Ports Performance in European Intermodal Transport
A Comparative Study of the Development in two Intermodal Nodes
Port of Rostock - Port of Świnoujście

Master Thesis

Master’s Programme
European Spatial Planning & Regional Development
(2008 – 2009)

Supervisor: Jan-Evert Nilsson

Submission: 11th May 2009

Author: Ulrike Reimer
email: reimeru@gmx.de, phone: 00491736225743
Acknowledgement

Accomplishing the master thesis I was supported by some persons and I want to thank all those who helped me finishing. I would like to express my sincere gratitude to my supervisor Jan-Evert Nilsson for all the meetings and exchanges of ideas during the writing process. Sincere thanks to Jürgen Neumüller (IU Potsdam), Thomas Biebig (Rostock Port) and Krzysztof Pilarski (Szczecin and Swinoujście Seaports Authority) for their time and the profitable conversations. Furthermore, I would like to say a special thank to some of my classmates for the exchanges of informations and helpful tips.
In the end, many, many thanks to my whole family, to Marco and Silke for giving me unfailing support and sometime critical notes.
# Table of Contents

1. Introduction.................................................................................................................. 5
   1.1 Study questions and methodology................................................................. 8
   1.2 Structure............................................................................................................... 9

2. Introducing intermodal transport.................................................................................. 10
   2.1 Aspects of intermodalism.................................................................................. 11
   2.2 Indicators of intermodal transport over seaports............................................. 13
       2.2.1 Standardisation and interoperability...................................................... 13
       2.2.2 Ports infrastructure.................................................................................. 15
       2.2.3 Hinterland connection............................................................................ 17
       2.2.4 Terminals – container handling capacity & quality......................... 18
       2.2.5 Transport and terminal operators......................................................... 19
       2.2.6 Institutionel aspects & financing............................................................ 21
   2.3 Compendious & pursuing.................................................................................... 24

3. Intermodal performance of Rostock and Świnoujście.............................................. 25
   3.1 Regional Introduction of Rostock and Świnoujście........................................... 26
   3.2 The ports – Rostock and Swinoujscie............................................................... 29
       3.2.1 Status of standards regarding to interoperability................................. 34
       3.2.2 Infrastructural offers of Rostock and Swinoujscie............................... 36
       3.2.3 Connecting the hinterland...................................................................... 38
           3.2.3.1 Road connections........................................................................... 38
           3.2.3.2 Railway network.......................................................................... 40
           3.2.3.3 Transport by sea........................................................................... 42
           3.2.3.4 Inland waterway.......................................................................... 44
       3.2.4 Operators................................................................................................... 45
       3.2.5 Freight handling capacity....................................................................... 46
       3.2.6 Financing.................................................................................................. 48
   3.3 Conclusion............................................................................................................. 49
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Future Perspectives</td>
<td>51</td>
</tr>
<tr>
<td>5. References</td>
<td>53</td>
</tr>
<tr>
<td>6. Figure index</td>
<td>57</td>
</tr>
</tbody>
</table>
1. Introduction

Export and import or rather freight traffic needs well developed and resilient ways of transportation. It is a fact that the transport performance increased massively in the past decades within the European Union. The transport, including all transport modes like road, rail, inland waterways, maritime transport and air transport, was increased by 31 % between 1995 and 2005 (Figure 1.1). The road and sea transport are required the greatest part with 44% and 39% of the total freightage in 2005.¹

![Figure 1.1: Freight transport performance, EU-25, 1995-2005 (in billion tonne-kilometers)](image)

source: European Commission – Panorama of Transport

Therefore, the future trend looms and many European institutions as well as research programmes like ESPON (European Spatial Planning and Observation

Network) prognosticated the enhancement in good flows especially after the last European enlargements since 2004. The inherent 12 new Member States expect an increasing freight transport and induce national and European policy makers to create transport strategies linked to the eastern part of Europe.

The European Union drafted the TEN-T (trans-European transport network) guidelines in 1996 and is still working on it to structure a firm traffic system with main transportation channels over the whole European territory. In February 2009 the EU published the Green Paper, a TEN-T policy review, which sets the focus on new challenges in the future transport. The TEN-T contains 30 priority projects and includes all traffic modes. (Figure 1.2)

**Figure 1.2: TEN-T and its 30 priority axes**

[source: cp. European Commission - Transport]
The blue square in the map localises the area around the ports Rostock and Swinoujscie, which are the study objects in this thesis. By taking a closer look at the map section you can see that on the German part the axis number 1 ends in Berlin and the axis number 20 crosses Hamburg, Bremen and ceases in Hannover. On the Polish side it is similar. The axes, which is the nearest one is also number 1 ending in Berlin. Farther in the eastern part of the country the European Union set the axes 23 (crossing Warszawa) and 25, which both end in Gdansk. In sum, there is one port in Poland at the Baltic Sea, which is linked to two priority axes. Westwards you find Hamburg included in a priority axis also as a linkage to Scandinavia.

One big question raises in this context: why is an extension of the axis number 1 not a priority of the European future transport system to link the the ports Rostock and Swinoujscie as nodal point on a north-south-axis? If you just take a look at the blue square, the area around the two ports seems like a periphery. German and Polish politicians were also wondering about these facts and developed their own strategies to establish the ports in the transport system all over Europe. Furthermore, the political strategies were used to position oneself in the European transport policy.

Figure 1.3: Baltic-Adriatic-Development Corridor

source: cp. Joint Spatial Planning Department Berlin and Brandenburg

Figure 1.4: Central European Transport Corridor

source: cp. CETC
During a conference in November 2007 in Berlin, the East German Länder signed the Berlin Declaration to establish the Baltic-Adriatic-Development Corridor (Figure 1.3), which crosses 13 European counties. Thereby, the port of Rostock adopted a crucial point as a traffic centre between Central Europe and Scandinavia.

One year before, in September 2006, 3 Polish regions flanking the German border signed together with Region Hradec Kralove (Czech Republic), Region Bratislava (Slovak Republic) and Region Skåne (Sweden) the Interregional Agreement on Establishing the Central European Transport Corridor (CETC). (Figure 1.4) Here, the transport link to Scandinavia is over the port Swinoujscie in connection with Szczecin.

These strategies seem to be really important to the eastern part of Germany and the western part of Poland. But these ports are so close together, that they have the choice between cooperation or further competition. The current situation is quite interesting and therefore the port of Rostock and the port of Swinoujscie will be the study objects in this thesis. To compare the ports it should be necessary to figure out what measure do the ports have set to support intermodal transport or on which level of development the ports are. The compared traffic nodes are mediumsize ports in relation to ports like Rotterdam or Hamburg. Nevertheless, the ports own several links to different traffic modes as well as the close connection to Scandinavia. Furthermore, it is important to find out whether the ports themselves either want to be a priority transport node in intermodalism or this objective is just secondary.

1.1 Study questions and methodology

Therefore the overall research question that this thesis will discuss is:

How do the seaport of Rostock and the seaport of Swinoujscie process their development and performance to manage intermodal freight transport in consideration of the European and national strategies?

This main question includes several approaches and has to be split up as follows:
• What does the term intermodal freight transport conceal? The intermodal transport system in general will be described by different definitions from several specialists to gain knowledge about typical aspects of intermodalism, the function of the system and finally the advantages and disadvantages.

• What are the main characteristics of intermodal transport over sea ports? It is important to figure out what the essential indicators are to make the comparison between Rostock and Swinoujscie work. A fair comparison is based on unitary facts.

• How do the ports manage intermodal transport in consideration of the development? During the comparison the ports will be estimated and analysed to get knowledge of their actual state. The collected data will be completed with the result of the expert interviews.

• What are the future perspectives? To answer this question all facts will be resumed the characteristics of intermodal transport, the results of the comparision and the political strategies to get a particular description of the future potentials and finally to conclude all aspects in a critical discussion.

1.2 Structure

Before this thesis gets a usable conclusion, it is inevitable to have a look at its outset. In chapter 2 the term "intermodal transport" will be clarified. Several definitions will give an overview of this subject and its attributes. By going into details, the characteristics of intermodal transport over seaports will be described to get the indicators for the comparison. Furthermore, the strengths and possible weaknesses will be analysed. Chapter 3 is the practical part of the thesis, where the port comparison will be the key issue. First, there will be a regional description on both, Rostock and Swinoujscie. Second, the ports will be analysed by the given indicators from chapter 2. Finally, there will be a critical discussion about the current development and the performance of the ports relating to intermodal freight transport. The last chapter is trying to give a prospectus and will come up with some realistic future perspective for Rostock and Swinoujscie.
2. Introducing intermodal transport

Wealth and economic growth rest on an efficient transport system. The foreign trade encourages wealth and therefore also workplaces. Germany as well as Poland are export nations and need a suitable intermodal transport system. Currently, the concept of intermodal transport is a highly discussed issue within the transport policies of the European Union as well as of the Member States. The efficient cross-border transport of goods is vital for common future trade within the Single Market of the EU. The European Union uses the combined transport and its modes in an extensive way. The continent possesses a sufficient domestic and European-wide infrastructure, which includes all transport modes like road, railway, inland waterways and seaports. The European Union intends to create huge transport corridors including land-land plus land-sea traffic chains from the East to the West likewise from the South up to the North by implementing all modes and combine them. The conditions of intermodal transport within the EU are still there and have to be developed and used efficiently, especially in the new Member States regarding to the increasing flow of goods in the future.

The core issues are transport junctions with container logistics, where the freight containers have to be load on several modes. But what is meant by intermodalism in detail? What are the characteristics to achieve and developed a cost-efficient and rapid transport by varied transport modes? The literature gives a common and clearly defined overview, but it also contains different terms, for instance multimodal transport or combined transport instead of intermodalism. There are different definitions which discuss the subject basically from the technical point of view including standardisation of container sizes and swap bodies or e.g. the depth of water at ports. Other descriptions set their focus on institutional aspects, on the influence of governmental institutions and political strategies.

In the following section most of the aspects will be described and discussed to find out what are the characteristics of intermodal transport relating to the comparison of the two seaports.
2.1 Aspects of intermodalism

In general, intermodal freight transport can be defined apart from particular details as a “concept of utilizing two or more suitable modes, in combination, to form an integrated transport chain aimed at achieving operationally efficient and cost-effective delivery of goods in an environmentally sustainable manner from their point of origin to their final destination.”

In 2001 the OECD (Organisation for Economic Co-operation and Development) exposed the topic of intermodal transport and tried to define “the elements of an intermodal freight transport system that makes efficient use of the various transport modes involved in the management of supply chains from the producers of raw materials to the consumers of final products.”

Another definition was set in a book by William R. Black and Peter Nijkamp published in 2002. They stated that “We define intermodal transport as the transport of unitized loads through the coordinated use of more than one transport mode in such a way that the comparative advantages of the various modes are maximized and the transport chain is guided as a single unity.”

The UNECE (United Nations Economic Commission for Europe) also discussed intermodal transport and said it is “the movement of goods in one and the same loading unit or road vehicle, which uses successively two or more modes of transport, without moving the goods themselves in changing modes.”

In 2001 the European Union published the White Paper “European Transport Policy for 2010 – Time to Decide”, which assayed the European transport and gives proposals for improvement. The intermodal transport plays a significant role in that case to achieve the aims of the European Transport policy. The so called 12 principle measures in the White Paper are among others:

- revitalising the railways
- improving quality in the road transport sector
- promoting transport by sea and inland waterway

---

• turning intermodality into reality
• building the trans-European transport network
• adopting a policy on effective charging for transport

This extract shows the the overall goals in the European transport policy and includes preconditions for intermodal transport e.g. improving the ways of freightage.

In sum, the most conspicuous catchwords in the preceding explanations related to intermodalism in transport are the following:

• various combined transport modes (road, rail, water, air)
• more than one mode
• transport in the same loading unit
• the efficient use of the modes
• functioning floating transport chains

These are the basic characteristics of intermodal transport. But what are the conditions or indicators in detail, also in consideration to the transport over seaport?

---

2.2 Indicators of intermodal transport over seaports

The mentioned basic characteristics can be adopted for any logistic node. But in detail, every traffic junction has its own development like different structures, stakeholders, regulations or technologies and ports appear like special ones. Loading goods were one of the original functions of sea ports and is still a big part of it. But in the past decades the launching of companies became more and more attractive. Ports are mostly financing themselves and therefore their need the yield of tax also to improve the transport system. This mixture of functions within the ports let them grow to huge logistics centers. Among others, the main task of logistics centers among others like storage is to load freight between modes. Therefore, the intermodalism adopts the basic function. Now it seems to be interesting to find out how the intermodal system works.

2.2.1 Standardisation and interoperability

To understand the complexity of intermodal transport, it is important to get information about the inside connections of the transport chains so called segments. (Figure 2.1)

The demand of Full-truckload (FLT) regarding to intermodal transport is that the loading unit should be compatible with the other traffic modes like shortsea, inland waterway or railway. During the nineteen sixties for example the intermodal transport of cargo by different modes was increasing in the last mentioned modes. The reason was the agreement between the US and the EU about standardised container. But the freightage by truck became more popular and shrunk the won market of other traffic modes. In general, a transport chain starts and ends with the carriage by trucks except of companies, which are located for example in seaport or other logistics centers. Therefore, at the starting situation it is decisive what kind of container will be used for the transport within the logistics structure to keep the interoperable movement of goods. The containerisation revived the intermodal transport again, because any kind of goods could be carried by containers. Increasingly industries detected that containers have the benefit to be useful in an intermodal transport chain.
Specific shipping containers “as they are usually termed are generally constructed of steel for strength and to meet the requirements of legislation and to standard dimensions established by the International Standards Organisaton (ISO), hence the term ISO container.”\(^7\) The ISO containers for shipping are in general 8-foot wide, 8-foot high by 20- or 40-foot long. A further construction for containers called “High Cube” tenders a high of 9-foot. But the choice of dimension is always compatible with the several transport modes. The stability of the containers allows the stacking over quite a number of coats.

The advantages of the carriage by standard containers in intermodal transport are:

- short transit times
- no repacking of freight
- automation of technical processes in freight handling

• good utilization of the cargo compartment
• adapted dimension of swap bodies and cranes

Disadvantages could be in relation to aggregated shipments:

• high investment costs
• high expenditure in coordination
• production costs like adaptation for trucks and rail (braking systems or subfloor)

On the one hand, it is a fact that for instance 70 % of bulk cargo will be transported by containers. Most of the cargo will be loaded by this process so called Lo-Lo (Lift on-Lift off). On the other hand, the Ro-Ro (Roll on-Roll off) principle evinces an efficient way to regulate costs: trucks and trains loaded with containers (not only ISO shipment containers) will be moved by ferries. Nevertheless, this time-efficient type of transport by standardised containers is important for an interoperable performance in intermodal transport.

Another important aspect of interoperability in intermodal transport over ports is the communication system. To ensure a non-conflictual transit over seaport, it is significant to establish a common communication system. All actors like container terminals, carriers, shipping companies and rail operators should have access to the system. One big system promises a fast and efficient load, because e.g. the customers will exactly know if one ship is reloaded, so there will be no extensions of waiting time for others. Nonetheless, the ports have to be prepared for delays in the course like hugh parking places for lorries. But this is lying in the responsibility of the port and its infrastructure.

2.2.2 Ports infrastructure

The infrastructure provides a kind of skeletal structure to coordinate the different modes within the docks. Thereby, it is essential that the railway lines and the traffic by roads or rather by motorways are in a close connection to the loading terminals. In case of a high traffic volume it is important that parking places for lorries and
sidings for rail are available to avoid traffic congestion, resultant time delays and to keep the loading places in the terminals free. But also in terms of inland waterways there should be enough moorings for the inlandgoing vessels to load goods between the them in a efficient way. This also applies to the transport by ferries. Railway lines and roads have to be linked to the landing stages of the ferries. In general, a high density of departures und arrivals need a well functioning infrastructure to cope the combined loading of goods to the several modes, but also to transport incoming cargo to other terminals of the port for storage or processing in a settled company. Some ports benefits from established terminals which are only responsible for the combined loading of freights in the intermodal transport. The amount of terminals respectively the separate parts of a port and their functions determine the quality of the ports infrastructure. The upgrading of transport capacities is always connected to an extended and developed infrastructure to transact the export as well as the import in a suitable transport chain, which is connected to a well developed hinterland connection.

Figure 2.2: Intermodal transport operations

source: The Future of Intermodal Freight Transport

Figure 2.2 shows two different types of a transport system and emphasizes the importance of the local infrastructure within the ports. The first one recomends that the vehicles, like combination of barge or train for instance, are loaded on various container terminals. The left one shows the alternative where a specific inland shuttle carries the cargo to a collection terminal to coordinate the incoming and
outgoing hinterland travel.\(^8\) Doing this in an efficient way is one of the challenges in intermodal transport.

### 2.2.3 Hinterland connection

In fact, it is also one of its strengths, because the intermodal hinterland traffic links the seaport by different modes with regional inland terminals, airports, other seaports or with places of destination. A well-developed traffic system is essential for the intermodal carriage, because a speedy and therefore cost-efficient transport needs a network in good conditions. The traffic network offers international access to the whole European territory.

Hinterland connection can be defined also as the traffic system in the surrounding area of the port. This kind of hinterland connection is more regional and lies within a radius ranging from approximately 100 till 200 kilometers. In the discussion of intermodal transport over seaports within the European Union the hinterland connection covers the whole territory and implements all destinations, for instance in Italy or Greece in the South and Copenhagen or Helsinki in the northern part of the EU.

In the analysis of the hinterland connection of the two ports Rostock and Świnoujście it is important to figure out what kind of links consist. Motorways for example should be multi-track and also easily accessible. It is an advantage when the motorway is not toll charged. Proper developed railways are electrified and should have a speed minimum around 80 km/h, better is 120 km/h to guarantee a high-speed transport. The inland waterways have to offer a broad river bed and sufficient deep navigation channel to enable a higher traffic flow on the river and have to make it possible to keep the freight transport save.

The linkage to metropolregion apart from the mentioned destinations valorize the several modes, because huge manufacturing industries are established in this kind of areas and need the close connection to the intermodal transport services. The same is also applicable to consumer items, because cities or rather the inhabitants consume a lot and every type of goods. Also the ports profit from the inclusion of

cities, because the more companies and logistics centers are involved in the traffic system, the more freight will be loaded over the seaport. A well working hinterland connection ensures a better integration of a port within the international crossborder freightage and allows a continuous transport though the whole European territory as well as over its borders. Furthermore, to manage the predicted increasing good flow, an up-to-date technical equipment as well as a organisation within the terminals is a basic assumption to accomplish the shipment.

2.2.4 Terminals – container handling capacity & quality

Europe has a lot of big and mediumsize seaport along its borders. Therefore, it is one of the key issues of the rival seaports to offer an efficient and successful transfer of freight containers. The customers like the owner of the freight, logistics service providers or companies, which are involved in the transport chain, have the power to decide over which ports their containers will be loaded. In this business costs and time of the carriage are the vital facts among the quality and safety. Terminals at ports are the interfaces of changing the modes by loading the freight or using the Ro-Ro principle. The ownership of the terminals, which differs between public, private or a mixture of it, can be of prime importance. In the majority of cases the port authorities, which are instructed by the government, manage the port, but mostly in terms like infrastructure or power supply. Terminals, which are only owned by the port authority, have the opportunity to offer a speedy loading, because all steps of procedure will be coordinated by one actor. The same applies to terminals which belong to privat owners. Frequently, terminals are organized by several companies. This kind of situation also emphasises advantages. If different actors are specialised for specific parts of the loading process then the freight handling could be accomplish in a higher quality, because every partition will be worked out by an expert. On the other hand, the communication and coordination between them have to go smoothly, otherwise the quality of loading is going well, but the fast transaction could be affected. Then again, a difficulty regarding to the quality in the case of one processor can be arise. It does not mean that one owner could not process well. It depends on the labour force which will be provided.
Certainly, the prices as well as the speed play a significant roll, but other indicators are also fundamental to guarantee best possible intermodal transport like the technical equipment. For instance, the average container crane should be able to load or unload more than 20 containers per hour. Another example could be the condition of moorings and swap bodies particularly with regard to safety and quality of loading.

According to these facts mentioned above, the handling price and a fast transit as well as the timing between the several steps of procedure are the basic elements of an adequate loading with high quality. The costs or rather the using charges and the speed are interacting in case of terminal cartage for instance. The costs of terminal cartage are quite huge and if a lorry or a train is waiting for loading, the costs will increase. Therefore, the interludes between time- and costs-efficient loading have to work out. The charge system within ports is complex and detailed, but it is also clear defined like port dues, wharfage fees or demurrage fees.

The handling capacity is also an important fact to measure the quality of terminals. The amount of loading units for example or the type of goods, their origin and destination, the number of workers and loading berths are essential to give a statement.

In general, the port authorities and the terminal operators are responsible to offer high quality transfer opportunities.

2.2.5 Transport and terminal operators

With this term, transport operators indicate a mass of involved organisations, service providers, companies or shipper. The acting of the several operators depends on facts like the taking modes, the type of cargo, the origin, the destination and the costs. Mostly, the ports have contracts with big companies, for instance the ferry line operators or cooperate with the major European intermodal transport operators, which also record an increasing freight transport and profit from the carriage by different modes. Examples for huge transport operators and their development in transported volumes between 1990 and 2002 are shown in Figure 2.3. By taking a closer look you will recognize that the freightage grew constant and doubled in the transported volumes.
For example, Rail Combi is the container division of the Swedish operator Green Cargo. Rail Combi has merged in March 2002 with the freight division of Norwegian State Railways (NSB). Rail Combi is specialized on the transportation by rail and set great store by environmentally friendly transportation. Another example could be the ICF (Intercontainer-Interfrigo SA), a Swiss company which deals with rail-road combined freightage. The company develops transport concepts for the transport over the major corridors by rail. UIRR (International Union of Combined Road-Rail Transport Companies) has 19 members from 12 different European countries which are concerned with combined transport.

The cultivation of this kind of relationships should be one of the ports priorities, because the largest operators have the power to influence the European decision makers in the transport policy.

As mentioned before, a lot of users are involved in the intermodal transport chain and was grouped as follows by EIA (European Intermodal Association):

- Shippers: Mostly, the shippers are also the owner of the freight and contracts are signed for the carriage between the location
- Forwarders: The forwarder elaborates the best solution for the cargo transport and briefs the logistics companies
• Ocean shipping lines: They are responsible for the maritime hinterland freight movement and ensure that their customers’ requirements are met.
• Logistics service providers: These are companies with logistics assets like storage areas or container freight yards.  

Finally, on the supply side of intermodal transport you will find operators responsible for the different traffic modes (rail, road, barge, shortsea transport) and the terminal operators who provides transshipment equipment and places for temporary storage of the cargo.

Terminal operators are in some cases the port authorities which are mostly supported by the government. On the other hand, one private companies or several companies own a terminal and are responsible for the loading process or specialized on steps of the procedure. The privatization of terminals or wharfages has increased in the approximately past 10 years. In general, in Germany as well as in Poland terminals are managed by the port authorities, by private companies or a mixture of it. That means one section of the terminal for instance is owned by the port authority and an adjacent part is managed by a company for port services like cargo handling, transportation and so forth.

The operators’ markets are overlapping among each other, but also linked to other various market segments, which are not dealing with intermodal aspects primarily. On the surface it appears a confusing network, but if the communication and timing is working, it will be a time-efficient and flexible transport within a intermodal chain.

2.2.6 Institutionel aspects & financing

Historically ports contain a monopoly of power, where port facilities and the basic infrastructure have been provided by the public sector. But in the past years the privat investment sector became more and more influence.

The financing of ports’ infrastructure or terminal segments is complex and differs in the several ports. As a general rule, infrastructure measures within the European Union are financed by governmental financial resources. It is complicated,
because ports adopt various tasks. First, ports act as interfaces within intermodal freight transport chains, which argue for governmental support regarding to infrastructure investments. Second, ports are also huge industrial estates, where for instance power plants, manufacturing industries and logistics enterprises are settled. Therefore, ports are comprised by different firms and have to operate under the legitimacy of market competition.

Currently, the financing of the infrastructure is split in governmental and private funding. The ports’ authorities are often representatives of the government and in most of the cases they are accountable first of all for infrastructure measures followed by the ferry and cruise terminals and the combined loading of goods. In these areas, the financing of measurement should be clear and financial resources runs into access channels, berths and traffic systems. This supports the private sector, which provides e.g. labour for loading activities or own a separate part of a terminal, maybe the whole terminal, to transact an individual operation within the loading chain. Therefore, the financing system of ports could be divided into three scopes, the basic governmental funding, receipts of i.e. port dues or leasings and finally private investments by operators or shipowners. Port authorities mostly work to cover the costs and are not considered to be profit-oriented. Receipts are wharfages and leasings. Expenditures are infrastructure investments which are often financed by state subsidies and administration costs. The benefit of port dues allows further investments in the infrastructures or the expansion of the port among the conventional governmental investments. Wharfages or rather the charges for using a port, which depends on facts like size of vessels, time of storage or the loaded tonnage, can be split up as follows:

- charges for the provision of services and facilities to enable a ship to enter safely and use the port;
- charges for specific services or supplies rendered;
- rents or charges for the use of land or equipment owned by the port. ¹⁰

Regarding to this most common charges, ports are a kind of independent systems, which mostly finance themselves in their spatial borders except of European or national funding.

Private investments support this mentioned thesis. Terminal operators for instance or shipowner, who invest in terminals, will profit by this investment, because it proffers more discretionaries and special rights.

Some advantages of private investments are the controlling effect, because the investors are the decision maker, the payer and the user. That means all sequences and decisions are taking by one investor and accelerated the process, which means a gain of time. On the other hand, the governmental funding is structured differently from its organisation. Here, the policy is the decision maker, the taxpayers give the money and the terminal operator profits from the funding, which is more complex than the complete private financing by one investor.

A disadvantage of this type financial arrangement could be the complex structure, the different responsibilities and the amount of acteurs who are involved, because it is difficult to manage and coordinate the finance system in a fair way relating to the equivalent development of the port and its segments. Furthermore, the cooperation between the operators has to be efficient and successful.
2.3 Compendious & pursuing

By assembling all the facts, the complexity of an intermodal transport over seaport is obvious. The mentioned indicators are overlapping and influence each other. To figure out the information of the ports, which are the study objective in the thesis relating to these indicators will illustrate the performance in intermodalism. The characteristics are the given basis for the comparison in the following part of the thesis and will support the critical assessment.

How is the status of the infrastructure system in Rostock and Swinoujscie?
What kinds of modes transport the freight over the seaport?
Is there a separated terminal just for the combined loading?
Who are the important stakeholders and who of them are European-wide operators?
Are the loading constructions or rather the terminals working to capacity?
What kind of communication system will be used at the port?
What are the financial resources and how is the distribution of competence?

To answer these and other questions will be the key issue of the comparison to get as much information as possible to create a fair comparing and to elaborate the strengths and weaknesses for further recommendations.

But first of all it is important to understand in what kind of environment the ports are located. Therefore, the comparison will start with a description of the ports and their surrounding areas, both analysed on the basis of similar regional aspects.
3. Intermodal performance of Rostock and Świnoujście

Comparing Rostock and Świnoujście by means of the mentioned indicators of intermodal freight transport over seaports will be the practical part of the thesis. But, before starting the comparison it will be useful to get some short background information of the two different countries and the cities.

East Germany, where Rostock is located, and Poland have an akin history since the Second World War ended. A consequence of the Second World War was the implementation of planned economy and the heading of the communism in regional development. The breakup of the so called Eastern bloc in 1989 was the starting point for a social market economy within the capitalism.

But there are also differences in the historical development regarding to the European Union Membership. Germany belongs to the founder members of the EEC (European Economic Community), was involved in the main decision-making processes or rather the treaties since 1957. The eastern part of Germany joined the EU after the reunification in 1990. Poland became a member during the huge enlargement in 2004, when 10 new Member States acceded. From the historical point of view the two countries show a suitable basis for comparing except of the used currency, because Germany joined the ECU (European Currency Unit) and Poland did not.

The ports which are the study objects in this thesis are part of the mentioned countries. Getting a little bit more background informations about the port of Rostock and Świnoujście it would be an asset to become familiar with the cities.
3.1 Regional introduction of Rostock and Świnoujście

Rostock is located in the north-east of Germany at the Baltic Sea. The whole area of the city covers approximately 181 square kilometre. The river Warnow is crossing the city in a length of 16 km. In September 2008, 200,566 inhabitants lived in Rostock. According to the population and the size, Rostock is the biggest city of the Federal State (German Länder) Mecklenburg-West Pomerania. Rostock has a well developed density of population which is 1105 inhabitants per square kilometre.

The City is divided in 21 districts and is ruled by the Lord Mayor the head of Rostock, who will be supported by 3 separate senats. The senats deal with subjects like financing, social, environmental and economic issues, health, building and future visions. The citizenry, committees as well as the municipal companies and services are also involved in the decision-making process.

The biggest populated area of Rostock lies in the western part regarding to the river. In the East, the main industrial estate and a forest area are shaping the landscape. The main economic sectors are the public and private services with 21,659 employees, the tourism, the ship building industry and the shipping followed by the University as an important employer. The rate of unemployment is quite similar with 14,7 % (2007) to the rate of the whole Federal State (15,4%, 2007). But the unemployment rate tops the German average of 8,6 % in 2007 enormous.  

Rostock is well accessible by the motorways A 19 and A 20 (E 22), by train and airplane to Rostock-Laage the regional airport partly used by the military and civil air traffic. The city lies between the axes Berlin-Copenhagen and Hamburg-Szczecin and has a close connection to whole Scandinavia by air and of course by ship.  

---

11 unemployment rate: http://www.meinestadt.de/rostock/statistik?Bereich=ranking&Kreis=rostock&Kreisfrei=&id=12
12 all data from the official website of Rostock: www.rostock.de
Swinoujscie is situated in the north-west of Poland also at the Baltic Sea and is spread over 44 several islands of which only 3 (Uznam, Wolin, Karsibór) are populated. The whole area of the city covers 195 square kilometres and had a population of 40,901 inhabitans in June 2008. The city is located at the river Swine which flows into the Baltic Sea and is connected with the river Oder southerly over the Szczecin Bay.

Swinoujscie is one of the biggest cities among Szczecin of the voivodeship West Pomerania. The city is partitioned in 7 districts and the Mayor of Swinoujscie is the representative of the whole area. The Mayor will be supported by two deputies, who deal with subjects like town affairs, transport, building, real-estate management, social aid, health and education. The Town Council acts as an interface between the local government and the citizens.

The administration and service center as well as the tourist facilities are located on the island Uznam. The industrial area occupies a part of the island Wolin where the port is situated, too. The third inhabited island Karsibór is dominated by agrarian tourism. The main economic sectors are similar to Rostock like the maritime economy, the tourism and the service sector, because the two cities have the same geographic positions at the Baltic Sea. It seems like, that Swinoujscie performs very well in its economic branches, because the rate of unemployment decreased in the recent year to roughly 14% in 2007, which underlies the rate of the whole voivodeship West Pomerania (16.4%, 2007). Comparing to the unemployment rate of Poland, which covered 11.2 % in 2007, Swinoujscie is superjacent.

Swinoujscie is connected to the railway system and to the European route E65, which starts in Malmö (Sweden) and ends in Chaniá (Greece). Another traffic link is given by inland waterway over the Szczecin Bay. Motorways are not crossing the city as well as an airport does not exist, but Szczecin is affiliated to the motorway number 6 and has the medium size airport Szczecin-Goleniów.

14 unemployment rate: http://www.paiz.gov.pl/index/?id=a5e308070bd6dd3cc56283f2313522de
The two cities evince some commonalities and differences (Figure 3.1).

![Figure 3.1: Comparing of the Cities (Rostock and Swinoujscie)](source: own illustration)

<table>
<thead>
<tr>
<th>Commonalities</th>
<th>Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>geographical location</td>
<td>located area</td>
</tr>
<tr>
<td>main economic sectors</td>
<td>city size/inhabitants</td>
</tr>
<tr>
<td>rate of unemployment</td>
<td>accessiblility</td>
</tr>
</tbody>
</table>

Both cities profit from the same geographical position at the Baltic Sea and established similar main economic sectors. It is not surprising that cities which are situated at the sea are raising in economic sectors like maritime economy or tourism. A higher employment rate within the service sector is not an entire phenomenon of the location. It is more a general fact that the service sector increases, because the worldwide development runs through a service society. The rates of unemployment appear equal, but in Poland or rather Swinoujscie a high decrease of the rate happened in the last few years. This dynamic process did not occur in Germany. In Germany the rate of unemployment decreases slow or stagnates. Therefore, assuming that Swinoujscie is in a positive economic boom, the decrease of the unemployment rate could be a supported fact. But since the financial and economic crisis, the situation could have changed in the last year, because the ports are reliant on the freightage which also influence the intermodal transport. The current decrease of main productions is still affecting the freight handling capacity of the seaports. But, the geographical position of Rostock as well as Swinoujscie gives a suitable basis for the detailed comparison.

Rostock and Swinoujscie also differ in the cases of the city area, the amount of inhabitants or the accessiblility. Especially the accessibility could be a decisive indicator relating to the performance of the ports in intermodal transport, which will be discuss on the following pages.
3.2 The ports – Rostock and Swinoujscie

Seaports are usually facilities which are situated at an ocean or a sea and transact ships in the loading process. Seaports are own by public institutions and private companies. This depends on the port segments like terminals, storage places or infrastructure. Seaports also provide the technical equipment for all steps of procedure within a loading chain.

Regarding to the modern EU transport strategies in terms of intermodal transportation, the ESPO (European Sea Ports Organisation) defined a more detailed explanation of seaport in June 2004.

“Seaports do not merely handle ships. A modern port interconnects and offers a choice between various transport modes. Goods are transferred from sea to rail, road and inland navigation and vice versa. Ports combine networks of rail tracks, roads, canals and rivers which connect the sea with the European hinterland. An infinite flow of products pass through them in many different forms. [...] Ports are characterised by a constant movement of ships, trains, trucks and barges which bring these products from the place where they are produced to their final consumer. Intermodal door-to-door transport, the environmental-friendly alternative to congested roads, would be impossible without seaports.” 15

Furthermore, seaports give an alternative to cost-intensive and long-winded solid crossings projects through the sea like bridges or tunnels. In this case, seaports are more flexible, because it is easier and more cost-efficient to raise or bring down capacities and further on to create new connections with other seaports.

The port of Rostock is located in the north-west of the city. It covers an area of 7,5 square kilometre16. The historical development shows that the port extended and rose after the Second World War. During the World War the port finally lost also his local rating. At times of the German Democratic Republic (GDR) the port grew constant, but not fast enough to cope the freight handling during the eighties. This taut situation caused a cooperation between Rostock and Swinoujscie first. The flow of goods was divided between the ports and the working relationship began to

---

15 ESPO: Crossroads of Transport Networks. Brussel. 2004
http://www.espo.be/downloads/archive/2f7f415a-12ca-4337-9ee7-c278af0d92a0.pdf
prosper. But this kind of support stopped after the reunion or rather the fall of the Berlin Wall as well as of the Iron Curtain. The implementation of the social market economy strengthened the idea of competition and induced the port to position within the continuous competition.

Today, the port of Rostock proves 7 several segments for different utilizations (Figure 3.2) and it envisaged to become one of the biggest logistic centres along the Baltic Sea cost. The navigation channel is 120 meter wide and 14,5 meter deep.

**Figure 3.2: Rostock Port**

source: cp. Rostock Port Authority
The segment number 1 which is also framed in blue proves the important section relating to intermodal transport and provides 14 berths. In this segment you will find the regular ferry terminal with a size of 200,000 square metres\(^{17}\), where lorries and trains will be transported together with the standard passenger transit. The Ro-Ro Service is located more southern and will be completed with the so called KLV-terminal (Kombinierte Ladungsverkehr – combined cargo terminal) and a huge paper terminal. In this section, e.g. block trains will be loaded and ship by ferry. Currently, in this area three trains can be processed simultaneously. The KLV-terminal covers an area of 70,000 square metres\(^{18}\). According to the mentioned facts, the segment number 1 is to all appearances the intermodal centre of freightage and the focus will be set on this segment in the following analysis.

The other parts of the port are divided as follows:

- number 2: parcel service terminal
- number 3: coal, wood, building materials, fertilisers, corn, heavy cargo, maritime industrial park
- number 4: corn, building materials, heavy cargo
- number 5: oil, propellants
- number 6: liquid fertilisers, ammoniac
- number 7: cruise terminal

The Port of Rostock is owned by the Federal State Mecklenburg-West Pomerania and the City of Rostock and will be represented by the port authority (Hafen-Entwicklungsgesellschaft Rostock mbH). The port authority is focussed on the development of the port infrastructure and manages the property, the quays and the water area. Another task is the leasing of its property as well as its real estate and the extension of the port.

The port of Swinoujscie is situated in the middle of the city. Compared to Rostock, with about 200 metres its navigation channel is broader and has a depth of 14,3

\(^{17}\) Hafen-Entwicklungsgesellschaft Rostoch mbH: http://www.rostock-port.de/schiffsverkehr/faehrverkehr.html
\(^{18}\) Seehafen Rostock Umschlagsgesellschaft – SHRU: http://www.portofrostock.de/deutsch/dienstleistungen/komb-verkehr.html
The wider range could be an advantage concerning the security, because the ships have more space for crossing and navigation. During the Second World War the port was a German military port and after the war, or rather, after the destruction of Swinoujscie, the Polish council of ministers decided the reconstruction of the city and its port in 1958. The port grew in the past decades and has a close cooperation with the port of Szczecin.

The port of Swinoujscie can be divided also in 7 several segments (Figure 3.3). Regarding to intermodal transport the section number one is the important one, because the ferry terminal offers a combined transport service by regular ferry transit and furthermore a Ro-Ro service for trains and lorries. The ferry terminal covers an area of 95,000 square metres\textsuperscript{19} and provides 7 berths which is less than in Rostock.

\begin{figure}[h]
\centering
\includegraphics[width=0.8\textwidth]{figure3_3.png}
\caption{Port of Swinoujscie}
\end{figure}

\textsuperscript{19} Port Szczecin and Swinoujscie:
But, the further analysis will show in terms of infrastructure, freight handling capacity and hinterland connection, if the size is more important than the division and the utilization of the area, because the relation between for instance the loading cargo or trains and the amount of transport operators could be more interesting regarding to the performance in intermodal transportation.

The other remaining parts of the port Swinoujcie are allocated to the following:

- number 2: ship repair yard
- number 3: forest products, food stuffs
- number 4: dry bulk, general cargo, storing and southly container terminal
- number 5: reloading terminal vegetable oil, petroleum products, methanol
- number 6: military port
- number 7: marina

The Port of Swinoujscie is owned by the Szczecin and Swinoujscie Seaports Authority and the major shareholder is the State Treasury. The main tasks are the development of the port infrastructure, securing land for the development of the port and also leasing its property and real estate.

Figure 3.4: Tasks of Swinoujscie port

<table>
<thead>
<tr>
<th>main objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Westpomeranian Logistic Centre (together with Szczecin)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>major tasks/priorities</th>
</tr>
</thead>
<tbody>
<tr>
<td>management of infrastructure &amp; property</td>
</tr>
<tr>
<td>planning of port development &amp; securing land (future LNG terminal &amp; cruise destination)</td>
</tr>
<tr>
<td>supporting business activities not providing port services</td>
</tr>
</tbody>
</table>

Figure 3.5: Tasks of Rostock port

<table>
<thead>
<tr>
<th>main objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>competitive logistic centre</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>major tasks/priorities</th>
</tr>
</thead>
<tbody>
<tr>
<td>development &amp; modernization of infrastructure</td>
</tr>
<tr>
<td>leasing of property &amp; renting of real estate to open new business segments</td>
</tr>
<tr>
<td>service support in combined transport (KLV terminal) &amp; extension of the port area</td>
</tr>
</tbody>
</table>

source: own illustration
The main tasks and the overall objective is recaped in figure 3.4 compared with the main tasks of Rostock port (Figure 3.5).

Concluding the mentioned description of the ports, both are active in combined transport. Rostock has the advantage of the size regarding to the current and future transport operators and named the area beside the ferry terminal combined cargo terminal, which makes clear what is processing. But it doesn’t mean that the port of Swinoujscie does not provide these kinds of services. Apart from the ferry terminal Swinoujscie port offers also Ro-Ro services without passenger transport. During the interviews to the thesis, the representatives of the port authorities stated that the intermodal transport is not the number one priority, although it is presenting one of the EU transport policies. The overall objective of both is to become a huge logistic centre along the Baltic Sea coast, and therefore the saving of land and offers for future companies as well as investors have a higher priority than the support of intermodal transport (Figure 3.4 & 3.5). But the port of Rostock is planning a further extension within the combined cargo terminal and lists the support of intermodal transport in the tasks of the port authority, which is also shown in figure 3.5. This could be an advantage for Rostock concerning a suitable performance in intermodalism. The subordinated priorities of Swinoujscie are lying mainly in the extension of the port regarding to new terminals like a cruise and a LNG (Liquefied Natural Gas) terminal (Figure 3.4). It appears that Rostock is more initiative in terms of intermodal transport than Swinoujscie, because Rostock rather promotes intermodal transport in publications than Swinoujscie does. But it is only one part of the whole issue and it is essential to analyse the ports regarding to the following indicators like infrastructure, financing or interoperability which are mentioned above in the theoretical part of the thesis.

3.2.1 Status of standards regarding to interoperability

During the research, the spectrum of intermodal transport over seaports solidified in terms of involved segments of the ports and in the way of processing. Especially in the studied ports the understanding of intermodal transport based on the cargo transit by ferry and Ro-Ro services, causing by the time- and cost-efficient transport which is given by this way of freightage, because there is no temporarily storage and therefore no extra charges for using the port. Admittedly, this type of
transport does not need the ISO standard container regarding to the interoperability of the technical equipment inevitably, except of the KLV terminal in Rostock, because lorries and trains roll into the ferry or will be pultruded if the loco is detached from the train. Both, Rostock and Swinoujscie performing at the same level relating to this way of transport. The KLV terminal of Rostock port also loads containers by cranes or stacker trucks and is reliant on standard container and semitrailer sizes. The hardware of intermodal transport needs equal block trains and, for that reason, equal locos. But it will be more time- and cost-saving if the loco has not to be uncoupled. The two ports offer the opportunities for both and maintain the principle of intermodalism that the freight should not change the loading unit.

In this segment, the software part is more essential for interoperability in intermodal transport. First, an overall communication system would improve the process of loading. The main reasons are among others the implementation of all actors within the freight handling like shippers, transport and terminal operators or logistic forwarders. Therefore, an open communication and information platform offers the possibility for an efficient transaction, because the current situation is published in the system and in the case of deviations like delays, all involved actors have the chance for further acting. But Rostock as well as Swinoujscie do not have any type of an integrative communication system. The port of Rostock projects the launch of an overall efficient EDP system. Swinoujscie thinks about an akin project which will improve the coordination of combined transport in the future.

Another aspect in relation to interoperability could be the connection to “the development of an EU-wide ERTMS system, a further harmonization of operational and legal procedures as well as a reduction of barriers at borders for rail freight transport.” The ERTMS (European Rail Traffic Management System) envisages implementing an equal and intelligent rail traffic system and comprise train safety, communication system as well as timetable management. Currently, six transport corridors are involved and it would be an opportunity for Rostock and Swinoujscie to get in touch with this initiative. But before starting future projects like communications systems, the ports need a well developed infrastructure.

---

3.2.2 Infrastructural offers of Rostock and Swinoujscie

The port infrastructure establishes the backbone of any transport within the seaport and contains all connections to traffic modes as well as parking places or berths for instance. The port authorities are responsible to offer well developed infrastructural facilities. By analyzing the infrastructural offers, the focus of the following section is set on the terminals where the intermodal transport is processed by the ferry terminals and also the KLV terminal in Rostock. Introducing the infrastructure with the water conditions, Rostock offers with an amount of 14 more berths than Swinoujscie. But the number of Rostock implies both terminals, the ferry and the KLV terminal. Swinoujscie port provides 5 berths in its ferry terminal and 2 of the 7 are used for Ro-Ro service without passenger transport. The amount of berths is an essential fact regarding to the number of current involved operators like shipowners and furthermore future customers. Because the more berths are offered, the more ships can be processed and the more destinations can be included. Not only the number, but also the conditions of the berths are important. Comparing the biggest berths of the ports, Rostock is performing well in relation to the length with 383 meters and also another one also in the depth with 10,36 meters. Swinoujscies technical depth is up to 7,5 meters and the length takes up to 196 meters.

Swinoujscie is planning a development of one berth and focusses on a length of 240 meters and on a depth of 12,5 meters. The realisation of the project should be initiated between 2010 and 2013. If the extension is successful, both ports will offer suitable facilities for shipping.

Interesting would be the traffic connection to the berths and the assumption for places to coordinate the incoming modes.

---

23 Port Szczecin and Swinoujscie:
24 Port Szczecin and Swinoujscie:
25 Port Szczecin and Swinoujscie:
Furthermore, the future possibilities deal with the increasing flow of freight which is prognosticated by several institutions. Rostock as well as Swinoujscie offers a connection by road and rail and both tender a rail link to two berths (Figure 3.6 & 3.7). According to this, it seems like the amount of berths does not appear to be significant, because both ports actually have not the possibility to offer more than two railway connections to the ferries and therefore the two ports are on the same level.

But Rostock possesses more rail lines for processing trains relating to the loading within the KLV terminal, where also the paper terminal is also located. Further on, Rostock strives an extension of the rail lines southly of the KLV terminal to raise its capacities and provides more space for rail wagons, which supports the intermodalism in transport. Nevertheless, Rostock has to adapt the technical loading equipment for the further expansion to prevent waiting times and the increasing costs for the transport operators. In general, the planned extension of port Rostock suggests a strong establishment in intermodal transport along the Baltic Sea coast. Swinoujscie as well hopes to grow “in the next few years due to the construction of a LNG Terminal – which is expected to be built by 2015 and growing transshipment throughput at the Ferry Terminal in Swinoujscie[...]”.

---

According to the statements of extension, the ports do not stagnate. Furthermore, they try to become a constant at the Baltic Sea. Another advantage of Rostock is the link to the motorway A19 which ends directly on the port’s main street. Swinoujscie has an equivalent connection by the European route 65 which stops in the middle of the ferry terminal. Considering the road infrastructure of the ports, both offers good conditions also regarding to the parking spaces and traffic lanes which are connected to the ferry berths (see figure 3.6 & 3.7).

But how is the connection to the hinterland designed and what are final destinations and therefore the ranges of the ports?

### 3.2.3 Connecting the hinterland

The hinterland connection makes a statement about the reach and influence of the ports within the European territory, which is important to be connected to the major good flows and profit from the integration to the European-wide freightage. Achieving a clear understanding of the hinterland connection, it is useful to divide the analysis by the different traffic modes. This process will be helpful to order the strengths and possible weaknesses.

#### 3.2.3.1 Road connections

The road connection is essential for the freightage by lorries which is still the most used way of transportation. Between 1995 and 2005 the freight transport by road recorded a growth of approximately 38%, which is the fastest increase of all transport modes.\(^{27}\) This confirms the importance of a well developed road connection to the intermodal terminals in the seaports.

The advantage of Rostock port is the direct link to the motorway A19 and to motorway A20 which crosses Rostock (figure 3.8). These motorways have two traffic lanes each direction at least and offer a relatively fast and secure transport, because bold overtaking manoeuvre can be obviated. The A19 is close connected through the port of Rostock. Therefore, crossing the city by regular one lane roads

\(^{27}\) European Commission (ed.): Panorama of Transport. Luxembourg. 2007. p. 5
will be avoided and that is a great option also in consideration to the noise and air pollution of the city Rostock. In general, the motorway network is well developed spread throughout Germany and in addition, the A19 respectively A20 links to the motorway system and affiliates the port to the huge network.

Figure 3.8: Rostock hinterland connection – road

An example is the important connection to Berlin (Figure 3.8), because the metropolitan region is implemented in the TEN priorities and functions as a huge logistic interface as well as an immense consumer market. This link supports the implementation of the Baltic-Adriatic-Development Corridor which was mentioned as the political strategy of the East German Länder in the introduction. According to the European routes, Rostock is a part of the E22. The E22 connects the United Kingdom (Holyhead) over the Netherlands, Germany, Sweden and Latvia with Russia (Ishim) and sets a basis for an East-West transit.

Swinoujscie also profits from the connection to Berlin over the motorway A6 which crosses Szczecin and thus of the German motorway network (Figure 3.9). The link to the motorway is given by the European route E65 which passes through the ferry terminal up to Ystad and further on to Malmö. The European route connects Sweden with Greece (Chania) and runs through the most of the East-European countries or rather the new member states. This connection supports the seaport Swinoujscie in the case of establishing the port within a main transport corridor for
the North-South transit like the explanation of the Polish policy strategy. Currently, there it is not a two-lane road in Swinoujscie, which is an disadvantage regarding to the increasing flow of goods and further on to the extension of the port in intermodal transport by ferries. Nevertheless, an extension to two lanes is planned and will be implemented in the years 2014-2020 during a modernization of the polish national roads and motorways.

In sum, Rostock takes the advantage of the present realized road conditions. Swinoujscie can ladle out its entire potential in a few years when all modernizations are finished. Relating to the status of the road development, Rostock is on a higher level. Certainly Swinoujscie will level up, because the basis is given by the E65 and have to be developed to a higher quality, like two traffic lanes for instance.

3.2.3.2 Railway network

The transportation by rail increased less in the past years with approximately 9%28 compared to the road transport for instance. In some places in Rostock the railway freightage is occasionally regressive, like the port authority stated. The transport

---

by train also enjoys massive support by the European Union against the background of environmental-friendly and non-polluting carriage. Relating to envisaged advantages of the intermodal transport like a speedy and cost-efficient freightage, the preconditions should be continuously electrified and well developed rail lines. Both seaports are connected to railways in mint conditions. Rostock for example has “daily shuttle trains run to and from Verona, Basel, Domodossola, Hamburg and Wels (Austria). Their cargo is carried to and from Scandinavia on RoRo vessels or ferries. Via the hubs of Duisburg and Hamburg the entire intermodal network can be used.”\textsuperscript{29} This is an imposing example of the implementation of European-wide intermodal transport. Swinoujscie also has shuttle trains from Brzeg Dolny (Poland) which ends at the container terminal and will be loaded by regular processing, that means by using technical equipment like cranes to move the loading units. This procedure is also intermodal but not in the relation to the definition in the comparison, where the focus is set on transport by ferry or Ro-Ro services.

In general, both ports have suitable railway connections which achieve a reach of Central and South Europe with the link to Scandinavia by ferry. Therefore the preconditions are equal, but Rostock’s shuttle trains put the port on a higher level relating to the North-South transit and wider ranges. A stronger outreach is given by shorter distances to Swinoujsci like Poland or the Eastern part of Germany. The train connection in this area is used bonded. But Swinoujsci is linked to the railway system, which crosses the whole European territory and has the possibilities to extended through the network.

Both ports are profiting from the proximity to metropolitan area Berlin, where a direct link exists by rail to Rostock as well as to Swinoujsci over Szczecin. According to the political corridor strategies the German part profits directly from the solid railway connection. Again, the ports Swinoujsci and Szczecin are hardly interconnected, but the study object is still the comparison of seaports. However, the railway as well as the road connection is linked to the transport by sea or rather by ferries and furthermore the transport over the sea is the main task of seaports in intermodalism causing by the location.

\textsuperscript{29} Rostock Port Authority: http://www.portofrostock.de/english/services/intermodal.html
3.2.3.3 Transport by sea

Intermodal transport should be fast and cost-efficient, because it has to differentiate from the regular loading. In relation to the transport by ferries, the amount of destinations, the type of the ferry and the timing of departures could be useful indicators. Rostock as well as Swinoujscie profits from the short sea shipping, which is also politically supported by the European Union. Short sea shipping means the transport of freight between countries which are located for instance at the same sea or where the distances are relatively short without crossing an ocean. The transport network by ferries of the two ports is shown in the Figures 3.10 and 3.11, which also underlines the understanding of short sea shipping.

As you can see in the Figure 3.11 (blue lines) Rostock is also connected to Finnland and the United Kingdom by the Ro-Ro service which starts from the KLV terminal including the paper terminal. The link between Swinoujscie and Helsinki (Figure 3.11) is also a Ro-Ro connection. The link to Klaipeda in Lithuania is a combined connection starting in Szczecin and is still in the planning process. That means, it is not representative regarding to intermodal transport by ferries and Ro-Ro services. Both figures show a connection to Oslo, but it is not a direct link in intermodal transport. These connections are regular tramp links like general cargo or container lines. By completing this issue, Swinoujscie has also a general cargo connection to Iceland. In sum, the seaports final destinations are alike and
therefore the ports compete at the same level regarding to their destination
countries.

The standard ferry links are described in detail in Figure 3.12. Rostock has a
higher amount of ferries, final destinations and scheduled time of departures. A
reason for that can be the number of berths which offer more places for ferries and
therefore more space for transport operators. But, regarding to the transportation
of trains by ship, both ports have the railway connection to Sweden. But they differ
considering the destination.

**Figure 3.12: Ferry connections**

<table>
<thead>
<tr>
<th>Denmark</th>
<th>Port</th>
<th>Ferry</th>
<th>Timing: departures</th>
<th>Destination</th>
<th>Operator</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rostock</td>
<td>car/lorries/passenger</td>
<td>daily: approx. 10 ferries per day</td>
<td>Gedser</td>
<td>Scandlines</td>
</tr>
<tr>
<td></td>
<td>Swinoujscie</td>
<td>car/lorries/passenger</td>
<td>5 weekly: 1 per day</td>
<td>Copenhagen</td>
<td>Polish Baltic Shipping Co</td>
</tr>
<tr>
<td></td>
<td></td>
<td>car/lorries/passenger</td>
<td>1 day per week: 1 per day</td>
<td>Rönne</td>
<td>Polish Baltic Shipping Co</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sweden</th>
<th>Rostock</th>
<th>car/lorries/passenger+train</th>
<th>daily: approx 2-3 per day</th>
<th>Trelleborg</th>
<th>Scandlines</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rostock</td>
<td>car/lorries/passenger</td>
<td>daily: approx 2-3 per day</td>
<td>Trelleborg</td>
<td>TT-Line</td>
</tr>
<tr>
<td></td>
<td>Swinoujscie</td>
<td>car/lorries/passenger</td>
<td>daily: approx 2-3 per day</td>
<td>Trelleborg</td>
<td>Unity Line</td>
</tr>
<tr>
<td></td>
<td></td>
<td>car/lorries/passenger+train</td>
<td>daily: 2 per day</td>
<td>Ystad</td>
<td>Unity Line</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Finnnland</th>
<th>Rostock</th>
<th>car/lorries/passenger</th>
<th>4 weekly: 1 per day</th>
<th>Helsinki</th>
<th>Tallink Silja</th>
</tr>
</thead>
</table>

| Latvia      | Rostock         | car/lorries/passenger     | 4 weekly: 1 per day      | Ventspils    | Scandlines                  |

source: own illustration

Therefore, the local competition in Sweden is not as hard as it were if Rostock also
ships also to Ystad. An other advantage is the link to countries where Swinoujscie
is not connected with in ferry transportation like Finnland or Latvia. Rostock offers
a broader variety to the transport operators which are using the freightage by ferry
or Ro-Ro services. This situation is a local advantage compared to Swinoujscie,
because the two ports are so close together, that transport operators have the
possibility to choose Rostock instead of the Polish port. But if the preceding
transport was done by inland waterways, than the advantage is on Swinoujscie.
3.2.3.4 Inland waterway

The inland waterway connection by the river Oder to Swinoujcie procures a firm advantage compared to Rostock. Rostock is also located at a river, but the Warnow arises approximately 60 kilometers southwestern from a lake and is not navigable for barging. This competitive edge is used by Swinoujscie and further on by Szczecin to offer all traffic modes for intermodal transport. Figure 3.12 shows the whole inland water network and Swinoujscie as a seaport is located in a great central position.

![Figure 3.12: Inland waterways](source: Port Authority Szczecin – Swinoujscie)

The river course of the Oder is a strength regarding to the establishment of Central European Transport Corridor. But there are also some disadvantages. First, the water quality is endangered by a high transport flow. And secondly, during the summer time the water level sinks due to a long drought. Therefore the river is unnavigable at some segments. However, the inland navigation gives a suitable alternative to the other traffic modes and uses the natural lines of transport which are mostly connected to huge cities, because of the historical urban development. The freightage by inland waterway to Berlin for instance has also a long tradition attended beyond.
3.2.4 Operators

In the following, the focus will be set on the transport operators which are dealing with the carriage by ships or rather ferries. The reason is the mass of transport operators within the intermodal transport chain like forwarders, lorry companies, supplier, railway operators, owners of the cargo and logistic companies or forwarders. But, regarding to the European major operators, one company has to be named even though it is not inevitable operator within the intermodal transport chain. In Rostock the big transport operator DB Schenker is integrated in the freightage over the seaport. Rostock can gladly see itself being involved in the transport system of DB Schenker.

The regular ferry transport which also includes the Ro-Ro service is effected by 3 operators in Rostock (Scandlines, TT-Line, Tallink Silja) and two transport operators in Swinoujscie (Polish Baltic Shipping Co., Unity Line). The relation between the number of berths and the amount of operators could emphasize that Swinoujscie utilizes its capacities in a more efficient way. But the amount of ferries also counts. Taking all operators of Rostock together, 13 several ships are calling the port which underlines the high amount of departures mentioned before. Swinoujscies operators offer 5 different ferries on the whole. Therefore, the more developed connection or rather the offer of transport solutions and posibilities lies with Rostock.

Furthermore, the pure Ro-Ro section is provided by 5 several transport operators. This information seems to be important and has to be included to demonstrate the well networking of Rostock port. In Swinoujscie the pure Ro-Ro connection is operated by Euroafrica Shipping Lines, assumed and realized by Unity Line. Therefore, the amount of transport operators in Swinoujscie port does not arise. Consequently, the last mentioned fact affirms the higher level of Rostock comparing to Swinoujscie.

The terminal operators manage the steps of procedure during a loading process between several modes. In Swinoujscie, the ferry terminal is owned by one operator. The company Terminal Promowy Swinoujscie sp. z.o.o. operates the terminal by handling the ferry traffic freight and passengers to Sweden and Denmark. The strength of this kind of organisation is the responsibility of all processes and therefore the coordination depends only by one company.
Regarding to Rostock’s ferry terminal the situation is quite similar, because the terminal is also owned by one operator. The big difference is that the terminal is managed by the port authority or rather by the city of Rostock and the Federal State Mecklenburg-West Pomerania. Swinoujscies port authority has not a property like this, because all terminals are owned by companies. A weakness of this exclusive possession could be the financial aspect, because in a joint venture, the secure is given by several financial resources. But the port of Rostock benefits from public resources which need a lot of arguments to get the funding, but they are still saver on long term treatment. Nevertheless, the port finances itself by charges and fees for using the facilities. On the other hand, a private company like the terminal operator of Swinoujscie has the possibility to react faster caused by its own financial resources.

The KLV terminal in Rostock port is owned by the terminal operator Rostock Trimodal GmbH. “It is a joint venture of Seehafen Rostock Umschlagsgesellschaft mbH (64.8 %), Kombiverkehr Deutsche Gesellschaft für kombinierten Güterverkehr mbH & Co. KG (25.2 %) and Hafen-Entwicklungsgesellschaft Rostock mbH (10 %).” This company is mainly responsible for the intermodal transport in Ro-Ro services and provides the technical equipment as well as manpower. Here the financial support is splitted and thus the funding for modernizations of the equipment is easier to realize, because it is not only public financial resources.

Now, it is essential to figure out how the performance of the terminals within the intermodal transport chain works in relation to the cargo handling.

### 3.2.5 Freight handling capacity

The freight handling capacity is the most published information of ports, because it gives a clear and unambiguous explanation of the ports performance in cargo handling.

The ferry terminal of Swinoujscie which includes Ro-Ro loading recorded a huge increase during the past years. “Since 2004, handling at the terminal has been

---

30 SHRU – Seehafen Rostock Umschlagsgesellschaft: [http://www.portofrostock.de/english/services/intermodal.html](http://www.portofrostock.de/english/services/intermodal.html)
growing nearly 20% each year.\textsuperscript{31} In 2008, the handling reached an amount of 4.9 million tonnes of cargo.\textsuperscript{32} By translating the cargo handling in relation to the number of berths, the average lays at 700.000 tonnes per berth. This method of calculating the average supports work as comparison between the ports, because they differ in many things like the area of the intermodal terminals or the number of berths.

Rostock’s performance in freight handling was 13.7 million tonnes and decreased comparing to 2007 by 10%.\textsuperscript{33} But the cargo handling in Ro-Ro services increased up to 2.3 million tonnes\textsuperscript{34}. A reason for the displacement is the new Ro-Ro link to Finnland, whereby the ferry connection was relieved. The average between berths and the composite amount of cargo handling (ferry and Ro-Ro) is approximately 1.14 million tonnes. Comparing these two averages Rostock transacted more freight over its ferry terminal and Ro-Ro terminal. In order to completeness, the KLV terminal in Rostock transacted approximately 60.000 tonnes in 2007 and the rising trend continues. The Rostock port authority stated that the port is working to capacity and therefore the mentioned extension has to be implemented except of the current financial and economic crisis. Both ports are affected by the crisis, but also both continue in constructing and developing. The freight handling will probably decrease this year, but a crisis is normaly a temporary phenomenon. It is an opportuinity to set the focus on modernization and renewing instead of stagnation or waiting.

The quality of loading goods decides over which port will be transported. The terminals of Rostock as well as the terminal of Swinoujscie were developed recently. Both seaports offer a high quality loading. But what are the costs of a fast and qualified loading? What is the whole amount of using the port? Who of the port is more “cost-efficient”?

\begin{itemize}
\item[\textsuperscript{31}] Port Szczecin – Swinoujscie: Port Handbook 2009-2010. Szczecin. 2009. p. 18
\item[\textsuperscript{32}] Port Szczecin – Swinoujscie: Port Handbook 2009-2010. Szczecin. 2009. p. 18
\item[\textsuperscript{33}] Rostock Port Authority: http://www.rostock-port.de/news/detailansicht/article/rekordumschlag_in_rostock/67.html
\item[\textsuperscript{34}] Rostock Port Authority: http://www.rostock-port.de/news/detailansicht/article/rekordumschlag_in_rostock/67.html
\end{itemize}
3.2.6 Financing

The port authorities of Rostock and Swinoujscie are owned by governmental institutions and they are not acting profit-oriented. The port charges due to finance the infrastructural facilities and modernizations to guarantee best possible preconditions for using the port by all actors.

The reach of dues and charges appears to be immense, because the regulation of dues depends on tonnage, used quays, typ of cargo, typ of ship, entering the port with cargo or empty and so forth. By making the comparison possible the focus is set on two dues, the dues of ferries and Ro-Ro vessels. The port of Rostock budget for combined passenger-cargo ferries 0.05 Euros per registered tonnage (RT). The same applies to the incoming and exit Ro-Ro vessels. Swinoujscie offers a regulation by GT (gross capacity of the vessel) and differs between tonnages dues and quay dues. The ports had published their port dues tariffs by different use of scale units, but it is not a weakness because 1RT = 1 GT. But, regarding to Rostocks indication, the tonnage dues will be used in the following. The port of Swinoujscie receives approximatly 0.17 Euros per GT (PLN 0.77/GT) for Ro-Ro vessels and 0.14 Euros (PLN 0.65/GT) for ferries.

The mentioned facts give an overview about the cost-efficient use of the ports. Certainly, there are more dues which can be deciding, but regarding to the dues for ferries and vessels for entering and exiting, the port Rostock offers a more cost-efficient use. A reason for that could be the higher amount of handling tonnages, because the more loaded vessel transit the port the less could be the arrangement of dues for financing further modernizations and developments. But Swinoujscie maybe has to offer higher fees to hold the financing on an equal level which is legitimate. However, the close local positon of the port puts Swinoujscie under pressure to reconsider about possibilities to decline the dues, because future transport operators have the power to choose the cheapest opportunity.

---

36 Szczecin and Swinoujscie Seaports Authority: Port Dues Tariff. Szczecin. 2006. p. 3
3.3 Conclusion

Both ports are still in process to perform more efficient and effective comparing to the past year. It is a typical procedure regarding to the dynamic market economy and it is essential to keep the challenge. In sum, it seems that the port of Rostock is on a higher level in its performance in intermodal transport. Foremost, the size, the amount of berths, the coherent distinction between ferry- RoRo- and KLV-terminal show that the port understands how to deal with the combined transport regarding to its priority in the EU transport strategies. Swinoujscie is lagging behind in its development in respect of the intermodal transport. It does not relate to the quality and know how of the port. It is associated with the arrangement of the priorities. If intermodalsim will be one of the port priorities, than the focus should be set mainly on the intermodal trade and therefore on the expansion of the ferry and Ro-Ro terminal accessory to the processing extension of the mentioned berth.

Another difficulty except of intermodal transport is the networking of the ports regarding to links and information flow. The port authority Rostock is well organized in its coordination of information and linkages to involved partners and outsiders. Swinoujscie has a backlog to coordinate the communication, because there is no detailed data basis, the linkage to involved partners are malfunctioned and English versions are not available everywhere. This could be a huge problem in relation to future cooperations with potential partners and actors.

It seems like the comparison is a little bit unfair concerning by the size of the ports. Futhermore, the strong connection between Szczecin and Swinoujscie complicated the comparison by separating both. The stongest power is up to Szczecin in relation to for instance the huge logistic centre or inland navigation. But the key issue of the thesis is a comparison between seaports and thus Szczecin could not be included. But on the other hand, the comparing is really interesting, because both ports want to be connected to the major European-wide transport corridors like the trans-European transport network by establishing national strategies relating to the Baltic-Adriatic-Development Corridor and the Central European Transport Corridor.

That is the political level of intermodal transport. In reality, both ports could put more efforts in relation to the strived aim of intermodal transport within the
European Union. One reason is the reach of political strategies and the implementation of mentioned objectives. However, there are some disparities between the theoretical approach, the political strategies and the implementation of intermodalism transport. The theory states that intermodal transport is the freightage between two or more various traffic modes within a transport chain to achieve an efficient or rather cost-efficient transport of goods. But, where is the limit regarding to “usual” freight transport over seaports? Traditionally, sea ports load cargo from one mode to another which is a prevalent procedure. That is why the ports as well as this thesis set their focus on the transportation by ferries or Ro-Ro ships, because it easier to distinguish and draw a line to regular loading. Another reason for focussing on this segment of a port are the facilities and possibilities to create a fast and cost-efficient transport by several modes by Ro-Ro services or entering the ship independently by rolling into the ferry. Furthermore, is intermodal transport over seaport just another name for transport by ferries and Ro-Ro ships or rather a political phrase? It is both and much more. The best explanation of intermodal transport is defined by UNECE mentioned in chapter 2. They put in the little important detail: “[...] the movement of goods in one and the same loading unit or road vehicle [...]”. The confusing and not detailed definitions maybe do not advance proactivities of the ports. According to the entire ports comparing and proactivity, the seaport Rostock puts more efforts in supporting intermodalism.
4. Future Perspectives

Establishing major European transport corridors, political strategies are essential, because finally the policy decides. To strengthen the Baltic-Adriatic-Development Corridor, which is the strategy of the East German Länder, the port of Rostock is involved in two Interreg IVB projects in the Baltic Sea region as well as in Central Europe. Interreg IVB is a programme to strengthen transnational cooperation to achieve a common goal. The two projects are SCANDRIA (Scandinavian-Adriatic for Growth and Innovation) and SoNorA (South-North-Axis). Swinoujscie is also involved in the project SoNorA. Cooperations like this one, offers opportunities to cooperate by achieving a common objective like the implementation in European transport corridors. The problems are the different national strategies and the insistences on them. A solution could be a reconsideration of the corridors (Baltic-Adriatic-Development Corridor and Central European Transport Corridor) to one specific common corridor which includes the transport course of both, but is represented by one name. That would be a exemplary cooperation. Regarding to the ports, which have a so close location, it will be more sensible to act together within a common transport corridor. A reason for that could be the funding support by the European Union, because the EU would have not the difficulty to decide which corridor project gets the funding or which project will be more supported. Therefore, it appears to be logic to act in concert.

Advantages of EU projects are the cooperation and the networking between the project partners. Beyond the projects by the European Union, there should be also a communication platform where important information of Rostock and Swinoujscie or rather all Baltic sea ports for instance are published for an improved exchange of data. An other aspect could be a section for best practice solutions regarding to ports affairs. This kind of cooperation can be lift up on another level as the competition level to create a common basis.

The ERTMS or similar systems are a further chance to strengthen the position of the ports within the market economy. Safety and interoperable transport on railways within continuous corridors could be a future perspective. The European Union supports the freightage by trains also respectively to environmental-friendly transportation. Combining this with the offered common communication by the
ERTMS, it will be a suitable basis for efficient carriage by train to the seaports interfaces.
The keyword communication system applies to the intern port coordination, too. Swinoujscie should be active to accomplish a project for an overall communication system within the port or rather within the terminal for intermodal transport to connect all actors in a common system. Rostock is still working on an integrated communication system and has to push it further.
In sum, both ports have the opportunity to become a constant in intermodal transport. The quality and the capacities are more essential than e.g. the size of the port. Fair dues for port using as well as a fast handling of the cargo vessel are deciding for a combined transport. Further expansions and modernizations ensure holding a high quality level.
Currently, the financial and economic crisis influences the freight handling capacity of the ports, but it will be probably a temporary phase. The port of Rostock noticed that and is looking forward with its extension projects. The implementation of projects is a long-winded extending over several years. Therefore, starting expansions and modernization projects now could be an advantage in the future. But the individual initiative of the ports counts.
5. References

Books:

- European Commission (ed.): Panorama of Transport. Luxembourg. 2007
• Rostock Port: Hafen Rostock. Rostock. 2008
• Rostock Port: Regulations and Harbour charges 2009. Rostock. 2002
• Swinarski, Björn: Bewertung see- und landgeschützter Transportketten im Ostseeraum. Wirtschaftliche und umweltbezogene Aspekte. Hamburg. 2005
• Szczecin and Swinoujscie Seaports Authority: Port Dues Tariff. Szczecin. 2006
• Vrenken, Huub / Macharis, Cathy / Wolters, Peter; EIA (ed.): Intermodal Transport in Europe. Brussels. 2005

Documents:

• Deutsche Bahn: Intermodal – the No.1 in Europe for Combined Transport. Berlin. 2008
• ESPO (European Sea Ports Organisation): Crossroads of Transport Networks. Brussel. 2004
  pdf-file: http://www.espo.be/downloads/archive/217f1415a-12ca-4337-9ee7-c278af0d92a0.pdf
• European Energy and Transport: Trends to 2030 – Update 2007. no place. 2007
• Frequentis GmbH: Maritime Communication System for Port Communication Solutions (PCS). Vienna, no data
• Lüttmerding, Attila: Improving The South-North Interconnectivity and Cohesion in Central Europe. Erfurt. 2009 (handed over by Mr. Jürgen Neumüller, IU Potsdam)
• Studiengesellschaft für den kombinierten Verkehr e.V.: Kombinieter Verkehr 2006. no place. 2006
• Polish Information and Foreign Investment Agency (PalilZ): Poland’s Logistics. Warszawa. 2006

Webpages (February – May 2009):

• Central European Transport Corridor (CETC): http://www.cetc.pl/
• Central Statistical Office (Poland): httpwww.stat.gov.pl
• European Commission: http://ec.europa.eu
• ERTMS: http://www.ertms.com/
• Hafen-Entwicklungsgesellschaft Rostock: http://www.rostock-port.de/
• Joint Spatial Planning Department Berlin and Brandenburg: http://gl.berlin-brandenburg.de/
• Polish Information and Foreign Investment Agency: http://www.paiz.gov.pl
• Rostock City: http://www.rostock.de & http://www.meinestadt.de/rostock
• Seehafen Rostock Umschlaggesellschaft: http://www.portofrostock.de
• Swinoujscie City: http://www.swinoujscie.pl
• Szczecin and Swinoujscie Seaports Authority: http://www.port.szczecin.pl
6. Figure index

- cover picture:
  http://photomarginale.de/meer%202.jpg

- Figure 1.1 - Freight transport performance, EU-25, 1995-2005 (in billion tonne-kilometers):
  European Commission (ed.): Panorama of Transport. Luxembourg. 2007. p. 69

- Figure 1.2 - TEN-T and its 30 priority axes:

- Figure 1.3 - Baltic-Adriatic-Development Corridor:

- Figure 1.4 - Central European Transport Corridor:

- Figure 2.1 - Intermodal transport and the freight segments closest to it:

- Figure 2.2 - Intermodal transport operations:

- Figure 2.3 - Transported volumes of the major European intermodal transport operators 1990 – 2002:

- Emblem Rostock:

- Emblem Swinoujscie:

- Figure 3.1 - Comparing of the Cities (Rostock and Swinoujscie):
  own illustration

- Figure 3.2 – Port Rostock:

- Figure 3.3 – Port of Swinoujscie:

- Figure 3.4 – Tasks of Swinoujscie port:
• Figure 3.5 – Tasks of Rostock port:
  own illustration

• Figure 3.6 – Ferry terminal Swinoujscie:
  http://www.port.szczecin.pl/eng/index.php?option=com_content&task=view&id=83&Itemid=76

• Figure 3.7 – Ferry + KLV terminal Rostock:

• Figure 3.8 – Rostock hinterland connection – road:

• Figure 3.9 – Scwinoujscie hinterland connection – road:

• Figure 3.10 – Sea links of Rostock:

• Figure 3.11 – Sea links of Swinoujscie:

• Figure 3.12 – Ferry connections:
  own illustration

• Figure 3.13 – Inland waterways: