The role of port development and cooperation from a strategic perspective / How to create a central hub in STC/Port of Køge and hereby enhance collaboration in the Baltic Sea Region
Final Report
The Role of port development and cooperation from a strategic perspective / How to create a central hub in STC/Port of Køge and hereby enhance collaboration in the Baltic Sea Region

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<tr>
<td>ACL</td>
<td>Amber Coast Logistics</td>
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<tr>
<td>BSR</td>
<td>Baltic Sea Region</td>
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<tr>
<td>BaSIM</td>
<td>Baltic Sea Information Motorway</td>
</tr>
<tr>
<td>EUROPLATFORMS</td>
<td>European Association of Freight Villages and Logistics Centres</td>
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<tr>
<td>FDT</td>
<td>Association of Danish Transport and Logistics Centres</td>
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<td>MoS</td>
<td>Motorways of the Sea</td>
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<tr>
<td>UNCTAD</td>
<td>United Nations Conference on Trade and Development</td>
</tr>
<tr>
<td>STC</td>
<td>Scandinavian Transport Centre</td>
</tr>
<tr>
<td>StratMoS</td>
<td>Strategic Demonstration Project for Motorways of the Sea</td>
</tr>
<tr>
<td>TEN-T</td>
<td>Trans-European Transport Network</td>
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<tr>
<td>TEN-T EA</td>
<td>Trans-European Transport Network Executive Agency</td>
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<td>WP</td>
<td>Work package</td>
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1 Introduction

The aim of this report is to investigate the role of port development and cooperation from a strategic perspective / how to create a central hub in STC / Port of Køge and hereby enhance collaboration in the Baltic Sea Region. At the same time the project is an overview / pre-feasibility study related to two sub questions: How to apply the development of Port of Køge into a hub in order to create a new and central hub in the Baltic Sea Region; and second how to set up a closer cooperation between the Port of Hamburg and Port of Køge in a strategic perspective.

The conducted research is part of the on-going Amber Coast Logistics (ACL) project, which “is a collaborative logistics project that supports the coordinated development of multimodal Logistics Centres and thus fosters the connection of remote areas in the southern and eastern Baltic Sea Region” (www.ambercoastlogistics.eu). This research serves as a joint report of the two Danish ACL partner companies, which are actively involved in the ACL project.

The research - undertaken in relation to the report - could create a great opportunity, a new and innovative strategic solution, a network / cooperation between Sweden, Denmark and Germany in order to connect them with other Baltic Sea countries. The port cooperation between Hamburg and Køge could create a new cooperative “bridge” between Denmark and Germany in connection to road, rail and maritime transport. It is worth to mention that the current project is in line and parallel with the new TEN-T guidelines, which is ensuring “cohesion, interconnection and interoperability of the trans-European transport network” (tentea.cc.europa.eu) of the European Commission.

The project consists of the following different chapters: the Problem formulation chapter highlights the background of the above mentioned research issues. The next chapter gives information on the Amber Coast Logistics project to understand how the research questions are related to a real business problem.

The Methodology chapter describes the research design - System Research Design – the methods for how the research will be evaluated, and the data collection process. The collected data consist of primary (interviews) and secondary data (books, articles, organisational websites, guidelines, reports and case studies).

The Theoretical consideration chapter helps to get a deeper understanding on the topic, it will analyse the Concept of development, Concept of cooperation, Concept of intermodal and multi-modal transport, the Port interfaces and their hinterlands, and the Port development and hub creation. Based
on this knowledge the following sub-parts can be elaborated: *Port of Køge as hub in the Baltic Sea Region*, and *Strategic cooperation between Port of Hamburg and Port of Køge*.

The *Summary and Conclusions* give an overall assessment of the project including all of the main assumptions and finding of the project.

### 1.1 Chart of the project

Figure 1 highlights the structure of the report, the main chapters and the connections between them. It can be easily seen how the Introduction, Problem formulation, Introduction of the partner companies, the Amber Coast Logistics project, the Methodology and the Theoretical consideration are applied in research. The theoretical considerations - Concept of development, Concept of cooperation, Concept of intermodal and multi-modal transport, Port interfaces and their hinterlands, Port development and hub creation - helps to understand the background of the research topic: The role of port development and cooperation in a strategic perspective /How to create a central hub in STC/Port of Køge and hereby enhance collaboration in the Baltic Sea Region/. Based on it the following chapters can be elaborated: Port of Køge as hub in Baltic Sea Region and Strategic cooperation between Port of Hamburg and Port of Køge. The last steps of the project are the Improvement of the concept of cooperation and the Summary and Conclusions.
2 Problem formulation

The research in this report is resulting from activity 4.3 of Work Package 4 in the Amber Coast Logistics project, where the following topic was given: *Elaborate operational challenges at the port interfaces of multi-modal transport chains in the light of their hinterland development.*

In the middle of February 2012 the research topic was further elaborated and together with another involved project partner, STC - Scandinavian Transport Centre / Port of Køge the following Danish proposals for research topics were presented to the partners of WP4. Each of the topics was accepted by the ACL partners after which the report work begun. (see Figure 2):

- Proposal of STC (Scandinavian Transport Centre) / Port of Køge
  - Implement the evolution of port Køge into hub in order to create a new and central hub on the Baltic Sea

- Proposal of FDT
  - Set up closer strategic cooperation between Port of Hamburg and Port of Køge

Both research topics are actual and innovative and highlight real business situations / problems, which serve as a basic to the current research topic: The *role of port development and cooperation in a strategic perspective /How to create a central hub in STC/Port of Køge and hereby enhance collaboration in the Baltic Sea Region/*.

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**Danish Proposal (FDT, STC/Port of Koege) (II.)**

Proposal of STC (Scandinavian Transport Centre)/Port of Koege

- Implement the evolution of port Køge into hub in order to create a new and central hub on the Baltic Sea

Proposal of FDT

- Set up closer strategic cooperation between Hamburg and Køge

**Results/output:**

- Joint partner report included the overview and feasibility study of the mentioned proposals (40 pages).

**Responsible:**

- FDT, STC/Port of Køge

**Deadline:** June, 2012

---

Figure 2: Danish proposal of FDT, STC/Port of Køge of the ACL project, source: Bentzen at al. (2012)
3 Amber Coast Logistics project

The core research topic will be supplemented by an overview and a small scale pre-feasibility study on the following sub-questions: How to apply the development of port of Køge into a hub in order to create a new and central hub in the Baltic Sea Region and second, How to set up closer cooperation between the ports of Hamburg and Køge seen from a strategic perspective. In order to better understand the topic it is important to introduce shortly the Amber Coast Logistics (ACL) project and Work package 4 activity 4.3.

The Amber Coast Logistics project “is a collaborative logistics project that supports the coordinated development of multimodal Logistics Centres and thus fosters the connection of remote areas in the southern and eastern Baltic Sea Region.” (www.ambercoastlogistics.eu)

Main objectives of ACL:
- To improve cargo flows and strengthen economic ties between emerging eastern European countries (Belarus, Russian Federation and Ukraine) and EU member states within the Baltic Sea Region (BSR),
- To facilitate sustainable mutual development,
- To offer transparent services to the market which are neutral in terms of effects on competition.

3.1 Work package 4 activity 4.3

The current project is part of WP 4 activity 4.3: “Operational challenges at the port interfaces of multi-modal transport chains in the light of their hinterland development.” The aim of this activity is “to analyze the current state of affairs concerning the existing maritime and port-hinterland infrastructure along the amber coast and future needs. By making an assessment of needed development of ports as well as functioning interfaces in the transport chain (infrastructure and communication), especially towards their hinterland, concrete transnational strategies and proposals for improving quality and efficiency of hinterland connections along the Amber Coast transport network will be composed.” The results of activity 4.3 are “transnational strategies for improving hinterland accessibility from the BSR ports involved in the Amber Coast Logistics project”. All of the ACL partners are involved in the project, and especially supported by ACL ports and logistic stakeholders. The activity started on January 2012 and a final deadline is September 2013.
4 Methodology

The aim of the Methodology chapter is to describe how the research should be evaluated and what data collection methods are needed. It is a strategy or action plan, which is guiding the project research and explains how to understand and use the different methods and give reasons for the choice of the relevant paradigmatic consideration and presents the research design in details. Based on (Denzin and Lincoln, 1998) it is needed to deploy whatever strategies, methods or empirical materials at hand in order to fulfil the objectives of the investigations. Finding new methods or combine existing ones are also useful to serve the purpose.

4.1 Research Design - System Research Design

Research design described as the “action plan” or “blueprint” of the research. It provides a logical flow of activities that allows seeing the connections between the research questions and the set of data are considered to be relevant to address the questions. It helps to understand how the data have been collected and analysed and the results obtained. Research design is also in connection with the underlying paradigm(s) - meta-theoretical consideration(s) - as well as the empirical material collecting methods (Kuada, 2010, p. 49-50).

Figure 3: System Research Design of the project, source: own creation, based on Kuada (2010)
The relevant paradigmatic consideration is the systems approach; the focus is on the relationship between the individual parts of the system. Related to the current research it means that the world consists of the real business player (Scandinavian Transport Centre (STC) / Port of Køge) and its environment, the transport and logistics industry. There is a relationship between the individual parts of the system and on how the subsystems are in connection and affect each other. The land and maritime transport companies cooperate and are in connection with each other in the Baltic Sea Region. The company has two business problems to solve: How to apply the development of port of Køge into a hub in order to create a new and central hub in the Baltic Sea Region and second, How to set up closer cooperation between the ports of Hamburg and Køge seen from a strategic perspective.

In order to understand how the system operates in a challenging and dynamic world the System Research Design (see Figure 3) is applied in the project. It shows the methodological procedure between the World and the Tools. The World means the Scandinavian Transport Centre (STC) / Port of Køge and its environment, the transport and logistics industry. The Tools of the research are the theoretical considerations - Concept of development, Concept of cooperation, Concept of multi-modal transport and Port development and hub creation –, which are helping the project in the understanding and elaboration of the research topic.

4.2 Methods and techniques – data collection

This section adopts the specific data collection methods and techniques. The data collection strategy is created in connection with the methodology and problem formulation. Based on the chosen methods it is determined what techniques to use in the data collection and how to use the acquired data in the project. It is needed to ensure the validation and reliability of the data.

In order to answer the research question(s) and meet the objectives, there is a possibility to reanalyzing data that have been already collected for other purpose. Such data are known as a secondary data. Another way is to collect new primary data for this special purpose. The appropriate method of the project - systems approach - uses secondary and primary materials.

4.2.1 Primary data

There are three main ways of collecting primary data: observations, interviews and questionnaires. Observations, semi-structured and unstructured interview were part of the preparation of the project; however the use of questioners is not suitable data collection method to conduct the present research.

The first used form for gathering primary data was via informal non-standardised unstructured interviews (no predetermined list of questions) from which was gained deeper insight into general areas of the research topic.
The second type of gathering primary data was to conduct non-standardised semi-structured telephone interviews. The semi-structured interview covered a list of themes and questions. It was sent previously to the participants before the telephone conversations; however, the questions were varying at the end from one interview situation to the others. The first telephone interview was with Sebastian Doderer, the project manager of Port of Hamburg Marketing and the second one with the Thomas Elm Kampmann, the managing director of Scandinavian Transport Centre (STC) / Port of Køge.

Based on both types of non-standardised interviews, the final outline and the content of the project were elaborated. The face-to-face and telephone interviews obtained the valid and reliable information from the respondents / representatives of the organizations.

4.2.2 Secondary data

Figure 4 helps to summarise all kinds of secondary data, which were taken into consideration in the research. According to Saunders at al. (2009) secondary data can be divided into three main groups: documentary, multiple source and survey.

![Figure 4: Types of secondary data, source: Saunders, Lewis and Thornhill (2009)](image)

Regarding the project, several written materials, such as organizations’ databases and websites, journals, newspapers and FDT’s internal communications (e-mails, letters, memos, presentations) were used. In the field of multiple source, both area-based and time-series based secondary data, such as books, journals and government publications (TEN-T guidelines) and case studies were applied.
The aim of using case study as a research technique is to provide support for the analysis in a practical point of view. In order to better understand how to set up a closer cooperation between the ports of Hamburg and Køge, two case studies have been chosen in the field of port cooperation at international level. Both case studies related to the Baltic Sea Region (BSR) and shortly summarize the cooperation between Denmark and Sweden (Copenhagen Malmö Port (CMP)); and between Sweden, Denmark and Estonia (The Baltic Sea Hub and Spokes Project). The first case highlights the cooperation between Port of Copenhagen and Malmö, the second one between Ports of Aarhus, Gothenburg and Tallinn.

4.3 Limitations

A large number of ports are located in the Baltic Sea Region, and in an optimum situation multiple Baltic Sea Region ports should have been involved and interviewed in the making of this report, thus creating an overview of the full sea-based transport chain between the western located and the eastern located Baltic Sea ports. Though, this research report primarily focuses on the development of Port of Køge and later on the strategic cooperation between Port of Hamburg and Port of Køge, so the research focus has been concentrated on these ports. The ports have been selected based on the proposals of two Danish companies, which are involved partners of the Amber Coast Logistics project.

The process of the development of Port of Køge as a hub in the Baltic Sea Region is based on the strategic location of Køge (connect North and South with East and West) and the number of investments supporting the project (new railways, highway extension, opening Fehmarn Belt Fixed Link), while the description / process how to create a logistics centre, combined transport terminal or extend the port area can be representative for all over the world.

The cooperation between the Port of Hamburg and Port of Køge can be seen mainly in the opening Fehmarn Belt Fixed Link, which will ensure a direct link by railroad and highway between northern Germany and Zealand in Denmark. In this way the project is not representative for all the Baltic Sea ports, but due to the applied case studies, the research can be generalized and give useful ideas for other ports worldwide.

Due to the limited time there have been conducted interviews only with the representative of Port of Hamburg Marketing and the managing director of Scandinavian Transport Centre / Port of Køge. It can be a possibility to further develop the project, and conduct interviews with other ports and investigate the opportunity of setting up more cooperations around the Baltic Sea Region.
5 Theoretical consideration

The aim of Theoretical consideration chapter is to demonstrate the selected theories / concepts which are considered to be pertinent to the issues of investigation.

In relation to the research topic The role of port development and cooperation from a strategic perspective the concept of development and cooperation will be investigated. As mentioned in the Problem formulation the research is part of the Amber Coast Logistics project Work package 4 activity 4.3 which task description is: Elaborate operational challenges at the port interfaces of multi-modal transport chains in the light of their hinterland development. In order to get a deeper understanding on this topic, the theoretical consideration chapter will analyse the Concept of intermodal and multi-modal transport, the Port interfaces and their hinterlands, and the Port development and hub creation. Based on this knowledge it can be elaborate the following research questions: How to create a central a hub in STC / Port of Køge and hereby enhance collaboration in the Baltic Sea Region.

5.1 Concept of development

It is important to mention that the concept of development is extremely broad considering the social science, the international and regional, the business and professional, the cultural or other fields of development. This part of the project puts the emphasis on the business development in order to be consistent with the research topic. Business development considers the process of growing the business. According to the world’s most trusted Oxford dictionaries development is “an event constituting a new stage in a changing situation”. The world is in continues development, in order to be competitive on the market, the companies has to apply the state-of-the-art information and communication technologies.

According to Sørensen (2012) the business development refers to "the tasks and processes concerning analytical preparation of potential growth opportunities, the support and monitoring of the implementation of growth opportunities, but does not include decisions on strategy and implementation of growth opportunities". These tasks and processes are developed and implemented by business developers. Both in the development and implementation phases the business developer collaborates with the representative of organization (R&D, Production, Sales) in order to apply the knowledge and feedbacks. In this way the growth opportunity will be successfully integrated.

5.1.1 Methods of business development

According to Johnson and Scholes (2002) there are three different business development methods, which companies can use to execute their development: internal development, joint developments and
external development. Internal development means that the organization builds up its own resources and competences itself. In case of joint developments, the companies can share their existing knowledge and technologies in order to achieve synergy and market advantage. In terms of external development the organizations gain further resources and competences by taking over another company or create one legal entity from the two merging firms.

![Business development methods diagram](image)

**Figure 5: Business development methods, source: own creation, based on Johnson and Scholes (2002)**

### 5.1.1.1 Internal development

The first business development methods is to develop internally, to build own resources, competences and activities. This method called internal or organic development. It is a long process to create own resources, competences and activities. In order to be competitive the companies have to have the state-of-the-art technologies as fast as possible. In this way the internal development is not fully appropriate. On the other hand, to develop all activities individually, the firm needs huge investments in the field of product development and build new facilities. The new areas such as research and development (R&D) cannot always cover the investment cost of the companies. The advantages of the internal development are that the company has a high level of control over its activities. In case of the firm is the first in the market and there is no way to create joint or external development, the company has to take the risk and invest in the development of its own resources, competences and activities. (Johnson and Scholes, 2002, p. 374)

### 5.1.1.2 Joint development

The second method is joint development. Two or more companies / organizations share their resources and activities in order to achieve common goals and strategies. In a fast changing environment is it difficult to secure the necessary skills, ideas, technology and market knowledge alone, but the cooperation with other companies can increase the company’s competitiveness on the market. One of the reasons why companies cooperate is that both firms can concentrate on its own strengths and focus on their core competencies (the activities which they are good at). The jointly working companies can get an access to the resources, competences, products and services of each other, which can improve their efficiency and decrease their costs. By close relationships the organizations can learn quickly from each other and use this knowledge later on in their internal development. The forms of joint
development can be tacit collusion, informal networks, strategic alliances, franchising or licensing, joint ventures or consortia. (*Ibid*, p. 377-382)

### 5.1.1.3 External development

External development offers faster development opportunities than the internal development. The two main forms of this business development method are acquisition and mergers. By the acquisition (takeover) or merger (voluntary fusion) of another company, the firm gets access to the resources, products, services, competences, and knowledge of the acquired company. Most of the time these sources were not available internally, or the development of them would take longer time. In the competitive and globalised world mostly the companies which work in the field of information, media and telecommunication tend to use this type of business development method. It is needed to analyze the cost of the merger and acquisition and compare the potential cost of the internally developed resources and activities (including the risk).

The main disadvantages can be the high risk of the potential problems. It is costly to invest and buy another company, and the internal rate of return is considerable in a long time period. The cultural differences can lead to the collapse of the acquisition or merger. Different type of management, the languages barriers can cause several problems. The expected synergy can also be influenced by the cultural differences and the post acquisition management.

The main advantages of external development are to create strategic and financial synergies through complementary resources and competences. It is easier to overcome the entry barriers to specific or new markets, especially when markets are fragmented (deregulation), acquisitions and mergers are good solutions to quickly penetrate the market and increase the market share. Other motives could be to eliminate competition or getting access to distribution channels or suppliers that might be taken over by other competitors. (*Ibid*, p. 375-377)

### 5.2 Concept of cooperation

The concept of cooperation is a process of working or acting together. In the evolution or in the social sciences the meaning of cooperation is different such as the cooperation between animals or between humans is also different. According to the world’s most trusted Oxford dictionaries cooperation is “the action or process of working together to the same end”. In order to be consequent and connect the right concept of cooperation with the research topic the role of port development and cooperation in a strategic perspective, the theory of cooperation in international business will be investigated including the types and limitation of the cooperation.
5.2.1 Nature and rationale of cooperation

There are a lot of benefits and reasons of the partners to collaborate. Based on Stonehouse at al. (2004, p. 214) collaboration can take place between an organization and any of the following:

- Suppliers
- Customers
- Financiers
- Competitors
- Governments
- Other public organizations

“Collaboration may lead to mergers and acquisitions. More often it can take place between businesses who retain their separate identities but who collaborate in a network on a short or long-term basis.” (Ibid)

According to Contractor and Lorange (2002, p. 9) joint ventures, licensing and other types of cooperative agreements have at least seven more or less overlapping objectives:

1. Risk reduction
2. Economies of scale and or rationalization
3. Technology exchanges
4. Co-opting or blocking competition
5. Overcoming government mandated trade or investment barriers
6. Facilitating initial international expansion of inexperienced firms, and
7. Vertical quasi-integration advantages of linking the complementary contributions of the partners in a “value chain”

In order to further elaborate the easiest way to consider the strategic contribution of a joint venture. In this case the risk reduction means the product portfolio diversification, the dispersion and/or reduction of fixed cost, lower total capital investments and faster entry and payback. Economies of scale and or rationalization mean the lower average cost from larger volume and lower cost by using comparative advantage of each partner. Complementary technologies and patents can reach technological synergy; companies can exchange the patents and territories. In case of co-opting or blocking competition can be created defensive joint ventures to reduce competition and offensive joint ventures to increase cost and/or lower market share for a third company. Overcoming government mandated trade or investment barriers means receiving permit to operate as a “local” entity because of local partner and satisfying local content requirements. According to initial international expansion there is a benefit from local partner’s know-how. Vertical quasi-integration means the access to materials, technology, labour, capital, regulatory permits and distribution channels, there are benefits from brand recognition, establishing links with major players and drawing on fixed marketing establishments. (Ibid, p. 10)
Stonehouse et al. (2004, p. 215) used identification of Reve (1990) to describe two explanations of what holds alliances together:

1. “The economic approach which states that alliances exist between businesses because the parties involved see the possibility of increased profits. Such relationships depend on safeguards to protect the interests of the participants, and the relationship is therefore ‘impersonal and unstable’.

2. The behavioural approach which says that there is value attached to the relationship between the parties involved, social ties are built, there is trust and integrity and personal contacts are important. Such alliances are usually longer lasting and more stable.”

5.2.2 Limitations of cooperation

The previous paragraphs put the emphasis on the strategic and economic rationales for forming cooperative ventures, but there are some limitations of the corporations which should be also assessed before reaching the decision on whether to form a cooperative venture. Working together with another partner is not easy. Cross-border cooperation can have possible “language difficulties, cultural differences, style incompatibilities, differences in values and norms; the anticipated “political” climate within the context of partners’ organization; and the presence of a sufficiently strong “mentor” who will push the cooperative venture.” The importance of the above mentioned “softer” issues can be lessened with careful planning process, so both partners understand the fundamental strategic and economic rationales involved. (Ibid, p. 25) This list can be extended with other potential problems, such as the initial rationale for collaboration may shift over time (e.g., technology changes or one partner has a reduced need for the other), an increase in competitive pressures, which changes the competitive environment for one or both parties; and changes in the market. (Stonehouse et al., 2004, p. 215)

5.2.3 Types of cooperation

As can be seen from Figure 6, there are two basic types of cooperation: horizontal and vertical, which can be divided in upstream and downstream cooperation.

5.2.3.1 Horizontal cooperation

Horizontal cooperation is between two or more companies at the same stage in the supply chain. It is usually an agreement between competitors, who are planning to strengthen the participating companies against outside competition, possibly an aggressive and larger competitor. The horizontal cooperation focuses on sharing the technology, skills, costs and risk. It can also increase scale economy benefits to both parties, thus giving vertical advantage over suppliers.
5.2.3.2 **Vertical cooperation**

Vertical cooperation can be devised in two types. *Upstream cooperation* is toward suppliers and mainly related to resource leveraging by improving access to and control of resources and better supply chain linkages. *Downstream cooperation* is toward distributors and customers. Collaboration with distributors provides improved access to customers and allows greater marketing synergies between a business and its distributors. Neither the upstream nor the downstream directions allow the business to gain cost or price advantage against its competitors. The arrangement can be used to circumvent local import or export restrictions. (*Ibid*, p. 216)

![Types of cooperation diagram](Image)

*Figure 6: Types of cooperation, source: own creation, based on Stonehouse at al. (2004)*
5.3 Concept of intermodal and multi-modal transport

As previously mentioned, the research is part of the Amber Coast Logistics project WP 4 activity 4.3 with the overall heading “Operational challenges at the port interfaces of multi-modal transport chains in the light of their hinterland development.” In order to better understand the topic, this part of the project helps to explain what the difference between intermodal and multi-modal transport is; and what the advantages of applying the multi-modal transport concept are based on a “door-to-door” solution.

Due to the globalization of the production and the liberalization of services there is a need for reliable and cost-effective transport and logistics services. The modern technologies and commercial practices considering the development of new forms of international transport: combined road / rail transport and sea shipping. (UNCTAD, 1995)

5.3.1 Intermodal transport

Intermodal freight transport involves the transportation of freight in an intermodal container or vehicle, using multiple modes of transportation (rail, ship, and truck), without any handling of the freight itself when changing modes. In the intermodal transport chain several separate modes of transport are combined, where flow of goods are on road, rail, air or water. All separate parts of the chain are responsible only for its part. (Transportation – Logistics, 2008)

Figure 7: Intermodal Transport, source: Roso (2008) based on Woxenius (1998)
According to Woxenius (1998) the intermodal transport chain can be divided into two systems, the Administrative system and a Production system. The Administrative system is responsible for managing transport. The forwarder and the intermodal companies have the information to start the flow of the goods. The actors of the Production system work together with the freight forwarders and / or international companies. There are several internal actors between the consignor and the consignee, for example the haulier, the terminal company, the railway company, and shipping line. The participation of the actors depends on the nature of the transport (road, rail or water). The consignor prepares / fills the unit loads. This activity is followed by the road haulage where lorries are used. The terminal company is responsible for the transshipment; it is using suitable equipments in the terminal e.g. mobile cranes. The railway company fulfils the rail haulage with the use of wagons. The shipping line organises the sailing on the sea using ferries / ships. After the goods arrived to the terminal of country of destination another railway company or haulier are connected in the production system until the goods will arrive to the consignee. The intermodal transport chain as a whole system is defined by the infrastructure, laws and regulations, political and economical decisions, demand for transport services, and competing single mode-transportation.

5.3.2 Multi-modal transport

Multimodal transport represents the flow of goods, where at least two different modes of transport are involved.” Multi-modal transport exists on the global market, in this way there are a variety of cultures, languages and commercial practices involved. In many cases a Multimodal Transport Operator (MTO) organizes the whole transport chain on the base of one contract. Nowadays MTO’s are in practice the freight forwarders. “An MTO should have the knowledge and skill to organise the transportation of goods through different modes of transport. He should be aware of what is happening in the areas of technological development, political stability of countries, congestion of routes or mergers of operators.” (UNESCAP, 2011)

Multimodal transport uses the combination of transport modes more effectively, environmentally friendly and handles the door to door transport operation at national and international level. It combines the specific advantages of the various transport modes, the flexibility of road haulage, the larger capacity of railways and the lower costs of water transport in the most suitable way.

Multimodal transport “means extensive use of information technologies and carrier networks and regulatory frameworks that can provide freedom to plan and operate to carriers and reliable liability regimes to customers. On top of that multimodal transport needs to be competitive in markets where unimodal operations not only have been there for a long time, but also are simpler to handle and most of the times are more cost effective.” (Gorcheva, 2012)
According to Rodrigue \textit{at al.} (2009) the multi-modal transport system integrates three geographical areas: national (or global), regional and local. Due to the development of new modal and intermodal infrastructure, urban regions have a growing accessibility to the international market. Several parameters of regional transportation are transformed, or significantly modified. Figure 8 shows the regulation of movements of a corridor within a multi-modal transportation system. The system consists of competing hub centres, where the regional and local transportation networks meet. The regulation of flows is coordinated by distribution centres at local level; this is often just a single transport terminal. The flow is coordinated by articulation points at global level, where major transport terminals and related activities can be found. The articulation point can have the combination of the modal and intermodal functions at the same time. These points ensure the link with the maritime-land interface in the international transportation. Port cities are the main agents of this function. Containerization is more and more developed in the maritime-land interface. Several ports decided to apply the container related new technologies to keep and consolidate their status as hub centres.
Advantages of multimodal transport (UNESCAP, 2011):

- “Minimises time loss at trans-shipment points: Multimodal transport, which is planned and coordinated as a single operation, minimises the loss of time and the risk of loss, pilferage and damage to cargo at trans-shipment points. The multimodal transport operator maintains his own communication links and coordinates interchange and onward carriage smoothly at trans-shipment points.

- Provides faster transit of good: The faster transit of goods made possible under multimodal transport to reduce the disadvantages of distance from markets and the tying-up of capital. In an era of Globalization the distance between origin or source materials and consumer is increasing thanks to the development of multimodal transport.

- Reduces burden of documentation and formalities: The burden of issuing multiple documentation and other formalities connected with each segmented of the transport chain is reduced to a minimum.

- Saves cost: The savings in costs resulting from these advantages are usually reflected in the through freight rates charged by the multimodal transport operator and also in the cost of cargo insurance. As savings are passed onto the consumer demand increases.

- Establishes only one agency to deal with: The consignor has, in case a MTO is used, to deal with only the multimodal transport operator in all matters relating to the transportation of his goods. It is including the settlement of claims for loss of goods, or damage to them, or delays in delivery at destination.

- Reduces cost of exports: The inherent advantages of multimodal transport system will help to reduce the cost of exports and improve their competitive position in the international market.”

Container transport is one of the most efficient and cost effective modes of multi-modal transport. The transshipment of containers from train to ship or from truck to ship (and opposite direction) is mostly performed in medium or larger ports, as the port have to be equipped with expensive loading and unloading container facilities. The well developed hinterland (train / cargo roads in the direction of the ports) is also an important factor in order to achieve successful operation in the multi-modal transport chain.

5.4 Port interfaces and their hinterlands

The previous chapter introduced the intermodal and multi-modal transport concept in order to get a clear picture how the multi-modal transport chain is built up. This chapter helps to understand what the port, the port hinterland / foreland mean and what kind of types the port hinterland has. Based on this knowledge the most important information - which is related to the maritime-land interfaces and port hinterlands – will be summarized. The Trans-European Transport Networks (TEN-T) project is shortly introduced in order to highlight the development opportunities related to port areas and
hinterland connections at European level. The next part summarizes the operational challenges at port interfaces based on the abovementioned sub-parts. The last part of this chapter highlights strategies for improving port interfaces and hinterlands in the Baltic Sea Region.

“The integration of transport functions provided by logistics and the re-orientation of maritime networks have redefined the functional role of ports in value chains and have generated new patterns of freight distribution and new approaches to port development. Furthermore, the development of better hinterland connections in many cases has become as important as the port facilities themselves to secure additional traffic. Maritime shippers and inland transport companies have become actively involved in providing more efficient (capacity, cost and time-wise) hinterland connections.” (Rodrigue and Notteboom, 2006)

5.4.1 Port hinterlands

Ports are important transshipment points in the multi-modal transport chain, they are the nexus of maritime and land transport systems. Ports activity and accessibility are in connection with the land they are connected to, the so called hinterland. Any change in the hinterland connections e.g. better or new land transport corridors can determine the traffic of the ports.

![Figure 9: The Hinterland of a Transport Terminal, source: Rodrigue and Notteboom (2006)](image)

According to Rodrigue and Notteboom (2006) each terminal is part of a geographical space, which they provide services to. Transport terminals have their own hinterland, which represent a set of customers - manufacturing and retailing activities - whom it has transactions with. These transactions involve movements of freight, which will be transshipped by the terminal. Movements can mainly be categorized as the main hinterland and the competition margin: The main hinterland is an area where the terminal has a dominant or an exclusive share of the flows. It is traditionally the core market area of the terminal, where the accessibility is the highest. It is possible for other terminals to compete over the main hinterland, but in this case the other terminal is probably not successful in overtaking clients. The competition margin represents an area where a terminal can be competing with other terminals.
The competitiveness becomes a matter of differential accessibility, costs, quality and reliability of service.

Based on Figure 9 can be seen that there are two terminals, terminal A and B which are competing over two clients in their competition margin, which is overlapping in one geographical space. There is exists a island within the hinterland of another terminal, but it has connection with terminal A. It could be mainly due to a privileged relationship between terminal A, a client and/or because of an efficient inland distribution system serviced by a specific transport corridor.

To sum it up there are three ways to have clients for the terminals. First of all, it is important that each terminal has to have a good location and good hinterland connections and serve the clients from the main hinterland reliably. In order to find more clients, the second way is to get clients in the competition margin, and offer lucrative and reliable services on good price and with good quality. The third way is to attract them from another hinterland area in the way of creating good relationship and connecting the terminal with main transport corridors, such as the TEN-T corridors.

5.4.2 Port forelands

It is needed to mention that terminals have hinterland and foreland connections. The foreland is also considerable in case of a successful port development.

“The term foreland is the ocean-ward mirror of the hinterland, referring to the ports and overseas markets linked by shipping services from the port. The foreland is above all a maritime space with which a port performs commercial relationships. It includes overseas customers with which the port undertakes commercial exchanges. The foreland is measured by the share of a port, or a group of ports, being taken over their foreland relatively to the forelands of other ports. It defines the interactions of a port with elements of the global economy. As the global economy expanded, the foreland of ports became increasingly complex.” (Ibid)
There are more assessments, research and feasibility study related to port hinterlands, but in order to understand the multi-modal transport chain, the foreland and hinterland should be considered and assessed as a whole system. The importance of door-to-door services and networks are emerging, and the ports can be seen as one link in through transport chains.

### 5.4.3 Types of port hinterland

Table 1 describes three sub-components of the hinterlands, the macro-economic, the physical and the logistical hinterland in order to understand the spatial and functional nexus of it.

<table>
<thead>
<tr>
<th>Concept</th>
<th>Macro-economic</th>
<th>Physical</th>
<th>Logistical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elements</td>
<td>Transport demand</td>
<td>Transport supply</td>
<td>Flows</td>
</tr>
<tr>
<td>Attributes</td>
<td>Logistical sites (production and consumption) as part of GPHs</td>
<td>Transport links and terminals</td>
<td>Mode, Timing, punctuality and frequency of services</td>
</tr>
<tr>
<td>Challenges</td>
<td>International division of production and consumption</td>
<td>Additional capacity (modal and intermodal)</td>
<td>Supply chain management</td>
</tr>
</tbody>
</table>

**Table 1: Types of Port Hinterland, source: Rodrigue and Notteboom (2006)**

The **macro-economic hinterland** is related to the transport demand, which depends on the production and the consumption. In this perspective the macro-economic hinterland is not counting taking into consideration the existing and the potential clients. Due to the globalization other factors / attributes have to be looked at, such as the interest- and exchange rates, prices, saving, production and debt. In this context, the international trade influences the port-hinterland relationships. Macroeconomic forces, production and trade imbalances at regional level have strong impact on port hinterlands.

The **physical hinterland** is to be seen in connection with the transport supply (modal and intermodal perspective). It considers the network of modes and terminals, which are connecting the port to its hinterland. Intermodal transportation improves the accessibility and efficiency of the hinterlands. Due to the globalization the amount of containers handled by ports has been significantly increased. This fact in the international transport has created requirement for ports worldwide to provide physical capacities at the terminals in order to be able to transship the containers. This change has effected the hinterlands (corridors) as well.

The **logistical hinterland** is concerned by the organization of flows as they are taking into consideration the existing macro-economic and physical settings. The main issues are in connection to
the modal choice (shift to other modes). Maritime shippers became more and more active parts of the organization of the hinterland flows of the ports. Based on alliances, co-operations or contracts they keep the contact with rail and road transport companies. (Ibid)

5.4.4 Maritime-land interfaces and port hinterlands

The research about Port hinterlands, Port forelands and Types of port hinterland developed by Rodrigue and Notteboom (2006) gives an understanding on how the port is in interaction with its environment. Based on this knowledge it can be summarized the most important information / challenges which are related to the maritime-land interfaces and port hinterlands:

- Maritime-land interfaces have a growing importance in logistics in order to enhance the capacity and the cost efficiency.
- Maritime companies may opt to bypass one port to the advantage of another if its efficiency is not satisfactory and if its hinterland access is problematic.
- The ports are the nexus of maritime and land transport systems.
- Geo-political situations determine the port’s final success.
- Port-related challenges are mainly the congestion, growing costs, limited handling capacity and the generation of additional traffic.
- Ports should be able to answer the requirements of modern freight distribution (e.g. containers).
- Forming strategic alliances in the port sector itself could lead to secure the port own efforts and investments.
- By using an offshore hub terminal in conjunction with short sea shipping services, it is possible to reduce the number of port calls and increase the throughput of the port calls left.
- High-order service networks will have fewer ports of call and bigger vessels than lower order networks. Increasing volumes as such can lead to an increasing segmentation in liner service networks and a hierarchy in hubs (both ‘offshore’ and ‘mainland’).
- The extra-ordinary length of administrative and legal procedures requires well-balanced time planning in order to get stakeholders’ participation in port development processes.
- Port hinterlands:
  - Shippers and inland transport companies have become actively involved in providing more efficient (capacity, cost and time-wise) hinterland connections.
  - Inland distribution becomes of foremost importance in port competition, favouring the emergence of transport corridors and logistics poles.
  - With a more efficient access to the hinterland, mainly through modal shift, port competitiveness can be increased.
  - The emergence of new land based transport corridors is more frequent.
  - Port hinterlands are strongly shaped by port dynamics and location.
5.4.5 Trans-European Transport Networks (TEN-T)

In order to highlight the development opportunities related to port areas and hinterland connections at European level, it is needed to consider the European Coordinator’s research: *Trans-European Transport Networks (TEN-T), The Sustainable Maritime Vision for Europe, Building on Europe’s Maritime Legacy and Looking Beyond Global Trade*.

“The development of Motorways of the Sea (MoS) will provide a framework for the deployment of high level standards for efficient, safe and environmentally friendly maritime transport operations, which can be fully integrated in a door-to-door transport chain. MoS, whilst ultimately aiming at the increase of cargo flows to be carried by maritime traffic, will have as a priority the development of efficient ports and of better port hinterland infrastructure and connectivity, which are the stepping stones for traffic to occur and flow smoothly.” (Valente de Oliveira, 2011)

In the TEN-T report (2011) can be found the list of development priorities related to port areas and hinterland connections:

**Within port areas**
- Railways connections to the quays and piers
- Superstructures, construction works and equipment that allow for a better coordination of administrative procedures (one stop shop / guichet unique) e.g. customs, health and sanitary, veterinary police, emigration, port operations’ services
- Superstructures, construction works and equipment aiming at an efficient management of the cargo flows in the port area, e.g. port gateways, cranes, piers, etc.
- Dredging of berths and canals to keep navigation or to increase the size of the target vessels
- Intelligent infrastructure
- Alternative re-fuelling facilities for ships (e.g. LNG bunkering)
- Promotion of the role of European ports and the MoS network. Once the new TEN-T network is defined, the core network of ports and MoS should be promoted in a brochure outlining its operational characteristics and potential, based on common indicators

**Hinterland connections**
- Connections to the hinterland for – railways, inland waterways and motorways – and, especially to logistics platforms located in the interior
- Building of logistics platforms and dry ports
- Junctions, bridges, tunnels and other elements of access to the ports that could improve connections to the hinterland
• New railway lines or sections, by-passes and other upgrading which can help to lower travel time of travel and increase punctuality
• Integrated MoS systems connecting shipper and receiver

5.4.6 Operational challenges at port interfaces
Considering all of the information, what have been written so far, the operational challenges at port interfaces can be summarized as following:

• Finding the clients considering the opportunities of the main hinterland, competition margin and other islands (create relationships).
• Global thinking, consider the port hinterland and foreland as a whole system; it will lead cost efficient solutions.
• Following the new transport guidelines and regulation in order to be well-informed in the creation / transformation of the port (e.g. environmentally transport solutions).
• Familiarization with new transport projects subsidized by public organizations (e.g. TEN-T project of the European Union) in order to finalized the needed capital and operative expenditures.
• Increasing port efficiency:
  o Modernization
    ▪ High capacity, cost efficiency
  o Ensuring efficient infrastructure (container handling)
  o Ensuring state of the art information and communication technology
• Synchronization of maritime and inland freight distribution, using Multimodal Transport Operators (MTOs) in the multi-modal transport chain.
  o Effective organization of freight distribution
  o Well balanced planning and project management
    ▪ Forming strategic alliances, co-operations
    ▪ Keep in contact with global maritime operators, sign contacts with rail and road transport companies
    ▪ Considering macro-economic and physical settings of port hinterlands

5.4.6.1 Strategies for improving port interfaces and hinterlands in the BSR
The related Amber Coast Logistics project WP 4 “Sustainable and efficient transport concepts: multimodal transport” supports the multimodal transport solutions via efficient interfaces and the greener transport through modal shift towards the sea. According to this the following strategies can be proposed in order to improve the port interfaces and hinterlands in the Baltic Sea Region:

• Create integrated logistical supply chain; achieve added value and more efficient transport in the Baltic Sea Region (BSR).
• Improve port and hinterland facilities in the door-to-door transport chain:
  o Developing new land based transport corridors, which is easier than move locations of terminals in effective, efficient and environmentally sustainable way.
• Create “green” profile for the ports, including facilitating the environmental sound practices.
• Establish a set of criteria to choose competitive seaports in the BSR. It can be based on current or future potential capacity.
  o Appoint / nominate and develop Baltic Sea ports, which can fulfil the modern special requirements (high capacity, cost efficiency) and attract individual ports in the future.
• Develop corporation between larger and smaller ports using the complementarities and avoiding the competitive situations and overlapping activities. Create added value (synergy), provide better services, attract more cargo and achieve win-win situation.
  o Specialization of ports by enhancing the competitive profile of ports (analysis can be based on a SWOT analysis)
    ▪ One port would specialize on oil related cargo, the second one on industrial cargo and general cargo and the third one on containers.
• Create strategic and cross-border corporation with the aim of:
  o Cost sharing
  o Creating the suitable legal framework
  o Offer longer term relationship for less permanent tenants
  o Strengthen the network between the ports / their regulation environment, for example create suitable general agreement of port corporations.
• Conduct interviews with port authorities and port- and transport organizations in order to gather deeper knowledge about the current transport regulations and projects (roads, investment plans) in the Baltic Sea Region.

5.5 Development of ports and hubs

In order to analyse the research topic The role of port development and cooperation in a strategic perspective /How to create a central hub in STC/Port of Køge and hereby enhance collaboration in the Baltic Sea Region/ it is important to highlight the evolution of a port (helped by the Anyport Model) see below, to get an overview of the main characteristics of the ports and the hubs and to get acquainted with the process on how to create a hub from a port from a theoretical perspective. This chapter helps to understand why it is important to develop a port into a modern transport hub, and what the added values are (e.g. economy of scale, economy of scope, openness for all operators, etc.).

5.5.1 Evolution of a port – Anyport Model

Bird developed in 1980 the Anyport model to describe how the port infrastructure evolves. The model identifies three major phases to explain a port development process:
1. **Setting**: Geographical consideration is the primary factor related to the initial setting of the port. The evolution of port started from the original port, mainly the ports were equipped with cargo handling facilities to handle trading and related activities such as warehousing and wholesaling, located at sites directly adjacent to the ports.

2. **Expansion**: The industrial revolution and growth created impacts on port activities in the maritime industry considering the trade volumes. Quays were expanded and it was required that the docks have to handle growing amounts of freight and increasing number of larger ships. The development of intermodal transport enhanced the integration of rail operations with port terminals to increase accessibility to hinterlands. Port-related activities also included the value-added activities (cargo consolidation).

3. **Specialization**: In order to be able to handle specialized freight such as containers it is needed the specialization / development of terminals. Considering the larger ships it is required to have deeper channels, longer berths, more yard spaces, and comprehensive intermodal facilities. The original port sites, located adjacent to downtown areas became obsolete and were abandoned, which was an opportunity for the port operators to create large and new ports to cope with the increasing demand from port users. (Lun *et al.*, 2010, p. 226)

![Figure 11: Evolution of a Port (The Anyport Model), source: Rodrigue *et al.* (2009)](image_url)

“..."The Anyport model is useful for expanding traditional port developments; however, it has some limitations in analysing contemporary port development. More importantly, the model does not consider the recent development of shipping networks and the use of hub-and-spoke approach in container shipping." (Ibid) At the same time the model doesn’t consider port development into the water, which, though more expensive, in some cases can be the only option for developing the port further.
5.5.2 Port competitiveness and development

This section will introduce the port characteristics, which are influencing the port traffic performance and various measures of port performances.

5.5.2.1 Port location

The location is one of the most important elements of a successful port. According to (Chew, 2011) the ideal site has sufficient space for the operation, easy entrance, deep water, a small tidal range and a climate that will not hamper port operations at any time of the year. The roles of a port are different according to whether it is a feeder, regional or global hub port.

Ports has generally natural gateways to rich hinterlands, their aim is achieve cost leadership (economies of scale) or service differentiation (economies of scope) in order to attain growth in the fast changing and highly competitive environment.

“Small-island ports with no direct hinterlands must first focus on cost leadership and then develop value-added services after cargo has been attracted. While ports with locations that are natural gateways to rich hinterlands are evidently in a better position to develop the sea-to-land interface and inland transport services, what was once a secure area for a port to draw traffic from, is no longer the case with the advent of double-stacking of containers on rail-cars and the establishment of inland intermodal hubs.” (Chew at al., 2011, p. 33)

Considering ports competition, it is worth to mention that ports are not just in competition with ports in their local area and along their immediate seaboard, they also compete with distant seabords attempting to serve the same inland areas.

As can be seen from Figure 12 a number of port location factors affects port attractiveness and competitions. In order to have a successful and well operating port the following port geographical location factors can be summarized: port accessibility, size of hinterland, closeness to high imports and export areas, closeness to main navigation routes, proximity of competing ports, proximity of feeder ports, space availability for future expansion, good water conditions (sufficient depth and small tidal range), favourable climate though the year and conducive operating environment (low operation cost, economic and political stabilities).
5.5.2.2 Port efficiency

The cost of shipping is determined by the port efficiency, the increasing vessel sizes can increase the unproductive cost of vessels waiting for services at ports.

Containerization has gained popularity and has become an essential component of a unit-load-concept in international sea freight transportation. Hence, many researchers have examined the issue of achieving port efficiency via operations optimization in the context of container terminals. It is important to mention that the provision of up-to-date facilities, equipments and information technology infrastructures play an important role in increasing the overall port efficiency. (Chew at al., 2011, p. 36)
communications is EDI (Electronic data interchange). EDI helps in the structured transmission of data between organizations electronically. EDI is used to transfer electronic documents (e.g. bills of lading) or business data for example from one maritime trading partner to another without human intervention. Modern port handling equipments e.g. cranes, new container facilities are also part of the port infrastructure, such as the size of the container yard, number of specialized terminals, number of reefer (cooling) points, number/length of berths, backup space on terminal, super infrastructure and the size of port terminal capacity.

5.5.2.3 Port characteristics on performance

In the abovementioned two sections (Port location, Port efficiency) the most important factors were highlighted related to the port competitiveness and development, but it is needed to consider that a good location and a good infrastructure are not just only the port characteristic which are responsible for the success of the ports. Table 2 summarizes all the necessary elements which are needed to consider. It can be divided into six main groups: (1) port efficiencies, (2) port productivity, (3) port service, (4) port management, (5) port-induced cost, and (6) other.

<table>
<thead>
<tr>
<th>Port characteristics on performances</th>
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<tr>
<td>Port efficiencies</td>
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<tr>
<td>Frequency of Port Calls</td>
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<td>Port Berthing Time Length</td>
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<td>Labor Problems</td>
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<td>Economies of Scale (e.g. Cargo Volume/Size of Port)</td>
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<td>Diseconomies of Scale (e.g. Cargo Crowding Out Effect/Port Congestions)</td>
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<td>Material Handling Efficiency</td>
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<td>Goods Loss and Damage</td>
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<td>Flexibility of Operations Process - Large/Odd size Freight, Large Volume Shipment, Special Handling</td>
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<td>Port productivity</td>
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<td>Rate of Container Movement</td>
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<td>Number of Cranes Moves per hour</td>
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<td>Port service</td>
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<td>Port service Working (or Port Operations) Hours</td>
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<td>Shipment Information</td>
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<td>Provides Assistance in Claims Handling</td>
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<td>Offers Convenient Pickup and Delivery Times</td>
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<td>Port Service Coverage - Routes</td>
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<td>Reliability</td>
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<td>Port management</td>
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<tr>
<td>Management Expertise and Aggressiveness</td>
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<tr>
<td>Number of Port Operators</td>
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<td>Privilege Contracts to Shippers/Carriers</td>
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<td>Government Taxes and Incentives</td>
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<td>Bureaucracy, Custom Administration and Regulations</td>
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<td>Coordination Between Departments</td>
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<td>Inland Freight Rates</td>
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<td>Others</td>
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<td>Port Reputation</td>
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<td>Port Security (Port Safety/Terminal Security)</td>
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Table 2: Port characteristics on performances, source: Chew at al. (2011)
Port efficiencies related mostly to the port infrastructure, but in order to be efficient, the port has to have a lot of port calls, enhance the possibility of berthing time, solve the potential labour problems, attract more and bigger size cargo and feeders, try to avoid the congestions, hand the materials efficiently and carefully, minimizing the loss and damage of the goods and offer flexible operation process, for example special handling, and work with large or odd size freight.

The port productivity can be measured by the rate of the container movement or the number of cranes moves per hours. Due to the spread of the container transport it is more and more important for the ports to have the special container handling equipment in order to remain competitive.

The enhanced number of port services can help in the competitiveness and development of the ports. The more services you offer the more chance to attract the various customers. The big ports offer 24 hours port service seven days per week. The convenient pickup and delivery times, the given shipment information are not neglectable, but the most important is to be reliable in order to keep the customers (it is always easier than getting new ones).

The port management is responsible for running the port successfully. The members of the management have to have deep knowledge and to be experienced. They keep the contact with the port operators sign contact with sippers / carriers, following and apply the government taxes, incentives and regulations, give the directions to the departments and build good contact with the bureaucracy.

The port-induced cost should be competitive on the market, without applying the suitable charges and rates (port -, and handling charges, loading/discharging -, inland freight rates). It is needed to use benchmark date and compare the prices of the ports with the competitors.

As other port characteristics it can be mentioned the port reputation and the port security. In order to create a good reputation, the port should be secure and reliable, offer various services with good quality and on good prize. (Ibid)

5.5.3 Development of shipping hubs

The shipping services are more and more complex; the importance of the shipping network is increasing, which is characterized by the fewer ports of call and the deployment of bigger vessels. This trend in the shipping industry makes the evolution of ports and the creation of hubs necessary.

5.5.3.1 Hub definition

According to Rodrigue at al. (2009) hub is “a central point for the collection, sorting, transshipment and distribution of goods for a particular area”. It is “a central location in a transport system with
many inbound and outbound connections of the same mode”. Based on the world’s most trusted Oxford dictionaries hub is “the effective centre of an activity, region, or network”.

### 5.5.3.2 Hub-and-Spoke concept

The terms of hub is often connected with the "Hub-and-Spoke" concept. This concept was introduced first in the airline industry in the last 1970s and later become a primary distribution model for the leading international logistics companies. This concept drives the companies to consolidate shipments on a large scale of major terminals (i.e. hub) and to redistribute the smaller shipments to their respective destinations via radical links (i.e. spoke). (Song and Panayides, 2012, p. 195)

Figure 14 shows the maritime hub-and-spoke transport. The intermodal container ship arrives from the ocean shipping to the hub port trans-shipment point, where the freights will be transshipped and transferred further by smaller feeder ships. After the feeder ship have arrived to the regional port of destination / feeder port, the ship will be on-loading and the freight will be transported to the final destination by truck or rail.

![Maritime Hub-and-Spoke Transport](image-url)

**Figure 14: Maritime Hub-and-Spoke Transport, source: own creation, based on Transport Canada (2010)**

There are several examples of successful international hub-and-spoke feeder services, including the “classic” hub-and-spoke network, such as the Port of Hamburg, which serves as a hub for traffic destined to the Baltic (as well as a gateway to mainland Europe). The benefit of the hub-and-spoke operations are the cost efficiency, service provision, and market position. (Lun *et al.*, 2010, p. 227)

The development of shipping hubs indicates a higher level of integration between sea-based and land-based transport system by using intermodal transport system such as the “inland waterway and feeder operations:
• *Inland waterway ports:* There are inland maritime ports that are integrated with inland waterway services on direct shuttle services by barges or small ships.

• *Inland feeder terminals:* This is a recent concept proposed to enhance direct inland connections with a direct rail service. The agile port system is typical example that benefits from intermodal transport with improved efficiency in port operations.” (*Ibid*)
6 Port of Køge as hub in the Baltic Sea Region

This chapter is a sub-part / extra activity of the Amber Coast Logistics project WP 4 activity 4.3 “Elaborate operational challenges at the port interfaces of multi-modal transport chains in the light of their hinterland development.” Scandinavian Transport Centre (STC) / Port of Køge and FDT Association of Danish Transport and Logistics Centres submitted the following proposals at the ACL meeting in Ventspils, 15th February, 2012:

- Proposal of STC (Scandinavian Transport Centre) / Port of Køge
  - Implement the evolution of Port of Køge into a hub in order to create a new and central hub in the Baltic Sea

- Proposal of FDT
  - Set up closer strategic cooperation between Port of Hamburg and Port of Køge

This chapter gives an overview / pre-feasibility study on the first proposal and functions as a “stand alone” report, which means a project in the ACL WP 4, which will provide inputs to other ACL activities, but as such does not require inputs from previous ACL activities to be started up and finalised. The chapter includes the strong involvement of Scandinavian Transport Centre / Port of Køge and divided into three main parts, Further development of Scandinavian Transport Centre (STC) into a Logistics Centre, Creation of a combined transport terminal in Køge, and Creation of a Unit-terminal in Køge port, which is followed by last section, Synergy between the new developed STC, Combined transport terminal and Unit-Terminal.

6.1 Further development of Scandinavian Transport Centre (STC) as Logistics Centre

The first approach to develop Port of Køge into an important hub for the Baltic Sea Region is the further development of Scandinavian Transport Centre into a modern Logistics Centre. STC is a large combined business park and transport centre with direct link to the highways on Zealand (Denmark) in Northern Europe. The area is 130 hectares and additional 50 hectares extension has been already planned. The Transport Centre’s aim is to create a logistics and distribution centre to the Greater Copenhagen area and to be one of Denmark’s most important logistics hubs by developing warehouses, other facilities and services. In order to create a logistics centre from STC it will be investigated what the optimal site arrangement in logistic centre area planning are, what the logistic centres’ functionalities and organisation aspects are (included operation and maintenance of facilities / buildings - types of terminals, cargo goods and load units, and the development and implementation of new activities / facilities), what the key determinants for the success of logistic centres development are and what the main challenges of the logistics centre developments are.
A Logistics Centre is a centre in a defined area within which all activities relating to transport, logistics and the distribution of goods - both for national and international transit, are carried out by various operators on a commercial basis.

The operators can either be owners or tenants of buildings and facilities (warehouses, distribution centres, storage areas, offices, truck services, etc.), which have been built there. In order to comply with free competition rules, a Logistics Centre must be open to allow access to all companies involved in the activities set out above.

A Logistics Centre must also be equipped with all the public facilities to carry out the above-mentioned operations. If possible, it should include public services for the staff and equipment for the users. In order to encourage intermodal transport for the handling of goods, a Logistics Centre should preferably be served by a multiplicity of transport modes (road, rail, sea, inland waterway, air).

To ensure synergy and commercial cooperation, it is important that a Logistics Centre is managed in a single and neutral legal body (preferably by a Public-Private-Partnership). Finally, a Logistics Centre must comply with European standards and quality performance to provide the framework for commercial and sustainable transport solutions. (Bentzen et al., 2003)

### 6.1.1 Logistic Centre area planning

If an area would like to be a Logistics Centre, based on the best practice the following areas should be considered during the planning (*Ibid*, p. 192):

- Topography and shape of the area
- Site configuration and size
- Local connections and transport networks
- Storage facilities (types, capacities, buffer areas)
- Land topography and soils
- Transportation access
- Utilities
- Future expansion capacity
- Public policy
- Telecommunication infrastructure
6.1.2 Logistic Centres’ functionalities and organisation aspects

Figure 15 shows the spectrum of feasible functionalities for a Logistics Centre. The extent of operations to be managed and carried out by the Logistics Centre depends on the actual demand and on the own activities of the tenants.

Logistics Centres compared to stand alone distribution centres can offer cost savings for provision of essential amenities (e.g. electricity, telecommunication) and allow the provision of facilities that might otherwise not be economic to install such as truck service and support facilities; customs clearance facilities; centralised waste disposal; centralised landscape maintenance; enhanced security systems; public transport connections; additional commercial services (shops, restaurants); open access IT systems; training facilities and multi-user office space. \(Ibid,\) p. 216)

6.1.2.1 Operation and maintenance of facilities / buildings - types of terminals, cargo goods and load units

Based on Figure 15 it can be seen that one of the key tasks of the Logistics centre is the Operation and maintenance of facilities / buildings. Different types of terminals such as general cargo terminal, container terminal, cold store terminal, and combi terminal (transshipment of the cargo units is between road and rail) can handle different type of cargo goods and load units. In order to get clear picture about what kind of cargo goods and load units are the following sections give information.
There is a general correlation between types of goods and transport terminals. Different types of goods require special handling during the transportation. Goods can be divided into four types considering the way of handling:

- **Bulk:** bulk goods e.g. grain, gravel
- **Full load:** (large shipments often to only one consignee)
- **Part loads / less than full loads**
- **General cargo:** (small consignments)

Generally speaking bulk and mass-produced goods belong to the lower value category. General cargo means better produced products, more small consignments (per unit weight) which have higher value. Typically, there is a correlation between the value of the transported goods and the demand for transport time and quality of transport - the higher the value, the greater the demand for fast and accurate delivery. Storage inventories are minimized, optimized and planned. The flow of goods is in relation to the production and the market. Carrier transport and logistics systems often requires the presence of some nodes (e.g. terminals), which allows the change of transport modes and/or carriers.

The characteristics, design and equipment of the terminals depend on the load units. Generally there are three types of loading units used in transport: containers, trailers and swap bodies. Each of them has some different characteristics, which important in relation to terminal / logistics centre layout, design and equipment are.

**Containers**

Container (e.g. reefer / cooling and tank) typically used for sea transport and the transport of liquids (e.g. chemicals). Containers are available in different lengths; the most common are 20 and 40 feet. ISO containers’ dimensions (20 foot, 589 x 235 cm) which do unfortunately not fit to the euro pallets measurements on 80 x 120 cm. There have been developed the so-called “pallet wide” containers which are compatible with euro pallets. Trailers are suitable considering both the length and wide of the euro pallets’ dimensions.

In a dual-terminal, the transport between the management area (where the loading off and on take place) and the depot is done by the so called terminal tractor or reach-stacker. The dual-terminal, which handles containers, typically requires depot areas. The depots are also used for storage of empty containers.
Trailers

The trailers are used in several types of terminals. Trailer vehicles are unpowered vehicles pulled by a powered vehicle. They can be raised / lifted and exist in different size. The most important feature of the trailers, that they can also be used in unimodal (road) transport. The disadvantages of trailers compared to the containers that they need more place in the terminal, they cannot be stored on each other, and the truck must be switched on and off. Generally the trailers transport higher value goods, in this way the timing is really critical, the time saving organisation is essential. The combined terminals with large amount of trailers need bigger place in the terminal area, but the need for long term storage is reduced.

Swap bodies

Swap bodies are standard freight containers for road and rail transport. The design of swap bodies is optimized to minimize empty weight, saving on initial purchase cost (less material is required to manufacture) and on trucking fuel cost (less dead weight to be transported). Swap bodies are usually not stackable or liftable - unlike the more widespread shipping containers (ISO containers) – they can be lifted only at the bottom. Cranes use usually more time to manage and move swap bodies and
trailers than containers, because they require more special handling. Based on the characteristics of the swap bodies they are unsuitable for ship-based overseas transportation. (COWI, p. 9-10)

Figure 18: Storage of swap bodies in a combined terminal

The various types of cargo units such as containers, trainers and swap bodies have different physical appearance / characteristics, and requires special handling and transport mode. The Logistics Centre in Køge will allow the transhipment of trailers and swap bodies from rail to road and vice versa.

6.1.2.2 Development and implementation of new activities / facilities

In the recent years the development and implementation of new activities / facilities play a more and more important role in the Logistics Centres. In order to be competitive on the market it is not enough to have the have the facilities and buildings, the transport companies require value added services such as banks, resting facilities, repair and welfare facilities, etc.

According to a North Sea Region survey, called StratMos (2009, p. 175-176) Identifying and Analysing the Characteristics of Complementary Ports, the most relevant hinterland terminal (dry port) services:

- Vehicle loading and unloading
- Handling facilities
- Warehousing and storage
- Third party logistics (warehousing, cross-docking, inventory management, packaging, and freight forwarding)
- Customer service
- Consulting services
- Data services
- Trucker’s social facilities
- Maintenance of units (container, swap bodies and trailers)
Hinterland terminal advantages

- Reducing total transport expenses
- Strengthening the ports role in the transport chains (e.g. Port of Køge)
- Strengthening multi-modal solutions (rail and road)
- Reducing the high cost, centrally located port areas
- Reducing local environmental problems
- Avoid traffic bottlenecks

6.1.3 Characteristics of a Logistic Centres

The following section summarizes the common and strategy-characteristics of the Logistic Centres:

- Unite all activities related to transport and logistics
- Open for private and public transport as well as enterprises and companies
- Create a development environment for the transport sector
- Create physical integration of transport by road, rail, inland waterways and sea (and in the best case – air)
- Achieve economies of scale through co-operation internally and co-operation with other Logistics Centres and hereby create efficient transport chains and network solutions for optimal cargo flow and distribution
- Supplies the most advanced IT infrastructure and solutions that usually are barriers for the individual company (intelligent transport systems based on advanced technologies, i.e. EDI, communication and information systems)
- Located in a 100-150 ha territory, depending on the activities the size can reach 4-500 ha

For the transport and logistics companies the existence of a close co-operation within organised Logistics Centres will increase the opportunities of planning international transports and optimising the usage of transport equipment and resources. Thereby Logistics Centres obtain a rationalisation profit. (Ibid, p. 20)

6.1.4 Key determinants for the success of Logistic Centres development

In order to create a successful logistics centres from Scandinavian Transport Centre it is worth to summarise the key determinants for the success of Logistic Centres development:

- **Openness**: Logistics Centres are open to all new companies that want to be located in the centre on commercial basis;
- **Common facilities**: Availability of facilities for freight handling that can be used according to cost sharing principles, or as a common good in the Logistics Centres;
- **Organisation**: The existence of a legal body that can act on behalf of the transport framework centre, and secure the common interests of the Logistics Centres located companies;
- **Intermodality**: Logistics Centres supports the concept of combined and intermodal transport concept, thereby contributing to an efficient European transport system. (*Ibid*, p. 7)

### 6.1.5 Main challenges of the Logistics Centre developments

In recent years Logistics Centre developers faced the following main challenges:

- To establish alternative investment and operation concepts for the Logistics Centres intermodal terminals and to integrate them into existing transport networks;
- To react on the ongoing process of restructuring of the transport and logistics industry leading to a higher degree of concentration and internationalisation (tendency for bigger companies with own logistics networks, partly outside the Logistics Centres network);
- To react on the fact that the logistics industry as key Logistics Centres target group is changing from traditional transport and warehousing business towards complex supply chain management (SCM). (*Ibid*, p. 25)

Considering that Scandinavian Transport Centre is a developing business park and transport centre in Køge, which offers a number of facilities for vehicles and drivers such diesel filling station, parking, cafeteria, showers for drivers, vehicle wash, workshop, washing machine and tumble dryer for drivers clothes it is not needed to establish a Logistics Centre as a green field development. The good location/area, several independent business units, transport companies and added value services are given, however it is needed to consider and extend the facilities and services based on the above highlighted Logistics Centre functionalities. The characteristics, key determinants and success factors are also summarising the essential knowledge what the most important factors and information are, what Scandinavian Transport Centre has to seriously consider and successfully implement in order to fulfil the requirements of a Logistics Centre and face the challenges of the recent years LC development.

#### 6.1.5.1 Assessment of STC as a Logistics Centre

The Association of Danish Transport Centres (FDT, 2009) conducted an analysis, which has introduced 4 categories and to each category 19 characteristics of a Transport Centre. This analysis will be used for the assessment of Scandinavian Transport Centre to show which existing Transport Centre characteristics STC has, and which characteristics are missing and needed to be further developed.

These categories in a Danish context are calculated and described as follows:

**A. The national centre with a special European importance** is characterized by a location by one or more general high-class transportation corridors (TEN-T Trans-European Network Transport), provision of multimodal transport, integrated cooperation with a number of other European transport centres regarding scheduled service, Information Technology, etc.
B. The national centre with European importance is characterized by a location at an overall corridor (TEN-T). A degree of intermodality and servicing of European and internationally-oriented traffic.

C. The national centre with regional importance is characterized by a certain modality, service functions for the regional area, distribution and warehousing facilities for the region.

D. The regional centre with local importance is characterized rather by service offering than actual traffic supply. The centre has a certain volume of distribution for the immediate hinterland area, or be partner with larger centres.

Table 3 shows the four main categories /sizes of a Logistic Centre with their characteristics and the assessment of STC.

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<th>Assessment of STC</th>
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Table 3: Four categories of Transport Centres and their characteristics, source: FDT (2009)

1. Located on a TEN-T corridor

It is obviously important for the centre’s expansion; the location is directly to the efficient functioning road and / or rail network. The development of each region has always been characterized by growth based on the presence of infrastructure. From a user perspective the location is important in terms of the distribution costs. An overall corridor network ensures quick delivery of goods.

STC fulfils the requirement, because it is located on the Core Network Corridor No.5 Helsinki-Valetta.
2. Located at a high class motorway

A major distinction between a category A or B centre and a Category C or D centre is the access to a high class motorway. The importance of quick access to the main international routes is significant in both location growth standpoint and in connection with applying for grants for infrastructure, including TEN-T grants scheme for infrastructure.

STC fulfils the requirement, because it is located at the junction of three motorways: E20, E47 and E45.

3. Located at a high class railway

In the multimodal transport sector the time factor is crucial. Time savings can be achieved by fast and efficient loading, switching between modes and unloading. Access to high-class corridors and thus a quick delivery of goods to the main transport corridors provide a high level of service and hence the centre potential.

STC cannot fulfil totally the requirement at the moment. Even if it has a railway connection direct from STC to the Roskilde-Næstved line, but it is not a high class railway. It is important that in the near future the new electrified high class railway between Copenhagen and Ringsted (2018) will pass through via Køge.

4. Number of transport modes

The number of transport modes at each Logistics Centre can be critical. It could influence the decision of foreign firms in choosing distribution centre and transport hub. The 4 important modes are: rail, road, sea and air, the first three are the most often used modes for transportation.

SCT has mainly two transport modes, road and sea. It is only 3 km from the Køge Harbour.

5. Width of activities

The various transportation centres’ width of activities vary greatly. The basic objective should be the full service of cargo, equipment and personnel. The individual centres have adapted service provision and activities in relation to the natural opportunities and broods and tenant requirements. The using of the optimal full-service "one stop shopping" concept can enhance the development. There is also a great opportunity to start the great synergy among the different transport and logistics facilities, and among the various users of the centres.

SCT has medium width of activities, and has strong opportunities to create synergy among the different transport and logistics facilities, and among the various users of the centres.
6. **Volume of distribution / hinterland (trade potential)**

Centres’ function and sizes is largely determined by the area in which they act. Demographics, the level of consumption and production in the area, and the overall assessment of the Centre as a hub for nationwide distribution play a major role for the Centre's growth potential. A greater distribution potential and hinterland often results in opportunities for expansion of its service functions for the goods. Examples could include freight yards, terminals, warehouses, cold storage, freight forwarding and trucking firms, shipping companies, combining terminals, etc.

STC has a large trade potential, Port of Køge is situated very closely to Copenhagen and 1.8 million consumers are situated in the vicinity of the greater Copenhagen area, and 3 million consumers situated in the Øresund region. SCT can serve the Greater Copenhagen area and the Øresund region, but on a bigger scale being a hub for distribution in and out of the Baltic Sea Region (100 million inhabitants).

7. **Built around an organizational legal entity**

The Danish transport centres are currently characterized by very different organization and management structures. Common to all is that each of them serves as organizational legal entities. The organizational entity must take formal responsibility and ensure continuity in the Centre's functions and relations to tenants, owners and users. The organizational leadership also acts as a partner in relation to the transport centre associations and private organizations and public authorities and institutions, both in terms of dialogue around the centre and development of the centre. It is important for the centre dissemination and idea that the organizational entity has the necessary expertise and financial background. The organizational entity may be advantageously constructed as a public company based on a public private partnership.

STC fulfils the requirement, because it was established by the Køge Municipality (2001) and it is still owned and supported by it.

8. **Geographically connected area**

A geographically contiguous area is important for the identification of the individual transportation centre’s physical space. This is especially important for the centres, which consist of existing firms within a local - not geographically contiguous - area and would like to achieve more benefits. It would be natural that future centres of any size and category to be placed on contiguous land.

STC cannot fulfil totally the requirement; because in this case Port of Køge is also “part” of STC, and there is 3 km between the port (sea side) and the STC (land side). It is not geographically connected area, but it is connected by road and in the future by railway.
9. Provision of services / facilities

Service functions for example, which are primarily targeting freight supportive activities and passenger transport. Nature and scope of these services are a function of the traffic volume passing through the area. A location directly on a transport corridor is therefore essential for the centre. In order to provide service facilities can be made separate contracts with known vendors who rent or buy fields. An important prerequisite is that the services offered are freely available to all users of the transportation centre.

SCT has medium width of activities for vehicles and drives such as diesel filling station, parking, cafeteria, showers for drivers, vehicle wash, workshop, washing machine and tumble dryer for drivers’ clothes. It is recommended to enhance the number of freight / cargo facilities, third partner logistics services.

10. Included in other cooperation

It will typically be Category A or B centres that have benefited from networking. Networking may, among other things be reflected in the traffic exchange, material depots, EDI cooperation, educational relations, participation in national or international working groups and projects, etc.

STC fulfil the requirement, because it is member of the Danish Harbour Association, Association of Danish Transport Centres, etc.

11. Included in cooperation with other transportation centres

Centre collaboration is an important part of the development for transport centres in Denmark. Collaboration helps to ensure a reasonable development, creating business support for individual centres operate in regional and local areas. Cooperation is important for the visibility to the outside world. Through visibility, clear mission, forward-thinking strategies and clear policy, it can be achieved nationally and internationally interest. In Denmark, FDT - Association of Danish Transport and Logistics Centre is the logistic cooperation of the transport organization.

STC fulfil the requirement, because it is a member of FDT and in this way can cooperate with other transport centres such as Danmarks Transport Center (DTC), Herning - Ikast Transport Center (HITC), Horsens Transport Center (HOTC), Hirtshals Transportcenter (HTC), Høje Tåstrup Transportcenter (HTTC), Nordisk Transportcenter (NTC) and Taulov Transportcenter (TTC). (www.fdt.dk)

12. Focus on sustainable solutions

The Transport Centre will naturally attract large volumes of traffic. Energy consumption and environmental initiatives are therefore issues that should be in focus. Centres should be exponents of a movement towards sustainable transport and distribution. The overall physical environment such as the fuel sales, emissions from trucks, water protection, CO₂, etc. must be in order in each
centre. Centres may, among other things seek to promote the sustainable city-logistics through customized solutions in the area in which they work. The centres will also be ideal locations for new innovations in transport, as safe and secure rest areas and support economic and social sustainability perspectives.

STC fulfil the requirement, because it promotes green transport, the modal shift, i.e. the usage of sea transport (Port of Køge). The new railway connection around STC will be also opportunity to perform a more environmentally friendly way of transport.

13. **Member of a national organization (FDT)**

All seriously working platforms in category A, B and C fulfil the requirements for membership for FDT. Society and economy of the organisation should be adjusted to current conditions and current tasks.

STC fulfil the requirement, because it is a member of FDT.

14. **Member of EUROPLATFORMS**

Category A and B centres should also be a member of EUROPLATFORMS - European Association of Freight Villages and Logistics Centres, seeking greater contact and intimacy between European centres in EUROPLATFORMS.

STC fulfil the requirement, because it is a member of EUROPLATFORMS.

15. **Associated with a major logistics centre**

Smaller transportation centres with regional or local significance can - as long as they meet the criteria to be open and neutral - admit as associate member of the FDT. This can be done after approval of the closest located transport centre with membership of the FDT.

STC cannot fulfil the requirement, because it not member of major logistics centre.

16. **Open for all transport stakeholders/interests**

Openness is the key word. Without disclosure of the individual centres’ work, visibility cannot be created. Visibility is important for the centres’ role as a value-creating partner for business.

STC fulfil the requirement, because it is located several service and other companies in STC such as Burger King, Bram Stål A/S, DBK Logistics Service, EvoBus Danmark A/S, HD Ejendomme, KP logistic, Lemvigh-Müller, NCC, Netto, Nyscan, OK, SAC Leasing and Statoil, and STC is still open for new incomers. ([www.stc-koege.dk](http://www.stc-koege.dk))
17. **Handles European and international traffic**

Category A and B centres must be able to offer multiple transport modes for both national and European and international traffic. The various modes are not needed to be physically represented in each centre, but partnerships between transportation centres and ports, for example can help to ensure that the centres "direct" can receive freight and goods transported by ship. The range of modes, frequencies and delivery speeds are essential to users' choice.

STC fulfil the requirement, because it is handles European and international traffic, e.g. from and to Sweden, Germany, Baltic Sea Region, etc. Furthermore Port of Køge is part of STC.

18. **Handles national traffic**

The national traffic, including city distribution, must be exported from category A, B and C centres. The distribution must also include nationwide deliveries.

STC fulfil the requirement, because it is handles national traffic, e.g. Greater Copenhagen area, Øresund region, other part of Denmark.

19. **Handles regional and local traffic**

The regional traffic must be exported from all type of centres (A, B, C and D).

STC fulfil the requirement, because it is handles regional and local traffic, e.g. Greater Copenhagen area, Øresund region, etc.

According to the conducted analysis it can be seen that STC can almost fulfil all of the requirements established by the FDT in 2009 in Danish context. Based on the assessment, the highest correlation between STC and the categories can be found at category B, which means that STC is a national centre with regional importance and characterized by a certain modality, service functions for the regional area, distribution and warehousing facilities. The weakness of STC is a missing high class railway connection. The further development of STC should focus on the development of train connections on hinterland and also between the STC and Port of Køge.
6.1.6 STC is part of the Core Network Corridors


"The Commission estimates that investment needs in transport amount to EUR 500 billion in the entirety of the TEN-T network for the period 2014-2020, of which an estimated EUR 250 billion will need to be invested in the core network (in particular, the core network corridors) of the TEN-T. “The accelerated implementations of the trans-European transport Core Network corridors will favour more adequate transport infrastructure coverage of the Union, modal-shift and co-modality. Innovative information and management systems, that will form part of the network, will provide support for logistic functions, inter-modal integration and sustainable operation in order to establish competitive transport chains, according to the needs of the users. The efficiency of the transport system will be improved, with an important reduction of congestion and travel times.” (European Commission, 2011, p. 57)

Table 4 shows that Corridor 5 is Helsinki (Finland) - Valletta (Malta), which contains that route / corridor, where Køge (40 km from Copenhagen) is also located:

- Fehmarn: mode of transport is rail, there are ongoing studies, construction works related to Fehmarn Belt fixed link (road and rail) between 2014 and 2020
- København (Copenhagen) - Hamburg via Fehmarn (access routes): mode of transport is rail, access routes DK to be completed by 2020, access routes Germany to be completed in 2 steps (2020 - 2027)
Table 4: Core Network Corridors (CNCs)

<table>
<thead>
<tr>
<th>No</th>
<th>Name of CNC</th>
<th>Locations/cities of the CNC</th>
</tr>
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The new TEN-T guidelines promote the development of freight terminals and logistics platforms (that meet capacity criteria) of the 10 multimodal corridors, which is a great opportunity for STC to develop its Logistics Centre and co-finalised it with the European Union.

According to Pamela Luică (2012) “New technologies and concepts such as “green” corridors for freight transport are vital factors in meeting EU’s objectives promoted in the strategies for the next decades. In conditions such as these, the EU focuses on implementing projects on intermodal platforms and connection hubs between different transport modes, especially for railway and port transport and this objective should optimise the impact that the “reducing carbon footprint” concept
has on freight traffic by improving the efficiency and capacity of intermodal hubs and supporting the development of “green corridors” in conformity with the TEN-T guidelines.

The promotion of the development of an integrated and multimodal transport system is one of the priorities and consists in the proposals for freight terminals and logistics platforms of the European Union. Based on the fact that the Køge is part of the Core Network Corridor No 5 there is a possibility to obtain co-financing from the EU when further developing STC into a Logistics Centre, creating the combined terminal and developing the unit terminal in the port. In 2020 the opening of the Fehmarn Belt Fixed Link will also enhance the strategic importance of Scandinavian Transport Centre.

6.1.7 Strategic thinking of STC

After gathering all of the related knowledge how to further develop a Logistic Centre from the existing Scandinavian Transport Centre (Logistic Centres’ functionalities and organisation aspects, included the Operation and maintenance of facilities / buildings - types of terminals, cargo goods and load units, and Development and implementation of new activities / facilities; Characteristics of a Logistic Centres; Key determinants for the success of Logistic Centres development; Main challenges of the Logistics Centre developments) it is important to mention that one of the most important factors is the strategic thinking and decision making. Scandinavian Transport Centre has to find the balance between the market forces, motivate the players, and invite logistics companies and logistics providers to work together with the new Logistic Centre. In order to have a successful Logistic Centre STC has to create a sufficient environment, collecting transport and production, develop large warehouses, other key facilities and services. Based on the Assessment of STC as a Logistics Centre it is needed to further develop the railway connection on hinterland and between STC and Port of Køge to achieve the main goal to create a well-running and modern distribution centre to the Greater Copenhagen area and south Sweden.
6.2 Creation of a Combined transport terminal in Køge

This chapter will investigate the opportunity for creating a Combined transport terminal in Køge. A new Combined transport terminal can create added value by establishing facilities on the Core Network Corridors (defined by the European Commission) furthermore the planned land based terminal has an optimal location next to the highway and the new electrified railway between Copenhagen and Ringsted (2018). The terminal can function as a future Nordic rail hub creating synergy among the huge amount of train going in transit through Denmark from both Sweden and Germany and among the trains which pass through the area the Combined transport terminal can be also the national transport hub of Denmark.

Before the concrete analysis of Køge as a land based combined terminal, the following sections will give an overview about the combined train transport, the functions of the combined terminal – gateway, satellite and hub - and best practice for combined transport (CT) terminals in order to gather the necessary knowledge about how to set up a combined transport terminal in Køge.

6.2.1 Combined train transport

This section gives a brief overview about the concept of combined transports, the characteristics of the cargo units and the overall importance of the terminals in the transport chain.

Combined transport means “Combination of means of transport where one (passive) transport means is carried by another (active) means which provides traction and consumes energy” and a transport where the major part of the journey is by rail, inland waterways or sea and any initial and/or final leg carried out by road are as short as possible. (OECD Glossary of Statistical Terms, 2012)

Figure 19: Organization of a typical combined transport, source: own creation based on COWI (2010)

Figure 19 shows the organization of a typical combined train transport, which uses cargo units (containers, swap bodies or trailers), and the rail is the main way of transport between Market A and Market B. The transhipment of the cargo units is on the combined terminals at both ends of the train transport. The transport to and from the combined terminals, called the pre- and on-carriage is made by trucks. In some cases the transshipment at the combined terminals are connected directly with the
sea transport (ports) instead of the train transport as main transport mode. In other cases the transhipment of the cargo units in the combined terminal is from one rail vehicle to another. (COWI, 2010, p. 9)

6.2.2 Functions of the combined terminal – gateway, satellite and hub
Combined terminals are part of the network of the terminals. The function of the terminal depends on its position in the network. There are three different terminal functions:

- Gateway
- Satellite
- Hub

Figure 20 illustrates the domestic terminal system consisting of gateways, satellite and hub terminals connection to the port terminal. Terminal can be defined as a “gateway” when used as a transhipment terminal for local / regional goods. It also has a function as a “satellite terminal” in the overall terminal system. Pre- and port shipment (pre-and on-carriage) is carried by truck. A “hub terminal” join two or more key connections (road to rail or sea). In practice, the unit loads are assembled, distributed, and lifted by cranes and reach stackers.

Køge as a land based Combined transport terminal will be used as hub and gateway in the future, which means that two modes of transport such as road and rail will be connected. The Køge terminal can be also used as a future Nordic rail hub and as the national transport hub of eastern Denmark.
6.2.3 Best practice for combined transport (CT) terminals

The DIOMIS study (2007) “Best practices for the management of combined transport terminals” identified a number of aspects to improve the terminal operation and management in general. All of the below described information: basic functions, additional services, basic components and improvement of management and transhipment capacity of CT terminals are essential and useful knowledge to create the Combined transport terminal in Køge.

6.2.3.1 Basic functions and additional services of CT terminals

Basic functions are related to the rail/road interface position in the supply chain and any intermodal terminal is required to match, and additional services, which a terminal operator may or may not offer depending on the local demand for them (DIOMIS, 2007, p. 10):

- Transhipment of loading units between different transport modes
  Road - Rail - Inland Navigation
- Terminal Handling
  - Check-in/out
  - Security check
- Intermediate Buffer for loading units / vehicles
- Agency function for railways and operators
- Storage of loading units (Container-Depot)
- Temperature controlled / dangerous goods
- Trucking Service
- Container Repair
- Customs Services

6.2.3.2 Basic components of CT terminals

In recent years a modular shape of terminals (see Figure 21) has been developed which is made of:

- One - or better double-sided rail access, where
- Signalling allows for entry with momentum and direct departure of the train by the main line traction unit
- Three to five “train long” (length can vary between countries) handling or transhipment tracks, with
  - Rail-mounted gantry cranes (RMG)
- Two to three interim storage or buffer lanes
- One loading and one driving lane
- Road side access with
- Check-in / check-out area (gate) and sufficient parking space
6.2.3.3 Improvement of management and transhipment capacity of CT terminals

According to the Diomis studies, the transhipment capacity of intermodal terminals can be enlarged by increasing the physical infrastructure (building of additional handling tracks, extension of tracks, upgrading the rail and road side accessibility, extending the storage of buffer space) or the acquisition of additional or more efficient cranes. These are the so called “hard” measures. The “soft” measures include the improvements in the process organization or in communication procedures. This part focuses on the “soft” tools which are suitable for improving the management and transhipment capacity of the existing CT terminals:

- Increase of flow factor
- Control of shunting services
- Supply of road trucking services
- Extension of terminal opening times
- Sophisticated capacity management systems
- Automated loading unit identification
- Separation of rail-side and road-side handlings
- Task management according to pre-notification
- Punctual rail services

The knowledge of “hard” and “soft” measures can give useful information how to plan the combined terminal in Køge further. The state-of-the-art physical infrastructure and the successful management and transhipment capacity will give the success to the terminal in the future.
6.2.4 Køge as a land based Combined transport terminal

Køge has a perfect location; it is geographically part of the Core Network Corridors (defined by the European Commission). The establishing of a Combined transport terminal in Køge can create added value on the core network corridor. It is important to mention that the terminal will be located next to the new highway and the new electrified railway between Copenhagen and Ringsted (2018) and in this way surrounded by the newest infrastructure and state-of-the-art technological solutions. (see Figure 22)

![Map of Denmark showing Køge's location](image)

**Figure 22: Strategic location of Køge: close to sea, rail and road, source: STC (2012)**

After the establishment of Fehmarn Belt Fixed Link in 2020 (an immersed tunnel that is proposed to connect the German offshore island with the Danish island of Lolland. This would cross over the Fehmarn Belt in the Baltic Sea - 18 km long - hence providing a direct link by railroad and highway between northern Germany and south eastern Denmark) Køge will have an even better strategic location.
6.2.4.1 Location of the Combined transport terminal in Køge

In designing the rail link project between Copenhagen and Ringsted, the Danish Parliament decided that Trafikstyrelsen (the Danish Transport Authority) should explore the possibility of building a combined terminal in Køge. A combined terminal should be seen partly as a part of the rationalization of freight handling and as the possibility of being able to transfer more freight from road to rail transport. A combined terminal allows the transhipment of containers, trailers and swap bodies from rail to road and vice versa. By placing the terminal close to the town it has the opportunity to collaborate with the Scandinavian Transport Center and to exploit the access to Port of Køge. There is an already existing side track to Transport Center from Lille Syd Banen and there are plans made on how to develop the combined terminal. (Trafikstyrelsen, 2008, p. 3)

Trafikstyrelsen has investigated the possibilities of locating an upcoming combined terminal near Køge in the area between Jersie Mose and Køge Å, where the west highway is laying in a long soft curve. Here there are opportunities to connect the terminal to the new railway, transport centre, motorways and rail connection to the Port of Køge. Trafikstyrelsen has conducted a preliminary assessment of this area to find the best location for the combined terminal – considering the technological requirements of the rail and road and environmentally friendliness. Two places are assessed as suitable for a destination area, and three places are assessed as suitable for terminal's loading area. The suitable places are described below.

New tracks in connection with the installation of the combined terminal are showed with red trace and all the possible solutions are shown in the same map. The black trace in the long curve indicates the double-track in the Copenhagen-Ringsted project, which is a prerequisite for the creation of a combined terminal in the same area.

On Figure 23 can be seen that Number 1 and 2 are assessed as suitable areas for arrival; letter A, B and C are assessed as suitable for terminal's loading area.

1. Arrival area between Ølby and Højelsevej
2. Arrival area by Salbyvej
   A Loading area at the Scandinavian Transport Centre
   B Loading area between Ølby and Store Salby
   C Loading area between Højelsevej and Salbyvej
Arrival area between Ølby and Højelsevej

An arrival area can be placed between Ølby and Højelsevej parallel with a new railway Copenhagen-Ringsted via Køge. The location makes it possible to build direct rail link, sluice track, bridge or tunnel longer to the west. A solution with bridge or tunnel would require that three tracks will go through Vittenbjerg fredning instead of those two, which were planned for the main route Copenhagen-Ringsted. Since the terrain is hilly and the arrival area must be horizontally, there is a need for extensive field works.

Arrival area by Salbyvej

There can also be an arrival area further west between Højelsevej and Salbyvej. The arrival area crosses Tranemose Bæk and Salbyvej, which can be moved to a new road connection with Højelsevej.

Direct track connection will require that the three new tracks will go through the outskirts of Vittenbjerg fredning instead of the two, which were planned for the main route Copenhagen-Ringsted. A sluice track would require three tracks to go through Vittenbjerg fredning over Køge Å, like a solution with tunnel or bridge also will require three tracks through Vittenbjerg fredning and over Køge Å. A solution with a bridge or tunnel also requires extensive field works.
A Loading area at the Scandinavian Transport Centre

A loading area at the Scandinavian Transport Centre is a possibility. The centre already has a track with north-facing access from the centre to the Lille Syd Banen. Scandinavian Transport Centre and Køge Municipality have plans to expand Scandinavian Transport Centre and widen to four rail tracks with trace connections in both directions, where after the area could function as a small combined terminal. If the new building solution is realized, then this loading area can be associated with one of the suggested arriving areas on the new track.

Though the loading area at the Scandinavian Transport Centre cannot be expanded to handle 250,000 TEU per year, because of the current utilization of the area, but it can be used in combination with one of the two other loading areas.

As a first stage of a combined transport terminal at Køge, a new loading area can be created at the Scandinavian Transport Centre at the same time with the construction of an arrival area. Since then, this constantly can be enlarged at one of the other loading areas, with the need up to the maximum specified size.

A disadvantage is that there is approximately 1.5 km from the loading area to the two possible arrival areas. It requires increased shunting and providing in this way higher operating expenses. On the other hand, there are several advantages of the loading area at Scandinavian Transport Centre – especially which is already in use as a loading area and has road connection to Lyngvej.

At the Scandinavian Transport Centre it is a possibility to have a rail link to Lille Syd Banen and therefore a connection to Port of Køge.

B Loading area between Ølby and Store Salby

Between Ølby and Højelsevej it is possible to place a loading area approx. 500 m from Store Salby and app. 300 m from Ølby parallel with Vestmotorvejen. A loading area here will require the construction of an access route from the Scandinavian Transport Center. Access to the Køgebugt Motorvejen may be provided by the ramps at Lyngvej. There is place enough for the terminal to be able to handle 250,000 TEUs annually. The positioning of the location is consistent with Køge Municipality area planning.
Loading area between Højelsevej and Salbyvej

There can be placed a loading area between Højelsevej and Salbyvej app. 500 m from Store Salby and Ejby. The area is close to Ejbyvej, where it will be possible to build entrance and exits to and from Vestmotorvejen.

The terminal has space enough to handle 250,000 TEUs annually. The area is located in the rural zone, and inside Fingerplanens transport corridor. (*Ibid*, p. 9-11)

As mentioned before Trafikstyrelsen (Danish Transport Authority) conducted an analysis, which investigated the possibility of building a combined terminal in Køge. The analysis included an assessment of the existing combined terminals - Taulov, Høje Tastrup, Helsingborg and Malmö - which considered being significant in connections to the new combined terminal (included the capacity and freight volumes). Furthermore the analysis presented concrete and international examples of “best practices” in the field of combined terminals. COWI A/S in cooperation with the German consulting company ECT Consultants GmbH and Baltic Consult GmbH prepared the combined analysis of market and terminals for the request of Trafikstyrelsen and published it in October 2010.

The analysis was well-prepared, but due to influence of the strong competition the conclusion was not correct. The analysis suggested to further develop the Høje Tastrup combined terminal referring to the fact that the main flow of the freight rail traffic north / south of Zealand should go on this path. With this reasoning Høje Tastrup terminal was suggested to be expanded in the future instead of Køge. Since the new electrified railway between Copenhagen and Ringsted (2018) will pass through the area of Køge, the proximate location close to Port of Køge would make a much more suitable location for a combined terminal, since synergies with seaborne transports would be much easier to establish from a combined terminal in Køge compared to the terminal in Høje Tastrup.

To sum it up, considering the added value, which can be created on the Core Network Corridors, the new electrified railway between Copenhagen and Ringsted (2018) will apply the best technologies and solutions, confirming that Køge is ready to establish a combined transport terminal. It could function also as a future Nordic rail hub in the rail transport between North (e.g. Sweden) and South (e.g. Germany) and the national transport hub of eastern Denmark, helping the environmentally transport by enhancing the use of rail instead of the congested road transport.
6.3 Creation of a Unit-Terminal

This part of the project will highlight the advantages and describe the possible implementation of the Unit-terminal with the aim of making the Port of Køge into a modern and highly efficient entry and exit port in the Baltic Sea Region. The Unit-terminal would develop and handle mainly the additional ship-based ro/ro traffic, which could be later extended to also contain container traffic. The reason of the specialization on ro/ro is that the Baltic Sea Region in maritime aspect will use this type of transport mode in the future. The unit-terminal is located in the East-West corridor of Denmark, which means an easy and environmentally friendly transports (sea and rail) connection through United Kingdom, Esbjerg and Køge to the Baltic Sea Region (e.g. Klaipeda, Liepaja, St. Petersburg).

6.3.1 General description of the unit-terminal project

Port of Køge has a strategic location on the Eastern part of Denmark and Eastern shoreline of Zealand, exactly:

- 40 km south of Copenhagen (city centre)
- 45 km from Copenhagen Airport
- 4 km from Scandinavian Transport Centre, at the intersection of the Danish motorway system with E20 and E45 going north – south and west

By establishing a modern and efficient port in Køge its strategic location could be fully utilised.

Figure 24 shows the central location of Port of Køge, which ensures the basic principle of creating the unit-terminal in Køge and making it possible to connect the rail, sea and highway (Scandinavian Cargo Corridor – Køge, 2012, p. 2):

- Entry and exit point to a major customer and industrial market in and around Copenhagen
- Located on the TEN-T map of corridors in Northern Europe, connection North and South with East and West
- The Fehmarn Belt Fixed Link (2020) will improve the road and rail access in Køge
- Connection point between the Baltic Sea Region and Denmark
- The new electrified railway line between Copenhagen and Ringsted (2018) in mid-Zealand will pass through Køge and connect the Øresund region with it
- Connect East Denmark (Køge) with West Denmark (Esbjerg) and beyond i.e. United Kingdom and the Netherlands

The global project of the Unit terminal addresses the need to move traffic from the heavily congested roads to other modes of transport by improving the possibilities for intermodality through short sea traffic and the use of rail.
The unit terminal would use the existing infrastructure around Køge, including Scandinavian Transport Centre, which encompassed an area of 120 hectares, equal to 1,200,000 m² in 2000 (year of establishment) and which recently has been extended to a total of 180 hectares. Currently about 15 logistics and transport companies are operating at the area of the centre, occupying about 80 hectares, with a daily traffic flow of more than 1,200 lorries. (Ibid, p. 4)

A new electrified and double track railway line from Copenhagen to Ringsted is under construction, which will be completed in 2018. The new line will connect Køge directly with the European Railway network. This will provide direct access from Køge to the following locations:

- To Rødby, 120 km south of Køge, where the new Fehmarn Belt fixed link is planned to open in 2020, which will include both a rail and road connection to Germany. This will most likely generate cargo transport on rail from major ports like Hamburg and Lübeck of both trailers and containers directly to Denmark. As an integral part of the Fehmarn Belt Fixed Link project the two countries, Denmark and Germany, have promised each other to upgrade the railway network.
line between Ringsted and Rødby in Denmark and between Puttgarden and Lübeck in Germany with two tracks and electrification.

- To Sweden, where the existing fixed link across Øresund is only 50 km from Køge.
- To West Denmark, where the fixed link at Storebælt supports a coherent East – West access and cargo flow within Denmark, and currently also to Germany. \textit{(Ibid)}

It is planned that the railway line from East to West Denmark, from Køge to Esbjerg, will be electrified in 2015. This will ease cargo transport between East and West Denmark on rail, i.e. between Køge and Esbjerg.

“From 2018 the current railway line from Køge to Næstved will be electrified, which will facilitate easier rail transport on Zealand, from Copenhagen, through Køge and onwards to the Southern part of Zealand. The existing railway line from Roskilde to Køge, which continues to Næstved passes by the Scandinavian Transport Centre, where a secondary track leads directly to the Centre.

From the railway station in Køge there are good existing railway connections to the Port of Køge, and these branch lines could be extended to be part of the new section of Port of Køge.” \textit{(Ibid)}

![Figure 25: Map with the new Port of Køge, new Combined transport terminal, location of Scandinavian Transport Centre with the connecting railway lines and roads, source: STC (2012)](image-url)
Figure 25 shows the interconnectivity of the Port of Køge, the existing port related areas, the future port expansion areas, the urban and non-urban areas, the existing road and railway network and the future railway track. The easier access and the efficient logistical solutions would help the on-going infrastructure investments in Denmark, which are already supported financially by TEN-T grants. The implementation of a new port at Køge would also sustain intermodal transport solutions which are in motion.

The map of Northern Europe illustrates the strategic location of Port of Køge (see Figure 26). It can be seen that the east-west potential cargo flows and the north-south corridor cross each other at Port of Køge.

The main objectives of the creation of the unit-terminal can be summarized as follows:

- "To transfer the transport of goods from road to ship and from road to rail and thereby promote the development of greener transport corridors within Northern Europe.
- To provide, additional, improved and direct access to and from industrial and consumer markets in and around greater Copenhagen, including the area of Malmö in Sweden, with a population of 1.5 million consumers and with more than 50 manufacturing industries with
more than 20 employees each in Copenhagen alone, of which 11 has more than 100 employees.

- To connect East and West Denmark, from Køge to Esbjerg, along a new electrified and direct railway line.
- To connect East Denmark, and thereby indirectly West Denmark, with a growing import and export market in the Baltic Region, including its hinterlands from the Baltic Sea and through Belarus, Russia and Ukraine.
- To secure free, competitive and efficient market access for producers and consumers along the European Core Transport Network.” (Ibid p. 5)

6.3.2 Description of the proposed actions

The unit terminal supports the continued modernisation and expansion of the Port of Køge at the shore line of East Zealand, 40 km south of Copenhagen, in order to be able to receive and handle an increased volume of cargo in the port. The port is able to handle more than 1.5 million tons of cargo annually. Based on port statistics from the last two years this makes the port into a class “A” port according to EU standards.

Port of Køge will be extended by constructing 25 hectares, 250,000 m², of a new unit-terminal, which will be built to handle Ro/Ro and Lo/Lo cargo, as it is foreseen that there will be an increased demand for this type of transport, especially between Denmark and the countries in the Baltic Sea area. (Ibid p. 6)

In the medium and long term, it is expected that feeder ships from the major international container ports in and around Denmark, for example Aarhus, Hamburg, Cuxhaven, and Gdynia will be servicing the new unit-­--terminal at Port of Køge.

The unit-terminal could be prepared to so it has railway tracks directly to the new berths, which can be connected to the national railway system from the nearby station in Køge.

In case of the unit-terminal at Port of Køge cannot be constructed, there will not be sufficiently available area for developing and handling additional ship-based ro/ro traffic in and around the greater Copenhagen area and therefore the use and development of green corridors for transporting industrial and consumer goods would be not successful in the Copenhagen area. The new port at Køge will concentrate on the handling of ro/ro transports from the Baltic Region, but also be capable of handling goods from other regions, which need to import / export goods from a growing North European market. The existing port is being extended through amendment of a new 40 hectare (400,000 m²)
landfill in the future, in this way the unit-terminal can complement the on-going extensions. *(Ibid, p. 7)*

Figure 27 shows that the project is divided into six activities starting from 2012 and finishing in 2017:

- **Activity 1: Preparatory works:** include the completion of an already on-going Environmental Impact Assessment (EIA), and the further investigation of the transferable volumes of goods linking the Western and the Eastern parts of Denmark together in a rail and sea based intermodal transport solution.

- **Activity 2: Design and construction of breakwaters for the Unit-Terminal:** two parts of a new breakwater will be designed and constructed. Firstly along the access area to the unit-terminal, secondly, the remaining part of the breakwaters surrounding the Unit-Terminal.

- **Activity 3: Design and construction of the unit-terminal perimeter structure:** deals with the design and construction of the unit-terminal perimeter structure (quay wall and revetment), where site investigations, detailed design and actual construction work will be undertaken.

- **Activity 4: Design and construction of dredging and reclamation works:** the design and construction of reclamation works will be completed.

- **Activity 5: Quay Equipment**

- **Activity 6: Pavement and Drainage**

It should be mentioned that throughout the implementation of the proposed Action, a number of general activities like project management, monitoring, supervision, reporting, etc. will be carried out. *(Ibid, p. 10)*
The project of unit-terminal is supported by number of infrastructure investments between 2015 and 2020, which ensure a modern and efficient port in Køge:

- In 2015: Railway line from Køge to Esbjerg will be electrified
- In 2016: Danish highway system with E20 / E45 (going north-south and west) will be extended, where Port of Køge located (only 4 km from it)
- In 2018: New electrified and double track railway line from Copenhagen to Ringsted via Køge will be set up, and the current railway between Køge and Næstved will be electrified
- In 2020: Opening of the Fehmarn Belt Fixed Link, which will provide a direct link by railroad and highway between northern Germany and southern Denmark

The unit-terminal will be the “market” for different transport solutions, such as Ro/Ro, Lo/Lo, container (later on) and rail traffic. A number of other ports, shipping and other companies could use the well equipped and state-of-the-art new unit-terminal in Køge. (Ibid, p. 8)

The global project - including the Action - is illustrated below (see Figure 28).

![Figure 28: Illustration of the Unit-Terminal, source: STC (2012)](image)

6.3.3 Contribution of the Unit-terminal to the TEN-T priority projects

The unit-terminal project would align with the TEN-T priority project called “Motorways of the Sea” and more specifically it would further strengthen the on-going Motorways of the Sea priority project called “Motorway of the Baltic Sea”, which linking the Baltic Sea member states with member states in Central and Western Europe, including the route through the North Sea / Baltic Sea Canal.
The unit-terminal would furthermore have a direct network effect on the TEN-T railway priority project with the opening of the Fehmarn Belt Fixed Link (2020). It will be possible to make a direct railway connection from the unit-terminal and to the new railway line Copenhagen – Ringsted (with planned opening in 2018), which will go through Køge.

Finally it should be mentioned that the unit-terminal supports the principles, concepts and ideas of the 2011 EC White Paper on “Roadmap to a Single European Transport Area”. This concept respect the possibilities of applying intermodal transport solutions where road, sea and rail could be integrated and thereby optimise the performance of multimodal logistic chains, among others by using more energy efficient modes.

Due to the strategic location, the expanded Port of Køge can benefit from the extended transport network in its hinterland, including both rail and highways, and a substantial demand and supply of cargo needs from the consumer and industrial markets nearby. As the same time the Port is located at the entry to the Baltic Sea, which will open up for new markets and thereby transport needs to be satisfied.

Nowadays a maritime link between the area of greater Copenhagen and the Baltic Region exists with a few weekly departures. Most of the goods have to go through Copenhagen, which creates bottlenecks, congestion and unnecessary air and noise emissions. By the opening of a new direct maritime link between Liepaja and Køge for ro/ro and lo/lo transport the access to the markets will improve drastically.

The implementation of the unit-terminal would provide the opportunity for freight forwarding agents, shippers, stevedoring firms and other stakeholders in the logistic chain to take full advantage of environmental and related economic benefits from direct access to co-modal transport solutions. ”Thereby the Scandinavian Cargo Corridor could be established, with its base in Køge.” (Ibid, p. 16-17)

6.3.4 Contribution of the unit-terminal to the EU policies and strategies

The unit-terminal would contribute to the further development of the European Union and its overall mandate and policies, as follows:

- By the possible opening of a new maritime link to the Baltic Sea, the competition between East Denmark and the Baltic Region will increase and the supply of connections will be improved and the transport prices will decrease.
• Markets within the EU will be better connected with the markets around the EU, which means that Denmark will be better connected to the Baltic Region and in this way further to the East, to Russia, Belarus and related markets.
• Through the development in Køge it will also make sense to connect it directly with Port of Esbjerg (North Sea) in order to establish a regular east-west rail connection.
• The potential growth of maritime transport through the development of Port of Køge will have a positive effect on the Baltic countries such as Estonia, Latvia and Lithuania. The investments in the economy, the environment and the infrastructure will be a direct asset for the development of possible new maritime links within the area.
• Due to the link between the regions of East Denmark - including the metropolitan area - and the Baltic Sea markets, the platform for establishing and building up an “inclusive growth”, as defined in the Europe 2020 targets is paved. (*Ibid*, p. 17)

6.3.5 Macro and regional socio-economic benefits

“The railway connection between the Port of Køge and the Scandinavian Transport Centre ensures a dynamic logistically handling of the cargo flows in Zealand. It ensures that the many large companies that are represented at the Scandinavian Transport Centre can quickly have their cargo lead towards shipment to Norway, Sweden and the Baltic and vice versa. This way, cargo can be transported by rail directly to shipment, without having to go through Copenhagen and thereby avoiding road congestions, unnecessary emissions of CO₂ and other pollutants and at the same time ensuring an effective handling of the cargo.”

In 2009 the Port of Køge made an analysis with the help of Gemba Seafood Consulting A/S and Grontmij about the port’s economic impacts, and an assessment about the economic impact of a possible expansion of the existing port. Based on this analysis the economic effects of the new unit-terminal can be estimated. The local and regional economy would benefit from the on-going expansion (30 hectares) and from the new unit-terminal (25 hectares).

Considering the employment, 115 additional persons are expected to be hired, the production value would enhance app. with more than 30 million EUR, and creation of income will be over 17 million EUR and these economic impacts would result 5 million EUR in taxation annually. (*Ibid*, p. 18)

6.3.6 Development of infrastructure around Køge

The development of the infrastructure around Køge is continuous. There are numerous on-going investment projects, which include major new railway infrastructures, extension of the nearby highway, and the construction of the Fehmarn Belt fixed link. These infrastructure investments allow for Port of Køge to benefit from.
Port of Køge is already extending the existing port with a new area of approximately 40 hectares (400,000 m²), which is supported by national, regional and local authorities. This extension will encourage the existing industries and commercial companies to move from the nearby area of the port close to the city centre in Køge in this way old area will be freed to accommodate an urban development scheme already planned and designed by the Municipality of Køge.

6.3.7 Impact of the unit-terminal on traffic management, congestion, modal split, interoperability, service quality, safety, security, competition

Impact on traffic management: By moving the existing port to the Northern part of the city of Køge, and thereafter establish the unit-terminal in relation to this, the amount of traffic going through an urban area will be reduced, thereby reducing traffic noise in the city.

Impact on congestion: The ships, which will come from the Baltic Region, will most likely use the unit-terminal. This will remove cargo transports from the road, where congestion on the European road network will decrease, which will lead to the reduction of CO₂ emission.

Impact on modal split: Port of Køge as wet port will have direct access to rail and road. The fact that rail could have direct access to the unit-terminal creates a remarkable possibility of promoting modal split.

Impact on interoperability: The unit-terminal will be a great possibility of creating synergy in line with other on-going and planned infrastructure investments on Zealand and in Trans-European Transport Network, which will facilitate interoperability in the future.

Impact on service quality: By securing a modern and efficient port operation, for cargo from sea, rail and road in the unit-terminal the service level will increase, and the port will become more competitive and comparable to any other modernised port within the EU.

Impact on safety: Considering the principle that the sea and rail transport are safer than the road and the fact that the unit-terminal has direct railway line and sea connection, it will support the safer transport solution.

Impact on security unit-terminal would have the state-of-the-art security systems which will follow the newest international standards, the best practice and economically most advantageous systems.
Impact on competition: unit-terminal can offer a competitive location and competitive rates which has a positive impact on the future transport costs, and will probably promote short sea transport modes in comparison to other and more polluting transport modes. (Ibid, p. 25-26)

6.4 Synergy between the Logistics Centre, Combined transport terminal and Unit-Terminal

All of the three individual elements – further Logistics Centre development, planning and building a combined transport terminal and creating a unit-terminal- are factors that can enhance the role of Port of Køge as an important hub in the Baltic Sea Region. This section puts the emphasis on the synergy, which is created by the three individual elements in the supply chain. The individual projects have their individual benefits, but considering the possible relationships between the Logistics Centre, the combined transport terminal and the unit-terminal, it can be seen that the benefit is more than the sum of three individual benefits separately. Globally thinking the cooperation and integration between the 3 elements result in a higher level of synergy and an environmentally friendly transport solution by enhancing the importance and usage of sea and rail transport.

Figure 29: Synergy between Logistics Centre, Combined transport terminal and Unit-Terminal, source: own creation

Figure 29 shows that there is a relation between all the three elements, which can create synergy. The individual relationships can be summarised as follows:

6.4.1 Synergy created by the Logistics Centre

The Logistics Centre can create sufficient environment, a logistics hub by collecting transport and production, developing large warehouses, and other key facilities and services. It will be a well-running distribution centre to the Greater Copenhagen area and south Sweden, which can create synergy on the EU Core Network Corridors. The Logistic Centre will reduce total transport expenses,
strengthen the role of the unit-terminal/ Port of Køge in the transport chain, intensify the multi-modal solutions (rail and road), reduce the high cost of the centrally located port area and avoid the traffic bottlenecks in the surrounding area. It is clearly visible that all of the individual benefits will positively effect on the combined transport terminal and unit-Terminal.

6.4.2 Synergy created by the Combined transport terminal

A new combined transport terminal has an optimal location next to the highway and the new electrified railway between Copenhagen and Ringsted (2018). In this way it will be surrounded by the newest infrastructure and state-of-the-art technological solutions and can create added value by on Core Network Corridors. The Combined transport terminal can function as future Nordic rail hub by creating synergy among the huge amount of train from Sweden and Germany (and forward) and among the trains which pass through the area. The Combined transport terminal can be considered also as the national transport hub of Denmark. The terminal ensures a good hinterland connection for the Unit-Terminal and gives the opportunity for the trucks / trains coming in and out to use the facilities and services of the Logistics Centre.

6.4.3 Synergy created by the Unit-Terminal

The unit-terminal will create Port of Køge to a modern and highly efficient entry and exit port in the Baltic Sea Region. It would develop and handle mainly the ro/ro traffic, which can be later extended to container traffic. The Unit-terminal will be also an entry and exit point to a major customer and industrial market in and around Copenhagen and connection point between the Baltic Sea Region (Klaipeda, Liepaja, St. Petersburg) and Denmark. It would connect East Denmark (Køge) with West Denmark (Esbjerg) and beyond i.e. United Kingdom and the Netherlands. It will help to transfer the goods from road to ship and from road to rail. The implementation of the unit-terminal would provide the great opportunity to develop its hinterland. Both the Logistics Centre and the combined transport terminal can take part form the positive effect on the increased number of ships / rails / trucks going in and out form the port and use their facilitates and services.
7 Strategic cooperation between Port of Hamburg and Port of Køge

This chapter focuses on the “Set up of a closer strategic cooperation between Hamburg and Køge”. The chapter is divided into six main parts: Motivation for seaports to work together; Port of Hamburg and its existing partnerships in and around the BSR; Hupac and the Shuttle Net European network; Case studies; Possibilities of the joint work; Potential results/benefits of the strategic cooperation.

7.1 Motivation for seaports to work together

Before using direct examples, such as the existing partnerships cooperations of the Port of Hamburg or other case studies to highlight how to set up cooperation between Port of Hamburg and Port of Køge it is worth to summarize the main motivations for seaports to work together (StratMoS, 2009, p. 173):

- Lack of space in port area
- Sharing knowledge
- Environmental benefits
- Sharing facilities
- Innovations
- Need for human resources
- Faster transhipment of goods
- Increase freight volume
- Share cost

In case of Port of Hamburg and Port of Køge the most important factors can be summarised as the increase of freight volume and reduction of cost by the faster transhipment of goods from and to Hamburg and Køge in Baltic Sea Region.

7.2 Port of Hamburg and its existing partnerships in and around the BSR

Port of Hamburg is located between the North Sea and the Baltic Sea. The Kiel Canal connects the port to Scandinavia and the whole Baltic Sea Region. The Elbeseitenkanal and the Midland Canal provide connections to the hinterland. The Elbe-Lübeck Canal provides an inland waterway from Hamburg to the Baltic Sea. The Port of Hamburg is transhipment centre for goods of all kinds and a one of the leading logistics locations in Northern Europe and on a worldwide basis.

Port of Hamburg has various partnerships with the aim of involve an exchange of technical and commercial know-how and experience on best practice and cooperates closely with the other ports in order to meet new logistical challenges. Its further objective is to build up strategic networks in ports with many trade routes from/to Hamburg. Hamburg cooperates closely with other ports on the Elbe River, Cuxhaven, Brunsbüttel and Glückstadt, as well as with the Baltic Sea ports Lübeck and Kiel, etc. Worldwide Port of Hamburg has six partner ports, or port cooperation agreements with Port of
Based on the telephone interview with Sebastian Doderer, the representative of Port of Hamburg Marketing, Amber Coast Logistics Project Manager; Port of Hamburg has existing partnerships in the Baltic Sea Region with Lübeck, Kiel, Sassnitz and Ust-Luga.

7.2.1 Lübeck

Port Hamburg and Port of Lübeck set up a strong alliance. The port in Lübeck and Lübeck-Travemünde functions as an important link between Hamburg and the whole Baltic Sea Region. Germany’s largest Baltic Sea port handles over 27 million metric tons (2010) of cargo annually and provides more than 100 departures per week to Scandinavia, Finland, Russia and the Baltic countries, as well as to the USA. Ferries and Ro/Ro traffic are particularly important.

The largest terminal operator is the Lübecker Hafen-Gesellschaft, which operates four cargo-handling terminals. Among them is the Terminal Scandinavienkai, Europe’s largest ferry terminal, which has nine berths and over 80 arrivals and departures per week. The terminal has been modernised and expanded extensively during the last few years. (Ibid)

7.2.2 Kiel

The seaport in Kiel is among the most flexible and economic ports on the Baltic Sea. Its favourable geographic position, channels deep enough for seafaring ships the whole way and direct access to rail and road networks make the port attractive for both cargo and passenger services. The port also profits from its position at the entrance to the Kiel Canal, the man-made waterway with the heaviest traffic worldwide. (Ibid)

Port of Hamburg has cooperations with Lübeck and Kiel in the field of marketing, port presentation and also political lobbying. These cooperations have been established (Lübeck in 2003, Kiel in 2006) in the contexts of cooperating within the Hamburg Metropolitan Region. The metropolitan region concept integrates city of Hamburg and area around.

7.2.3 Sassnitz

Port of Hamburg has a terminal operating company in Hamburg, called Buss Port, which operates one terminal in the port of Sassnitz. Buss Port Logistics operates efficient multi-purpose-terminals and stands for a multifaceted offer of port-specific services. As an innovative port service provider, Buss Sea Terminal Sassnitz handles bulk cargo, break bulk cargo, heavy cargo, project cargo and containers. Warehouse logistics as well as forming of the overall logistics chain also belong to the services provided. Located in Germany’s easternmost deepwater port directly at the Baltic Sea, Sassnitz is the single port in Germany capable of handling and transshipping Russian broad-gauge railcars. (www.buss-ports.de)
7.2.4  Ust-Luga

Port of Hamburg has cooperation with the Russian port of Ust-Luga. It is located in south of St. Petersburg, the new port / terminal that has been built in the past years. In Ust-Luga one of the Hamburg based terminal operating companies is the shareholder and therefore there is cooperation with them. “In December 2007 National Container Company (NCC, Russia) and EUROGATE (Europe's leading container terminal logistics group) signed an agreement provided for strategic partnership and cross-participation in container terminals in Ust-Luga (ULCT) and Wilhelmshaven (JadeWeserPort).” (www.container.ru) Port of Hamburg set up this cooperation, i.e. the EUROGATE investment in Ust-Luga the end of 2011.

Generally the main reasons for Port of Hamburg to set up these cooperations were the creation of synergies in the fields of marketing. More people will listen if the ports will act / or present themselves jointly, and it leads to cost saving. It is a more effective way to coordinate the offered services, and ensure that they will be complementary and not overlapping.

7.2.5  Budapest

Port of Hamburg has cooperation with the Hungarian combined terminal, called BILK in Budapest. The shuttle train of Eurogate Intermodal and BoxXpress went into services in 2006.. In 24 hours the freight from Hamburg can be transported to BILK with the new shuttle train connection. Generally the part of Port of Hamburg’s strategy is to create easy access in hinterland (1000 km) and ensure the fast moving of the freight and the good quality in transportation.

Port of Hamburg is interested in being involved in strategic cooperations in order to create better hinterland connections. Longer direct train connections can create better market position for the port.

7.3  Hupac and the Shuttle Net European network

Hupac is the leading combined transport operator through Switzerland and one of the market leaders in Europe. The company works to ensure that an increasing volume of goods can be transported by rail and not by road, thus making an important contribution to modal shift and environment protection. Hupac operates a network of 100 trains each day between Europe’s main economic areas.

It has around 5,900 rail platforms and combines the consignments of different transport companies into whole trains as a neutral, independent combined transport operator. These trains run back and forth between transhipment terminals on long and mostly international routes, with traction provided by external rail companies. The transport companies take care of local distribution. Hupac is committed to railway liberalisation and offers its services to all transport companies. (www.hupac.ch)

Hupac is a good example for a professional company, which can see the realistic opportunities and develop efficient transport solution and create active operation network.
Hupac created the Shuttle Net, which is their European network for high quality intermodal transport. There are 100 trains a day, which have direct connections from terminal to terminal. The daily and multiple daily departures are in line with fixed timetables, it is the utilization of the main European hub terminals for optimal transport logistics. IT systems for simple handling and efficient tracking and tracing help the efficient operation. The Shuttle Net moves around 700,000 road consignments per year on rails – quickly, safely, dependably and ecologically. The Shuttle Net trains carry all common loading units such as the containers, tank containers, swap bodies and semi-trailers with intermodal equipment. (Ibid)

Figure 30: Shuttle Net European network, source: Hupac (2012)

Figure 30 illustrates the non-stop train links / corridors in the European network. It can be seen that there are daily train connections in Taulov and Høje Tåstrup, which are existing combined terminals in Denmark. The new combined transport terminal and Logistic Centre in Køge with the state-of-the-art technological solutions, new facilities and surrounded new infrastructure can serve as a great opportunity to extend the Shuttle Net European network with the new stop in Køge. The shuttle train connection between Hamburg and Køge could create one of the basic factors of the strategic
cooperation between the two ports. Port of Hamburg and Port of Køge could create a common project and keep in contact with Hupac to make an analysis about the possible shuttle train connection between the terminals of Hamburg and Køge considering the freight flows, time, price, etc.

7.4 Case studies
The following case studies highlight port cooperations at international level. Both case studies related to the Baltic Sea Region (BSR) and shortly introduce the cooperation between Denmark and Sweden (Copenhagen Malmö Port (CMP)); and between Sweden, Denmark and Estonia (The Baltic Sea Hub and Spokes Project). The first case highlights the cooperation between Port of Copenhagen and Malmö, the second one between Ports of Aarhus, Gothenburg and Tallinn. The case studies help to analyse the importance of port cooperations in practical point view.

7.4.1 Copenhagen Malmö Port (CMP)

Copenhagen Malmö Port (CMP)

The history of CMP is a story about a unique cross-border alliance. For the first time in history, two ports in two different countries have joined all their port operations into one company, one organisation and one legal entity. CMP was founded 2001, following the merger of port and terminal activities in Copenhagen and Malmö.

The merger was a consequence of discussions in 1997 on the opening of the bridge between Copenhagen and Malmö. The bridge meant an end to traditional border traffic and an immediate decrease in the two ports’ cargo turnover and passenger traffic.

But at the same time the Øresund Bridge opened new important possibilities for transport and logistics. From the summer of 2000 the Danish, Swedish and Norwegian markets could be reached by one call. A combination ship/train/lorry greatly simplifies Nordic distribution and saves time and money. The Øresund Region consists of almost four million consumers and the Baltic Sea Region of 100 million consumers.

Since 2001, CMP has increased net sales by 70%. Annual profit has multiplied many times over, while staff numbers have only grown by 8%. But the economical climate changed in 2008 and CMP faces a new economic situation. Major investments have been the Nordic Hub car terminal (2003) in Malmö and the DFDS Terminal in Copenhagen (2004). In the near future major investments will include establishing new ro-ro facilities and a new container terminal in Malmö and building new quays for cruise ships in Copenhagen.

Source: Copenhagen Malmö Port (2011)
The aims of the cooperation between Port of Copenhagen and Port of Malmö are the following:

- Better utilization factor (personnel, berths, terminal areas, cranes and other equipment)
- Synergies (sell more on a larger market place = Øresund Region)
- Avoid “double investments”
- Economy of scale
- Improved market position - “Big is beautiful”
- Strong economic platform
- Improved competitiveness

The Copenhagen Terminal focuses on cruise, container, oil and bulk, while Malmö terminal puts the emphasis on goods ferries, new cars, logistics and conventional cargoes, oil and bulk. In this way CMP can sell and provide port-, terminal and transport services in the Baltic Region, which is a market of 100.000.000 (one hundred million) people. (www.cmport.com)

7.4.1.1 Distribution Centre Malmö

Malmö realised that future is not the bulk goods (cement, stones), it is needed to create value (ro/ro, logistics facilities), and use the core competences. Malmö changed the almost dead port into a lucrative intermodal transport and logistics centre. Land area is 1.500.000 m², a logistics centre with adjacent terminals for short sea shipping - containers, Ro/Ro and goods ferries; there is an integrated rail combined terminal and motorways are at the doorstep (see Figure 31). The creation of the distribution centre started in 2005 and fully developed in 2012.

The new unit-terminal in Køge and the Port of Malmö can be considered as local competitors. Køge can be inspired by the well planned logistics centre in Malmö and take some ideas to follow it and later on set up a cooperation with Port of Hamburg as a lucrative and new modern port on the Baltic Sea Region. CMP also has plans for a new container terminal in Nordhavnen, it is also worth to get familiarized with it and use the knowledge later on for a new container terminal in Køge (not part of the existing plans yet).
7.4.2 The Baltic Sea Hub and Spokes Project - Ports of Aarhus, Gothenburg and Tallinn

The Baltic Sea Hub and Spokes Project

The EU strategy for the Baltic Sea Region (BSR) is an important tool for bringing about closer, more coordinated and more focused cooperation, which will enable regions in eight Member States to plan, prioritize and implement activities, towards the same goals, in a more coordinated way.

This is why the Ports of Aarhus, Gothenburg and Tallinn have proposed a common Hub and Spokes concept under Motorways of the Sea. This concept is the backbone of the Action. The project is an ambitious, contemporary and far-sighted action to create the necessary framework for an integrated maritime transport system, which will promote and support a cost-effective and efficient door-to-door transport solution, link trade to transport and facilitate growth in the entire BSR.

Building stronger hubs in the BSR with strong feeder relations will attract direct calls by global carriers, safeguard the development of the BSR and relieve the pressure on the continental hubs and thereby allocate more capacity to handle their natural hinterland. Moreover, the Action will deal with current transport challenges, such as the massive flow in container and trailer traffic on over-burdened European road systems.
The action consists of 4 main activities: The Marine Integration Project (MIP), Port Access Aarhus, Port Access Gothenburg and Port Security Tallinn.

Thus, the main objectives of the action are to facilitate an efficient, environmentally friendly and attractive intermodal transport solution for the BSR and to improve access to markets in BSR. This will increase possibilities for trade and growth in the region and, in direct continuation hereof, an increase in the flow of goods by sea will help the BSR feeder ports grow and develop and make the BSR countries more competitive. I.e., the initiative will not only boost the economy by facilitating trade but also help make the BSR more resilient to shocks generated externally.

The Baltic Sea Hub and Spokes system is a joint project of the ports of Gothenburg, Aarhus and Tallinn. In a wider perspective and in a later phase, the action will also aim to include other ports in the Baltic Sea geographical area and neighbouring countries.

Source: Trans-European Transport Network Executive Agency (TEN-T EA) (2011)

To sum it up the cooperation between the three countries – Sweden, Denmark and Estonia - will promote and support a cost-effective and efficient door-to-door transport solution, link trade to transport and facilitate growth in the entire BSR. Action will deal with current transport challenges, such as the massive flow in container and trailer traffic on over-burdened European road systems, and will facilitate an efficient, environmentally friendly and attractive intermodal transport solution for the BSR and to improve access to markets in BSR. Furthermore the Action will also aim to include other ports in the Baltic Sea geographical area and neighbouring countries.

It can be also a great opportunity for Port of Hamburg and Port of Køge to join this cooperation and create a strong feeder relation with other Baltic Sea ports (Aarhus, Gothenburg and Tallinn). In this way it will be created a stronger relationship between Hamburg and Køge ports, which can enhance the freight flows and reduce the costs.

This case study can be considered as good example how to create closer cooperation between ports in the BSR. It can give an input for Port of Hamburg and Port of Køge to search for new opportunities jointly in order to create efficient and environmentally transport between the two ports.

### 7.5 Possibilities of the joint work

According to Sebastian Doderer (Port of Hamburg Marketing) it is quite obvious, that Køge will be linked with Hamburg through the Fehmarn Belt Link. Port of Hamburg Marketing is expecting that this link will lead to a massive change of way in organizing transport on the land side, and the last part
of the land side transportation between Denmark and Sweden and Germany is going to move on this corridor. It is also expectable that new services will be established and the number of cargo transported between Køge and Hamburg will rise significantly.

According to Thomas Elm Kampmann (STC / Port of Køge) the development of the rail connection between Hamburg and Køge can be seen as an opportunity considering the cooperation between Port of Hamburg and Port of Køge, though without rail tracks and a combined terminal established it is difficult to see a closer cooperation being set up. The inland combined transport terminal with the sufficient rail connection can be the key, but the development of new rail connection is the main investment, which development will need national or EU co-founding.

STC / Port of Køge is investigating the mode how to create added value Køge and offer a full and comprehensive supply of services within the port and transport industry in order to contribute to value added development in the transport chain and have better position in creating strategic cooperation with Port of Hamburg. Both ports are open and show willingness to find the way to have closer relationship and cooperate in the Baltic Sea Region in the future. There is a possibility to establish a shuttle rail network between the terminals with the help of Hupac, and to cooperate on the Core Network Corridor No. 5: Helsinki-Valletta. The cooperation between Port of Hamburg and Port of Køge could create a joint project, which is related to the transport corridors evaluation model. It would stimulate the market, attract trucks, organise the freight flow in positive way. The result would be the reduction of price and time, and the enhancement of safety in the freight flow. Transport Corridors Evaluation Model

As part of the strategic cooperation between Port of Hamburg and Port of Køge it is a great opportunity to prepare a transport corridors evaluation model considering costs of the transportation, time of the delivery and cargo safety. The model could highlight the impact of this cooperation on the Baltic Sea ports (e.g. Ventspils, Klaipeda, and Riga) in connection with the new maritime corridors and can stimulate the market and give a new way of freight flow organization.

In 2007 as part of the Baltic Sea Information Motorway (BaSIM) project - Scenario analysis of new maritime corridors - it was made a practical / empirical analysis by integrating relevant stakeholders illustrated through Gdansk – Helsinki, and corridors linking Klaipeda. Based on the practical calculations results can be taken a decisions on whether it is commercial viable to continue the preparatory work for creating a new transport corridors / sea motorways or not. The BaSIM project for the transport corridors evaluation took Gauss distribution with three the main factors:

- Costs of the transportation
- Time of the delivery and
- Cargo safety

In the transport corridors simulation model it was taken several factors related to motorways of the sea – e.g. distance and time from original place up to port, number of border crossing, sailing distance between ports, sailing in port area, loading and unloading, distance and time to destination place (road or rail) -, and road (railway) such as driving distance and time, number of border crossing, driver refresh time. (BaSIM, 2007, p. 24)

There is an opportunity with the help of Prof. Vytautas Paulauskas (University of Klaipeda), who actively participated in the above mentioned BaSIM project and also takes part in the ACL project, that there will be prepared a Transport Corridors Evaluation Model related to the effect of the cooperation between Port of Hamburg and Port of Køge. Hopefully it will be found new maritime transport corridor(s), which can optimize transportation costs, decrease transportation time and increase cargo (goods) safety in the Baltic Sea Region.

### 7.6 Potential results/benefits of the strategic cooperation

The port cooperation between Hamburg and Køge could create a new “bridge” between Denmark and Germany in connection to road, rail and maritime transport. The opening Fehmarn Belt Fixed Link (2020) will ensure both a rail and road connection between Germany and Denmark. The freight can come directly from Hamburg to Rødby (120 km south of Køge), and from Rødby to Ringsted and to Køge. The fixed link will most likely generate cargo transport on rail from major ports like Hamburg and Lübeck of both trailers and containers directly to Denmark. The trains can use the inland combined transport terminal in Køge.

The potential benefit of the strategic cooperation can be the establishment of the shuttle train between the terminals of Hamburg and Køge with the help of Hupac. Køge can be the part of the Shuttle Net European network, and in this way the shuttle train connection will enhance the freight flow and reduce the transit time and cost between the ports. The extra stop in Køge for the train flows can create added value. Køge can serve with extra activities, such as storing, labeling, assembling, cold store terminal, etc.

As both Hamburg and Køge is part of the Core Network Corridor No. 5: Helsinki-Valletta, it is a great opportunity to have cooperation in the new corridor. The new combined transport terminal, unit-terminal and Logistic Centre in Køge could function as a Nordic hub on Corridor 5 and by the cooperation with Port of Hamburg can be created a synergy between the individual distribution companies.
The transport corridors evaluation model can measure the impact of the cooperation on the Baltic Sea Region. The potential new maritime transport corridor(s) could use the new facilities and new capacity of the unit-terminal for freight distribution. It can simulate the market, attract trucks. After 2020, the opening of the Fehmarn Belt Fixed Link, it is expectable the reorganization of distribution patterns, methods and ways in the land based and maritime transport in the Baltic Sea Region.

Figure 32: Benefit of the cooperation between Port of Hamburg and Port of Køge on the BSR, source: own creation

Figure 32 shows that the strategic cooperation between Port of Hamburg and Port of Køge can have a affect on other ports in Baltic Sea Region, as the cooperation / joint work will simulate the market, attract trucks, and foster competition. It will have a positive effect on the freight flows organization by finding maritime transport corridor(s), which can optimize transportation costs, decrease transportation time and increase cargo (goods) safety in the Baltic Sea Region. Furthermore it can encourage the BSR ports to ensure better and more attractive services at better price and quality.

In line with the aim of the ACL project the cooperation will support the multimodal and environmentally friendly transport solutions, achieve more efficient transport in the BSR, improve port and hinterland facilities, developing new trade roads, develop cooperation between larger and smaller ports (Hamburg – Køge), use complementarities, create added value (synergy), provide better services, attack more cargo by creating strategic and cross-border cooperation.
Summary and Conclusions

Based on the problem formulation the aim of the research was analysed opportunities for further developing Port of Køge into a hub in order to create a new and central hub in the Baltic Sea Region (BSR) and to set up closer strategic cooperation between Port of Hamburg and Port of Køge.

The general aim is to create a sustainable and efficient multi-modal transport via land and sea. The research shortly introduced the partner companies, which are involved in the ACL project. Several data collection methods helped to evaluate the research, such as telephone interviews and case studies.

In order to better understand the research and be competent in the field of port development and cooperation the theoretical consideration chapter was applied considering the concept of development, cooperation, intermodal and multi-modal transport, port interfaces and their hinterlands, and developments of ports and hubs.

The first main part of the research is the creation of Port of Køge into hub in the BSR; several ideas were introduced for further developing Scandinavian Transport Centre (STC) into a Logistics Centre, the creation of a combined transport terminal in Køge and the creation of a unit-Terminal at the Port of Køge. All of the three ideas was carefully investigated and explained, included the created synergy which could be obtained between them.

The Logistics Centre can create sufficient environment and a logistics hub by collecting transport and production, developing large warehouses, and other key facilities and services. It will be a well-running distribution centre to the Greater Copenhagen area and south Sweden, which can create synergy on the Core Network Corridors. The Logistic Centre will reduce total transport expenses, strengthen the role of the unit-terminal/ Port of Køge in the transport chain, intensify the multi-modal solutions (rail and road), reduce the high cost of the centrally located port area and avoid the traffic bottlenecks in the surrounding area.

The new combined transport terminal can create added value by establishing facilities on the Core Network Corridors. The terminal has an optimal location; it is next to the highway and the new electrified railway between Copenhagen and Ringsted (2018). It can function as future Nordic rail hub creating synergy among the huge amount of train from Sweden and Germany (and forward) and among the trains which pass through the area. It can be also the national transport hub of Denmark.

The unit-terminal has the aim of creating Port of Køge to a modern and highly efficient entry and exit port in the Baltic Sea Region. It would develop and handle mainly the additional ship-based ro/ro
traffic, which could be later extended to container traffic. The unit-terminal is located in the East-West corridor of Denmark, which means an easy and environmentally friendly transports (sea and rail) connection through United Kingdom, Esbjerg and Køge to the Baltic Sea Region (e.g. Klaipeda, Liepaja, St. Petersburg).

The second main part of the research is investigating the opportunity of a strategic cooperation between Port of Hamburg and Port of Køge. The port cooperation could create a new “bridge” between Denmark and Germany in connection to road, rail and maritime transport. The opening Fehmarn Belt Fixed Link (2020) will ensure both a rail and road connection between Germany and Denmark. The fixed link will most likely generate cargo transport on rail from major ports like Hamburg and Lübeck of both trailers and containers directly to Denmark. The trains can use the new Logistics Centre, Combined transport terminal and the unit-terminal in Køge.

The potential benefit of the strategic cooperation can be the establishment of the shuttle train between the terminals of Hamburg and Køge. Køge can be the part of the Shuttle Net European network, and in this way the shuttle train connection will enhance the freight flow and reduce the transit time and cost between the ports.

As both Hamburg and Køge is part of the Core Network Corridor No. 5: Helsinki-Valletta, it is a great opportunity to have cooperation in the new corridor. Port of Hamburg and Port of Køge as a joint project can as a next step accept to run a transport corridors evaluation model, which can measure the impact of the cooperation on the Baltic Sea Region (price, time and safety of the freight flow). The cooperation / joint work will simulate the market; attract trucks and foster competition. Furthermore it will encourage the BSR ports to ensure better and more attractive services at better price and quality.

The further elaboration of the research is recommended, to investigate the opportunity of setting up cooperations between Port of Køge and other ports around the Baltic Sea Region with the aim of creating more synergy based on the new facilities (Logistics Centre, Combined transport terminal and the unit-terminal) in Køge.
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