innovation and knowledge and a world-class international business environment.

- In the Municipality of Vordingborg, the conditions for companies are advantageous: the tax rate is reasonable, the coverage tax is zero, and the prices of the land are among the lowest on Zealand.

8 RECOMMENDATIONS

The study give rise to recommendations that may support the development of a dry port. Some of these recommendations should be initiated as soon as possible, while other recommendations may be dealt with a little later and in parallel with the actual attraction of companies.

Recommendation 1: Organization and management

A dedicated management should be put in charge to develop a dry port concept in the Vordingborg area. Market insight and knowledge about the customer base and the actual operation of the area is of great relevance

- A dedicated and independent management with expertise and market insight should be put in charge of the logistics center/dry port. The management should be outsourced from the municipality to an existing management of similar logistics parks or to the port management in the port of Vordingborg.

Recommendation 2: Logistics center/dry port organizational structure

While the management should be taken care of by an independent and dedicated team, the organizational structure should be connected to the municipality.

- A company structure, as a municipality owned limited company as seen in many utility companies and seaports.

Recommendation 3: Identification and selection

An active effort to identify and attract new companies to the dry port is of great relevance for selling/renting out the area – the competition from other areas in Denmark and Germany is present.

- The management in charge of the logistics center/dry port should ensure the identify and attract the right customers to the center. This must be done by engaging active and specific knowledge about the logistics operation in the region.

Recommendation 4: Logistic center + dry port

The area of Vordingborg have a unique opportunity to combine a logistic center with a dynamic port and create value from a common activity.

- It is important to illustrate and highlight the potentials in a combination of a dry port and logistic center and synergies realized in collaboration with the port and in a next move develop a container function in the Port of Vordingborg.

Recommendation 5: Be ready and use socio economic option

Even though there is seven years until the Fehmarn fixed link is established it is of great importance to be ready for potential customers as soon as possible and use the locale socio economic benefits to create wealth and welfare in the municipality. There will be other operators in the area that see the same opportunity and there might not be room for several logistics centers in the region.

- Initiate and engage municipality and ensure that all partners, i.e., municipality, port etc., are ready for the new opportunity the logistic center/dry port possess. The economic impacts analysis done indicate a well-documented positive tax revenue, creation of new workplaces and well consolidated dynamic impacts in both short and long run scenarios contributing to socio economic welfare.

Recommendation 6: Collaboration with the municipality

The municipality is an important collaborator in providing the right frames for a dry port, and the local plans, environmental regulations, safety zones etc., and these plans should be available and preferably accommodate the needs and wants from potential customers.

- Ensure that all plans and regulations are accessible and accommodating what may be expected from a new company that wish to establish a business on the area.

Recommendation 7: Future and strategies

The areas laid out for potential dry port contain areas that is not yet developed and ready for sale should be included in a strategy and the potential usage of these areas should be visualized and completely ready for a potential buyer. Such plans should include a strategy for the area and what that may be achieved from this.

- Make a master plan for the development of the area – what is the vision for the completely developed area, including information on infrastructure, superstructure, and Eco structure.

Recommendation 8: Marketing

To identify and attract potential customers to the dry port with a focus on the four p's: product, place, price, and promotion. The marketing mix including visualization and knowledge about who the customers are is essential for the success of the dry port.

- Create a marketing plan, including visualizations, unique selling points, customer value proposition etc. to highlight the benefits of this exact location and dry port.