TransBaltic

Towards an integrated transport system in the Baltic Sea Region

RAIL-ROAD INTERMODAL TERMINALS (DRY PORTS) AND NECESSARY MARKET CONDITIONS

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REGION VÄSTERBOTTEN

REGION SKÅNE

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1 Background—TransBaltic

TransBaltic, as one of few transnational projects so far, has been granted a strategic status by the authorities of the EU Baltic Sea Region Programme 2007–2013. In this way the decision-makers have acknowledged the role of TransBaltic in fostering the sustainable development of the Region, the project's wide geographical coverage, deep focus on implementation, and the strong political backup at the national level.

TransBaltic is led by Region Skåne and lasts from 1 June 2009 to 31 December 2012.

1.1 Why does TransBaltic promote integrated transport systems in the Baltic Sea region?

Transport performance deficiencies are regarded by the business stakeholders as one of the most prominent barriers to economic prosperity and growth in the Baltic Sea Region (BSR). As underlined in the EU Strategy for the Baltic Sea Region, appropriate public policy response is needed to increase the accessibility of territories and the quality of connections, and to master the increasing flows in and across the Region.

The overall objective of TransBaltic is to provide regional level incentives for the creation of a comprehensive multimodal transport system in the BSR. This is to be achieved by means of joint transport development measures and jointly implemented business concepts.

1.2 Creating an action plan

The project wishes to address this key challenge by complementing actions taken by the national authorities within the framework of the EU Baltic Sea Strategy. The envisaged action plan will contain measures, which will address internal connectivity, interoperability, and intermodality constraints of the Baltic Sea Region from the sustainable regional development perspective. The plan will also feature regional preparedness measures for the increasing intercontinental transport flows in order to unlock investments that will better serve external accessibility of the Region.

1.3 The purpose and disposition of this report

The purpose is to analyse the dry port concept and context of its successful establishing in the region of Västerbotten.

The following research questions were defined in the request for tender. After each research question the intended method of analysis is described, and the section in the report where the research question is addressed.

1. What constitutes a profitable dry port in Scandinavia (based on the accumulated experience), and what are the necessary market conditions?

Based on a literature review in the field of intermodal transport and dry ports, an analysis of the contributing factors related to profitability is presented. The main body for this is sections *2.1 The transportation system* and *2.2 Road-rail intermodal transport in Sweden.*

2. What are key factors for a successful implementation of a dry port concept in the region of Västerbotten?

This question is addressed in section *2.3 Key factors related to intermodal terminal development and implementation*.

This research question will be addressed by a few case studies based on empirical observations and theoretical analysis. The main body for this is section *2.2 Road-rail intermodal transport in Sweden*, where the hinterland transport system is described and its principal seaport, Port of Gothenburg.

3. What is a suitable layout of a dry port in the specific socio-economic development conditions of the region of Västerbotten?

Based on interviews and secondary data an analysis will be conducted which aims to identify suitable segments and markets to be served by a dry port in the regions of Västerbotten. This research question is partly address in section *2.3.5 Regulatory framework and the "functional unit terminal" layout* by the blueprint of a terminal layout provided by The Swedish Transport Administration.

4. What are the success prerequisites for the two potential dry port facilities in the region of Västerbotten: the Nordic Logistic Center in Umeå and the terminal in Stensele?

This research question will be addressed by analysing how the two terminals could complement and collaborate with each other. The question is addressed sporadically in section *2.3 Key factors related to intermodal terminal development and implementation* and explicitly in the concluding part.

5. What catchment areas and seaport relations for those two sites are feasible to develop?

Based on identified potential market segments, I analyse how possible relationships with seaports could be developed and implemented. The main section related to this question is *2.3.1 Market potential*.

6. Highlight how SMEs in the catchment areas can utilise the potentials of the two dry ports.

In connection to the market analysis, the issue of SMEs and their possibilities to utilise available services and terminals is addressed. The issue of SME is also addressed under *2.3.1 Market potential.*

7. Highlight the importance of free access to dry ports, i.e., competition neutrality.

The issue of competition between terminals and transport modes, and the importance of neutrality is highlighted through a literature review and experiences from similar terminal developments. This research question is mainly addressed in section *2.3.8 Independence, transparency, and openness.*

8. How do the two potential dry ports fit within the larger and more comprehensive transportation system in the northern part of Scandinavia?

The existing and potential services of the two terminals will be discussed from the perspective of transport users. This discussion will focus on what demands and gaps the services fulfil in the transportation system. This question is mainly addressed in section *2.3.1 Market potential*.

9. Recommendations for local and regional authorities in the region of Västerbotten to sustain operations of the two potential dry ports (NLC and the Stensele terminal).

In the concluding section, important aspects and factors related to the development and success of the two terminals will be identified and discussed from the public perspective of the local and regional authorities. This part is based on input from the previous research questions.

2 Introduction

Because of the environmental impact of heavy road transport and the absence of direct technical solutions, it is of the utmost importance that alternative and indirect solutions are identified. One such possibility is the transfer of freight to more sustainable modes of transport. Intermodal freight transport, building on the connection of two or more modes, is one enabler of modal shift. Intermodal transport has enjoyed a growing interest from academia, industry, and the public sector in general and policy-makers in particular. Parallel to improved cost efficiency, growing market segments, and increased general interest in intermodal transport, more focus has been put on the development of inland terminals for handling and transhipment of goods.

Designing and implementing intermodal terminals, including the supportive functions, is a complex process involving public and private actors. This report aims to increase knowledge and understanding of the development process associated with dry ports and intermodal terminals in the context of Sweden and intermodal transportation. One main part of that aim is to identify key factors and actors in the development process of intermodal terminals and describe how these interact and affect the progress and overall status of the process. The report also tries to describe current trends and challenges related to the road-rail intermodal transport segment.

2.1 The transportation system

The transportation system can be described by the conceptual model developed by OECD (1992). The system consists of five layers: material flow, transport operation, information operation, transport infrastructure, and telecommunication infrastructure. In short, the material flow is consolidated and operated by appropriate means of transportation. In the traffic market, connections are made between vehicle flows, logistics service providers, and infrastructure capacity. The coordination and operation of material flows are supported by information exchange using telecommunication infrastructure. This model has been used by such researchers as Hansen (2002) and Wandel and Ruijgrok (1993) as a framework for analysing logistics, structures, and functions. The efficiency and accessibility of the transport system is determined not only by the efficiency of the layers but also by the efficiency and effectiveness of the interconnections between layers.

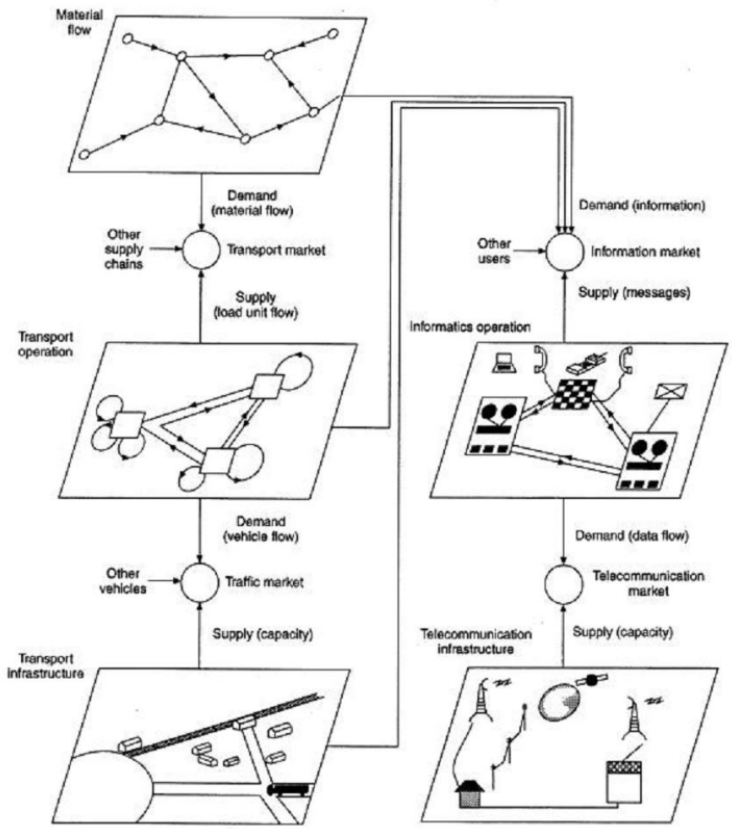

Figure 1. The 5-layer model of a transportation system (modified from OECD 1992)

The goal of a transport chain is to achieve overall cost efficiency and required logistics quality. The transport chain can be comprised of single modes or combinations of modes. The achievement of cost-efficiency and logistics quality is very much dependent upon the possibilities for a good match between demand characteristics of the material flows and the design components of the transportation system. Each transport mode has different inherent cost structures and operational characteristics. In addition, there are substantial differences between regions and countries when it comes to the usage of the different modes of transport. Some of the differences can be explained by geographical conditions, but other important facts are regulatory aspects, status of infrastructure, and occasionally technology.

FREIGHT TRANSPORT					
	EU-27	USA	JAPAN	CHINA	RUSSIA
billion tkm	2008	2007	2008	2007	2008
Road	*1 877.7*	1 922.9	346.4	1 135.5	216.3
Rail	*442.7*	2 656.6	22.3	2 379.7	2 116.2
Inland waterways	*145.3*	472.3		1 559.9	64.0
Oil pipeline	*124.1*	814.2		186.6 (5)	2 464.0
Sea (domestic / intra-EU-27)	*1 498.0*	333.0	187.5	4 868.6	85.0

Notes: (1) **USA**: including light trucks / vans.
(2) **Japan**: including light motor vehicles and taxis.
(3) **China**: including buses and coaches.
(4) **Japan**: included in railway pkm.
(5) **China**: oil and gas pipelines.

Figure 2. Freight transport in different regions. Source: European Commission 2010a

From a transport work (tkm) perspective, EU-27 extensively uses road transport. Japan has a similar situation, but compared to EU-27, Japan's geographical conditions make it more reliant on road transportation. The use of the double stacking of containers, and hence more loading capacity, is one reason why the US has a larger share of rail transport compared to the EU-27. Various types of electrical systems, signalling systems, etc., are other reasons why rail has a lower market share in the EU compared to other regions. Geographical conditions are, of course, a key for explaining the situation illustrated in Figure 2. However, the inherent characteristics of the different modes of transport apply for all the regions. This emphasizes that the situation in the EU-27 would be different if the transport system within the union could be more harmonized.

The importance of environmental friendliness within transportation systems is increasing. The trend toward less-polluting transport solutions and the quest for sustainable transport is caused by a combination of customer demand and regulatory frameworks. The transport sector is one of the largest polluters, and stakeholders aim to construct regulatory frameworks that facilitate the growth of sustainable transport solutions. Figure 3 illustrates the share and development of CO_2 emissions among different sectors within the EU and the unfavourable development that is taking place in the transport sector.

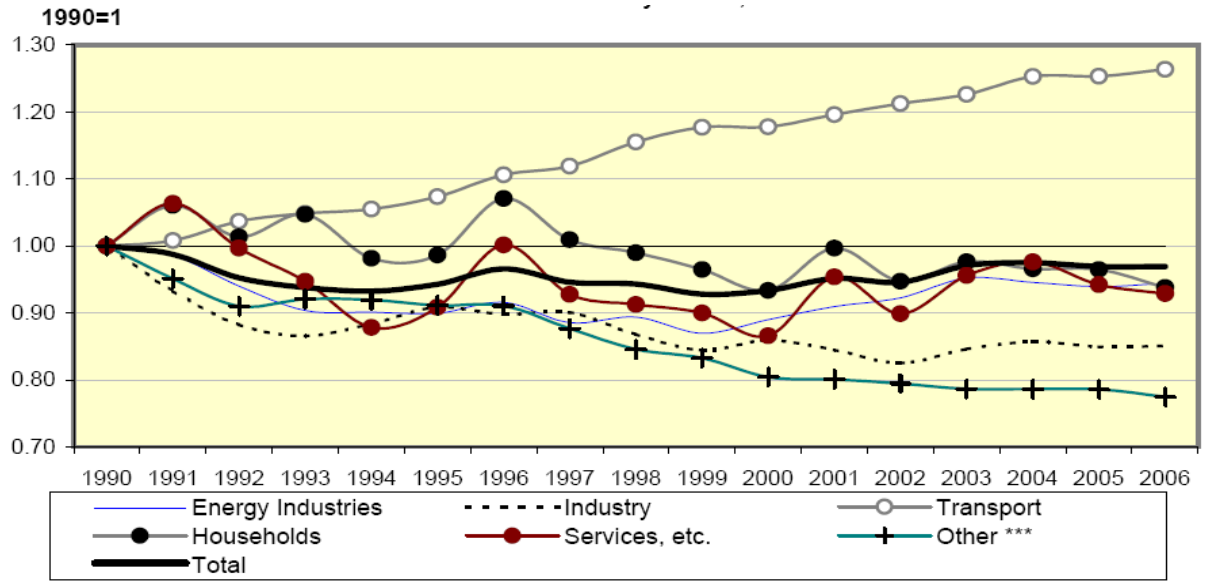

Figure 3. Emissions of CO2 by sector, Source: European Commission 2010b

The demand for more environmentally friendly transport solutions has had a great impact on the design of transportation chains, both in terms of technology used and modes of transport applied. Inland waterways and rail-based transport have inherited economies of scale and usually perform better over longer distances, in terms of environmental impact, than road, given the current technology and truck fuel. The environmental performance of rail is especially difficult to generalise since it varies greatly depending on the circumstances, e.g., possibilities for double stacking of containers in North America, and to some extent in China (cf. Meng and Niemeier 2000). Electrified railways are another key component for the environmental performance of rail. Given the most favourable circumstances, where railways are electrified and electricity is produced with renewable sources of energy, the CO_2 emissions of traditional diesel-based rail are many times higher than emissions of electrified rail (g/tonne-km) (Green Cargo 2010; SJ 2010). However, this does not mean that trucks are more environmentally friendly than diesel based rail. On the contrary, trucks emit more CO_2, and more importantly, from a local and regional perspective, trucks emit more particles and NO_X per tonne-km. Figure 4 illustrates the environmental impact of different modes of transport.

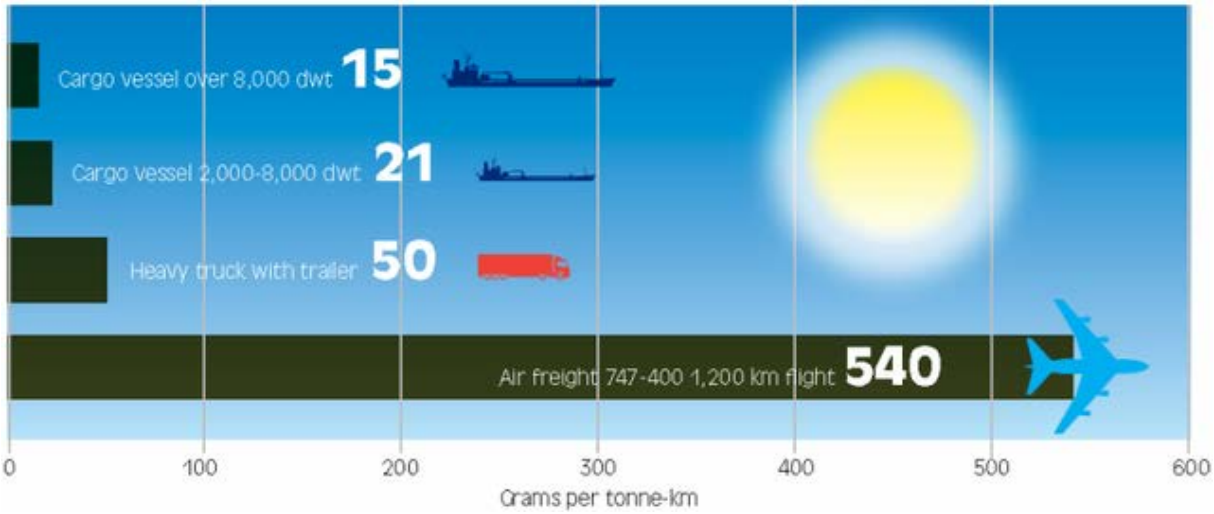

Figure 4. Emissions of CO2 by transport mode. Source: Maritime International Secretariat 2006

The demand for more environmentally friendly transport solutions has had an impact on the segment of intermodal transport as the next section illustrates.

2.2 Road-rail intermodal transport in Sweden

The volume of the intermodal transport market in Sweden had been fairly steady until 2000. From about 2000 a trend is noticeable as volumes starts increasing. This is around the same time the development of the Scandinavian port shuttles system started (see Figure 5).

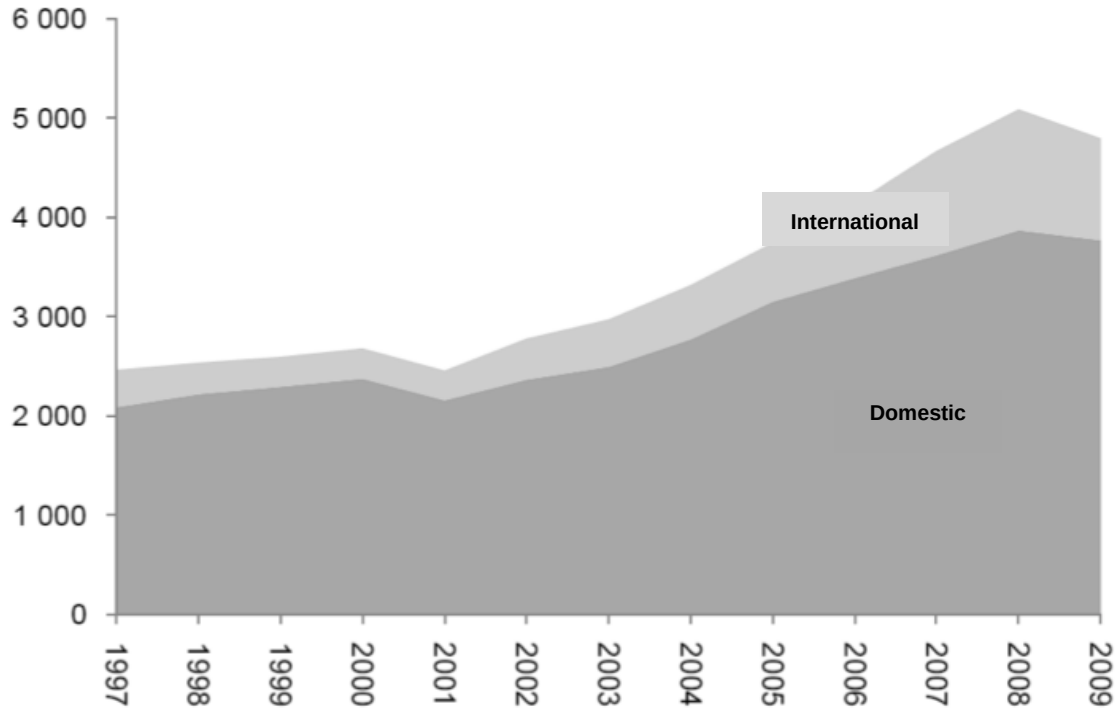

Figure 5. Transport performance by rail-based intermodal transport in million tkms. Source: Trafikanalys 2010.

Figure 5 indicates a substantial increase in both traffic with domestic destinations (i.e., domestic) and cross-border traffic (i.e., international). However, the "domestic" volumes have

increased more in comparison with the “intentional” traffic. The Scandinavian rail shuttle system related to Port of Gothenburg is defined as “domestic” traffic.

The development of dry ports and associated rail shuttles in Scandinavia has been remarkable during the last decade. Most of the rail shuttles have Port of Gothenburg as their destination. Currently, Port of Gothenburg has 27 hinterland rail shuttles to 23 different destinations and dry ports in Scandinavia connected to the port. The system is termed The Scandinavian Railport System. More than ten different rail operators exist in the system (Port of Gothenburg 2011b), an impressive number given that the rail sector in Sweden started its deregulation as late as 1988. Each shuttle has a frequency of at least three departures per week in each direction. The most frequent one operates about 14 times a week in each direction.

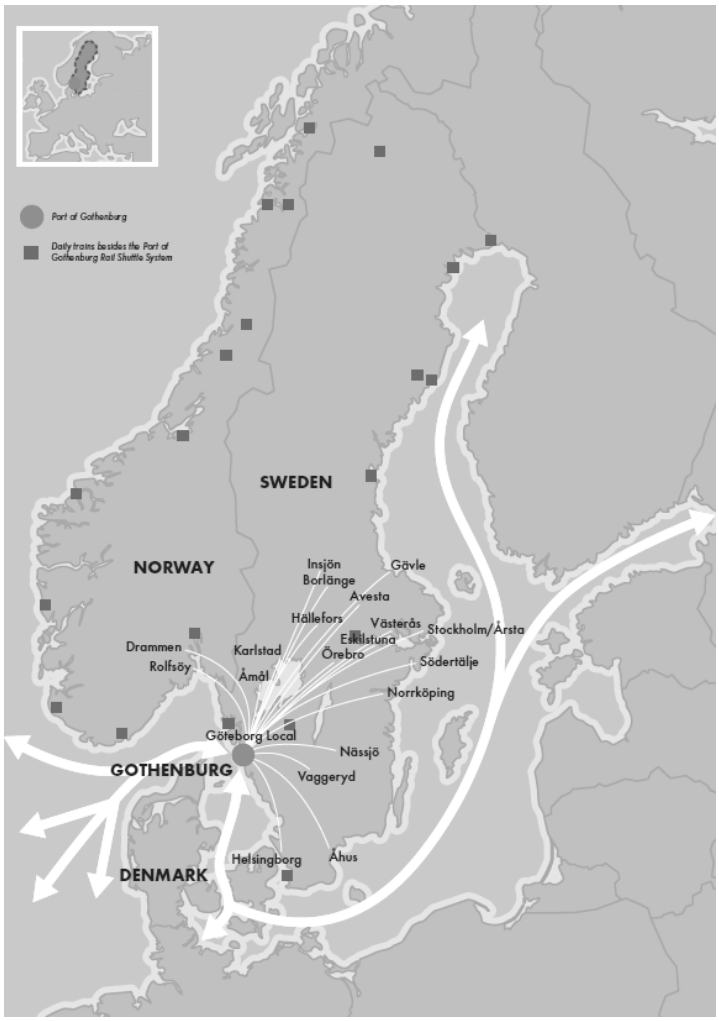

Figure 6. The Port of Gothenburg rail shuttle system as of September 2011. Port of Gothenburg 2011b.

The system contains both shuttles that serve distant dry ports of 200 or more kilometres as well as close-range dry ports. There are an increasing number of shuttles serving much shorter distances, traditionally operated by road. The shortest shuttle runs a distance of about 10 kilometres within the city of Gothenburg. In general, independent terminal operators manage the inland terminals, especially the large ones, while local logistics service providers generally operate the small terminals. There has been an increasing interest by terminal owners to establish independent operations in order to promote transparency and open market access. The trend started as the terminal owner INAB, owning the intermodal terminal in

Umeå initiated a tender for the terminal operations. The state owned company Jernhusen followed shortly after with the terminals in Stockholm, Gothenburg and Jönköping. This trend is another contributing factor to the increased number of rail operators and ultimately increased use of intermodal transport.

The system of shuttles and dry ports handled about 360,000 twenty-foot equivalent units (TEUs) in 2009 with a turnover of about €60 million annually (Bergqvist 2009). As of 2011, the rail shuttle system handled about 40–50% of all containers to and from the Port of Gothenburg.

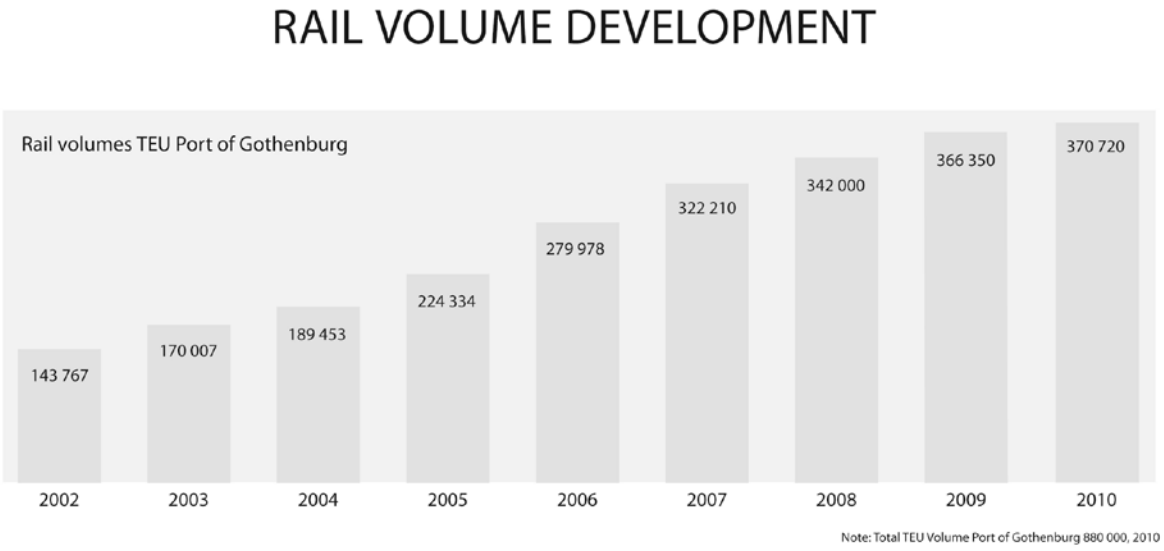

Figure 7. Rail volumes (TEUs) to and from Port of Gothenburg. Source: Port of Gothenburg 2011b.

Research indicated that the system decreases transportation costs by up to 10% compared to the direct road alternative (Bergqvist 2009). About 51,000 tons of carbon dioxide (CO_2) are saved every year as compared to the amount used by direct road (Port of Gothenburg 2011a). Recent developments include the introduction of a five-level "grading" system of the inland terminals that illustrates the scope and scale of offered services at the terminals.

Despite its impressive development, there are numerous challenges. Some of these factors can be described as critical success factors at different levels of the hinterland transportation system, e.g., at the port, the links, the terminals or related to framework issues such as regulation and planning processes. The next sections describe the most important factors and in what aspects they are critical for hinterland transport development in general and the development of dry ports and terminals in particular.

2.3 Key factors related to intermodal terminal development and implementation

This section is based on case studies and research related to the hinterland transport system in Scandinavia (e.g., Bergqvist 2011a; Bergqvist 2011b; Jensen and Bergqvist 2011; Bergqvist and Woxenius 2011; Bergqvist 2009; Bergqvist 2008b; Bergqvist, Falkemark et al. 2008; Bergqvist, Falkemark et al. 2007; Bergqvist 2008a; Bergqvist 2007; Roso 2006). The section starts out with analysing the issue of necessary market potential for the establishment of intermodal terminals and rail-based hinterland transport services.

2.3.1 Market potential

The market base (demand) for potential intermodal transport services is obviously the most important factor for developing inland terminals and successful associated traffic. A substantial demand and potential goods flow usually also speeds up the development process by creating an intense pressure on decision-makers, and at the same time, it is easier to secure necessary investments and funds. The largest momentum occurs if there is a parallel process associated with a large logistics-related business establishment in the area, such as a large distribution centre.

With high profitability, stakeholders have clear incentives to start the operation. Public support can improve/facilitate business profitability in various forms and time-perspectives. The need for this support is probably the greatest when the main users are comprised of small-scale shippers and carriers. In those cases, there is a need for collaboration in order to provide a critical mass for operations. There is always a risk that a deadlock may occur in which players are waiting for someone else to invest and act, i.e., there are no obvious advantages of being an "early-mover". In such cases, different forms of subsidies may facilitate the development process. The most common type of subsidy is related to the terminal lease or fee. Usually, a variable contract is issued where the terminal operator pays a fee per lift of a container or load unit. This setup can be regarded as a form of subsidy for terminals in an early development phase where volumes are very low. There might not be subsidies in the long run, but nevertheless, this is the risk of the terminal owner and hence also a form of subsidy from a risk perspective. From a market perspective, this setup more or less eliminates all form of risk associated with the investments in the terminal for the terminal operator, which means that it has to be regarded as a subsidy. One way of avoiding subsidizing the terminal operator, if desired by the infrastructure owner, would be to have fixed lower and upper fees combined with differentiated handling-based fees, however, such options are rarely exercised in the context of road-rail intermodal terminals and especially in Scandinavia. However, in the context of seaport terminal operations and concession agreements, this is not an uncommon structure.

All terminal developments in Sweden have been based on market potential estimations and analyses that then have been the platform for discussion and negotiation with the Swedish Transport Administration. The market potential determines whether or not the investments are judged to be socioeconomically positive and thus eligible for possible co-financing from the Transport Administration of up to about 30% of the total cost. The Transport Administration analyse to what extent the market potential is "reasonable" but the analysis as such has to be financed by the initiator and investor. However, since many of the terminals are developed in areas where there is no existing intermodal rail-based traffic, it is difficult to identify "reasonable and realistic" medium- and long-term potentials. A more recent problem relates to the situation where new terminals are being developed within each other's catchment areas, however, each terminal might take volumes from other terminals' catchment areas into account in their estimations as it is very difficult to determine where the competitive interface is. This issue is especially complicated as there might be several local development processes in a region in different phases, so you have the issue of "overlapping capacities" where the development of one terminal is justified by high utilisation close to the maximum capacity of another terminal.

When discussing the problem of excessive densification of road-rail intermodal terminals and dry ports it is important to recognize how diverse the markets for terminals are. First and foremost, we have a situation where competition, ownership, operation structures, openness, and transparency generate a market demand for more terminals, even if cargo can be handled with existing terminal capacity. This is an important factor that all stakeholders must be aware

of when assessing the conditions in which terminals are operating. Another aspect is that there is a general lack of differentiation between terminals. Today, many terminals focus on handling containers. There is a great opportunity to differentiate themselves from other carriers, reefers, biofuels, general cargo, port destinations, international transport, customs clearance, etc. (cf. Bergqvist 2009).

Discussions of terminal density can be expanded to also include various supportive alternative terminal operations where there are strong synergies e.g., efficient use of railway infrastructure, space, handling equipment, personnel. Today, we can see that several regions with intermodal terminals have attracted the establishment of other types of terminal segments, such as wood chips, logs, sawn wood, and biomass. The result of such an establishment is an overall increased efficiency in all terminals in that area. One reason for this trend is that a competitive location of a rail terminal can be applied to multiple segments and that there is a clear synergy between the terminal operations in the different segments.

In the case of the intermodal terminals in Storuman and Umeå they have quite different segments. While the terminal in Umeå functions as a hub terminal for northern Sweden, Storuman mainly serves the local and regional industries. This is also illustrated by the infrastructure layout and design at the two terminals, where, rail production efficiency and overall capacity is prioritised in Umeå to make sure that the terminal can handle and coordinate a large amount of rail traffic efficiency. In terms of goods types, Storuman is more focused on the bulk segments of biofuels, scrap, timber, etc. (Storuman 2005), while the main segment of Umeå is load units, such as containers, swap-bodies, and semi-trailers. Storuman terminal is also located at the connection between “Inlandsbanan” and “Tvärbana” and has an important role as goods volumes inputter in the link between east and west. Because of its strategic location, Storuman also has access to good infrastructure towards Norway (i.e., E12) and ultimately Mo i Rana. There is a great symbiosis between Storuman and Umeå since Umeå is located at the end of this line and enables for a strong north-south “Botniabanan” connection in relation to the east-west goods flow. Storuman has a multipurpose function both in terms of goods segments services and the type of traffic it generates (i.e., direct traffic and feeder traffic to for example Umeå).

2.3.2 Local enthusiasts—patience and long-term commitment

The presence of a local entrepreneur or enthusiast is an important and necessary factor for the successful development of a terminal. In a Swedish context, this enthusiast is usually found at a business development function within the public sector (Bergqvist, Woxenius et al. 2010). Based on all the contingencies and situations that may arise in a development process, continuity and sustainability of key actors are incredibly important and fundamental. The existence of local enthusiasts might be one explanation why there are so many strong local interests to develop intermodal terminals.

There are numerous aspects that can contribute to friction and problems in the development process. A public sector enthusiast is important in order to maintain good communication with politicians and local decision-makers, especially in times of political elections, which may lead to periods where political decision-making is difficult and sometimes impossible and periods of weak economic development. The importance of enthusiasts is particularly evident for small intermodal terminals in the absence of a distinct private investor and project manager that is common for major infrastructure projects.

One way of decreasing the reliance on individuals and local enthusiasts is interaction and collaboration with other actors in order to create a more stable process/institution. To establish a close and continuous cooperation between the private and public sectors, the

local/regional university may play an important role in adding a neutral platform for collaboration where analyses can be initiated and discussed in an academic framework. Collaboration with academics may contribute to long-term perspectives and focus on knowledge creation and exchange.

2.3.3 Financiers

Besides the level and nature of funding, the number of financiers can have a big influence on the collaborative environment. If they have different time horizons and rationality in their actions, there is the risk of slowing down the development process. It is not uncommon that different financiers have different views on the commercial conditions for terminal operations and how fast investments should be paid off. The experience and familiarity with working with large infrastructure projects with very long duration and strong regional ties is an important characteristic of a financier (Bergqvist 2009).

2.3.4 Localization

A conflict between municipalities regarding the location of a terminal is common and may significantly delay and hinder the development process (cf. Bergqvist 2008; Bergqvist, et.al. 2010). Since terminals usually have a larger catchment area than municipal boundaries, there is a potential source for conflict. An establishment by one municipality generally implies that a future establishment might be very difficult for its neighbouring municipalities in the foreseeable future. Given the long-term implications, it is natural for neighbouring municipalities to be cautious, since a neighbouring terminal establishment may affect the business attractiveness of that region and its different industry clusters. The most noticeable "disturbance" from a development perspective is the presence of an election. This aspect is important to recognize so that the process is not exposed to "unnecessary" stress that could be avoided or reduced.

2.3.5 Regulatory framework and the "functional unit terminal" layout

This section attempts to illustrate the views and perspectives related to intermodal terminals of the Swedish Transport Administration. The Swedish Transport Administration emphasizes that regional inland terminals are important to facilities' future growth of rail freight (cf. Banverket 2010). The Swedish Transport Administration has also recognized the importance of local presence and good cooperation between public and private actors to ensure a sustainable and efficient transport system.

One of the Swedish Transport Administration's key focuses is the availability of intermodal terminals, which means that they should be open and accessible for all or at least many actors in the transportation system. This means:

> *"The concept of availability involves the stimulation of broad geographical coverage, transparency, simple predictable decision-making, and competitive neutrality in relation to railway operators. Regional initiatives are important for development" (translated from Banverket 2010, p.9).*

Some important prerequisites for the establishment of regional intermodal terminals mentioned in research and by the Swedish Transport Administration are (Banverket 2010; Bergqvist, Woxenius et al. 2010):

- Located at large production and consumption areas

- Should have locations that form natural start and end points of goods flows that are linked to major international transport routes
- Should be strategically located in relation to goods flows (intersections of main goods flows etc.)
- Should be located where it is easy to switch between transport modes and redistribute flows
- Terminal geographic location should allow for efficient train production and attractive lead-times
- The terminals shall be open to the market
- The terminal operator's activities should be transparent to the infrastructure owners and preferably separated from other activities

The Swedish Transport Administration has developed strategies related to the development of regional intermodal terminals (Banverket 2010):

- To increase diversity and thus sharpen transportation concepts and cost-effectiveness, all Transport Administration's facilities and other business establishments in which the Transport Administration are co-financiers have the restriction to always be open to all railway operators on competitively neutral terms. This should, if necessary, be agreed upon in special cooperation agreements.

Sub-strategy:

- All new terminals will be designed according to "The functional unit terminal" and the Transport Administration will establish a plan for redesign of older terminals, under this definition.
- Regional initiatives should be identified.

As part of this strategy, the Swedish Transport Administration made some observations related to the effective transfer points and logistics parks development:

- Due to the urbanization taking place, the need for transhipment points near metropolitan areas is increasing. Logistics parks represent a regional labour political factor. The Transport Administration will be active throughout the planning process around such installations and will secure availability of land.
- Rail is efficient for transportation of large volumes over long and medium-long distances. This applies to costs, environmental impact, and safety. The Transport Administration should concentrate their efforts on technical development, investments,

and maintenance related to the major goods flows and to those nodes that are competitive in the long term.

Principle layout of a functional rail terminal, developed by the Swedish Transport Administration:

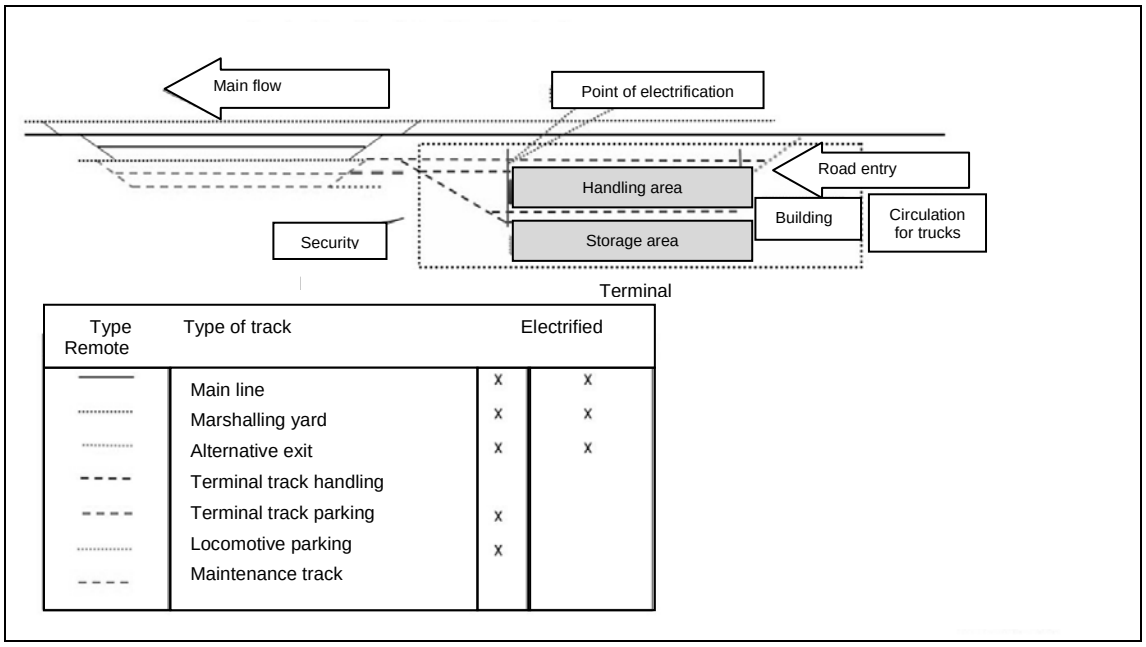

Figure 8. The functional unit terminal. Source: Banverket 2010

With the functional unit "Terminal", the Swedish Transport Administration refers to:

- Terminal
  - Handling surfaces
  - Load equipment cranes, forklifts, etc.
  - Connecting roads
  - Loading tracks, tracks for temporary parking
  - Buildings
- Transfer Yard
  - Remote controlled with electrified tracks

The transfer yard should have the following characteristics according to the Swedish Transport Administration:

- Yard where groups of wagons can be collected and returned with the effort of only the engine crew
- Remote controlled from the central train control
- Electrified if the connecting line is electrified

As far as tendering, ownership, and organization, the Swedish Transport Administration has no ambitions to operate cargo terminals themselves (Banverket 2010).

Investments in intermodal terminals are based on a 3-level categorization of intermodal nodes in which the Swedish Transport Administration may invest more in the higher level than the other two. Regional intermodal terminals with limited flows belong to the lowest level. However, it is possible for terminals to switch between categories/levels if their circumstances change (Banverket 2010).

The Swedish Transport Administration has the following restrictions on ownership and contracting:

- The Transport Administration intends to sign contracts with the infrastructure managers and property owners for access rights and control over terminals
- The Transport Administration requires terminal performance based on their sector responsibility:
    - Openness
    - Competitive neutrality
    - Availability

The reason for these requirements or preferences is that they help to open up the transport system to more actors and strengthen the competitiveness of rail transport and rail-based intermodal transport.

2.3.6 Efficient rail production

It's easy to forget the importance of efficient rail production when discussing terminal establishment as many of the actors involved in the early stages of the development process may have limited technical experience and knowledge of rail transport and terminal design. Listed below are a number of important aspects that should be considered and analysed in order to access the efficiency of the achieved rail production related to the terminal operations and associated logistics park (cf. Bergqvist, R 2011a):

- Location in relation to superior infrastructure. It is very important to know the limitations, conditions, and opportunities of the infrastructure to which the terminal is connected
- Marshalling. It is important that the terminal and nearby rail infrastructure enables efficient switching/marshalling and prevents unnecessary movements
- Slopes in the area and connecting tracks. This aspect affects the capacity, productivity, and investment needs
- Management of wastewater in the area
- Electrification of the tracks and terminal
- Signalling systems connected to the terminal, the need for switches, etc.

2.3.7 Efficient terminal operations

Like the efficiency of rail operations, there are a number of important aspects related to the design and layout of the terminal itself, which strongly affect the efficiency of the terminal operations:

- Paving. The most common surface is asphalt. The disadvantages of asphalt are the more expensive maintenance costs and shorter technical lifetime than concrete stones. Another aspect is that it contributes to increased wear and tear of truck tires, which increases the cost of the terminal operation
- In order to not limit the terminal's capacity too much, it is important to have separated entry and exit lanes and plenty of space in relation to the movements and circulation of trucks
- Another important aspect is the outlet for refrigerated containers/trailers that might benefit from coordinated planning and placement of the terminal's lighting and lighting poles
- It is a clear advantage for the logistics park if all the streets in the park and the connection to the terminal are classified as internal streets. This enables more efficient road haulage as longer vehicles can operate on the roads
- A well-functioning security perimeter around the terminal will improve security and prevent damages, theft, and vandalism. The planning of neighbouring fences and buildings con contribute to this protection while the need for investment in perimeter security is reduced

2.3.8 Independence, transparency, and openness

When evaluating logistics design, it is often necessary to choose whether the system should be opened or closed. There are several aspects to consider before making this choice. Clear ownership and dependencies related to terminals are important for long-term credibility and a functioning transport system. It can be problematic if the terminal operators have direct and specific interests in certain transport flows, as this can affect how the market views the terminal operator and the priorities made in their operations. Although equal treatment, with respect to quality and price, is guaranteed, there may be commercial and informational barriers that limit competition.

Municipalities often invest in terminals, which in itself is not a problem, however, it is an issue when municipalities are involved in the direct terminal operations through part ownership in the terminal operating company. It is especially problematic if the terminal operating partnership does not work under normal profitability requirements. An additional challenge lies in transparency and the relationship between the municipalities as infrastructure owners if they are also part owners of the terminal operating company. Even total ownership of the terminal operations may be preferable as compared to part ownership where the municipalities own a substantial part of the shares.

The Swedish Transport Administration often finances up to one third of the infrastructure needed related to the rail connection of the regional intermodal terminal. As described earlier, the Swedish Transport Administration sets standards of independence and transparency, however, the wording is quite vague and the control unclear. From the perspective of the Swedish Transport Administration, there is a very limited degree of monitoring and reporting related to the demands put forward in the cooperative agreement with the terminal operator once operations start.

2.3.9 Tendering and agreements

For the terminal operations, tendering is preferred as it allows for transparency through the nature of the process and the specific conditions, especially if the process is public such as in the case of public actors as infrastructure owners. Another advantage is that the terminal owner can continuously monitor the conditions and deviations, and as the ultimate measure, cancel the contract or choose other remedies. These opportunities are very difficult to realize if the terminal operator has "possessory rights" to the terminal in a lease agreement or similar.

Today, many infrastructure owners, such as the municipalities in Umeå and Falköping and the state-owned company Jernhusen, choose to contract terminal operations by tendering. The interest from the market has been significant. The tendering procedures and tendering documents have required better frameworks to be developed related to risk, service, contract periods, contract options, leases, marketing of the area, etc. One of the most important elements of these tendering processes is that the infrastructure owner is presented with new ideas as the bidders present their ideas and concepts. The aspect of tendering has increased innovation and creativity within the segment of intermodal transport and terminal operations.

2.4 Current trends and challenges

In this section a number of contemporary trends and challenges are highlighted.

Increased containerization. As global trade increases, the use of load units such as the container is increasing. Overall, this leads to both an underlying growth in movements and a shift towards using more load units. Economics of scale in container shipping and other container movements further enhance the cost efficiency of the container segment.

Deregulation and harmonization of rail markets. The deregulation and harmonization of the rail markets in Europe, and especially Scandinavia, has led to increased competition on the tracks and improved access for new entrants. Combined, this enables for more innovation and creativity in the marketplace at the same time it facilitates competition and cost efficiency.

International collaborations. More international alliances and cooperation are established that aim to improve the efficiency of international movements (e.g., Xrail).

Mergers and Acquisitions. According to statistics from Dealogic, the number of transactions within the global transportation and logistics sector increased by 13% to 892 under 2010. For example, Warren Buffett acquired Burlington North Santa Fe (BNSF) 2010 for $44 billion and Deutsche Bahn's acquired Arriva (UK) 2010 for £1.59 billion.

Development of dry ports. Throughout Europe, dry ports are being developed at a rapid pace. Seaports have recognized the importance of an effective and efficient hinterland system, and consequently are more interested in the hinterland movements and dry port functionality.

Rail-shuttles and semi-trailers. Currently, almost all dry ports and rail shuttles in the Scandinavian rail shuttle system have the same single idea of transporting containers to and from the Port of Gothenburg. There are great possibilities for differentiation and

specialization related to the segments of semi-trailers, swap-bodies, bulk, stripping and stuffing, reefers, express goods, specific industries (e.g., furniture, groceries), etc. Other noteworthy possibilities now starting to emerge include the interest by other sectors such as biofuel, round timber, etc. The segment of semi-trailers is a possibility that could substantially increase the volumes in the Scandinavian rail shuttle system. The semi-trailer segment poses some significant challenges since it is very different from containers in many aspects (Woxenius and Bergqvist 2011). A market-share of about 20% for the semi-trailer segment could increase the volumes of the rail shuttle system by about 100% (Bergqvist 2009).

Figure 9. Intermodal transport of semi-trailers. Photo: Fredrik Bärthel

Tenders and agreements. As previously described, there is a clear trend to tender terminal operations. Ultimately, it facilitates more competition while at the same time it contributes to openness, transparency, and creativity.

Multipurpose. As the market for terminal operations and rail transport opens up and more actors become interested in road-rail intermodality, more and more terminals develop into multipurpose terminals where many diversified market segments are managed. Common segments are containers, semi-trailers, swap-bodies, reefers, wagon-loads, biofuels, cars, bulk, 3pl, customs clearance, dry port, and timber.

Marketing. More and more shippers use intermodal transport as a tool for marketing. Environmental assessments of transportation are the platform for determining the environmental benefits of shifting to intermodal transportation.

Intelligent system design. As the transport system expands with new actors and segments, innovative solutions, where different shippers/carriers and goods are combined, are created. Coordination and consolidation of rail-shuttles, volumes balancing solutions, interregional shuttles, and the intelligent management of non-time sensitive goods are examples of areas where there are substantial activities at the moment. RFID and Geofencing are examples of technologies supporting this development.

Internalization of external cost. There is a global trend that external costs of transportation should be more and more internalized. Emission trading schemes, congestion charges, tolls, and taxes are examples of tools for internalizing external cost. Besides such tools, stricter regulation is being introduced. One example of this in the Scandinavian context is the definition of the SECA areas. The International Maritime Organisation (IMO), at its 58th environmental committee meeting (MEPC) in October 2008, adopted more stringent limit values for sulphur in marine fuels. The new rules imply that the limit value for sulphur in marine fuels in the Baltic Sea, North Sea, and English Channel (sulphur emission control area SECA) is cut from 1.5% at present to 0.1% in 2015. Globally, as in the rest of the EU, the limit value is reduced from 4.5% at present to 3.5% as of 2012. If shown to be feasible, an additional reduction shall take place down to 0.5% with effect in 2020. Otherwise, the reduction will come into effect in 2025. Estimation suggests that the cost of shipping in the Baltic Sea and North Sea may increase by as much as 20–28% until 2015 (cf. Skogsindustrierna 2010).

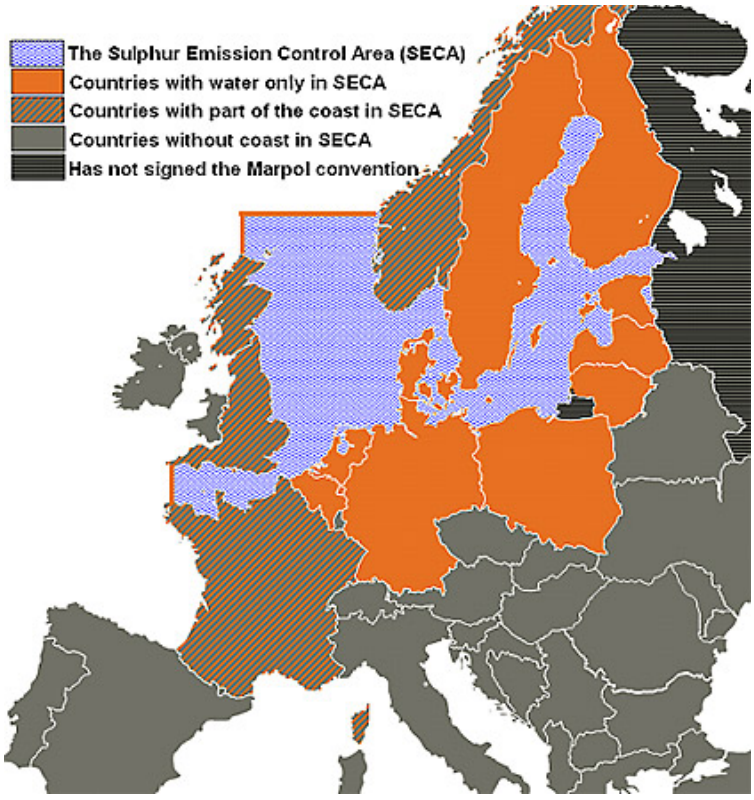

Figure 10. The European SECA area. Source: IMO

Combined, it is my belief that these trends will increase the future focus on systems and corridors. By focusing on these larger systems, goods can be directed towards those corridors where the efficiency is high and the environmental impact is comparatively low. These "green" corridors will likely have a larger public support and more infrastructure investments. As compared to now, there will probably be a larger focus on the hubs located at a corridor.

2.5 Conclusions and recommendations

In this conclusion, important aspects and factors related to the development and success of the two terminals will be identified and discussed from the perspective of the local and regional authorities. This section is structured according to the defined research questions.

1. What constitutes a profitable Dry Port in Scandinavia (based on the accumulated experience), what are the necessary market conditions?

Generally speaking the break-even point for an intermodal terminal based on load-units is a throughput of about 10.000 TEU annually. With a fee of about 200 SEK per lift such a terminal would generate about 1.5-2 million SEK in turnover. However, for multi-purpose terminals it is much more difficult to determine such break-even levels. This means that a dry port or terminal with multipurpose characteristics can be profitable with relatively low volumes. The main body for this is sections *2.1 The transportation system*, *2.2 Road-rail intermodal transport in Sweden,* and *2.3.1 Market potential.*

2. What are key factors for a successful implementation of a dry port concept in the region of Västerbotten?

The general aspects are addressed in section *2.3 Key factors related to intermodal terminal development and implementation* and *2.2 Road-rail intermodal transport in Sweden.* However, specifically for region Västerbotten the key factors could be described: collaboration with other terminals (NLC Umeå etc.), multi-purpose characteristics, and collaboration with local actors.

3. What is a suitable layout of a dry port in the specific socio-economic development conditions of the region of Västerbotten?

This research question is partly address in section *2.3.5 Regulatory framework and the "functional unit terminal" layout* by the blueprint of a terminal layout provided by The Swedish Transport Administration. From a strategic and local perspective the key is flexibility; flexibility in the sense of not developing an intermodal infrastructure too expensive to operate and flexibility related to the freight segments served (load units, biofuels, bulk, timber, etc.). Another important aspect is scalability, meaning the possibilities for the terminal and terminal area to expand with regard to future increase, industry establishments, warehouse establishments, and potentially new rail terminals serving new market segments.

4. What are the success prerequisites for the two potential dry port facilities in the region of Västerbotten: the Nordic Logistic Center in Umeå and the terminal in Stensele?

The fundamentally most important factor for the two facilities is market structures. Both have substantial potential markets and diversified and differentiated markets. Furthermore, they have excellent rail infrastructure connections and design, allowing for efficient rail production and handling. Both are very dependent on each other, and in order to be successful, great collaboration is required on many levels by terminal owners, terminal operators, transport service providers using the facilities, marketing, and shunting operations. Overall, there are great synergies to be realised through collaboration. Some of the collaborations might best take place in formal arrangements, others in informal settings. Other more general aspects are addressed in section *2.3 Key factors related to intermodal terminal development and implementation.*

5. What catchment areas and seaport relations for those two sites are feasible to develop?

The catchments areas of the terminals at Storuman and Umeå are quite different and cannot simply be defined as geographical based on the distance from the respective terminal. For Storuman there is a road catchment-area stretching to Norway and from a rail perspective

there are great opportunities to coordinate with traffic east-west and north-south. The same type of catchment logic applies to Umeå, however, Finland is an obvious opportunity to the east, where Umeå can offer attractive international transport solutions, both at the terminal in Umeå and the seaport in Umeå. Umeå is also located at a north-south rail link that connects many larger consumption areas. This positions Umeå as an important split-point in Northern Sweden. They may have somewhat overlapping catchment areas, but at the same time, focus on different segments. By clever coordination, the two terminals can improve the overall efficiency of the transportation system in the region, especially rail transportation. Traffic at the two terminals can be coordinated and contribute to overall cost efficiency.

6. Highlight how SMEs in the catchment areas can utilise the potentials of the two dry ports.

In the catchment area of both dry ports there are a significant amount of SMEs. The SMEs are an important market potential for the two dry ports as they have promising growth opportunities at the same time that many of them increase their import and export activities. Therefore, the two dry ports should focus on informing this segment about the possibilities that exist for dry port functions and associated transport solutions. One way of doing this is to provide a forum where transport service is provided and SMEs can meet in order to increase the understanding of each other's situations. The issue of SMEs is addressed under *2.3.1 Market potential.*

7. Highlight the importance of free access to dry ports, i.e., competition neutrality.

The free access aspect of terminal operations is essential, especially in connection to the SME segment. Neutrality should be a priority for terminal operators and terminal owners. The issue of completion between terminals and transport modes and the importance of neutrality is highlighted in sections *2.3.8 Independence, transparency, and openness* and *2.3.9 Tendering and agreements.*

8. How do the two potential dry ports fit within the larger and more comprehensive transportation system in the northern part of Scandinavia?

This aspect is mainly addressed in section *2.3.1 Market potential*. In this section, the role of the two dry ports, in connection to the subordinated infrastructure system, is addressed. The both have a unique role in connection to the overall transport system and, at the same time, have great interdependence. There are many synergies to be drawn from collaboration between the two. The position of Storuman can be characterised at the "meso and micro"-level, while Umeå is more positioned at the "macro, meso, and micro"-level.

9. Recommendations for local and regional authorities in the region of Västerbotten to sustain operations of the two potential dry ports (NLC and the Stensele terminal).

It is important that regional authorities understand the synergies between the two dry ports and coordinate as much of the development processes for the two facilities as possible. One example of an aspect to facilitate synergies is the rail link between Umeå and Storuman and beyond. This east-west link is essential for the development of the two dry ports and its status and efficiency needs to be addressed and secured. Furthermore, the authorities have an

important role to facilitate coordination and collaboration between the two dry ports. Areas for such facilitation could be: marketing, lobbying, infrastructure management, logistics related establishment, facilitation of 3pl services, terminal operations and associated tendering/agreements, shunting, facilitation of new transport services, providing a forum for shippers, carriers, and terminal operators to meet, etc.

The factors and issues addressed related to the terminal development process are summarised and illustrated in Figure 11. All factors are interconnected, however, the links in the figure illustrate the strongest relationships. From an evolutionary perspective, these links are especially interesting, as the strength of these relationships constitutes the efficiency of the terminal and related intermodal transportation.

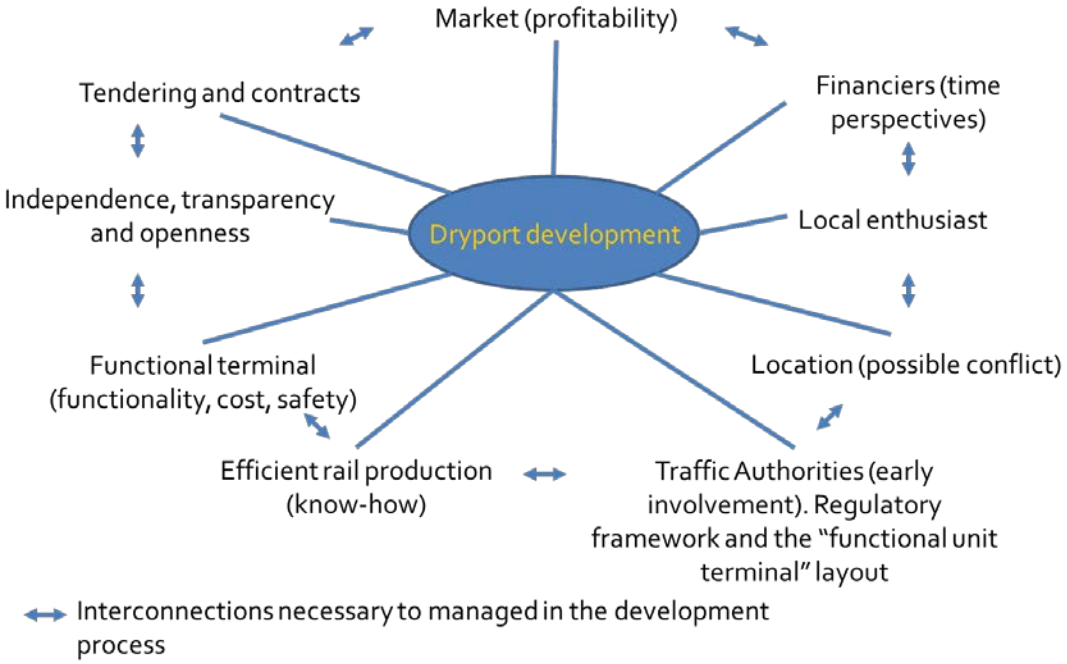

Figure 11. Important factors related to intermodal terminal development. Source: Modified from Bergqvist 2011a.

Related to the development of regional intermodal terminals and dry ports, and sometimes adjacent logistics parks, is the importance to recognize the need for a continuous process of creativity, innovation, and competence.

Finally, regional intermodal terminals and dry ports have an important role in ensuring a competitive and sustainable Scandinavian transport system in the future. The most important prerequisites for the future development of intermodal transport are capacity and efficiency at the endpoints and the intermediate infrastructure. Herein lies the investment and expansion of new infrastructure as well as the management of the existing infrastructure.

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