The Dry Port –

Concept and Perspectives

StratMoS WP C

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Main author: Lina Trainaviciute **FDT Team:** Kent Bentzen, Michael Stie Laugesen and Anthony Caruso.	**Contact persons in StratMoS**: Michael Stie Laugesen, Project Coordinator, FDT.
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Preface

The StratMoS project is a part of the North Sea Interreg IVB programme. The StratMoS project is in progress from January 2008 to March 2011 and has partners from Norway, Belgium, Denmark, Germany, United Kingdom and The Netherlands. Furthermore StratMoS partners remain in cooperation with partners from North-west Russia. This present Work Package C report has been developed and written by FDT- Association of Danish Transport and Logistics Centres with support from WP C partners.

The report consists of 12 chapters and 6 annexes.

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Main author:

Lina Trainaviciute

FDT Team:

Kent Bentzen, Anthony Caruso and Michael Laugesen

FDT- Association of Danish Transport and Logistics Centres

Roerdalsvej 201

P.O. Box 8412

DK-9220 Aalborg

Denmark

Telephone: +45 99 30 00 08

Fax: +45 99 30 00 07

E-mail: fdt@ntu.eu

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Executive Summary

At present, great attention is being paid to the development of intermodality in the EU, since it is a solution for many existing traffic problems. Motorways of the Sea (MoS) is seen as one of the important means for reducing road transportation and leading to sustainable and more efficient transport chains. However, in order to be competitive with the road transport, MoS services must be highly efficient. The quality of MoS services can only be improved by not only enhancing port facilities but also by developing the hinterland terminals and in this way strengthening the role of the port. A big impact on the ports' role in the transport chain can be made by developing Dry Ports, which can help to relieve congestion-related problems in the port, as well as increase the capacity and reliability of the MoS service.

There are several kinds of intermodal terminals that appear to be similar to a Dry Port by their functions and facilities, for example inland ports, inland clearance depots, conventional intermodal terminals, etc. However, the Dry Port is the most advanced of these, mainly because this concept includes at least the following functions: cargo transhipment from rail to road or the other way around, temporary storage of goods, consolidation and distribution activities, a variety of value-added services and customs clearance service (see Section *4.1. Forms of inland intermodal terminals*). The definition that we suggest in order to fully reflect the Dry Port concept is*:*

A Dry Port is an intermodal terminal situated in the hinterland servicing a region connected with one or several ports by rail and/or road transport and is offering specialised services between the Dry Port and the overseas destinations. Normally the Dry Port is container-oriented and supplies all logistics facilities, which are needed for shipping and forwarding agents in a port.

An important aspect to underline in the context of the Dry Port concept is value-added services, which support the users of the Dry Port with such extra values as saved time, convenience, reduced operational costs, etc. The availability of a variety of value-added services in a Dry Port makes it more attractive for businesses and therefore has the potential for attracting new customers. The examples of the services adding value to Dry Ports' customers can be; handling different types of cargo, handling dangerous heavy goods, support of the 3rd and 4th part logistics and customs clearance. More information about value-added services in a Dry Port can be found in Section 4.4.

Most of the procedures during different operations at a Dry Port are the same as in other kinds of inland terminals, however, it is worth to underline the procedures of import and export clearance, which add some complexity to activities in a Dry Port. Customs clearance is characterised by the number of the documents that have to be filled in and registered. More detailed explanation on customs clearance is given in section *4.5. Operational procedures in Dry Ports*; its implementation examples in Dry Ports are described in sections *8.1.4. Customs clearance at PSM* and *8.2.4 Customs clearance at CEAG.*

While considering the main aspects of the Dry Port concept, the selection of location is important. The location should be chosen according to the individual case. The location of a Dry Port and the distance between a Dry Port and the port that it serves can be set in accordance to theoretical, empirical, economical and technical measures. Moreover, different locations of Dry Ports bring different advantages, therefore the location can also be chosen according to these advantages (see Chapter *4.6. Location of Dry Ports*).

After defining the main problems in the logistics chain (Chapter *3. Drivers for the emergence of the Dry Port concept*) and defining the important aspects characterising Dry Ports (Chapter *4. Concept of the Dry Port*), we have analysed the advantages that Dry Ports can bring into the transport chain. The main benefits can be named as sustainability, reduced transport expenses, increased hinterland of a seaport and limitation of traffic bottlenecks (see Chapter *5. Advantages of Dry Ports*).

The level of Dry Port development and certain features related to efficiency depends on the governance model of the terminal. The governance consists of two components: ownership of a terminal and operations management and execution. Both of these can be executed by public or private sector actors. Therefore, considering the combinations of ownership and operations dependence on certain sector, three different options of Dry Port funding may occur: public funding, private funding or public-private partnership (PPP).

Each of the funding possibilities has its benefit. Usually in a public ownership case, the private sector is getting leasing opportunities. A Dry Port under public ownership could provide users a greater equality and fairness in treatment regarding the tariffs. Moreover, greater prospect for cargo movement on different transport modes would appear due to the centrally planned intermodal networks, which would also include the publicly owned Dry

Ports. Conversely, the public body may face a lack of experience in managing Dry Ports in comparison to the private sector.

The case of private ownership often appears in case of privatization, in order to attract private investment for infrastructure. The biggest benefit of totally private funding is the utilization of private resources into the national transport infrastructure. Additionally, another advantage is the possibility of greater flexibility in the adoption to trade, changing patterns of operations and the supply of tailored services. However, private arrangements usually have larger risk of failure and are lacking of control over prices.

The public–private partnership is featured by greater flexibility and the reach of synergies from cooperation between those two sectors. Public organisation is usually aiming at development of a balanced economic and legal framework and private body is carrying some risks, while also aiming at certain return on investment. Furthermore, the security of the project is increased regarding technical, legal and financial aspects due to a custom-made contractual framework. Additionally, the private sector is adding value to the PPP project with the greater know-how in comparison to the knowledge of a public entity. Besides, there are many other benefits, encouraging public and private entities to create the relations.

More detailed analysis on the funding and management forms of the Dry Port is suggested in Chapter *6. Governance of Dry Ports*.

The potential advantages of Dry Ports can be obtained only if a smooth communication is established among Dry Ports and other actors in the transport networks (see Chapter 7 and Section *7.1. ICT-based logistics networks*). This is obtained with information and communication technologies, which helps to improve the efficiency of the goods flows in the transport chains and to create door-to-door and just-in-time deliveries. Moreover, the communication based on ICT has to be standardised – compatible ICT systems have to be used among all the members of the network.

Additionally, the processes in a Dry Port are complex, especially because Dry Ports are bi-directional logistics systems, where the goods coming from ports are received and distributed to land, as well as the freight arriving by rail/road are received and delivered to ports for a sea leg. Therefore, high level of coordination and interconnectivity capabilities are necessary in a Dry Port. The implementation of management system based on ICT is necessary in order to execute easier and advanced coordination and management, together contributing to the

quality of the services and efficiency of terminal operators (see Sections *7.2. ICT-based operation management in Dry Ports* and *7.3. Data management in Dry Ports*)

Two examples of Dry Ports are analysed in Chapter 8 in order to get practical insight in the initiative processes, management and operations of Dry Ports.

The Dry Port of Madrid (Puerto Seco de Madrid – PSM) (Section 8.1) was initiated for the purposes of supporting the interests of the State-owned Spanish ports and the whole Spanish transport system. Moreover, the aim was also to balance rail and road transport use. The choice of location was made after considerations, concerning the most concentrated production and consumption areas, national and international intermodal connections, and concentration of logistic services companies. PSM is managed by a public company, whereas the company of public and private bodies was formed to operate the Dry Port.

PSM as a customs clearance office is working with an external transit customs clearance under the cover of T1 form (see Annex 5) and is mainly handling non-Community goods containers. Moreover, regarding the guaranties for the goods being transported between the ports and the Dry Port, no guarantees are needed in the case of PSM as operations are carried out by the 2 railway companies of Spain (basing this on the Community Customs Code). The same railway companies are responsible for the security of the containers.

The Dry Port of Madrid is orientated towards basic services in the Dry Port terminal and between the Dry Port and the ports. Several extra services are provided, e.g. container washing and empty container depot supplies.

The other case example of a Dry Port is a logistics centre which is being developed in Jekabpils, Latvia, (Section 8.2). It can be viewed as a Dry Port due to its connections with the Baltic ports and services that will be implemented. The project idea is to develop a multimodal logistics centre with rail and road transport, storage facilities, customs clearance, sorting, assembling, marking, packing and other value added activities. Its name – "Central Euro-Asia Gateway" (CEAG) reflects the core idea of the logistics centre. Its goal is to develop the corridor between the Far East and Europe and to become an important gateway on this corridor.

The choice of terminal location was made in relation to the networks of railways and main roads. The Dry Port has rail connections to the six nearest Baltic ports, moreover, Trans-Siberian and St. Petersburg-Warsaw railway lines are stretching through the CEAG.

The CEAG project was initiated, developed and owned by a private company, which has brought a strong know-how into the project. Additionally, the company brought the direct access to the owners of cargo flows, terminals and hubs, which are serving Far East –Europe flows provided by activities in Kazakhstan and China.

CEAG provides the usual logistic services for railway operators, logistics companies, importers and exporters and a variety of tailored services for importers and distributors, for example, handling of heavy goods, overcoming trade barriers, rent of offices and so on. The customs clearance in CEAG will be performed by the 100% -owned daughter company "CEAG Customs", providing two levels of customs clearance services: mandatory services and customs clearance services for single containers or wagons.

CEAG is a recently implemented project and is not yet fully developed. However, due to the strong market knowledge, an actively promoted and clear business plan, this Dry Port has a good basis for successful development in the future.

PSM and CEAG are two cases that show the different Dry Port functions in the logistics systems. On one hand, the Dry Port of Madrid was started by the public authorities and is governed by the public-private partnership, which is mainly supporting the interest of state ports. The Dry Port is oriented towards usual logistic services. On the other hand, the Dry Port in Latvia is based on private management and is more innovative and customer oriented, providing lots of tailored services as the main goals are directed to the development of the CEAG as a business entity with the aim of improving connections between Europe and the Far East.

Additionally, a review is made on political aspects on MoS and Dry Port development (Section *9.1. Policy on MoS and Dry Ports*). The example of potential MoS with integrated Dry Ports is analysed (Section *9.2. Integrating hinterland with MoS*). The emphasis here is put on the creation of quality of the services in the whole chain, environmental awareness of the actors involved, efficient infrastructure and connections.

At the end of the report, recommendations are provided for integration of Dry Ports into the MoS.

1. Introduction

At present, when the freight transport sector experiences very high volumes, congestion, pollution and other logistics-related problems arise due to the increasing levels of traffic. Therefore, there is a need for new solutions in the transport sector. It is essential to develop alternative, more flexible transport systems now in order to avoid critical bottlenecks in the future and to mitigate current and possible future environmental problems associated with the prevailing reliance on road transport. Intermodality is already recognised as a mean for solving some major problems – namely air pollution and congestion. Maritime transport and inland waterways are recognised as the most efficient forms of commercial transport able to reduce CO_2 emissions (EESC, 2009). Transportation by water is also seen as a means of reducing road congestion (de Oliveira, 2008). Thus, the combination of water traffic with other modes of transport has already gained increased popularity (ECE/TRANS/SC.3/2006/3).

The EU developed concept of "Motorways of the Sea" (MoS) has the main objective of reducing road congestion and/or improving access to peripheral and island regions and states by concentration of freight flows on sea-based logistical routes (de Oliveira, 2008).

These transport chains are more sustainable and should be commercially more efficient compared with road-only transport. Motorways of the Sea services are helping to improve access to markets throughout Europe, and bring relief to intensive European road systems. Article 12a of the TEN-T Guidelines is giving three main objectives for the Motorways of the Sea projects: 1) freight flow concentration on sea-based logistical routes; 2) increasing cohesion; 3) reducing road congestion through modal shift (EC, 2004). The stated objectives reflect that not only the maritime transport resources have to be increasingly employed, but also the potential in rail and inland waterways have to be used as part of an integrated transport chain.

However, even though the policy makers are putting efforts into promoting a shift from road to sea and other transport modes in order to create sustainable logistics, they are not the ones who are making the final transport mode choice and planning logistics chains. Transporters or 3rd party logistics providers are organising the logistics chains for transporting the goods. They will only choose to use Motorways of the Sea services if the maritime option is equally

good or better than other modes (de Oliveira, 2008). On a European scale, a truck can complete the whole door-to-door journey without the need to trans-load the goods, whereas additional trans-loading operations are causing additional costs. Moreover, road has the advantages of flexibility and at lower cost compared to other transport modes (de Oliveira, 2008). Therefore, the actors related to maritime transport and other modes than the road have to look for better solutions to gain competitive advantages; these combined solutions have to be environmentally friendly, quicker, more reliable, economically more attractive and safer in order to be really competitive (de Oliveira, 2008). Additionally, the Atlantic Transnational Network report (2006) is identifying that service quality, which includes regularity, frequency, dependability, flexibility and availability, is of fundamental importance to road carriers, maritime companies and logistic companies.

In order to make MoS services attractive, the organisation, operations and efficiency of MoS's logistics and logistics of hinterland, with which MoS are connected, have to be improved. These means would also strengthen the position of a port. Research has to be made on innovative technologies related to the ships, handling, interfaces of modes, terminals and hinterland connections (EC, 2006). The development of hinterland terminals is one of the concerns from the latter issue, which helps to strengthen the port's position. Ports can be especially closely related to and dependent on specialised hinterland terminals – Dry Ports. This means much more than just an additional link in a transport chain. It exists as a supplement for the port, where some of the functions of the port can be outsourced and in this way some of the problems of the ports can be relieved, the capacity and reliability of the MoS increased, and other benefits created. However, the implementation of the Dry Port can mainly give benefits and create added value if it is integrated into the MoS.

By defining the concept of the Dry Port, describing important aspects of the Dry Port implementation analyses and looking for the ways to make it an integral part of the MoS and logistics chains, this report suggests and supplies knowledge for the decision-makers when planning the links of MoS. More precisely, main topics are presented:

- Overview of the features of Dry Ports;
- Advantages and problems for Dry Port realisation;
- Options for Dry Port funding and management;
- Communication between the Dry Port and other actors in the logistics chain;
- ICT technologies for Dry Port management;

- Best practice examples;
- Dry Ports and MoS integration.

More information related to the MoS development in the North Sea Region can be found in the Work Packages B and D of the StratMoS project (www.stratmos.com).

2. Methodology

This report aims at providing support for incorporating the Dry Port concept into the MoS. It also aims at ways to create efficiencies in the Dry Port and in the networks where the Dry Port is functioning as one of the nodes. Therefore, certain methods have been used in order to exploit the possibilities for integrating Dry Ports into the MoS.

Firstly, the previously made researches on Dry Ports and similar inland terminals have been analysed and information, which is valuable for the conceptual and practical knowledge of the Dry Ports implementation in the North Sea Region, has been systemised and analysed.

Secondly, the results of a survey (FDT, 2009), which was carried out in several industries within the logistics sector, have been used in the report. The analysis of the results of the survey has been used in order to understand the up-to-date situation in the North Sea Region, regarding main logistics problems and the possibility to minimise them with the Dry Port implementation.

Thirdly, several examples in other regions in Europe have been chosen and analysed as best practice examples. To all of these a detailed questionnaire was sent and other sources supplementing with details about these Dry Ports were analysed to find out the following: first, there was a need to clear out the uncertainty regarding the possibility to implement customs clearance in inland terminals by giving the examples of organisation of customs clearance in inland terminals. Second, it was important to determine the functions of those Dry Ports in the transport systems in order to reveal the advantages that they provide. Additionally, other details had to be investigated in order to draw the general picture of the Dry Port terminal and services.

Fourthly, the StratMoS workshops on Dry Ports were also used as a source of information. The workshops intended to bring together people, who have experience in developing the Dry Port and these ones with interest in developing the Dry Port concept. Furthermore, the workshop had such aims as strengthening cooperation with the Interreg IV B Dry Port project, going from theoretical results to practical issues, and discussing ideas and possible challenges for Dry Port development. Finally, the intention of the workshop was to discuss the ideas for creating better integration of the Dry Ports into the MoS.

The named methods were used for illustrating the comprehensive picture of the Dry Port and leading to recommendations for its incorporation into the MoS and the whole transport chain. The report is supporting theoretical and practical information and inspiration about Dry Ports.

3. Drivers for the emergence of the Dry Port concept

3.1. Road congestion

There is a clear imbalance between the transport modes in the European Union. In year 2007 the road share of inland freight transport in the EU-27 was 76,6% of the total tonne-kilometres (Eurostat, 2008a). Moreover, passenger transport by car was reaching 83,4% of the total passenger-kilometres (Eurostat, 2008b). The large success of road transport is resulting in road congestions and environmental problems (White Paper, 2001). Every day 7,500 kilometres or 10% of the European road networks are blocked by traffic jams (Capineri and Leinbach, 2006, p. 24). Long-distance freight, particularly international freight traffic between EU Member States and between the EU and third countries, contributes significantly to the congestion (TravelDailyNews, 2008). Congestion on roads brings the increase of the fuel consumption in EU with a consequent rise in pollution levels. The congestion results in major social and environmental cost: loss of time, additional vehicle maintenance cost, indirect health effects and stress; more air pollutants are being emitted, greater noise is generated and more energy is consumed due to the congested traffic in comparison to smooth transport (Roso, 2006a, p. 4).

Road congestion has an impact on the efficiency and reliability of freight flows and therefore on the prices of the goods that are carried. Thus the shift from road to other transport means has to be made in order to create smooth transportation and reduce road congestion. Using the full potential of rail and short-sea shipping would provide part of the solution for these problems (Roso, 2006a, p. 4).

3.2. Port capacity problems

The intensive economical growth and increasing goods flows are causing not only the growing road traffic in Europe, but also more intensive maritime traffic. Therefore a number of the ports are facing challenges related to the capacity shortage or lack of efficiency. According to de Oliveira (2008, p.6), general port management and port services are more efficient and reliable in the North than in the South of Europe; however, the efficiency and hinterland connections have to be improved in all European ports. Moreover, the biggest

problems are faced by the primary ports – they tend to suffer from congestion and thus from loss of efficiency; whereas secondary ports now have good perspectives for growth and development (Oliveira, 2008, p.6).

A survey carried out by University of Turku revealed that the biggest bottlenecks for the growth and development of Baltic ports[1] were inadequate storage capacity and lack of expanding areas. Tightening environmental and other legislation came after these, alongside other capacity-related issues and inadequate demand for port services (University of Turku, 2008). The bottlenecks in the Baltic ports are illustrated below.

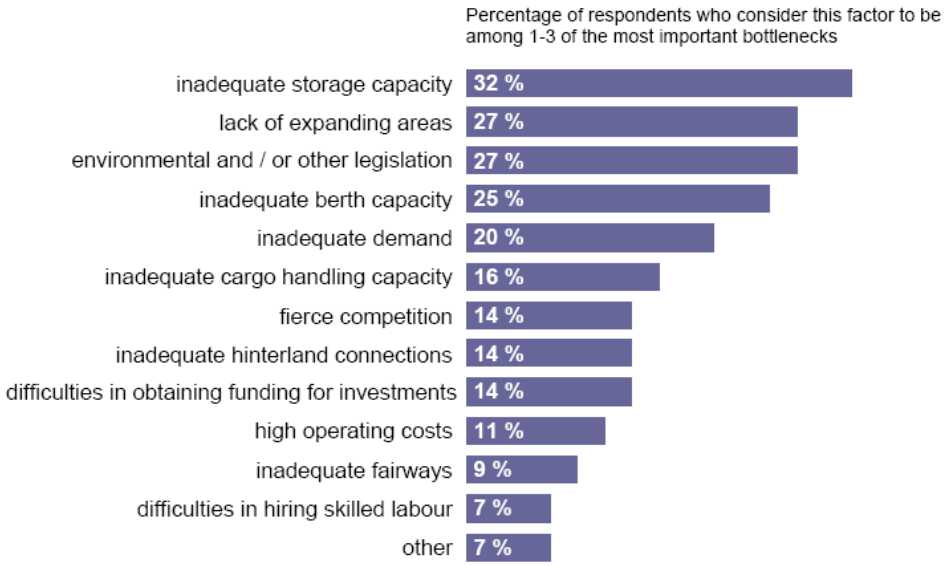


Figure 1. Major bottlenecks in the development and growth of Baltic ports. Source: Centre for Maritime Studies, 2008.

The same problems are likely relevant in other parts of Europe. Europe's busiest sea ports are not expanding quickly enough for handling growing container imports from Asia, therefore they are facing increasing congestion and delayed deliveries. Felixstowe and Southampton in United Kingdom, Rotterdam and Hamburg, among the biggest ports in Europe, have had to avert container ships in 2007 because of a lack of berthing space (International Herald Tribune, 2007).

Due to very limited space in congested ports, some functions become inefficient, for example sorting, which in general accounts for about 50% of all movements in ports (Schönknecht,

[1] From 44 ports that were participating in a survey, the majority (27) are small ports handling less than 4 million tonnes per year, 4 ports handle 4-10 million tonnes and 13 ports over 10 million.

2009). There is a number of transport chains concentrated on one container ship. Therefore container sorting operations become complex and require relatively much time. The average dispatch time of sorting in port of Hamburg, calculated by ILS Integrierte Logistik-Systeme GmbH (Schönknecht, 2009), takes approximately 24 hours. The same function could be performed in a more time saving way if it was carried out in the hinterland hub, where the containers would be transported by train.

The Global financial crisis which has started in 2008 might have slowed down the volumes of goods flows and relieved the congestion problem in the problematic ports; however, it is a temporary phenomenon, and economic will continue growing in the future.

The solution for ports congestions recommended by industry officials is to expand terminal capacity to cope with the strongly increasing imports of manufactured goods from China. However, expansion projects are not being implemented fast enough to keep up with the trade flow (International Herald Tribune, 2007). Moreover, the usual solution for port capacity problem - expanding its area by the water – may not be the only solution. Sometimes port authorities have to look for other ways out of the congestion problem, especially when it is not possible to expand the port infrastructure by the water.

3.3. Environmental problems

An efficient transport system is crucial for economic development and an asset in international competition. However, transport brings significant negative consequences in relation to various environmental problems. The remarkable increase in transport demand, particularly for road transport, has made the sector a major contributor to health and environmental problems in Europe (European Environmental Agency, 2003, p.71). As it can be seen from the figure below, the volume of freight transportation by road is having incomparably higher use than the use of rails or inland waterways and such level is remaining during a number of years.

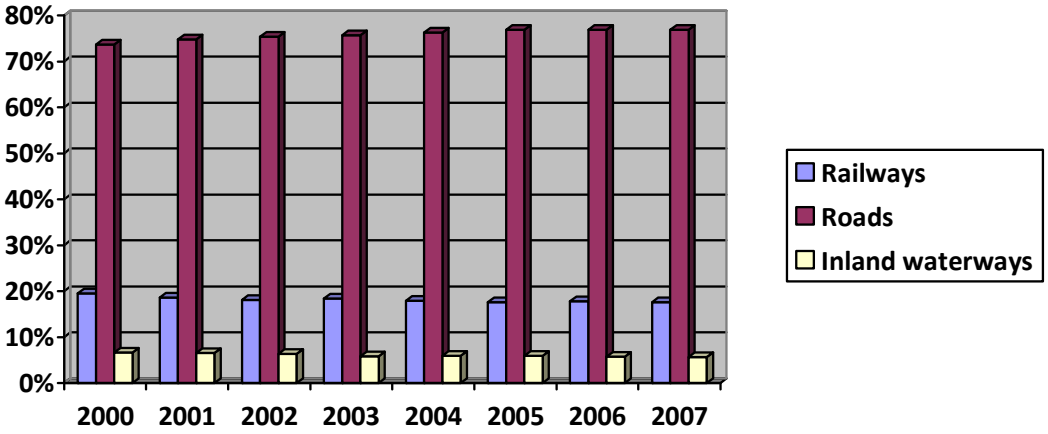


Figure 2. Modal split of freight transport in the EU-27(% in total inland freight tonne-km). Source: Eurostat, 2008c.

Transport operations have a significant impact on the natural environment and are main contributors to local and global environmental problems. Emissions of air pollutants such as CO, NO_X, SO_2, HCs, VOCs contribute to local air pollution, which damages the health of humans, animals and vegetation. Carbon dioxide (CO_2) emissions from transport are the major contributor (29% of man-made CO_2 is emitted by transport) to the greenhouse effect and the global warming. (European Commission Directorate-General for Energy and Transport, 2003, p.198)

Port infrastructure and operations are harmful for the environment as it can cause the modification of water systems and the interference of hydrological processes (Michail, 2006, p.3). Therefore the expansion of port infrastructure by the water in order to increase its capacity has destructive effects for the environment. A frequent problem caused by the ports, especially the biggest and most congested ports, is the noise and pollution, which makes inhabited areas located nearby to suffer. An especially unfavourable situation appears because of the intensive traffic of the trucks to and from the port through the cities. One solution for such situation can be the implementation of electric trains, carrying the goods to and from the port area.

Data from the Shortsea Promotion Centre in Finland (2003) gives the picture on the environmental performance of different transport modes in the areas of energy efficiency, air pollution and external costs.

	Short Sea Shipping	Rail	Road
Energy consumption, MJ/t-km	0,12-0,25	0,60	0,70-1,20
Carbon dioxide emission, g	30	41	207
External costs[2], % of all external costs caused by transport in general	0,5	2	92

Figure 3. The indicators of environmental performance of different transport modes. Source: European Commission's White Paper on Transport (2001) and Schreyer et al. (2004).

According to the above data, shipping is the most energy efficient transportation mode. However, rail is still more efficient compared to road transportation, sometimes even twice in terms of energy consumption per ton-kilometre. Considering the consumption of one kilogram of oil for one kilometre, 50 tons can be transported by truck, 97 tons by rail and 127 tons by water. Moreover, road transport emits 6,9 times more carbon dioxide than shipping and 5 times more than rail transport. Finally, the total amount of all traffic-caused (including all modes of transport) external costs that are being faced in EU, Norway and Switzerland is 134,3 million Euros per year. 92% of the expenses are caused by road transport (Shortsea Promotion Centre in Finland, 2003).

In relation to the described environmental performance indicators of different transport modes, road transportation is the least environmentally friendly transport mode, additionally the difference in the performance of road transportation and shipping/rail transport is extremely large, while on the other hand the use of road transportation is also much more popular than the shipping or rail transportation (see Figure 2). Modal choices have a significant influence on the environmental performance of transport systems; therefore effort should be paid for balancing the use of different transport modes.

[2] External costs include the costs that traffic (by road, rail, marine shipping, inland water shipping, air and pipelines) causes for the society, for example expenses connected with air emission, climate change, infrastructure, noise, accidents and congestion.

4. Concept of the Dry Port

The *Dry Port* is a rather new concept, therefore this name is rarely known even in the logistics industry. Moreover, sometimes different definitions are used to describe the concept. Therefore, it is necessary to review existing Dry Port definitions, analyse the concept more deeply and find specific features, differentiating Dry Ports from other transport terminals.

First, various inland intermodal terminals are reviewed (section 4.1.); then different definitions of the Dry Port are overviewed (section 4.2.). Second, the functions of Dry Ports are named (section 4.3.) and the separate section is given for the value-added services (section 4.4.) in order to stress their importance and possibility to provide additional benefits for the customers, thus in general raising quality of Motorways of the Sea service level and improving the competitiveness.

Additionally, operational procedures in Dry Ports are described (section 4.5.) in order to provide better perception on the specificity of the functions and purpose of Dry Ports. It is also important to get familiar with specific aspects of different locations of such intermodal terminals (section 4.6.). These aspects should be taken into consideration before implementing a Dry Port.

4.1. Forms of inland intermodal terminals

There are various types of inland terminals which are facilitating the goods movement in the transport chains. However, the terminology concerning inland terminals is often raising confusion due to the lack of strict determination of various names. Different names may be used to describe the same terminal type, and the same expression may be used to describe different facilities.

For instance, in Europe the name *inland port* is given for the terminals located on the inland waterways (Ioannou, 2008, p.122) and providing usual port services (Basel, Brussels, Charleroi, Frankfurt, Liège, Duisburg, Paris, Strasbourg, etc.). In contrast, *inland ports* in America do not necessarily have to be located on the inland waterways. The main idea is that inland ports would be the multimodal sites and would promote the value-added services, in this way facilitating the goods flow (Harrison et al., 2002). American *inland port* is a very broad term and is generalised name for such sites as *Industrial Park, Intermodal Hub, Air*

Cargo Port, River Port, International Trade Processing Centre and others (Harrison et al., 2002). The examples of such terminals are: Virginia Inland Port, Agile Port, Alliance Texas Logistics Park, Joliet Arsenal, Puerto Nuevo, Richards-Gebaur AFB, San Bernardino Intl Airport/Alliance, and Southern California Logistics Airport.

According to European terminology, *intermodal terminal* is wider term than the *inland port* since it includes not only the inland waterway-rail/road transhipment services, but also deep-/short-sea transhipment equipment (Ioannou, 2008, p.122). Other expressions, like *Freight Village, Logistic Centre/Platform/Park, Transport Centre, City Logistic Centre, Urban Distribution Centre* are used for the transport terminals designated for carrying out logistics activities (Ioannou, 2008, p.122). When logistics services are provided in the terminal in a further hinterland from a port, which is directly linked to the port/ports, the terms port *logistic activity zone*, *hinterland terminals*, and *Dry Port* are used (Ioannou, 2008, p.122).

According to the characteristics of different inland intermodal terminals, they were illustrated according to different development levels in Figure 4. The definitions of the terminals, that were used in order to compose the diagram, are given in Annex 1.

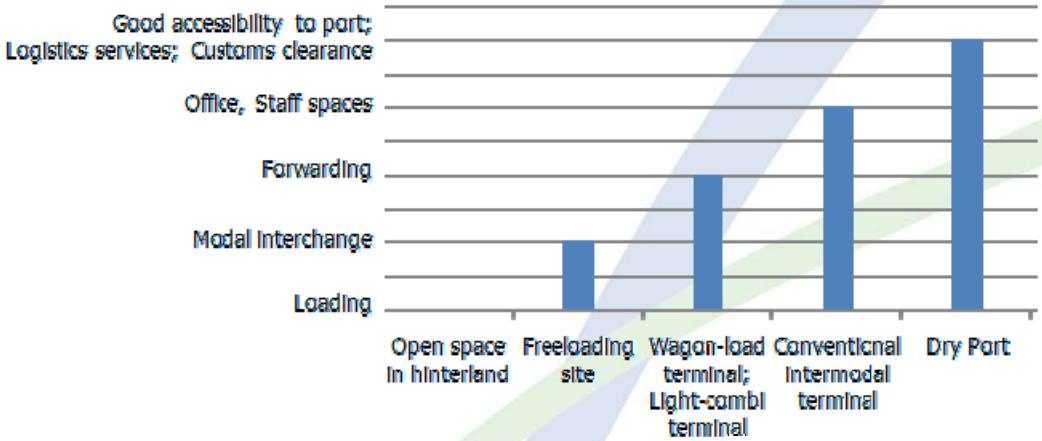


Figure 4. Different development level of intermodal inland terminals. Source: created according to literature given in Annex1.

The diagram above illustrates how terminals differ according to their functions. A Dry Port is most developed among the named sites and is characterised by loading function, modal interchange, forwarding function, office spaces, customs clearance, usual logistics services and direct and safe accessibility to port. This feature and the specific services available in a Dry Port provides it with the possibility to function as an additional hinterland for the port. A more detailed description of the Dry Port concept is given in the following section.

4.2. Different definitions of the Dry Port

There is no official Dry Port definition registered. Therefore, several versions can be found in the literature. Transport terminals having different functions than the ones named in the literature are sometimes containing the term *Dry Port* in their official name.

Tsilingiris and Laguardia (2007) describe the Dry Port concept as an inland intermodal terminal that is directly connected via rail and/or truck to one or more water ports, and which can substitute certain port services in certain areas. The authors stress that the main aim of establishing a Dry Port is to perform certain container handling operations that have undesirable temporal and financial implications when done at a congested seaport. They also propose the main advantages of a Dry Port:

- In a Dry Port container handling costs should be lower inasmuch as the land and the labour cost is lower.
- The spacious facilities together with the intermodal-centric design of the inland port accelerate the operations which are leading to positive monetary implications.
- From a network design point of view, the utilization of Dry Ports can decrease the generalized cost of dispatching containers.

Tsilingiris and Laguardia (2007, p.3) notice that because of the certain services that a Dry Port provides, it may appear to be similar to the distribution centre. However there is a main feature that separates the mentioned terms - a Dry Port is linked to the water port and can therefore substitute certain water port services, while a distribution centre does not necessarily link to a port (for example, the goods can be moved from the port directly to a Dry Port and only then the goods are cleared under customs). Moreover, an inland distribution centre is not necessarily linked to and dependent on sea ports, while a Dry Port is (Tsilingiris and Laguardia, 2007, p.3).

Leveque and Roso (2002, p.50) emphasize that the Dry Port is a particular type of inland intermodal terminal, together stressing the importance of port's functions employment at the Dry Port:

"*A Dry Port is an inland intermodal terminal directly connected to a seaport, with high capacity traffic modes, where customers can leave/collect their goods in intermodal loading units, as if directly to the seaport*."

Additionally to the basic services, transhipment, that a conventional inland terminal provides, such services as freight storage, consolidation, storage of empty containers, maintenance and repair of containers, customs clearance, and other services should be available at full-service Dry Ports (Roso, *et al*., 2006, p.5).

The definition suggested by United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP, 2006, p.2) describes a similar, yet more detailed concept:

Dry Port refers to *a defined inland location for the consolidation and distribution of goods that has functions similar to those of a seaport, and which includes customs clearance services. Seaport functions that could be expected to be typically present at these Dry Ports include container (and possibly bulk) handling facilities; intermodal infrastructure connections; a geographical grouping of independent companies and bodies dealing with freight transport (including, for example, freight forwarders, shippers and transport operators); and the provision of accompanying services such as customs inspections, tax payment, storage, maintenance and repair, banking and information communication technology connections.*

Furthermore, it is necessary to highlight that Dry Ports are existing as the mean for organizational and business strategies in a logistics chain:

"Dry Ports might be considered as "extended gates" for seaports, through which transport flows can be better controlled and adjusted to match conditions in the port itself. Thus the terminals can help to improve land access to ports in both physical and psychological terms. This means that a "Dry Port" is more related to the organisation and the service and business needs of the transport system, than related to a physical plant" (InterBaltic, 2008).

The given definitions are similar, especially that they all stress the similarity of port's and Dry Port's functions and transhipment function. Additionally, a Dry Port is described usually as container-oriented terminal; however, bulk handling function should not be strictly excluded in all the cases, but considered if there is a need for it in certain area.

To generalize the main idea of a Dry Port concept and to have the leading definition for this report, the following definition has been established:

A Dry Port is an intermodal terminal situated in the hinterland servicing a region connected with one or several ports by rail and/or road transport and is offering specialised services between the Dry Port and the overseas destinations. Normally the Dry Port is container-oriented and supply all logistics facilities, which are needed for shipping and forwarding agents in a port.

Additionally, the possibility to handle bulk cargo should not be strictly rejected and should be considered according to the need – in case there is demand and potential for using this function.

A Dry Port can exist as a separate terminal, or it can be a fully integrated part of a logistics centre or logistics platform. It can start its development as a single Dry Port and later expanded considering area and functions; or the other way around – customs clearance and other services characterising Dry Ports can be introduced in one of intermodal terminals in the facilities of a logistics centre/platform, and thus this terminal would become a Dry Port. In both cases, the overall facilities could be called logistics centre/platform with an integrated Dry Port; then the Dry Port would supplement activities of logistics centre/platform. One of the examples is the Logistics Platform of Zaragoza (PLAZA) in Spain (see a website of Zaragoza).

4.3. Functions of the Dry Port

Dry Ports can be built from scratch or it may be developed from an inland terminal including some additional facilities that are characteristic for Dry Ports. If an inland terminal fulfils the following conditions it can be theoretically counted to be a Dry Port:

- The terminal should have direct connection to a seaport either by rail or by road;
- The terminal should have a high capacity traffic mode (i.e. rail);
- The terminal should offer the same types of facilities as can be found in a seaport.

(FDT, 2007)

The realization of such conditions would mean that the customs services would be available at the terminal. That would allow making the goods ready for overseas travel already in a Dry Port. Thus, the cargo could be transported through the port without long waiting time and loaded directly onto the ship. The same idea would be relevant for the imported cargo. When the port is facing capacity problems, goods do not have to wait for the services at the port – after unloading from the ship they can be transported directly to a Dry Port. In that way ports are provided with extra available areas and their capacity is increased.

UNESCAP (2006) suggests that a terminal, having the status of a Dry Port, should be oriented to the expansion of its functions in order to be able to attract more enterprises and get more benefits from growing economics and increasing transportation volumes, as well as giving benefits for the area where it is located. As the very basis, it is enough for a Dry Port to provide services for handling and temporary storage of imported/exported loaded and empty containers and customs control. Afterwards it may expand the functions while including extra services. Moreover, even larger advancement can be reached while providing full import/export processes, broadening the functions towards industrial parks or special economic zones of assembly, manufacturing and agricultural processing (UNESCAP, 2006, p.3).

The main objectives of a Dry Port are:

- To function as an extra hinterland space for the port/ports and a terminal, where the port can outsource its functions;
- To act as a high quality terminal while improving the efficiency and effectiveness of the logistics chain;
- To promote a modal shift.

In order to implement the latter objectives, the following functions should be performed in a terminal:

1. Transhipment of cargo between different transportation means

This function requires having special equipment in a terminal to be able to transfer units from one mode to another. Good co-ordination of transhipment operations is necessary in order to make the operations less time-consuming.

In the Dry Port case it is most often the shift from rail to road or vice-versa. In exceptional cases a Dry Port may also include a waterway connection, when the cargo from port to the Dry Port is shipped by barge.

2. Sorting

When the goods are transported by a ship, containers have to be sorted in the receiving port since a number of supply chains, which have different points of destination, are concentrated in one ship. However, in order to have more space in the port area, which is sometimes very congested, distribution functions of port can be outsourced to the inland terminal – Dry Port. In this way ports are enabled to limit the possible port-related diseconomies of scale appearing from the growing volume of maritime transhipment (Notteboom, 2002).

3. Storing

The storing of goods can take different time periods in a Dry Port. When it is mainly used for distribution service, then the goods are stored for a long time period. Moreover, the space in a Dry Port hinterland can be used for the long-term storage of empty containers and waiting units. When the goods are transhipped from one transport mode to another in a Dry Port, or the goods are supported by other services, they are stopped for a shorter period of time, short-term storing is used.

Storing service is very important for the transport networks as some regions naturally receive more containers than they send and vice versa. Dry Ports can thus be connected and used to regulate the imbalance of containers flows.

4. Management of container flows to different ports

This function is relevant when a Dry Port has the connections and communication with several relatively close and the same type of ports (regarding the type of cargo they are handling). When one port at a certain time is too busy to accept the cargo, the shuttle train may be directed to a less congested port.

5. Consolidation of individual container flows

The containers from different shippers can be transported to a Dry Port, loaded on one shuttle train and transported to the port or far inland destination, for example from Europe to the Far East.

6. Reduction of pre- and post haulage of road transport and expansion of rail transport;

Dry Ports are usually linked to the ports by rail. That brings the possibility to consolidate the goods from different shippers at a Dry Port and transport them further to the port by rail. In this way Dry Ports are promoting traffic on railways rather than roads, which could bring significant environmental benefits.

7. Offering special- and extra services

One of the most important special services is customs clearance. When it is done in a Dry Port instead of the seaport the waiting time is reduced in the port. Usually this time is long and causing congestion. Some Dry Port functions listed earlier (functions nr. 2, 3 and 4) can actually only be fulfilled, when the port is congested.

Maintenance of units is also counted as extra service. This service is more relevant if a Dry Port provides a storage of empty containers that gives enough time for the maintenance of the unit. Many other extra services may be provided in the Dry Port.

A survey (FDT, 2009) was made among several transportation industries in North Sea region in order to find out which Dry Port services could be most relevant and would possible have the greatest demand. Such services as warehousing and storage, 3rd party logistics, customs clearance, value-added services and maintenance of units were investigated. The analysis was made of the responses received from the port authorities, consulting/planning and maritime transport sectors. The following figures illustrate the answers to the question *"Which hinterland terminal (Dry Port) services could be assessed as the most relevant?"*

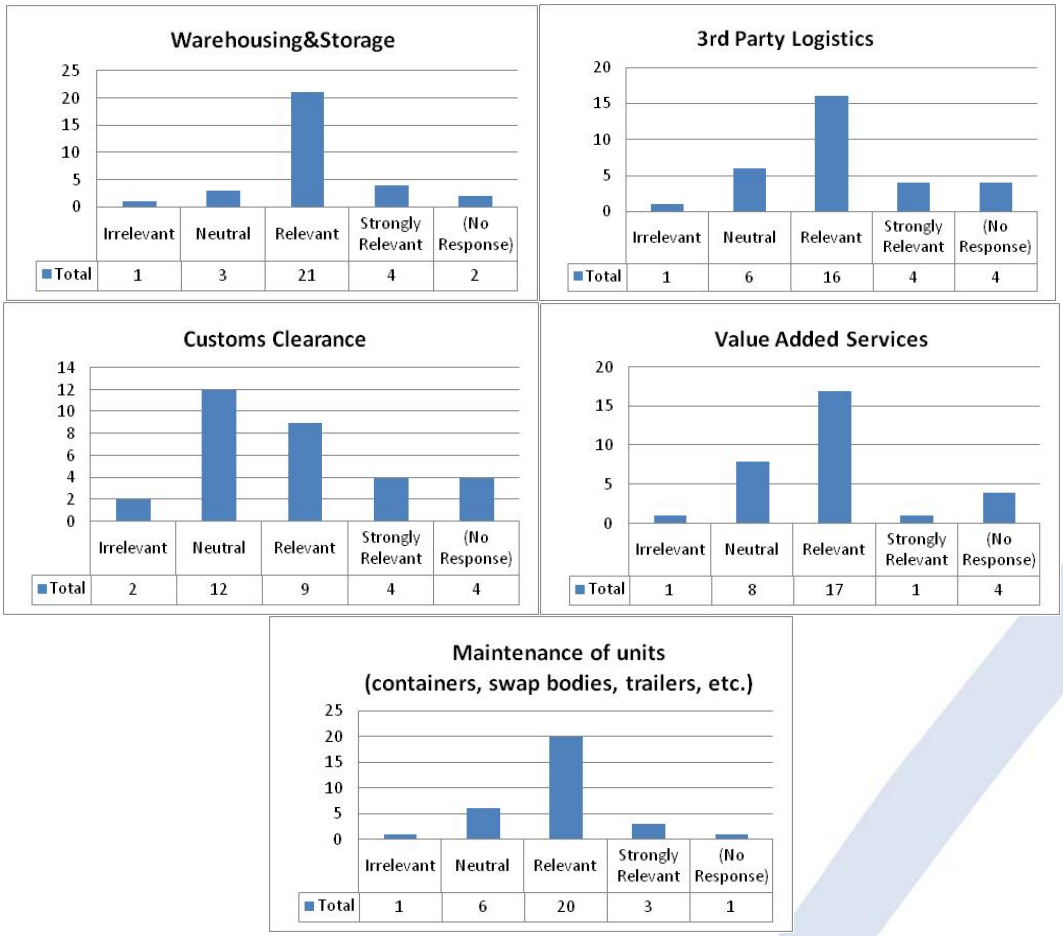


Figure 5. Evaluation of the relevance of the services in the Dry Port in the North Sea Region. Source: FDT, 2009.

The responses show that warehousing and storage, 3rd party logistics and maintenance of units have high relevance, they received 25, 20 and 23 positive answers respectively, whereas in total there were 31 responses among three mentioned sectors. Customs clearance and value-added services were evaluated with fewer positive answers, 13 and 18 respectively. On the other hand, these services received very few negative responses: customs clearance – 2, and value-added services – 1. According to the results of the questionnaire, an inference can be made that the usual and basic services of the transport terminals are important while establishing the Dry Port, moreover, the services of the firm/firms, managing the transportation of the goods (3rd party logistics), would have a demand. The same conclusions can be made about other value-added services. Many neutral responses were received regarding customs clearance service. The possible reason for this opinion can attributed to the lack of awareness of the potential advantage of customs clearance outsourcing from the port to further hinterland. Additionally, not all ports of North Sea Region are facing the congestion problem, therefore, only the ones, facing largest trade exchange need to outsource the customs

clearance to the hinterland terminal. Thus, the respondents of the survey did not evaluate the customs clearance service as one of the most relevant.

4.4. Value-added services in Dry Ports

The concept of value-added services means such kind of services that are provided for their users and support the goods of these users by adding extra value. This characteristic describes Dry Port's ability to add value to the cargo through the services that it provides in order to facilitate the objectives of the supply chain system. Dry Ports can form part of a value-driven chain while adding value to the goods passing through them. This involves adding value in the context of the different operations, services and capabilities that take place in a Dry Port environment including:

- capacity to provide third- and fourth-party logistics;
- capacity to launch new tailored services;
- capacity to handle different types of cargo;
- capacity to handle dangerous types of cargo;
- ability to adopt to altering schedules;
- the speed at which the Dry Port's management can take decisions on changing the schedules and speed on amending orders;
- variety of services in intermodal operations;
- capacity to convey cargo through the most diversified routes/modes at the least possible time to end-users premises,
- capacity to deliver tailored services to different market segments and to act as collaborative intermodal hub networks (Song and Panayides, 2007).

The added value that a Dry Port can provide depends on the type of added value services and the number of them, for example, how many services there is for adding value to cargoes, the flexibility of the Dry Port regarding customers' needs and the possible number of tailored services.

4.5. Operational procedures in Dry Ports

Most of the procedures during different operations at a Dry Port are the same as in other kinds of inland intermodal terminals, except the customs clearance procedures (if the client requires for customs clearance service). The very basic operational activities of a Dry Port related to the customs examination is to receive import containers (or another kind of cargo) arriving on trains, to unload and stack them, inform the importer, carry out the customs examination, and afterwards load the container onto a road vehicle to deliver to importers' customers; or appropriate operations for export containers.

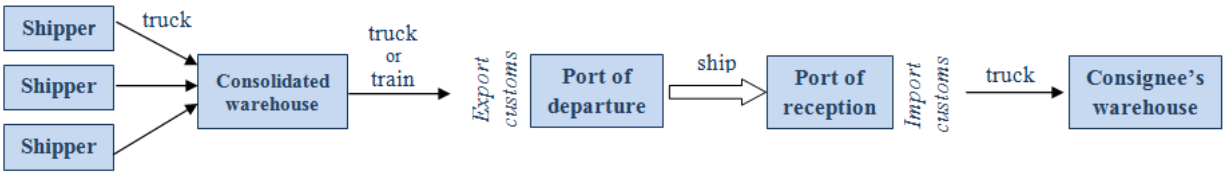


Figure 6. Transport chain without Dry Port. Source: own creation.

When a transport chain, based on the shipping, does not contain a Dry Port, then the operational procedures can be the following: the chain starts from the cargo being either containerized or palletized at shippers' warehouses. Then it is transported to the consolidated warehouse by truck where cargo is placed into containers if it is not containerized yet. Afterwards containers are transported to the customs via rail or road and to the port of departure, where all port related operations are accomplished and the cargo is shipped to another port (Tsilingiris, 2006). At the cargo at a port of reception is unloaded and transferred to the storage yard where the customs clearance is provided. After that the containers are moved from the port to transhipment facility or to the consignee's warehouse (Tsilingiris, 2006).

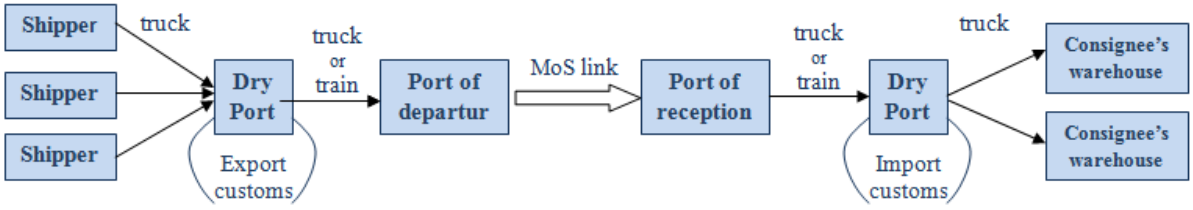


Figure 7. Transport chain with Dry Port. Source: own creation.

When a Dry Port is a part of the transport chain (see Figure 7), the possible scheme of the operations is the following. For exports, the goods are either containerised or palletised at the shippers' warehouses and transported to a Dry Port where cargo is placed into containers in the case it is not done previously. The formalities of export customs are completed and containers are loaded on the train and dispatched by rail to the port of departure. All charges are collected at the Dry Port, also all customs procedures (which at present can be applied electronically) are completed at this point and the exporters or importers do not need to do anything at the sea port (UNCTAD, 1991).

For imports, containers are unloaded from the ship at the port of reception, certain operations are being carried out and containers are being moved to a Dry Port. In a Dry Port the customs clearance is executed, afterwards, other services are carried out. Finally the containers are dispatched to consignees' warehouse.

Additionally, if a Dry Port is handling bulk goods, the procedures are different. However they are not described, as we mostly concentrate on the containers' traffic.

Activities in the Dry Port can be divided in the following main groups:

- receipt and dispatch of cargo;
- truck operations;
- loading/unloading of cargo/containers to and from trains;
- customs clearance;
- gate checks and security;
- storage of cargo and containers;
- information flow and communication;
- record keeping and data storage;
- billing and cash collection.

(FDT, 2007)

Important procedures in a Dry Port are related with import and export clearance. Permission for customs clearance service implementation in a Dry Port can be authorized by the customs authorities. Moreover, a number of procedures have to be executed in order to get the permission for customs clearance zone's implementation in transport terminals. The following most important documents have to be obtained:

- License for opening Pre-clearance customs zone (temporary storage of non-EU goods and EU goods for export);
- Permit for use of electronic data exchange system (electronic declaration system);
- Customs guarantee (depends on forecasted cargo turnover);
- License for Local Customs Clearance System.

For opening Pre-clearance customs zone or Bonded Warehouse the following institutions should be contacted:

- Customs;
- Veterinary Inspection;
- Fire Guarding Inspection;
- Environmental Protection Inspection;
- Insurance Company (or Bank) for getting Customs guarantee.

Usually there are certain security requirements in a Dry Port due to the implementation of customs clearance. Therefore, the terminal must have:

- Simple fence;
- 24/7 physical security (service provider or company itself)
- Described gate procedures (in/out control).

Customs procedures can be applied for different kinds of arrangements: a) release for free circulation; b) transit; c) customs warehousing; d) inward processing; e) processing under customs control; f) temporary admission; g) outward processing; h) exportation ((EEC) No 2913/92, 1992). The procedures of customs clearance require a lot of documents and information. The list of the documents mainly depends on the type of goods that are under clearance. They can be either European Community[3] or non-European Community goods. Grainger (2008) lists three groups of document that have to be submitted during the customs clearance in the EU. They are the following: a) customs declaration, b) supporting documents for non-customs controls that are tied into customs controls, and c) further sets of documents that are necessary for non-customs controls outside the umbrella of customs declaration.

[3] The list of the Community members is given in the Annex 3.

As an example of documentation complexity, some of the documentary requirements, necessary for imports into the UK and for export from UK, are illustrated in Annex 4. Arrangements for the documents will be similar in other member states of the European Union. The documents that need to be filled (on paper or electronically[4]) are named in the column under the name "Documents". These documents have to be checked and confirmed by the authorities listed in the column "Control".

4.6. Location of Dry Ports

While establishing a Dry Port, the choice of location makes an important impact on future performance, especially, considering that it is an intermodal terminal, having rail connection with the port. The intermodal transportation can be attractive for the shippers when the overall expenses are the same or smaller than the ones of road transport. When road substitution by rail was considered a decade ago, it was said that it was worth to carry out intermodal transport based on rail when the distance was not shorter than 500 km (van Klink and van den Berg, 1998). Additionally, Rutten (1998) suggested that intermodal rail transport could already compete with the road transport from the distances over 100 km, however, one condition should have been valid – the quality and service of the intermodal transport should have been of similar level or higher than the quality and service of road delivery. Furthermore, the costs of intermodal transport were said to necessarily be the same or lower than the road transport. On the other hand, today, when considering the implementation of the rail connections, the criteria considered previously should not be leading. At present, more attention is paid to the external costs of different transport means and their environment-friendliness, and to the overall transport corridor costs and added value. For example, research on Dry Ports cases in India show that even though shippers at present often choose to use Dry Ports located closest to their productions site, this does not minimize transport cost. The additional costs appear because of government policies and lack of value-added services to shippers in a Dry Ports (Ng and Gujar, 2008).

There is no single agreement on the minimum distance, which would be the most valuable (regarding the costs) to choose for location of the intermodal terminal, thus, the decisions

[4] A vision for electronic customs environment, set by the EC, is given in Annex 2.

have to be made on individual base for each case, also taking into consideration the objectives of the project implementation.

Rutten (1998) suggests that the location of an intermodal terminal can be evaluated according to theoretical, technical and economic potentials, in order to justify the new terminal and railway infrastructure. The theoretical potential could be expressed in the volume of road traffic and the volume of maritime rail containers predicted for certain year in the future and concerning certain transportation distance (ibid.). Technical potential should be evaluated after examination of infrastructure requirements. It concerns the calculation with the assumption of certain minimum train length and train frequency, while disregarding transhipment and road feeder movement costs (ibid.). Economic potential is founded on the "real" costs of infrastructure and external costs (ibid.).

These measures should tell to what extent intermodal transport may substitute road transport. Moreover, the calculation of economic potential should help to make a decision on internationalisation and on taxation measures.

Dry Ports' differentiation according to the distance from the port

The location of a Dry Port depends on the needs of the port or ports and the concentration areas of the shippers or receivers of the goods. The length of the rail connection (the distance between a Dry Port and port) can be defined according to the aspects of intermodal terminal allocation. Moreover, the evaluation of Dry Port implementation should be done not only according to the costs but also added value, which a Dry Port can give to the goods, customers and logistics chains should be taken into consideration.

Significant research on Dry Port distances have been made by Woxenius *et al*. (2004) and Roso, *et al*. (2006). According to these researches, Dry Ports can be divided into close, midrange and distant Dry Ports, and different variations were analysed and explained further.

It is useful to establish a Dry Port at a large distance (over 500 km) from a port when this place is near large areas of consumption and many manufacturers. Then the distant Dry Port has a potential to receive large volumes of goods as it can function as distribution centre for further areas or the consolidation node for shippers located around. Moreover, it can offer a variety of services related not only to the distribution and consolidation. The figure below is

illustrating an example of a distant Dry Port. It can bring significant benefits, considering that all the goods from the shippers around the Dry Port are transported to the port by rail, instead of transporting them by road from each shipper separately.

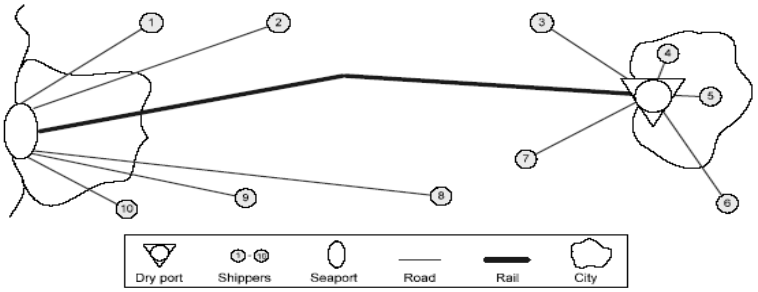


Figure 8. Distant Dry Port connected to the port. Source: Roso et al, 2006.

It helps to reduce congestion on the access routes to the port and in the area around the port. Together the environmental benefits may be reached due to rail implementation between the Dry Port and the port, because one train in Europe can carry the same amount of goods as 40 trucks (Roso, 2006b). As mentioned in section *3.3. Environmental problems*, road transport means are consuming more energy and emission of carbon dioxide is 5 times higher in comparison with rail transportation. Therefore, significant environmental benefits can be obtained.

Establishing midrange (distance is from around 70 km to 500 km) and close Dry Port (around 50 km or less distant from a port) is chosen when the port is lacking the storage area and its capacity cannot be increased, especially when there are no possibilities for the port to expand due to inhabited areas around or environmental aspects. The illustrations of such Dry Ports are shown below.

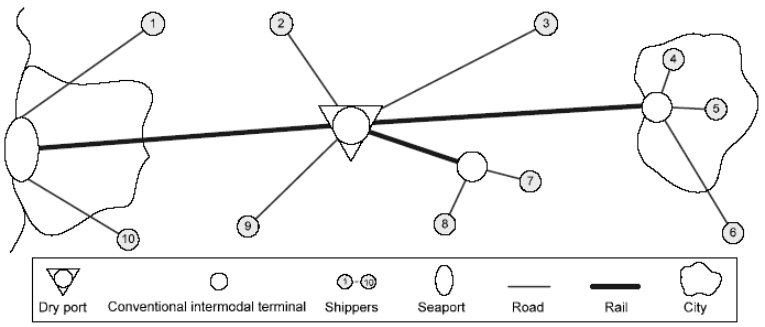


Figure 9. Midrange Dry Port connected to the port. Source: Roso et al., 2006.

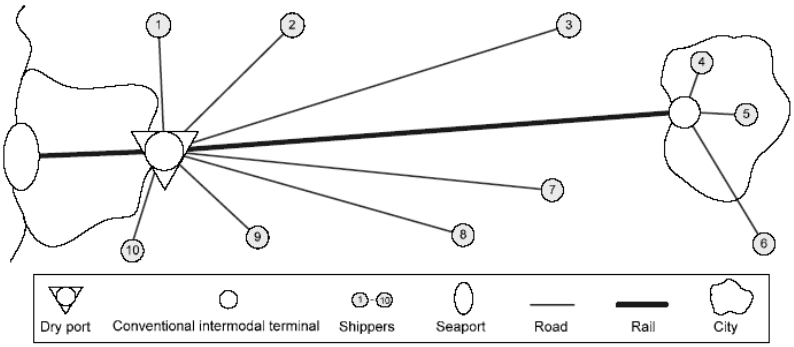


Figure 10. Close Dry Port connected to the port. Source: Roso et al., 2006.

The location of a Dry Port should be chosen according to the existing problems in the certain area, possible volumes of freight flows and potential to bring benefits to the selected area.

5. Advantages of Dry Ports

As mentioned previously, at present the logistics sector in Europe is facing some major problems related to environmental pollution and bottlenecks reducing the chance for efficient freight flows. Thus different actors of logistics sector are implementing various means in order to reduce the problems and avoid their increase in the future. Dry Port implementation and use in the transport chains can bring valuable benefits.

When sea ports are facing congestion and efficiency problems appear, expanding the port area by the water may not be the only solution possible. With the implementation of the Dry Port concept, ports can obtain a great benefit due to the possibility to expand its hinterland into the inland areas, further away from the water, and hereby outsource some of the services to another terminal, for example, container storage, and distribution or customs clearance. With such a solution, ports are able to send out the freight from their territory quicker and thus emptying space for the newly incoming cargo.

For example, in the case of the Netherlands, at the end of 20th century a realisation of public policy, which was unfavourable for massive terminal expansion, was especially growing. Therefore, many operations were transferred from the Port of Rotterdam to the inland terminals. The terminal operators in the Port of Rotterdam and the port authority itself has established handling and storage facilities away from the city itself, due to the clear purpose of relieving congestion in the largest port of the Netherlands and Europe. For instance, many inland terminals (also called satellites) were built at Moerdijk and Venlo (Slack, 1999). In the case of the Venlo area, distribution and logistics firms have been attracted to open intermediate wholesaling and distribution centres, which are linked by rail to the port of Rotterdam. That guaranteed traffic for the port and relieved space in the port area which is employed for a more essential transfer of activities.

The initiative for establishing the new Dry Port can be taken by the port authorities, even if the port is not facing congestion problem, or if the port authority simply see the need to expand its market and attract more companies. Liege Trilogiport project in Belgium can be given as an example. It was initiated by the Liege Port Authority and was started to develop in 2007. Due to its determination to take part in the Liege region's economic restructuring process, the implementation of Trilogiport offers the advantages for the revitalization of the

Lower Meuse Valley and the Liege region as a whole. Liege Trilogiport multimodal platform is a mean for the Liege Port Authority to accommodate new companies in the future, support the expansion of its river traffic, as well as stimulate the economic development of the Liege region (Liege Port Authority website, 2009).

Considering that Dry Ports act as influencers on and supporter of the intermodality (the change of freight transportation from road to rail and short sea shipping), the implementation of this kind of transport terminal should help to reduce the transportation by roads and its harmful effect for the environment. Moreover, regarding the fact that the infrastructure of ports' terminals also has negative influence on environment, and therefore ports sometimes have no possibility to expand when they are lacking storage area, due to environmental restrictions, Dry Ports could be a solution. It would serve as a hinterland of a port, avoiding the expansion of the port's infrastructures by the waterside and water pollution together with other negative impacts for the environment.

Additionally to the main benefits of Dry Ports, the list of other advantages can be found in the literature (FDT, 2007):

- Reducing total transport expenses;
- Shift from road to rail transport, which is more environmental friendly.
- Strengthening the ports' role in transport chains;
- Strengthening multi-modal solutions;
- Reducing the use of expensive, centrally located areas in the port;
- Possibly avoiding traffic bottlenecks, which give less congestion on the roads near the harbour area, due to the fact that a modal change has happened.
- Reducing local environmental problems in the cities;
- Especially in Less Developed Countries the development of the hinterland can be beneficiary for an area in form of creation of jobs in the affected area.
- The possibility of speeding up the customs clearance process for goods transferred overseas can be gained by establishing Dry Ports with the right to conduct customs clearance.

Different actors can benefit from the implementation of the Dry Port. The following table illustrates the advantages for different actors of the transport networks.

BENEFITS	**Freight forwarders**	**Shippers**	**Port authorities**	**Society**	**Road operators**	**Rail operators**
***Balance* between road and rail transport**				+		+
Shorter waiting *time* in port	+	+	+		+	
Reduced *road congestion*	+			+	+	
Prevention from increase in *environment* pollution				+		
***Strengthening* the sea *ports* role in transport chains**		+	+			
Reducing the use of *expensive areas in* the *port*			+			
Creation of *jobs*				+		

Figure 11. The advantages that different actors can gain from the Dry Port. Source: own creation.

The survey (FDT, 2009) made for this report among several transportation industries in North Sea region has helped to investigate what advantages could Dry Ports provide for the actors in the latter region. For the question *"Which of the following hinterland terminal advantages could be/are the most relevant for my organisation?"* the advantages listed below were provided as possible answers:

- Reducing total transport expenses,
- Strengthening the ports' role in the transport chains,
- Strengthening multi-modal solutions,
- Reducing the use of costly, centrally located port areas,
- Reducing local environmental problems, and
- Avoiding traffic bottlenecks.

The diagrams below illustrate the responses.

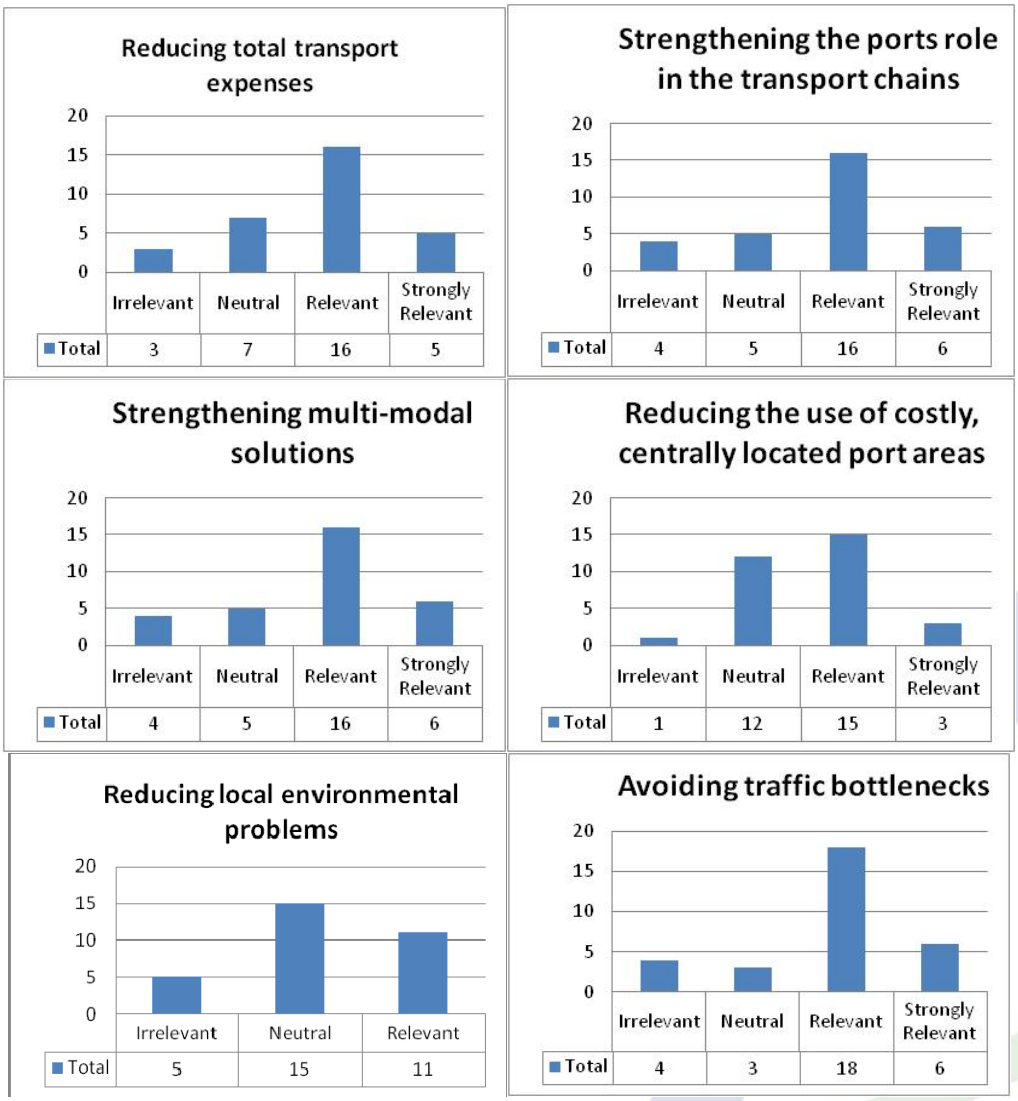


Figure 12. Estimation of the relevance of the advantages of Dry Ports among the North Sea Region respondents. Source: FDT, 2009.

Responses from the port authorities, consulting/planning and maritime transport sectors in the North Sea Region show that almost all listed advantages that Dry Ports could support with, are relevant for the participants of the survey – more than 50% of respondents named them as relevant or strongly relevant. The only exception is "the reductions of local environmental problems", which was relevant only for 11 participants out of 31. Most of the answers regarding the latter question from port authorities were 'relevant', from consulting/planning industry – 'neutral', and respondents from maritime transport sector also showed 'neutral' position about the advantage of reduction of environmental problems.

That may be due to the fact, that respondents of the survey were representing transport business–related activities, whereas the existence of the problem of environmental pollutions is most often admitted by the society, which is directly not involved in the transport business.

The results of the survey testify that freight transport chains passing through the North Sea Region are facing the problems of traffic bottlenecks. Moreover, they are causing environmental pollution. Dry Ports can be seen as a mean of improving this situation. Moreover, the representatives of the North Sea Region found it significant for their sectors, that Dry Ports can be a means for reducing total transport expenses, strengthening ports' role in the transport chain, expanding multi-modal solutions and reducing centrally located port areas.

The survey and literature helped to confirm that Dry Ports can bring added value into transport chains and is especially beneficial for large ports; thus, it is necessary to consider new developments of Dry Ports in the North Sea region or development of existing inland hubs into Dry Ports, where the services of the Dry Ports would have a demand. We have chosen one country in North Sea region – Germany – where a situation in ports is investigated regarding their planning activities of the connections with inland hubs and development level of these hubs. This investigation is a step forward in Dry Port development in Germany, helping to identify potential areas for Dry Port implementation and to strengthen/develop transport corridors. A description on German ports and their hinterland development can be found in Annex 6.

6. Governance of Dry Ports

Dry Ports can have different forms of management, depending on the initiator of the project. Rodrigue et al. (2006) differentiates two main components of terminal governance: ownership and execution of operations. *Ownership* defines the owner of the terminal site and facilities (including equipment). A Dry Port can be owned by either public or private organization:

- *Public ownership* is the most usual form for a Dry Port due to its economic and strategic importance for the ports, which are most often owned by public authorities, and for the countries. Under public ownership, the public authority is carrying out investment in infrastructure and plans future expansions. Afterwards the leasing opportunities are offered for the private sector which terms and duration can be negotiated (Rodrigue et al., 2006).
- *Private ownership* is less popular in the Dry Port cases and other kind of transport terminals. Many examples can be found in the United Kingdom and New Zealand, where the infrastructure for transport terminals are based on private funding.

Another component – *operations* – describes the execution of every day's activities in the terminal. Operations are usually implemented by different actors than the ones owning the terminal and that can be done also by both sectors:

- *Public* control of operations means that the public authority provides the handling equipment, deals with employees in the terminal, and operates the Dry Port terminal.
- *Private* companies can manage and perform operations in privately owned terminals or operate under concession agreement in publicly owned facilities (Rodrigue et al, 2006). In the latter case the facilities are leased to terminal operators for fixed periods of time and under certain conditions.

The possible options of governance modes of Dry Ports are illustrated below.

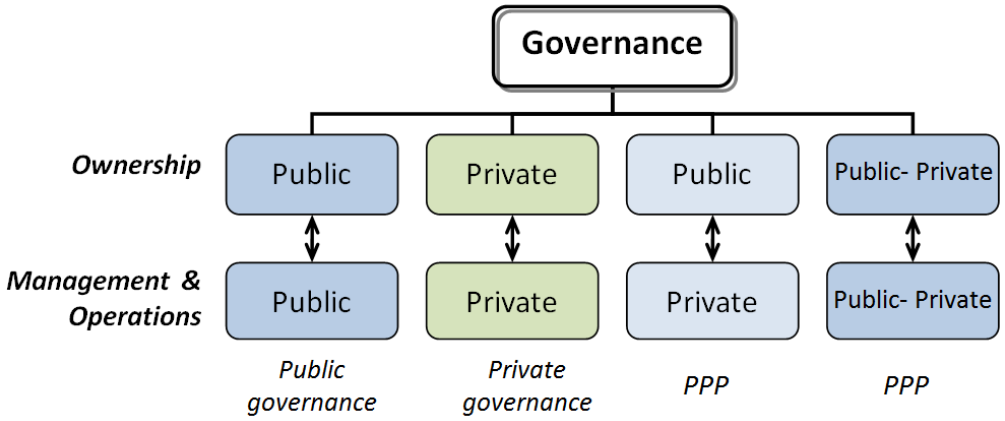


Figure 13. Possible governance modes

Depending on the initiator of Dry Port development and the body/-ies managing and operating the Dry Port, certain influence is made on the performance and future development of a Dry Port. Further, descriptions of possible Dry Port governance combinations are given.

6.1. Public governance

When the ownership is created by the public sector, the development of a transport terminal could be funded by the State treasury or through a public sector organization, the examples of which in a Dry Port case could be the railway or a port. The government is obtaining a control over operations, revenues and transport modes. Considering an advantage of a value brought to such project by public sector in comparison to private sector, public ownership could offer the greater equality in treatment to all users. Additionally, distribution of cargo among various modes within a centrally planned transport policy would be more equitable. The public ownership provides the shipping lines and foreign organizations with the assurance of greater security and fairness due to minimization of negligence, for example, profiteering, unreasonable tariffs, discrimination among user companies, etc. (UNCTAD, 1991)

Considering the importance of public governance of transport terminals Rodrigue et al. (2006) states that the long term investment is required in these terminals and the private sector may be not capable or unwilling to make such investment. The transport infrastructure and transport sector is strategically significant for a country therefore, the ownership and operation of transport terminals as public entity can be integrated with public regional and national economic policies. In this way the terminals can be owned and operated as public

entity, and can be integrated with public regional and national economic policies. (UNCTAD, 1991)

On the other hand, public facilities are often responding to market conditions too slowly (UNCTAD, 1991), for example, by keeping higher costs for services for the users, while competitors have lower costs, by suggesting limited number of services, while there is a demand for new services.

The minus of only public regime may be related to the experience in business practice in comparison with the private experience. Moreover, the restriction in the efficiency of a Dry Port may appear. Additionally, the difficulties may appear in allocation of adequate funds through State treasury, while depending on existing national priorities. To end up, public facilities are seen sometimes responding slowly to market conditions, tend to over-invest in non-economic developments, and have high costs to the users (Rodrigue *et al.*, 2006).

6.2. Private governance

Private governance brings the significant advantage by investing private resources in the national transport infrastructure. Private management, implied by private investments, can sometimes provide with such benefits as greater flexibility and faster response to trade, especially concerning changes in tariff structure, quick response to changing patterns of operations and the supply of special needs on every day basis. (UNCTAD, 1991)

However, such drawbacks of private arrangement are known as larger risk of failure of a project and lack of control over prices.

6.3. Public-private partnership

Rodrigue *et al*. (2006) explains that public facilities are sometimes having characteristics of slow response to market, tendency to over-invest in non-economic developments, and with high costs to the users. The belief that the private sector is more efficient than the public sector often leads to the concession agreement (Rodrigue et al., 2006). It is also based on the opinion that this form of governance keeps the ownership still under public control (ibid.).

Public-private partnership provides greater flexibility in development of a Dry Port in comparison with totally private governance. However, it can be reached only in case of the right way of making the initial agreement for forming the partnership. The rules set in the agreement should leave the possibility to change the type and form of relationship, as this will later give the opportunity to make new arrangement and implement new projects in relations to terminal and connecting infrastructure development. Moreover, financial justification of the project is significant, thus the important task for organisation from public sector is to select the best investments, and the private sector usually puts effort to earning a reasonable return on investments. (UNCTAD, 1991)

The FREIGHTWISE (2007) report outlines such benefit of PPP as risks' distribution between the public partner and the private partner.

The two combinations are possible for a funding form of public-private partnership:

1. The public sector invests in some facilities, for example railhead and main container handling equipment, whereas the private sector provides other facilities, for example, warehousing facilities, etc.
2. The public and private sectors provide the funds for a joint site operation under one management with unified control. (UNCTAD, 1991)

In the first case, advantages may be reached if the public sector is investing in such equipment in a Dry Port, which is likely to be rather capital-intensive and requires longer term investment in comparison to the other facilities in a terminal.

Second option ensures that a Dry Ports' functions as an integrated organization and develops in a coherent manner. Though, such great flexibility cannot be reached as in the case of totally private sector operations.

Some other benefits and characteristics of cooperation between two sectors that are giving the reasons for applying PPP contracts in transport sector are outlined by FREIGHTWISE (2007, p.69-70). They are related to both tangible and intangible resources:

- Growing budget limitation on public side;
- Financial resources, technological resources;
- Higher efficiency in management;

-
- Recognition of added value that private sector can bring;
- Know-how of the private firms;
- Transparency, public information and mutual shared information enabling future safe projects;
- The qualitative improvement of the project through the exchange of services provided and investment capacity;
- Exchanging technical, legal, financial competence between both sectors - public and private side;
- Bigger possibility to obtain dedicate loans from European Funding Institutions;
- Higher security of the project in relation to technical, legal and financial aspects due to custom-made contractual framework which, depends on agreed financial estimates, including different stages of the project lifecycle;
- Accelerated realisation (10%-20%).

According to the previous descriptions of possible ways of ownership and management and their benefits and drawbacks, the table below is summarising the most important aspects.

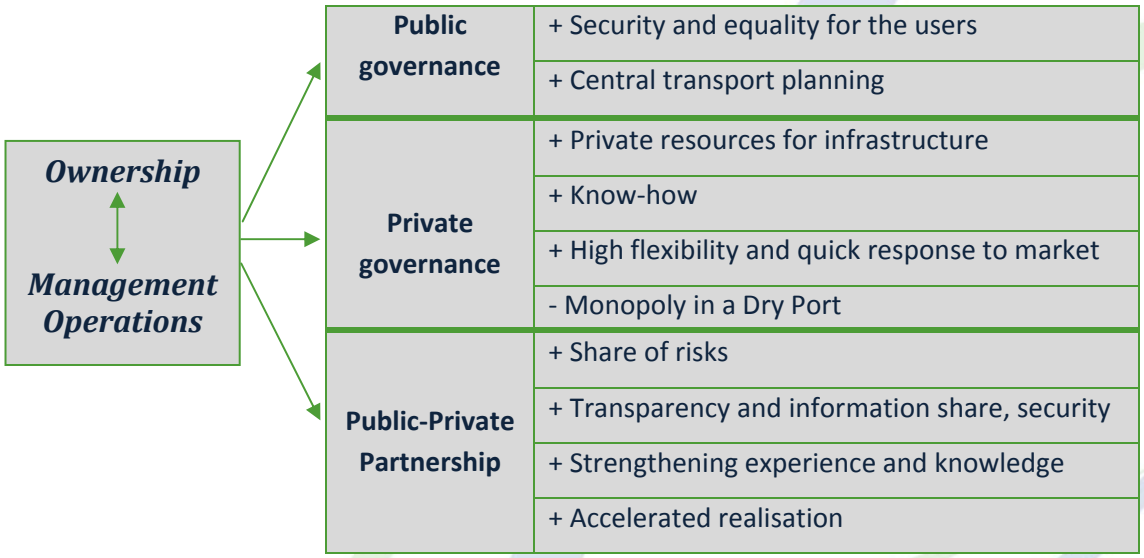


Figure 14. Main advantages and disadvantages of different forms of terminal governance.

In the next section the examples of different funding and management types of Dry Ports and other inland intermodal terminals are given.

6.4. Examples of governance of inland intermodal terminals

Different examples of forms of funding and management of Dry Ports exist. Theoretically the greatest advantage is reached in case of public-private partnerships, as the optimisation of different aspect can be reached, e.g. share of risk, financial resources, share of know-how, transparency. However, in practice the success can be reached in other cases too. Therefore, in all cases of governance it is most important to have good strategic planning to attract goods flow, cooperation and communication with different actors in order to create and efficient link in the transport chain.

Private ownership

Dry Port Muizen in Belgium, having connections to ports of Antwerp, Rotterdam, Zeebrugge and Dunkerque, is both owned and managed by private transport services company IFB (Inter Ferry Boats). The IFB provides integrated transport solutions by rail, barge and truck, supported by terminal operations, customs handling, ICT services, 24 hours monitoring and other services. The facilities of the same terminal are managed and operated by IFB together with other transportation companies: Unilog – is transporting the freight to United Kingdom, TRW - to South and Central Europe, ICF – to all European destinations, whereas the owning and managing company IFB is taking part in domestic destinations.

Dry Port Mouscron / Lille International is also owned and managed by private company DPML. Destinations: Antwerpen, Rotterdam, Zeebrugge, Duisburg, Athus, Muizen (via North European Network: 5 times a week); Novarra (via Novatrans: 4 times a week). Rail links to Antwerp and Zeebrugge are approved for customs-clearance purposes.

Terminal of *Athus* (connected by rail to Antwerp, Zeebrugge and Rotterdam) located in Belgium is owned and managed by the private company SA Terminal Athus, operated by private companies ERS (European Rail Shuttle) and IFB.

Public ownership

Multimodal terminal *Liege Trilogiport* in Belgium has been formed as a joint venture between the public investment ports of Antwerp and Liège, together with SPI+, a public investment company for the Liège region.

Concessions were granted first for management of the container terminal (15 hectares) Liège Trilogiport multimodal platform to a consortium made of Manuport Group (MPG) and Water Container Terminal (WCT). Both of these companies belong to the Australian financial group Babcock & Brown, which is active in real estate, infrastructures, leasing and finance. A concession for management of 30 hectares of the logistical sites was contracted to a German warehousing company, Deutsche Lagerhaus Gesellschaft (DLG) and the 10 hectares were contracted to De Pauw Warehouses. The current public investment for Trilogiport is estimated at EUR 50m, this includes EFRD and Walloon Marshall Plan *funding.*

Virginia Inland Port is owned by the Virginia State Authority, which is a public body. Additionally the same authority is responsible for operations and security of Virginia Inland Port. Virginia Port Authority has established Virginia International Terminals as a non-stock and non-profit corporation for the purpose of operating (through a Service Agreement) all the marine terminals owned by the Authority, including the Virginia Inland Port.

Joint ownership of public and private sectors

A Dry Port named *Azuqueca de Henares*, located 30 km from Madrid was established on 1995 and is jointly owned by private sector and the state. It has the rail connections with main Spanish ports (Barcelona, Bilbao and Santanders) with daily transportation service. The Dry Port had low volumes of goods handled for long period at the beginning. The impediments for the increase in volumes was the conditions of the existing road infrastructure and monopoly of the rail (Roso, 2009), which were overcome. In 2006 the Dry Port handled about 3000 TEU, whereas in 2007 strong increase was experienced – 18000 TEU were handled. To sum up, even though the joint ownership of two sectors could create positive conditions for the development of the *Azuqueca de Henares* Dry Port, several factors were influencing the situation and created the barriers for improved performance of the Dry Port.

Høje-Taastrup Transport Center (HTTC) is located in the suburbs of Copenhagen. The governance of this terminal is also structured as PPP. It does not provide all the services that are characteristic for a Dry Port, however it has potential to be developed as such due to the demand and existing facilities. Recently, transportation company Maersk has started new rail shuttle service from the Port of Aarhus (Denmark) to Copenhagen - Høje-Taastrup Transport Center (Maersk press release, 2009). The new service will have frequency of up to three departures per week. Additionally, it is going to bring economical benefit for shippers, as

Høje-Taastrup rail terminal is located close to the main customers areas, as well as it is significant for Danish society due to possibility to reduce truck traffic on the highways.

Eskilstuna Dry Port (Sweden) implementation was financed only by the public organisation Eskilstuna Energi & Miljö, which was a public utility organisation of Eskilstuna Municipality (Roso, 2006), whereas, it is operated and developed at present by local haulier Sörmlast AB and Eskilstuna Municipality (Eskilsutna Kombiterminal website, Sörmlast website). Eskilstuna Dry Port has direct rail connections to the Port of Göteborg and the Port of Malmö (in a distance of respectively 380 km and 550 km from the Dry Port). Additionally, within 100 kilometres of Eskilstuna, more than 33% of Sweden's population is located. Even though this Dry Port started its operations not long time ago (in 2003) it already handles 45.000 TEUs/year and 80% of them are transported on rail (Roso, 2009).

7. ICT use in Dry Port management

At present information flows play a very important role in the supply chain and make an influence in its successful operations. Lee, *et al*. (1997) emphasise the importance of information flows among members of the supply chain, where it acts as a mechanism for co-ordination. These information flows are important due to their direct impact on production scheduling, inventory control and delivery plans of individual members in the supply chain (Lee, et al., 1997). Information and communication technologies have become a crucial element in logistics. It helps to improve the efficiency of transportation and to create door-to-door and just-in-time deliveries by improvements in inventory control, warehouse management and ordering. Information system in logistics creates an interacting structure consisting of people, equipment, and procedures which together support the logistics manager with relevant information, which is used for the purposes of planning, implementation, and control. The data sharing between parties in the supply chain is of fundamental interest, and the flow of information is essential for carrying out an effective and efficient movement of goods.

The ICT technologies can provide a variety of benefits for the customers of the transportation services. Customers are able to get up-to-date information about the location of the goods due to the tracking and tracing technologies used. Furthermore, customers are able to get information, based on calculations, about the environmental impact of the transport services which the customer is making choice on. Additionally, the improved control of the transport chain using ICT brings reduced delivery time. These and other benefits are provided for the customers due to the use of electronic systems and easier information exchange, thus simplifying the access to different kinds of information and procedures regarding the transport chains.

Dry Ports must be an integral part of a logistics chain, therefore, they should be incorporated into the networks and linked to other transport terminals by implementing information and communication technologies. Moreover, not only the links from a Dry Port to other nodes should be based on ICT, but also Dry Port management, as that would significantly contribute to the implementation of lean operations and creation of efficiency in a Dry Port.

7.1. ICT-based logistics networks

Several main advantages, giving new perspectives for the companies, can be gained with the establishment of network of the transport centres:

- New potentials given by the community of the transport centre (or the Dry Port);
- Safe and quick communication and information exchange in the network;
- Possibility to implement new services due to cooperation;
- Cheap usage of new technologies and ICT supported services. (NeLoC, 2003)

The creation of network and easy communication enabled by ICT between a Dry Port and other transport nodes is a necessary mean for the organisation of lean movement of goods. This is especially true in relation to port and Dry Port communication, in order to solve port congestion problems and to stimulate the use of MoS. The solutions used and improvement of advanced information systems is one of the most important instruments for achieving efficiency in logistics activities, enabling planning the routing in advance and scheduling of the shipments (Kabashkin, 2007).

Usually each of the parties in one transport chain use different information and communication systems. Diverse semantic data standards exist between different regions of the world (e.g. in Europe - EDIFACT, in North America – ANSI, ASC, X12). Therefore, data integration platform, which would connect (transform) the information and data between the involved companies and authorities, should exist in such transport terminals as ports.

Kabashkin (2007) suggests several advantages of computer based information systems in transport chains:

- Improved management through tracking and tracing, together with more efficient control of own services and those of subcontractors;
- Outsourcing transport services, but staying in control of logistics performance;
- More accurate and transparent information on market demand and supply.

Despite the predicted advantages and potential of network based on ICT establishment, sometimes the positive results are not fully reached due to several major factors:

- Big companies located in a logistics centre or other transport terminal/complex often have their own network, thus they are not interested in joining other networks;
- Local technological solutions often are not able to change constantly and follow the new technologies or the changes in logistics standards. (NeLoC, 2003)

While implementing information and communication systems in transport terminals, possible problems have to be kept in mind. The logistics industry is dynamic and is experiencing continuous changes. Therefore it is necessary to implement such system, which can be renewed and adopted to the changes.

In NeLoC (2003) the functional and technical profile of the system is suggested. From functional side it is recommended to pay attention to the benefits in economic and quality sense, consider logistics and transport processes, also individual demands and existing solutions. Moreover, the system should be optimal for both individual and joint usage. Additionally, technical characteristics should include individually or jointly usable toolboxes, open architecture and interfaces, high level availability and safety standards, finally, the ability to integrate existing information technologies should be evident.

The following example explains the case of ICT in German ports and illustrates the communication between different actors in logistics chains. Additionally, the example illustrates the complexity of communication in transport chains, which is simplified using communication technologies.

A consignor and a consignee negotiate a contract to deliver some goods, e.g. bags of peanuts, in a container. They share the responsibility of the transportation chain according FOB (Free on board), which is one of the thirteen incoterms[5]. For the operation of the transportation chain they decide to do it in own responsibility (Merchant Haulage). The consignor makes a contract with the forwarder A to transport the container to the export terminal (terminal A). The consignee makes a contract with a shipping line and another forwarder (forwarder B) to operate the rest of the transportation chain. The shipping line offers the terminal operation to the consignee. He pays the terminal operation via the THC (Terminal handling charge) to the shipping line. The shipping line has a contract with the terminals for the handling operation.

[5] **Incoterms** or **international commercial terms** are standard trade definitions published by International Chamber of Commerce (ICC) and most commonly used in international sales contracts. The scope of Incoterms relates to the rights and obligations of the parties to the contract of sale with respect to the delivery of goods sold, but excluding "intangibles" like computer software. (ICC, 2009)

Also the forwarders have contracts with hauliers which are realizing the physical transport. The relations and links between the companies and involved authorities are simplified shown in *Figure 15*.

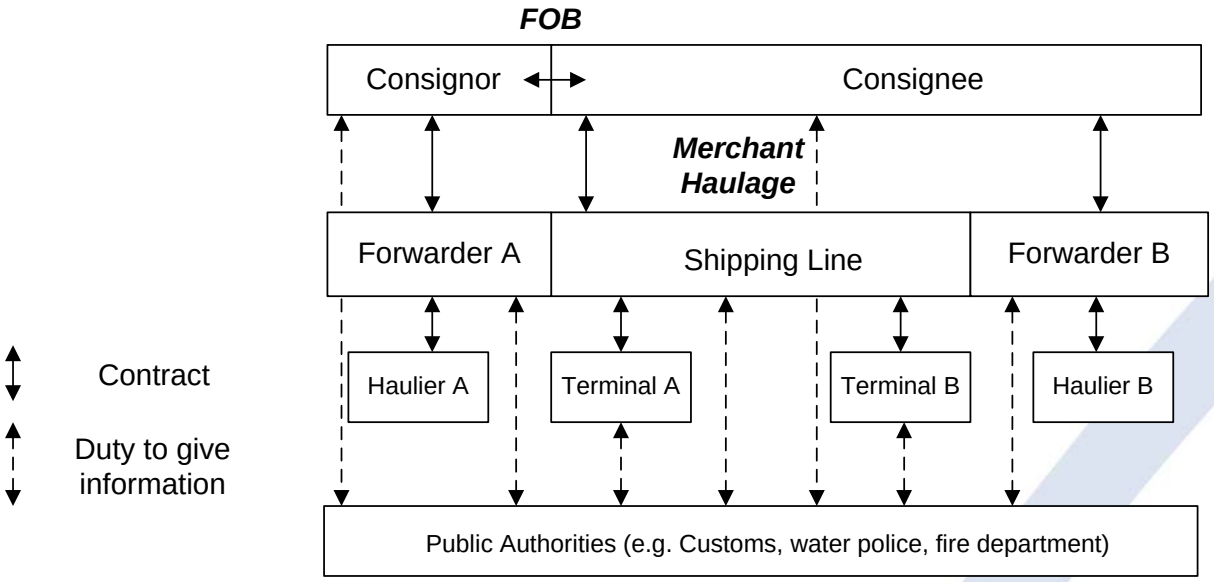


Figure 15. Contracts and legal links within a transportation chain. Source: inputs from Hafen Hamburg Marketing partners.

As mentioned before, thirteen incoterms exist. The transportation chain can also operate in carrier's haulage mode. More parties as shown in Figure 15 can be involved in a transportation chain. Each of the involved parties can use different information and communication. As it was mentioned previously, different regions of the world have different semantic data standards. An example is shown in Figure 16. Therefore all German overseas ports have a data integration platform, which transforms the information and data between the local involved companies and authorities. These platforms from port to port are individual and provided by different companies. In Hamburg the biggest platform is provided by the Dakosy AG. Bremen and Lübeck have other companies. Most of the companies are subsidiary companies of the local companies, for example by forming corporate models (AG = Aktiengesellschaft, German for corporation).

However these platforms have a drawback from a point of view of fair competition between the companies. Each of the companies providing data integration platforms has a data exchange monopoly in the port. Improvements and innovation can only implemented according to their business concepts.

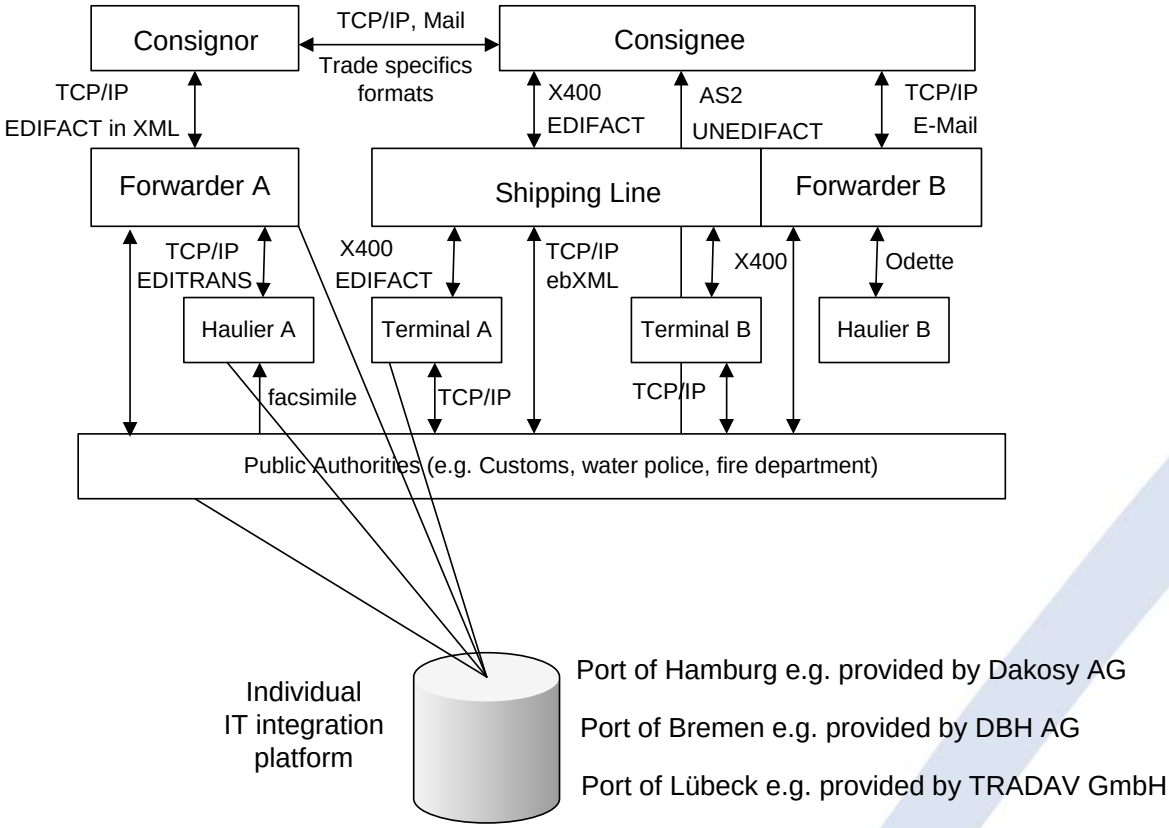


Figure 16. ICT and IT integration platforms in ports. Source: inputs from Hafen Hamburg Marketing partners.

7.2. ICT-based operation management in Dry Ports

Recently a lot of changes have taken place in European combined transport sector, e.g., increased popularity of intermodal services in priority terminals; significant increase of handling volume per terminal; the shift of economic risk of block train services from railways to intermodal operators creating conflicts with terminal operators regarding the process of loading/unloading trains; introducing new rail production systems (shuttle trains, multi-departure services); increased popularity of hub systems which require rail-rail transhipments at terminal, and others (UIC, 2007). In relation to the changes, the processes in intermodal terminals have become more complex and interdependent.

Information technology is one of the key means for reaching the efficiency in intermodal transport terminals, especially at large ones, as IT systems enable easier and advanced co-

ordination and management of the complex transport operations. IT systems located in a piece of software are supporting the operations of intermodal terminal. This support generally is related to the road-side inbound and outbound clearance of intermodal shipments, the rail-side inbound and outbound clearance of trains, and the road/rail transhipments of loading units (UIC, 2007). The main aim of the installed terminal management system is to improve the quality and efficiency of terminal operators. Additionally, the real examples have revealed that it can help to increase the capacity by 5-10% (UIC, 2007). For example, the computer programme TERMES is being used in the Dry Port of Madrid. This program enables the use of the wireless network in order to manage the traffic without documentation.

Mentioned facts witness that IT-based management systems would be undoubtedly valuable in a Dry Port implementation and could bring significant improvements in the whole transport chain, therefore it should be an incorporated element of fundamental equipment in a Dry Port.

7.3. Data management in Dry Ports

In relation to terminal management, it is important to mention data management. In such intermodal terminals like a Dry Port, it is crucial to have very smooth data organization and transfer, because part of the freight passing through the Dry Port is being cleared under customs. The quick and effective data management can be implemented with the help of EDI. A case of the Port of Valencia in Spain demonstrates one example. The port wanted to create a promotional and transactional Web portal, thus, it was necessary to provide an efficient way of comprehensive information on shipping services, as well as cost-effective tools for migrating paper-based processes to electronic media. In order to achieve these goals, the port deployed Microsoft integrated portal technologies. The portal for electronic information exchange allows cargo to pass through customs in several hours, whereas previously it used to take several days (ZDNetAsia, 2006).

The managers of Dry Ports should follow similar examples in ICT implementation in terminal management, in this way creating greater efficiencies for the services.

8. Dry Ports – Case Analyse

Previously the theoretic overview of different aspects about Dry Port implementation and integration into the transport chains was given. Further the two cases of Dry Ports are going to be analysed in details in order to illustrate two different types of Dry Ports. These types appear mainly due to different aims for initiative of the projects and funding structure.

8.1. Puerto Seco de Madrid (PSM)

The Dry Port of Madrid (in Spain known as Puerto Seco de Madrid – PSM) is an intermodal container terminal, which was initiated with a double strategic aim in mind. First, to support the interests of the State-owned Spanish Port System as a whole and of each individual port involved, also to promote the interests of Madrid as a top level logistics platform in Europe. Second, the initiative was aiming at promoting the use of rail transport and reducing road haulage, together fulfilling the EU policy for boosting combined transport. PSM forms part of the Trans-European Combined Transport Network. (Estrada, 2008, p.3)

The official purpose of the PSM's development is *"the design, construction, marketing, management, exploitation and operation of the rail container terminal known as the Puerto Seco de Madrid, and the provision of services facilitating both the handling and the transport and distribution of freight cargo"* (Estrada, 2008, p.3). At the time when the PSM was initiated, most Dry Ports in the world were serving a single port. The PSM was an innovative Dry Port because four competing ports worked in cooperation in order to develop the idea, share the costs and exploit the synergies and economies of scale that could be generated. (Estrada, 2008, p.4) The establishment of the Dry Port was necessary for these ports due to the constantly growing volumes of cargo (Figure 17). At present the capacity of the terminal is reaching 100.000 TEU per year.

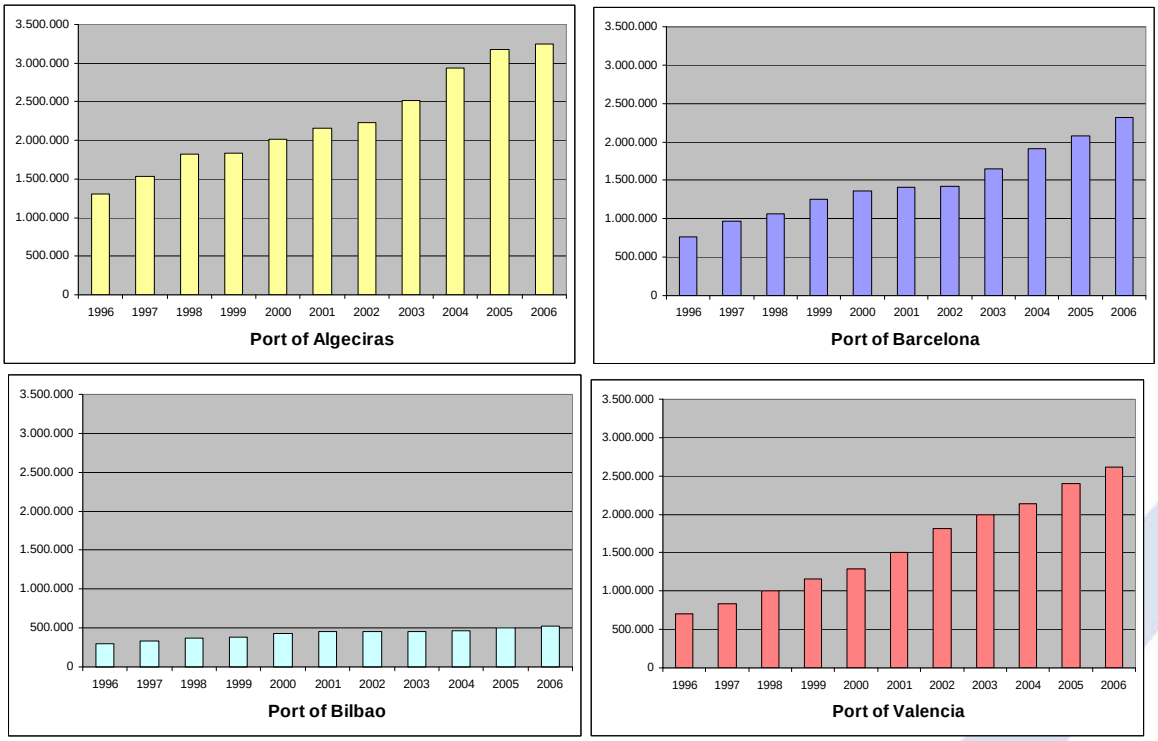


Figure 17. Container traffic evolution of the ports of Algeciras, Barcelona, Bilbao and Valencia in TEUs. Source: Estrada, 2008, p.4.

During the first five years of PSM operations (2000-2005), cargoes from thousands of containerships were handled. The Dry Port handles containers of many sea ports; however, 60% of them relate to the port of Valencia (Tsilingiris and Laguardia, 2007). In 2003 the Spanish Government approved a law (Ministerio de Hacienda, 2003) granting the Dry Port of Coslada with all the legal rights to offer custom and inspection regulatory services offered in water ports.

Considering the further development of the PSM, it is important to highlight that in the future it is planned to connect other Spanish ports to the PSM facilities when the traffic between these ports and the capital increases. Last year (2008) the cargo handled surpassed 60.000 TEU (Figure 17). At present expansion works of the PSM are being performed, thus in the future the capacity of the terminal will exceed 100.000 TEU/year. (Estrada, 2008, p.3)

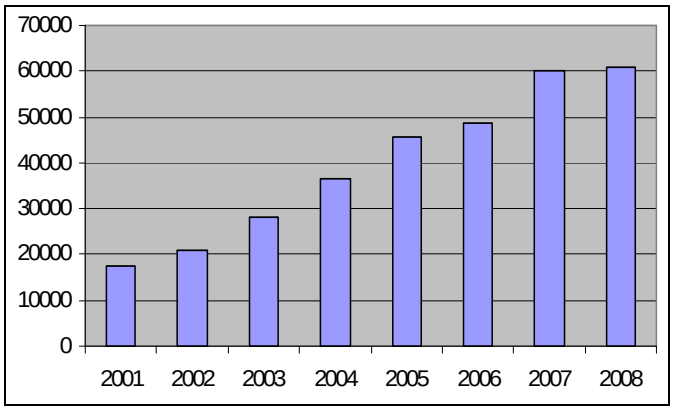


Figure 18. Traffic evolution of the Madrid Dry Port (TEUs). Source: Dry Port of Coslada, 2009.

There are also other Dry Ports under development in Spain, such as those being developed in Madrid, Zaragoza and other interior locations. Dry Ports in Spain are functioning according to the port model, combining several transport modes without facing congestion problems. Their locations are chosen according to the intersections of main inland transportation flows and in a close distance from important consumer demand areas.

Figure 19. Spanish mainland transport corridors. Source: Ministerio de Fomento, 2004.

There are several Dry Ports planned to be placed on these transport corridors identified by the Spanish Government (Tsilingiris and Laguardia, 2007). The nodes are divided into different classes (sub-regional, regional, inter-regional and international) and they depend on the flow intersection, proximity to demand poles and infrastructure connection. These Dry Ports are

shown in the figure below. There are several nodes marked by red spots, which means international class and the Dry Port of Madrid is one of those.

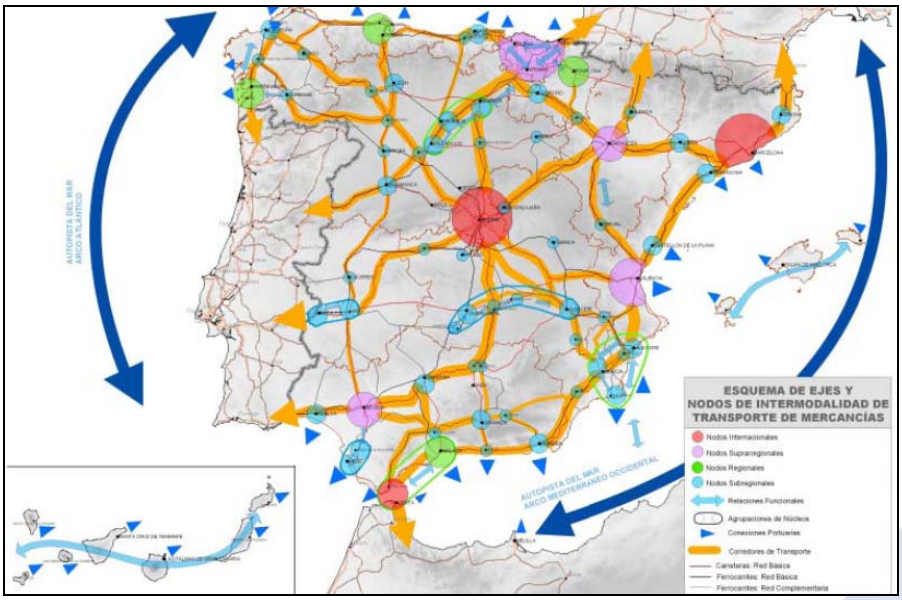


Figure 20. International (in red), inter-regional (in mauve), regional (in green), and sub-regional (in blue) Dry Ports of Spain. Source: Ministerio de Fomento, 2004.

8.1.1. Location of PSM

The municipality of Coslada, where the PSM is located, has a direct rail link to the Spanish Ports of Algeciras, Barcelona, Bilbao and Valencia. These four ports currently handle the highest container traffic on mainland Spain (Figure 19). The Port of Lisbon has recently started to cooperate with the Dry Port.

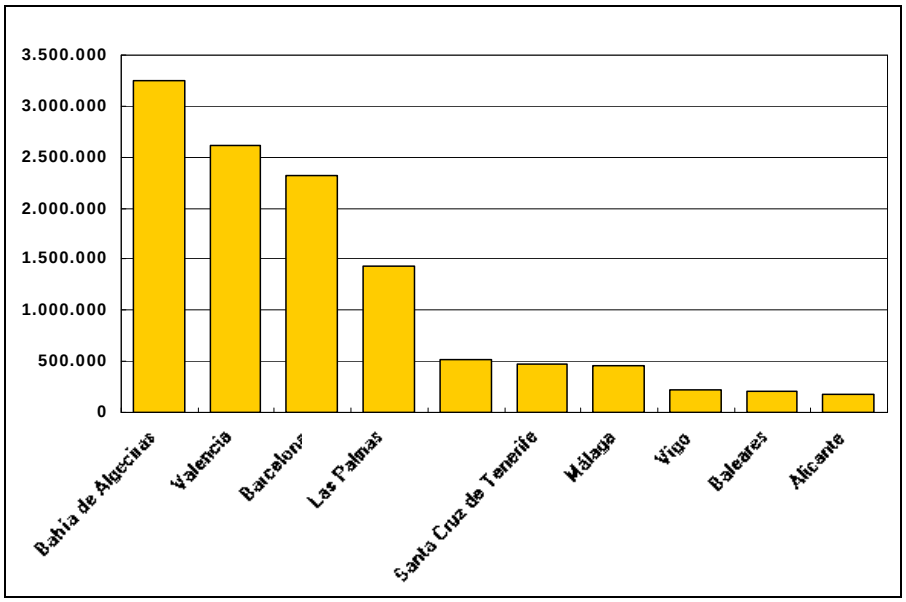


Figure 21. The Top Ten Spanish container ports: containers (TEUs) 2006. Source: Estrada, 2008.

The choice of locating the PSM in Coslada was made due to the following main reasons:

- Coslada is located in Madrid metropolitan area, which is a huge production (the second largest city by production in Spain) and consumption (4 million population together with 7.5 million consumers in Madrid service area) centre;
- Good national and international intermodal connections with Coslada area taking into consideration the radial motorway network and rail network;
- Many logistics services companies are located in the Coslada area, the most exceptional of which include the Coslada Integrated International Transport Centre (the CITI), the Madrid-Barajas Air Cargo Centre (the PSM is located next to Madrid's international airport, Madrid-Barajas) and the Vicálvaro rail station specialising in freight traffic.

(Estrada, 2008, p.4)

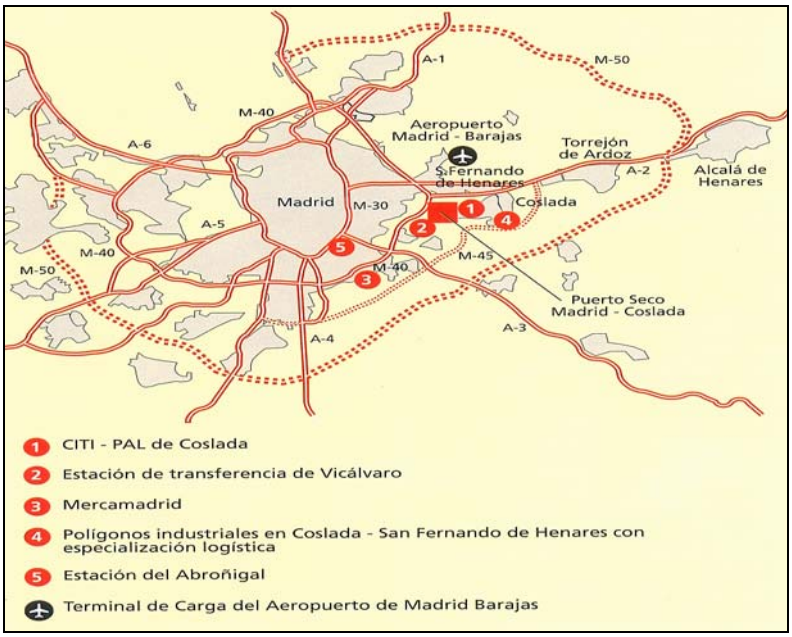


Figure 22. Location of the Dry Port of Madrid. Source: Estrada, 2008.

The listed aspects of location supported the Dry Port with high potential for the large volumes of goods flows, which are transported in long distance by rail. Thus the costs of transportation are low compared to the long distance transportation by truck. Moreover, the location of the number of logistics service companies in the same area gave the possibility for the Coslada Dry Port terminal to be a part of a large logistics platform.

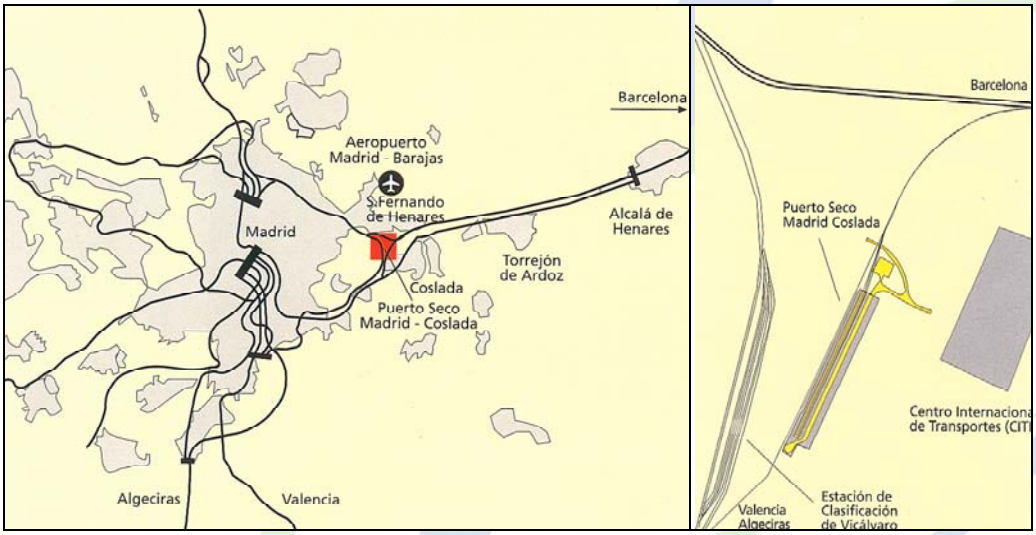


Figure 23. Rail network connection and general layout. Source: Estrada, 2008.

8.1.2. Governance of PSM

The Dry Port of Madrid was formed and is managed by the public corporation, whereas the operations are being carried out by the public-private partnership. In 1995 the company, called *Puerto Seco de Madrid, S.A,* was formed in order to manage the Dry Port. The company is responsible for the control of the functions carried out by the operators which were chosen by public bidding (Estrada, 2008). The founders of the *Puerto Seco de Madrid, S.A* were: the Spanish Port Authority, the port of Algeciras, the port of Barcelona, the port of Bilbao, the port of Valencia, the Autonomous Government of Madrid and a Spanish governmental company (Tsilingiris and Laguardia, 2007). From the beginning, operations of the terminal and the rail transport between the PSM and the sea ports are performed by a concessionaire (under a ten-year concession), the private company CONTE-RAIL S.A. (CR), owned by public company Renfe (main railway operator of Spain) (46%), *Dragados* SPL (50%) and *Puertos del Estado* (4% stock holding). (Estrada, 2008, p.10). Additionally, in 2007, a new operator called Continental Rail (a private company 100% owned by the construction Spanish group ACS) started transport operations (2 trains a week), developing land traffic from and to Valladolid – a city which is 150 km away far from Coslada. (Estrada, 2008)

The land used by the PSM is available due to the agreement reached among the Ministry of Development, the Madrid Regional Government, the Coslada Local Council and the State Company Ports of State (Puertos del Estado) together with the State Society for the Promotion and Development (SEPES). The above mentioned agreement guarantees the availability of this land for 50 years (Estrada, 2008).

8.1.3. Services offered in PSM

The following main services are provided in the PSM:

- At the dry port terminal: container handling, warehousing, haulage, rail car handling, train formation, documentation and data services, customs services, container consolidation/deconsolidation, container maintenance, goods storage and empty container depot supplies.
- At the port rail terminals: container handling, train formation, supply of documentation and data, and administrative procedures.

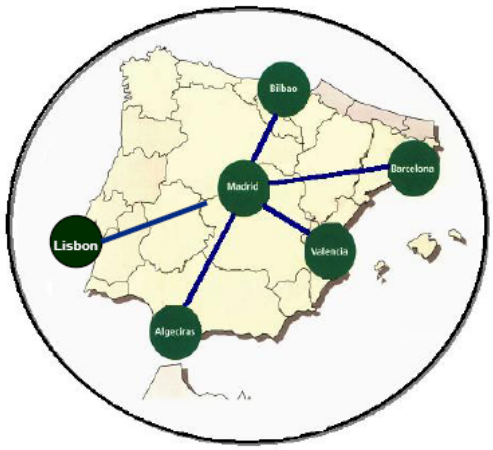
- The concessionaire is responsible for providing rail transport between the dry port and the seaports.

(Estrada, 2008)

8.1.4. Customs clearance at PSM

The provisional authorization of the customs clearance in the PSM was issued in February 2000, whereas the definite authorization was issued on April 2003.

The customs office of the Dry Port of Madrid is working with the external transit (suspensive arrangement) under cover of T1 form (see Annex 5). Mainly containers with imported non-Community goods are handled. In the case of imports, PSM is the customs office of destination, whereas Barcelona Seaport, Bilbao Seaport, Valencia Seaport or Algeciras Seaport are the customs offices of departure. When the containers-train arrives to the Dry Port, the customs police watch-over the containers security seals. The railway company finishes its transportation work and the containers remain under customs office control. The external transit procedure ends when the required documents are produced at the customs office. (Dry Port of Coslada, 2009)



Concerning an external transit for exported goods, PSM is the customs office of departure and the Spanish seaports are customs offices of destination.

The risk of the transported goods is taken by the operating railway companies – Renfe and Continental Rail. According to the Community Customs Code (1992), no comprehensive guarantee is needed in the PSM case: *"Article 95.1. Except in cases to be determined where necessary in accordance with the committee procedure, no guarantee need be furnished for: [...] (d) operations carried out by the railway companies of the Member States."*

8.1.5. Concluding remarks about the Dry Port of Madrid

PSM appeared due to the public sector's initiative and is a result of successful Spanish ports' cooperation. The Dry Port is supporting the customers with long distance transport services which are offering reliability, high quality and relatively small costs. Additionally, the risk of congestion on the roads and in the ports is reduced. Moreover, the direct rail connection between the Dry Port and ports is attracting the increasing goods flows; thus, the intermodal transport is promoted and sustainable transport development is complied.

8.2. Central Euro – Asia Gateway (CEAG)

CEAG is a logistics centre project which is being developed in Latvia, close to the city of Jekabpils. The project idea is to develop a multimodal logistics centre with rail and road transport, storage facilities, customs clearance, sorting, assembling, marking, packing and other value added activities. The Logistics Park covers 1,650,000 m^2, whereas together with the industrial zones, factories and other facilities the total area is more than 3,000,000 m^2.

The goal of CEAG is to develop the land corridor between the Far East and Europe and become one of the main gateways along this corridor. The corridor is illustrated in the picture below.

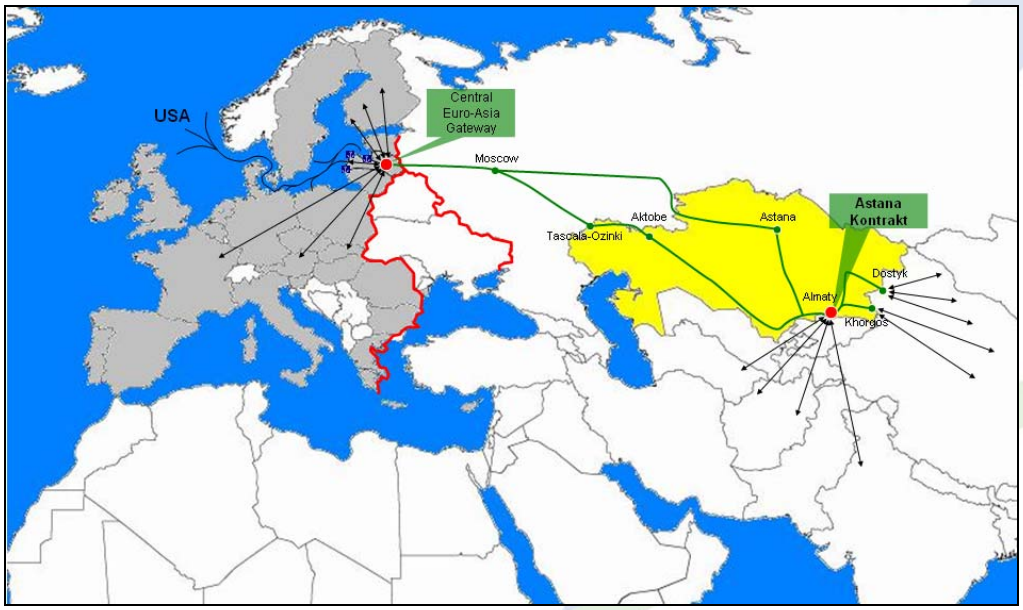


Figure 24. Functional model of CEAG. Source: CEAG presentation, 2008.

Though officially the term *logistics centre* is used for describing facilities of the CEAG, according to the features of the centre, it can be also called a Dry Port. More exactly, it should have a status of a Dry Port mainly due to its direct connections to the ports, roads and railways networks passing the territory, customs clearance and value-added services.

At present CEAG is in the development phase, however, certain functions are already implemented or will be available in a short period of time. CAEG will mainly provide consolidating and deconsolidating services to regular container block trains in traffic

respectively from Far East to Europe, as well as, from Europe and USA to CIS[6] and Central Asia via Baltic Sea ports. In addition palletized and packed cargo, which is transported by railway wagons and trucks, will be handled in CEAG. At present the development of CEAG may be divided into several stages:

- 1st stage of development is the Multimodal container terminal (handling of block-trains and road transport; 8 railway tracks, each 850 m; 4 RMG cranes and 3 Reach Stackers). Start of operations – autumn 2009;
- 2nd stage includes development of warehouses and assembling plants (approximately 72 000 m^2 covered space). Period between 2011 and 2013;
- 3rd stage – possible extension of the CEAG by obtaining reserved 100 hectares additional territory.

8.2.1. Location of CEAG

CEAG takes the strategic position at the crossroads of multiple main railway lines. These lines are connecting CEAG to six nearest Baltic ports (Klaipeda – 375 km, Liepaja – 355 km, Ventspils – 325 km, Riga – 150 km, Paldiski and Tallinn – 410 km). Additionally, there is a connection to the Trans-Siberian route and the St. Petersburg-Warsaw railway lines.

Figure 25. Rail network around CEAG. Source: CEAG website, 2009.

[6] CIS – Commonwealth of Independent States - regional organization whose participating countries are former Soviet Republics. The members are Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Moldova, Kyrgyzstan, Russia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan.

Railways and network of roads together with detailed planning of territory layout in a way to use existing internal road, buildings and runaway infrastructure in the most effective way are some of the important aspects making the location of CEAG exceptional.

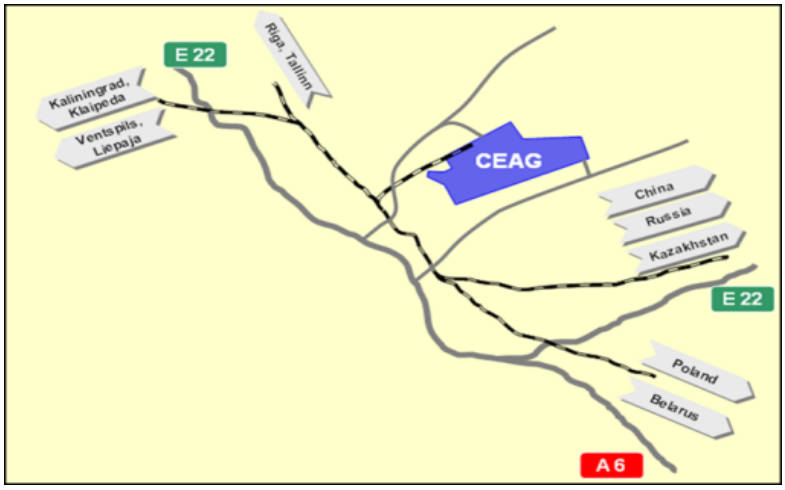


Figure 26. Strategic location of CEAG in the rail- and road- network. Source: CEAG website,2009.

8.2.2. Governance of the CEAG

The project was initiated, is being developed and owned by a private company – SIA Loģistikas Partneri – the leading logistics and international trade consulting company in Latvia, which has successfully realized a number of logistics projects in Europe and CIS countries. However, in the near future the ownership may change and different investors may become the major shareholders (~60%). At present SIA Loģistikas Partneri is carrying out development of the concepts and functional planning of several logistics centres in Kazakhstan. The idea is to link CEAG and those logistics centres into one network, and to establish new and competitive transport channel between China and Europe. Whereas the goods coming from China can pass Latvia through CEAG and be shipped further by the sea.

One of the main factors giving potential for a successful future of the CEAG project is the direct access of SIA Loģistikas Partneri to owners of cargo flows, terminals and hubs, which are serving Far East. Goods flows along the corridor appear because of the activities in Kazakhstan and China (e.g., industrial zone on China – Kazakhstan border; total territory of China side is around 140 km^2, total territory of Kazakhstan side is around 60 km^2). In such a way, already from the very beginning of the project the integrated network of logistics centres in Europe and Asia is established.

8.2.3. Services offered in CEAG

In CEAG logistics platform various services are going to be provided including transhipment, container and trailer loading, customs clearance and rent of tailor-made office spaces, warehouse and industrial premises. The following main services are offered for different groups of clients:

For railway operators:

- Modern and effective railway hub functioning according to the latest EU train handling technology, including 8 internal railway tracks (each 850 meters long), for handling container block trains and European railway organisation model;
- Handling of both - EU and non-EU goods is available in the Customs Control zone of CEAG

For logistics companies:

- CEAG as a railway hub consolidates large amount of different cargoes;
- Major customers (regional warehouses) are located within CEAG;
- Special customs clearance setup for trading with Russia, CIS and Central Asia.

For importers and distributors for European market:

- Overcoming trade barriers (quotas, licenses, etc.);
- Certification of the Product for use in Europe;
- Organizing appropriate Customs clearance model;
- Full logistics service setup (local and international);
- Advising on Trade organization alternatives (including tax planning);
- Rent of tailor made warehouse, office and industrial premises.

For exporters to CIS and Central Asia:

- Overcoming trade barriers (quotas, licenses, etc.);
- Organizing appropriate customs clearance model (both export and import);
- Full logistics service setup (local and international);
- Advising on trade organization alternatives (including tax planning);

- Rent of tailor-made warehouse, office and industrial premises.

Supporting services:

- VISA support (including invitation, VISA application procedure etc.);
- Assistance with accommodation (hotel reservations, rent of flat etc.);
- Legal assistance with Work permits;
- Full package of services for establishing (or buying) a Company in Latvia;
- Registration of Company as Tax Payer and VAT Payer in Latvian State Revenue Service;
- Assistance with Bookkeeping (full service possible);
- Others.

(CEAG website, 2009)

8.2.4. Customs clearance at CEAG

Customs clearance in CEAG will be performed by the 100% owned daughter company "CEAG Customs". "CEAG Customs" will provide 2 level customs clearance services:

- Mandatory services (initial and final clearance for full block-train);
- Customs clearance services for single containers/wagons etc. (normal customs clearance, which can be done also by customer himself or his broker).

In relation to the customs clearance at CEAG, the territory has physical security (fence and security service provider) and video surveillance.

8.2.5. Concluding remarks about CEAG

CEAG is an example of the Dry Port that appeared due to the private initiative and is being developed by private investments. Additionally, political support by Ministry of Transportation, Ministry of Economics, and Ministry of Foreign Affairs of Latvia has positively contributed to the development of the CEAG, its services and relations with partners.

With a high handling capacity (over 500,000 TEUs per year), completely computerised management system of container terminal, integrated traffic control modules for both rail and

road transport, a variety of added-value services and other aspects, CEAG has a great potential to attract goods flows and to become a link increasing the effectiveness in the transport chains. Moreover, due to the direct rail connections between the CEAG and Baltic ports, the goods coming from the East can be transported by train to the ports and shipped further to Scandinavian countries and Western Europe. Thus, the shift from road to short sea shipping and rail is significant. Together the environmental impact is reduced, as well as the costs for long distance transportation by truck would be higher in comparison with train or ship.

In the next chapter, Chapter 9 - *Integrating Dry Ports into the MoS*, the examples of the corridor between CEAG and Nässjö Logistics Park is an initiative for a new Motorway of the Sea service. This is based not only based on the link 'port to port', but on a more developed MoS term – 'Dry Port to Dry Port'.

9. Integrating Dry Ports into the MoS

9.1. Policy on MoS and Dry Ports

Motorways of the Sea are representing existing or new sea-based transport services that are integrated in door-to-door logistics chains and have particular features. MoS is one of the very important means towards a sustainable transport network as it is based on short sea shipping which, like it was mentioned in the beginning of the report, is one of the most efficient transport mode in relation to energy consumption and CO_2 emissions per tonne/km. Additionally, hinterland connection is an important part of the MoS concept. Especially rail connections are stressed to be important when considering MoS and hinterland connection. In this way, the EC is aiming to relieve road infrastructure and solve the problems of road congestion on Europe's main axes (EC, 2009). Inland waterway connections are considered to be a significant mean for reaching the latter aim as well. Moreover, MoS are crucial for improving access to peripheral regions and islands.

In relation to the MoS development, it has to be noted that the hinterland is an inseparable area of consideration when the creation of policies on and development of MoS is taking place (EC, 2009). Even thought the transportation of goods by sea is stressed, they have to be transported to the inland destination by land transport. Thus it is essential to integrate the MoS and inland transport in order to get an integrated logistics chain. Therefore, the investments should be made not only in port infrastructure and services, but also in the hinterland transport infrastructure in order to reach a better organisation of sea-based and land-based segments.

MoS projects have received strong political support through the European financing programmes TEN-T and Marco Polo II, through regional funds and the EIB. However at present only very few MoS projects have been implemented. Certain issues are seen as the challenges and barriers to face for the MoS implementation (EC, 2009, p.1-2):

- High complexity of co-operation between actors, organisational and administrative issues is characteristics for door-to-door transport chain based on MoS, thus the difficulties appear in the organisation of smooth operations and the financial side of a project;

- Proper integration of short sea shipping into the door-to-door transport chain is still not reached;
- The operations and infrastructure are not sufficient enough in the ports in relation to availability, reliability, efficiency of services and modal transfer;
- There is too much bureaucracy and lack of attractive pricing conditions in ports;
- **Bottlenecks in hinterland connection to the port, lack of Dry Ports;**
- It is necessary to build a reputation for MoS, which requires time and public support;
- The development of MoS has to be based on the needs of transport users;
- Too general criteria for MoS were defined up until now, which caused confusion;
- Confusion on the European funding opportunities;
- It is difficult to get long-term commitment from private sector partners for MoS projects, especially in the current economic situation.

In consequence, while developing the projects for MoS funding, the effort should be put in better integration of the MoS in the door-to-door logistics chain, better organisation of services and operations in order to reach the lean flow of goods, increased use of electronic documentation in order to reduced bureaucracy and paper work, and investments in infrastructure. Additionally, due to the confusion about the MoS concept and characteristics, and the low number of implemented MoS projects, the guidelines of the funding programmes are being revised while aiming at clearing up the uncertainties about the MoS concept and giving the lead for successful MoS development.

As a result, the possible key characteristics of the MoS are being suggested (EC, 2009, p.5-6). These are aiming at an adaptation of services, improving equipment and infrastructures in ports, removing bottlenecks in hinterland connections, implementing dry ports and streamlining operations and information flows with the intention of developing seamless goods flows across the whole logistics chain.

I. Integration of a transport chain and a European added value

- An intermodal door-to-door transport chain should suggest *customer friendly services* (easy to book, transparent tariffs, easy to pay for, monitoring freight location in real time, etc.), and well-*co-ordinated* transportation in the door-to-door chain.
- A *single window* for seamless, real time communication with clients.

- The *exchange of relevant information* among the operators in the transport chain in a common format.
- A *link* between at least two Member States or a Member State and a country which is not a member of the EU with a common border with the EU or with a coastline on a closed or semi-closed sea neighbouring the European Union.

II. Quality and viability of transport chain and growth potential

- *Reliable* services, *frequent*, *regular* and published schedules.
- *Short waiting time* at ports (sea, river or ***dry***) for completion of procedures, e.g. one hour is a good benchmark and objective.
- *Efficient modal transfer* of cargo and only exceptional delays possible.
- At least one departure per day for the regions with intensive trading and road traffic, and at least a few departures per week for remote regions with smaller trade exchange or non-congested inland traffic.
- The proposed MoS should target to overtake at least several percentage points of the traffic from the road leg.
- Potential of unrestricted *service growth* further for at least five years.

III. Efficiency and quality in sea ports

- Highly *efficient* and *competitive* port services.
- Ability to use *English* as a second language for all communications between shore and ship.
- The ports are giving the *priority to short sea shipping*.
- Ports related to the MoS have *non-congested connections to the hinterland*, where ***Dry Port*** terminal is a example.
- *Open and free competition* for all services and transport. The priority is given to rail and inland waterways connections

IV. Environment friendliness, safety and security

- *Low external costs*[7].
- The *security* offered by transport equipment and human resource of operators match with EU rules for safety and security.
- *No congestion problems* on the land part of transport corridor.

[7] External costs are - emission of noise, congestion, greenhouse gases and air pollutants, accidents, etc.

In these recommendations for the MoS criteria, Dry Port is viewed as a link, which can improve the efficiency and quality at the seaports when connecting it with its hinterland and together can act as a crucial means for streamlining operations across the whole logistics chain.

To sum up, the communication of the EC on MoS is giving a clear definition of MoS:

Motorways of the Sea are existing or new sea-based transport services that are integral part of door-to-door transport chains and concentrate flows of freight on viable, regular, frequent, high-quality and reliable Short Sea Shipping links. The deployment of the Motorways of the Sea network should absorb a significant part of the expected increase in road freight traffic, improve the accessibility of peripheral and island regions and states and reduce road congestion.

- *The MoS ports should ensure high standard efficient and competitive port services, including storage, pre and post delivery services, parking place and accommodations for accompanying personnel.*
- *The concerned ports are connected to their hinterland by sufficient and non-congested links including* ***through dry port terminals.***

The European co-ordinator for Motorways of the Sea, Prof. Luis Valente de Oliveira, has indicated in his annual reports in 2008 and 2009 the importance of the integration of logistics platforms (including Dry Ports) into the Motorways of the Sea.

9.2. Integrating hinterland with MoS

While the actors related to the short sea shipping are cooperating in order to compose the MoS and gain the support of the European funding for intermodal transport, they should not limit the MoS to the sea leg. Rail, inland waterways and/or short sea shipping combined in a MoS would strongly increase the chances of winning European financial support (Winters, 2009). Therefore, inland hubs, i.e. Dry Ports, which are connected to the ports by rail, should be integrated into the MoS.

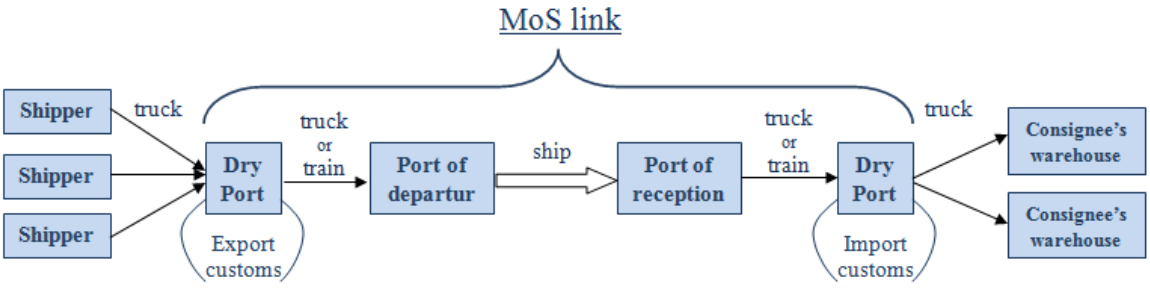


Figure 27. MoS link with a Dry Port. Source: own creation.

This section suggests the example of potential MoS with the integrated Dry Ports. The example of MoS consists of four links – CEAG, Free Port of Ventspils, Port of Oskarshamn and Nässjö Logistic Park. This corridor is under development and in the future freight movement through this corridor will be stimulated by Dry Ports. The important characteristics of CEAG were already analysed in sub-chapter 9.2. It was noted that CEAG logistics centre can be called a Dry Port. Additionally, it was mentioned that CEAG has a high prospective to stimulate the large flows of goods from the East, which could move further on to Europe after reaching CEAG. Additionally, due to the location of CEAG, it can act as a clustering link of freight coming through five Baltic ports (which were mentioned in Section *8.2.1. Location of CEAG*) from other parts of Europe and which would be transported to the Far East. In relation, one of the MoS could stretch from the CEAG in Latvia to another Dry Port in the other side of the Baltic Sea – strategically well located is Nässjo Logistics Park (LPN) in Sweden. Höglandets Terminal in Nässjo Logistics Park is recognized as Dry Port due to its facilities and services, which include customs clearance. Both of the Dry Ports have direct rail connections to the ports: NSL – with the port of Oskarshamn, CEAG – with the port of Ventspils. These four nodes, connected into the transport corridor, give the basis for the efficient Motorway of the Sea due to characteristics (quality system, modern equipment, high capacity rail connection, environmental management system, etc.), which are explained a bit broader in the descriptions of the nodes below. Moreover, investments for greater capacity and efficiency would be necessary in the future. Additionally, information and communication technologies would be the mean for ensuring the control and efficiency across the MoS.

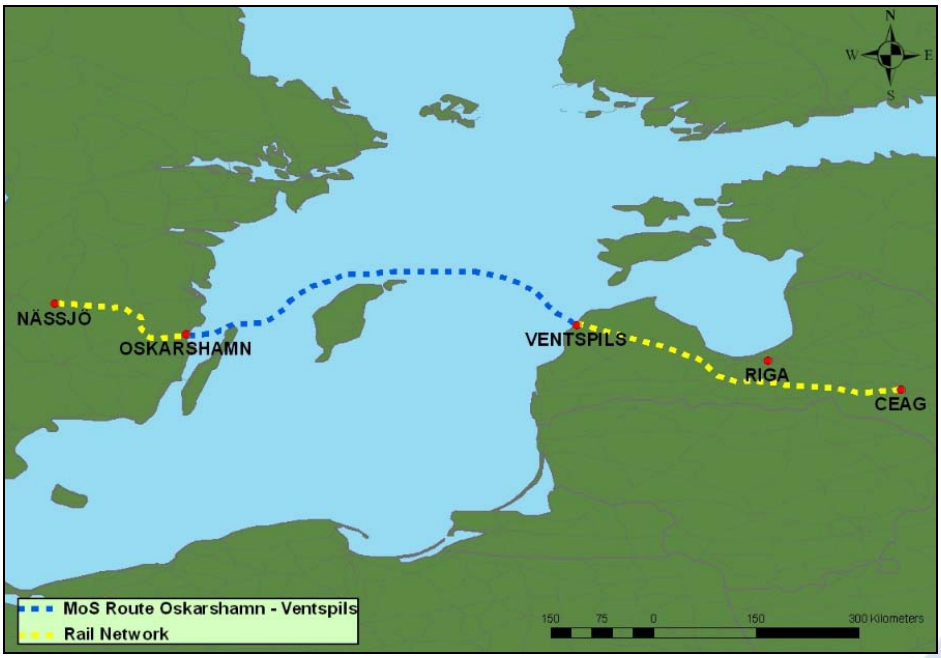


Figure 28. Corridor from LPN to CEAG.

Nässjö Logistic Park

Nässjö Logistic Park (LPN) is lying in a good location for serving the Swedish and Nordic markets for both inbound and outbound goods flows. Moreover, the highway E4 is stretching nearby, the main road 31/40 is passing the LPN and freight airport is located at nearby city of Axamo. Additionally, great investments in Swedish rail infrastructure in recent years were made in order to improve logistics in the country, which has strengthened Nässjö Logistics Park as a hub (Green Cargo, 2009).

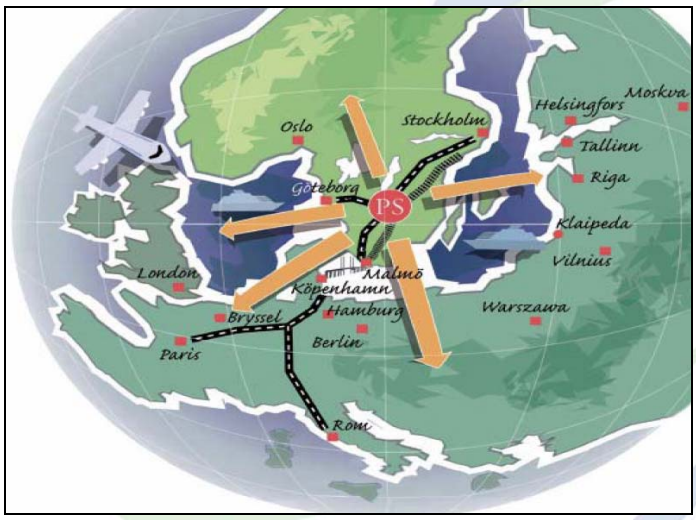


Figure 29. Location of Nässjö Logistic Park. Source: Logistic Park Nässjö presentation, 2008.

Höglandets Terminal AB is owned by the municipality and the private company Nässjö Åkeriet with equal parts. At present IKEA, JYSK, RUSTA and other logistics companies are operating at the Dry Port. Swedish Post has a terminal at LPN and together with Green Cargo they are making large investments in new train transport solutions for parcels and palletized deliveries. (Logistic Park Nässjö presentation, 2008)

Furthermore, innovative IT solutions are used in the LPN in order to be responsive and flexible for the customers' demands and needs. Additionally, environmental issues are taken into consideration while performing the operations in LPN.

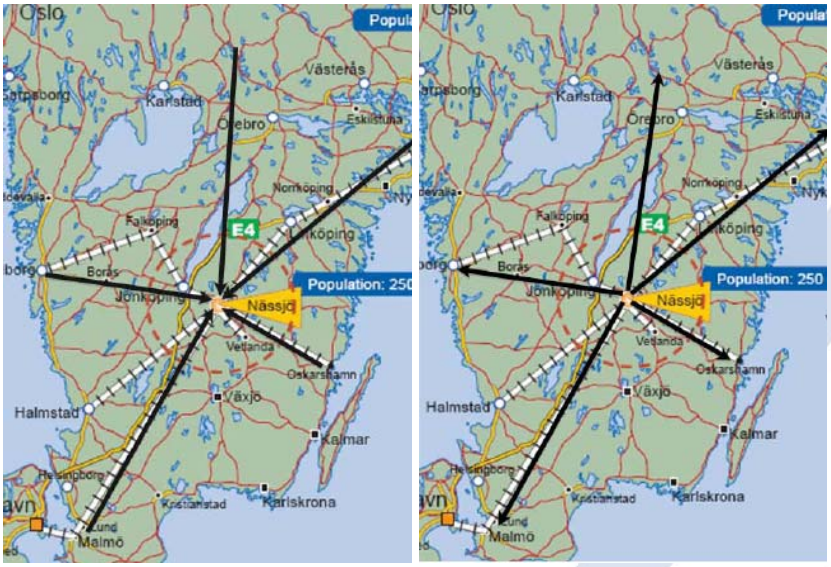


Figure 30. For both inbound and outbound logistics LPN is optimal. Source: Logistic Park Nässjö presentation, 2008.

The port of Oskarshamn

As it was mentioned, port of Oskarshamn has the direct rail connection to Nässjö Logistic Park. The efficiency and quality in the port is ensured by several aspects: the investment is being made for modern equipment (Invest in Sweden Agency, 2008) and the quality system. The ISO 9001 standard in the port of Oskarshamn describes the operative and administrative quality (Oskarshamns Hamn AB website, 2009a), port's management is responsible for establishment, application and sustainability of the quality system, the quality goals are established and the key measures are reviewed every month, quality requirements for resources, personnel and mechanical equipment are specified.

The port authority is also making extra efforts into improving the environmental performance of the port of Oskarshamn.

Figure 31. Port of Oskarshamn vision. Source: Oskarshamns Hamn AB website, 2009b.

Free Port of Ventspils

The Free Port of Ventspils in Latvia is one of the leading ports in Baltic Sea region by total traffic volume (Saurama et al., 2008). The ice-free port occupies 2623,9 ha, and is suitable for transhipment of different kinds of cargo (crude oil, oil products, liquid chemicals, fertilizers, metals, forest and fish products, coal, containers and Ro-Ro cargoes). Moreover, at present employment of the port is hardly reaching 50% of the maximum capacity, thus a Dry Port in this case could be a facilitator for additional goods' traffic through the port.

The port has implemented special safety means regarding the oil products to ensure that it would not reach the sea water. Additionally, the actors in the port are operating under environmental management system:

- The biggest companies of the port have international certificates for quality management system ISO 9002 and environmental management system ISO 14001.

- All of the port companies have obtained Environmental Licenses granted by Environmental Department of Ventspils City Council.
- At present environmental protection measures in the Free Port of Ventspils are implemented according to 3rd Draft of environmental Policy Plan of Ventspils, which covers 10-year period.

(Ventspils Free Port website, 2009a)

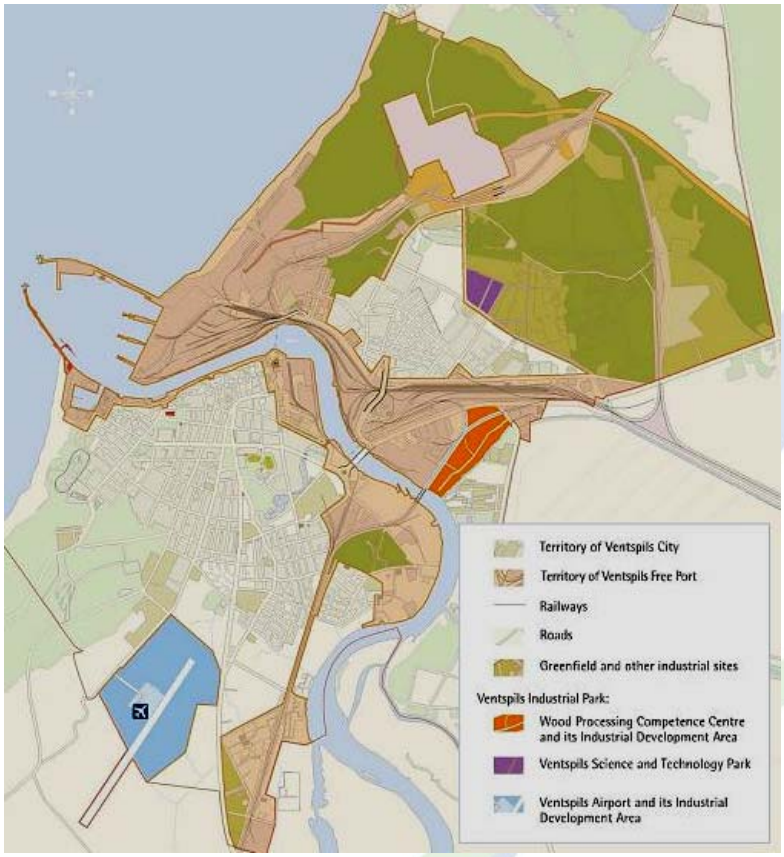


Figure 32. Territory of the Freeport of Ventspils (in pink). Source: Ventspils Free Port website, 2009b.

Transport hubs named in this sub-chapter have important characteristics for being a part of MoS, such as quality systems in the ports, environmental awareness and efficient infrastructure and connections. In order to effectively integrate the parts of MoS, however, investments have to be made in information technologies in order to improve the communication and information exchange between the management bodies in different transport nodes, transport modes operators and other organisations included in the MoS, in order to move towards cost-efficient and time saving solutions. Moreover, the security and safety of the goods in the entire corridor must be ensured, if it is insufficient, by improving a control and technologies used.

MoS services can act as an important role in balancing the transport modes, however, in order to be capable of attracting the goods flows, the services of MoS must be an efficient part of seamless logistics chains. Thus, the MoS services should contain such characteristics as integration, quality and viability for increasing the capacity of the transport chain, efficient sea ports and Dry Ports, safety, security and environment-friendliness. Dry Ports should be functioning as links in the MoS, which are increasing the capability of the ports and thus the general capability of the MoS. However, in order to create efficient MoS, all the links have to be integrated in the transport chain and should have the features which are creating quality in each of them individually.

10. Challenges of Dry Port implementation

The implementation of a Dry Port can bring significant advantages, however the realisation of such terminals or their later exploitation may be impeded by several major challenges.

First, Dry Ports are an extra transhipment point between two different transport modes. This means that additional costs in the total transport chain expenses are increased. These additional costs include monetary costs (terminal handling charges) and risk costs (damage) (van Klink and van den Berg, 1998). Thus, the attractiveness of the Dry Port and intermodality can decrease. However, this challenge can be surmounted with the high level of volumes handled (van Klink and van den Berg, 1998).

Second, long and complex planning process is relevant in relation to implementation of Dry Ports. Due to bureaucracy it may take an extensive time period until all the approvals related to the project and territory planning are obtained. It becomes a problem when a Dry Port project is initiated due to already existing transport chain bottlenecks, for instance, congestion in the port, port city pollution or road congestion in the port city and access to the port area. When the total time of implementation of the project takes too much time, the problems in the transport chain are increasing and later the implementation of a Dry Port may already not be a reasonable solution, thus additional solutions may be required.

For example, in Germany in order to start an implementation of Dry Port's or another kind of terminal's project the planning procedures named in the figure below are required.

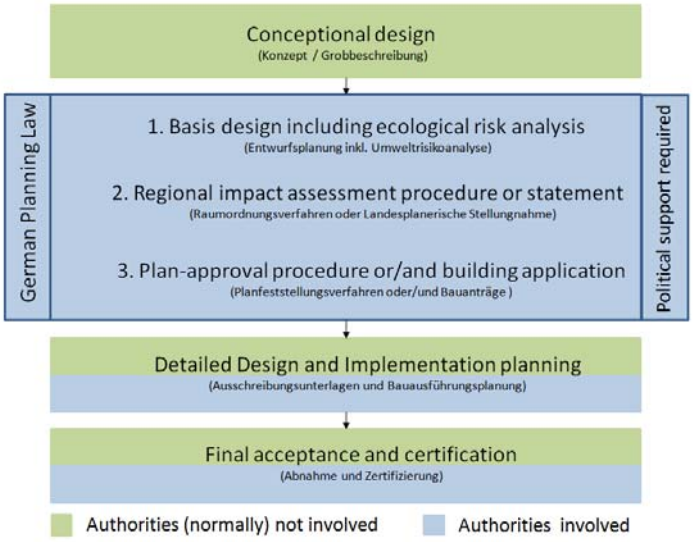


Figure 33. The procedures for the approval of the Dry Port implementation in Germany. Source: Schönknecht, 2009.

The above illustrated procedures - from the beginning of conceptual design until the final acceptance and certification – according to the calculation of ILS Integrierte Logistik-Systeme GmbH (Schönknecht, 2009), would take approximately 10-20 years. The congestion problem which the Port of Hamburg, Germany is facing today is already creating bottlenecks for the smooth flow of goods. A Dry Port could be a good solution at present to improve the performance and to increase the capability of the port, however if the implementation of the project lasts so long (more than 10 or even 20 years), it means that the Hamburg port will have to struggle with continuing congestion and loose a possible increase in capability.

Third, the lack or absence of investment source can appear as a significant impediment for Dry Port implementation. For example, the extension of hinterland for the Port of Hamburg is necessary at present, however the port is not able to finance the Dry Port by itself as the terminals at the port have only one source of income – the shipping lines. Any improvements in the hinterland connections have no direct benefit for the port terminals. Getting public investment is also impossible because the areas of the Dry Port and port would be located in different federal countries. Hamburg cannot invest easily in a Dry Port in e.g. Lower Saxony and vice versa. In this case the project of a Dry Port should be accepted as a national project and integrated in the queue of the German Federal Transport Infrastructure Plan.

Fourth, residents' resistance may be influential for the plans of the logistics sight development nearby, due to the risk of increased noise and pollution of the traffic to and from the site.

Thus, if there is a possibility, Dry Ports should be implemented further from residential areas. However, Dry Ports located close to port cities should not be strictly rejected. Even though viability of intermodal transport on shorter distances is heavily argued between academics, a research on close Dry Ports made by Roso (2008) has shown close Dry Ports' feasibility in some cases (Sydney's Port Botany and its close intermodal terminals).

Fifth, some difficulties may be faced after the implementation of a Dry Port. For example, when the container is checked and sealed at a Dry Port, it should be checked again at the seaport, since the cargo may be changed (robbery, modification, etc.) during the transportation to a seaport. Moreover, when the transportation concerns a unit loaded with hazardous material, a sign must be placed on the unit. The problem, which should be dealt here with, is that the signs, which should be put for rail transportation, are different than the signs to be used for maritime one. (Roso and Leveque, 2002)

Problems may also appear if a newly implemented Dry Port is equipped improperly, or the capacity is lower than the capacity of the ports, which a Dry Port is connected to. Real life cases where such problems appeared are the Dry Ports of Kurasini and Tabata in Dar es Salaam, East Africa. The companies which have been subcontracted to operate here were lacking essential facilities, including sturdy cranes for lifting containers. The lack of facilities resulted in inefficiencies in cargo handling. (IPPmedia, 2008)

The appearing challenges should not, however, prevent those interested in developing a Dry Port from doing so. Good communication and cooperation between different public and private bodies is necessary in order to enable effective solutions for the bottlenecks in the logistics chains.

11. Summarising recommendations

The Dry Port will be the link in the transport chain, which helps to improve the services of the MoS, if it is an integral part of the MoS. Therefore, certain features should be characteristic for the Dry Port and connecting infrastructure, certain actions should be executed in order to integrate the Dry Port.

- Dry Ports should provide such services, which can supplement the ports. Especially in the case of port's congestion, the services or functions which are taking relatively long time should be outsourced to a Dry Port. Examples of services can be customs clearance, sorting, long/short time storage, etc. In this way the port is relieved from the congestion and the transport chains become more efficient and lean.
- A Dry Port should be beneficial regarding supply chain efficiency and effectiveness. The Dry Port can also contribute to a better environmental performance of the total logistics chain.
- A Dry Port should have high capacity, modern equipment and infrastructure, as well as adequate storage capacity in order to be able to create benefits for different actors.
- The potential customers (freight forwarders or shippers) will be encouraged to integrate a Dry Port in their transport chains if this link is able to suggest added value, which can be created by the possibility to choose from the number of tailored services in the terminal, services adding value to the goods (e.g. labelling) or by providing certain services which are usually provided in the ports and in this way solving the problems regarding the lean flow of goods.
- High capacity and efficient hinterland infrastructure should connect a Dry Port with the port.
- The suitable location should be selected in relation to the distance from the port, technical and economical aspects. These aspects can help to evaluate the costs and competitiveness of the intermodal transport. However, not all areas are suitable for Dry Port implementation. For example, it can be difficult to find suitable location for building a Dry Port in Norway due to its landscape and scale of Norwegian ports.

- Information and communication technologies should be a mean for effective co-operation between different actors in MoS (e.g. ports, Dry Ports, rail operators, etc.) and for availability of customer friendly services.
- Management of operations in a Dry Port should be based on the information and communication technologies in order to enable easier and advanced co-ordination and management of transport operations, and to ensure safety, security and reliability.
- Governance of a Dry Port has to ensure transparency and equal treating of the customers and equitable infrastructure charging.
- Several transport modes should be served in a Dry Port.
- The problem of different labelling of the sea and rail transport should be solved.
- The possible role of Dry Ports in the logistics chain should be stressed more in the relevant European policy documents on Motorways of the Sea. There is still too little focus on hinterland infrastructure (between ports and Dry Ports) when MoS are discussed. Member States on their turn should invest in port hinterland connections to and from Dry Ports. However, Dry Ports are only one possible element of a MoS based transport chain in certain situations. MoS can in other situations also function without Dry Ports.
- The European Commission and the Member states should work on measures that may facilitate the integration of Dry Ports in the logistics chain: national single windows for integrated maritime transport, a single European transport document.
- Within the Logistics Action Plan, the European Commission plans to carry out a benchmarking of intermodal terminals in 2010. This should result in a code of best practice or in key performance indicators. The publication and dissemination of this benchmarking should contribute to a better use of and integration of intermodal terminals, including Dry Ports, in the logistics chain.
- The Dry Port should be considered by: the port cities where the goods from the ports are transported only by road; congested ports; national transport policy makers and planners of the countries, which are supporting the environmental efficiency; freight forwarders, looking for efficient and value adding nodes in the transport chains, and other actors of the logistics sector.

Dry Ports can be significant facilitators of development of efficient MoS services. All the listed characteristics are important for Dry Port implementation as a link in MoS. However, they cannot be applied equally in all cases. The degree of importance for implementation of each feature depends on the individual case of the Dry Port. Dry Ports can become an important link in transport networks while also acting as a clustering point for ports.

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Annexes

Annex 1 - Definitions of different intermodal inland terminals

Freeloading site – this type of terminal is characterized by simplicity. Basically it has an incoming track that is not electrified, a surface capable of sustaining the weight from the load and loading equipment and connection to road infrastructure. Occasionally terminals of this kind have a loading platform. Cargo handled at these sites is generally of low value, e.g. round timber. (Woxenius et al., 2003)

Wagon-load terminal – terminal has the features of the freeloading sites but is always equipped with a loading platform enabling loading and unloading from rail wagons with fork-lift trucks. Sometimes these terminals also contain water sheltered platforms. General palletised cargo is handled as well as other kind of cargo. There is also storage facility which is similar to ordinary lorry terminals with roof, walls and gates. The terminal area is sometimes fenced for higher security. Traditional terminal services are also provided , such as forwarding, stuffing, storing and stripping. (Woxenius et al., 2003)

Light-combi terminal – like a freeloading site light-combi terminal has a surface capable of sustaining the weight from the load and loading equipment and connection to road infrastructure. There is a fence surrounding the terminal area. (Woxenius et al., 2003)

Conventional intermodal terminal – this kind of terminal is able to handle all kind of ITUs, also relatively large flows of ITUs in an efficient way regarding the cost and the resource to lower the handling cost per ITU but have the basic characteristics as freeloading sites. To achieve this, terminal has to be well structured and have investments in facilities and lifting equipment. Lifting equipment can either be a gantry crane reaching over some railway trucks and lorry driving lanes or counter-balanced trucks. Moreover, terminal is facilitated for storing and handling dangerous goods. Office and staff space are also located in the terminal.

All standardised units, such as containers, swap bodies and semi-trailers, can be handled at these terminals. A number of additional services related to ITUs are provided by the terminal. Examples of such services are storing of full and empty container, dangerous goods handling. (Woxenius et al., 2003)

Annex 2 - The original vision for a paperless trade and customs environment

1. All customs and trade transactions are to be handled electronically and IT systems in each member state ought to offer traders the same facilities and be fully inter-operable; seemingly operating as if they were one single system.
2. All import and export compliance requirements are to be channelled through one single entry point / gateway.
3. The electronic exchange of declarations, including required supporting information and accompanying documents, would become the norm. Traders ought to be able to lodge declarations and notifications directly from their own IT systems.
4. The electronic transmission of harmonised data through common interfaces will allow traders to avoid the duplicate submission of similar data to other, non-customs agencies (e.g. for VAT, Excise, veterinary and other procedures). With reference to the Single Window concept traders will have to provide data only once, irrespective of the number of member states involved in the shipment.
5. Existing customs procedures are to be simplified and reduced from thirteen to three: importation, exportation and suspensive regimes.
6. The merger of existing procedures would allow the use of single guarantees for all procedures, including VAT and Excise.
7. The Single European Authorisation (SEA) would no longer be subject to bi-lateral agreements between member state customs administrations, and permission for central simplified clearance would be granted by the customs office responsible for the place where the trader is established, holds his main accounts or performs his main economic activities.

The original vision for a paperless trade and customs environment, set out by the Commission in 2003 (COM(2003)452), has seven key features. Source: Grainger, 2008.

Annex 3 – The list of European Community Members

The customs territory of the Community comprises of the territory of:

- Belgium,
- Bulgaria,
- the Czech Republic,
- Denmark, except the Faroe Islands and Greenland,
- Germany, except the Island of Heligoland and the territory of Büsingen,
- Estonia,
- Ireland,
- Greece,
- Spain, except Ceuta and Melilla,
- France, except New Caledonia, Mayotte, Saint-Pierre and Miquelon, Wallis and Futuna Islands, French Polynesia and French Southern and Antarctic Terrirories,
- Italy, except the municipalities of Livigno and Campione d'Italia and the national waters of Lake Lugano which are between the bank and the political frontier of the area between Ponte Tresa and Porto Ceresio,
- Cyprus (pending a settlement to the Cyprus problem, the application of the Community 'acquis' is suspended in those areas in which the Government of the Republic of Cyprus does not exercise effective control),
- Latvia,
- Lithuania,
- Luxembourg,
- Hungary,
- Malta,
- the Netherlands in Europe,
- Austria,
- Poland,
- Portugal,
- Romania
- Slovenia,
- the Slovak Republic,

- Finland,
- Sweden,
- the United Kingdom of Great Britain and Northern Ireland and the Channel Islands and the Isle of Man.

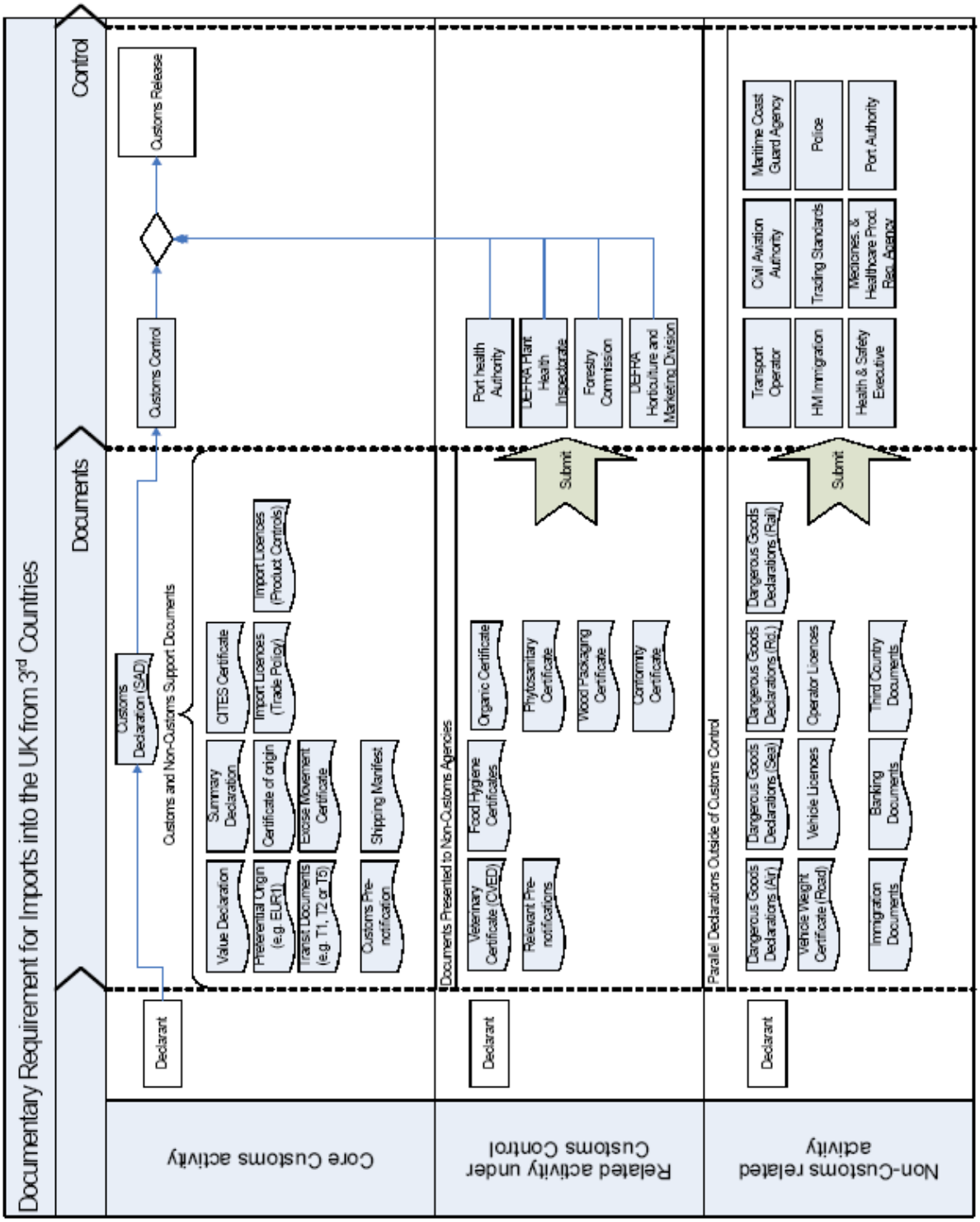
The customs territory of the Community includes the territorial waters, the inland maritime waters and the airspace of the Member States, except for the territorial waters, the inland maritime waters and the airspace of those territories which are not part of the customs territory of the Community as listed above.

The following territories, including their territorial waters, inland maritime waters and airspace, situated outside the territory of the Member States, shall also be considered to be part of the customs territory of the Community:

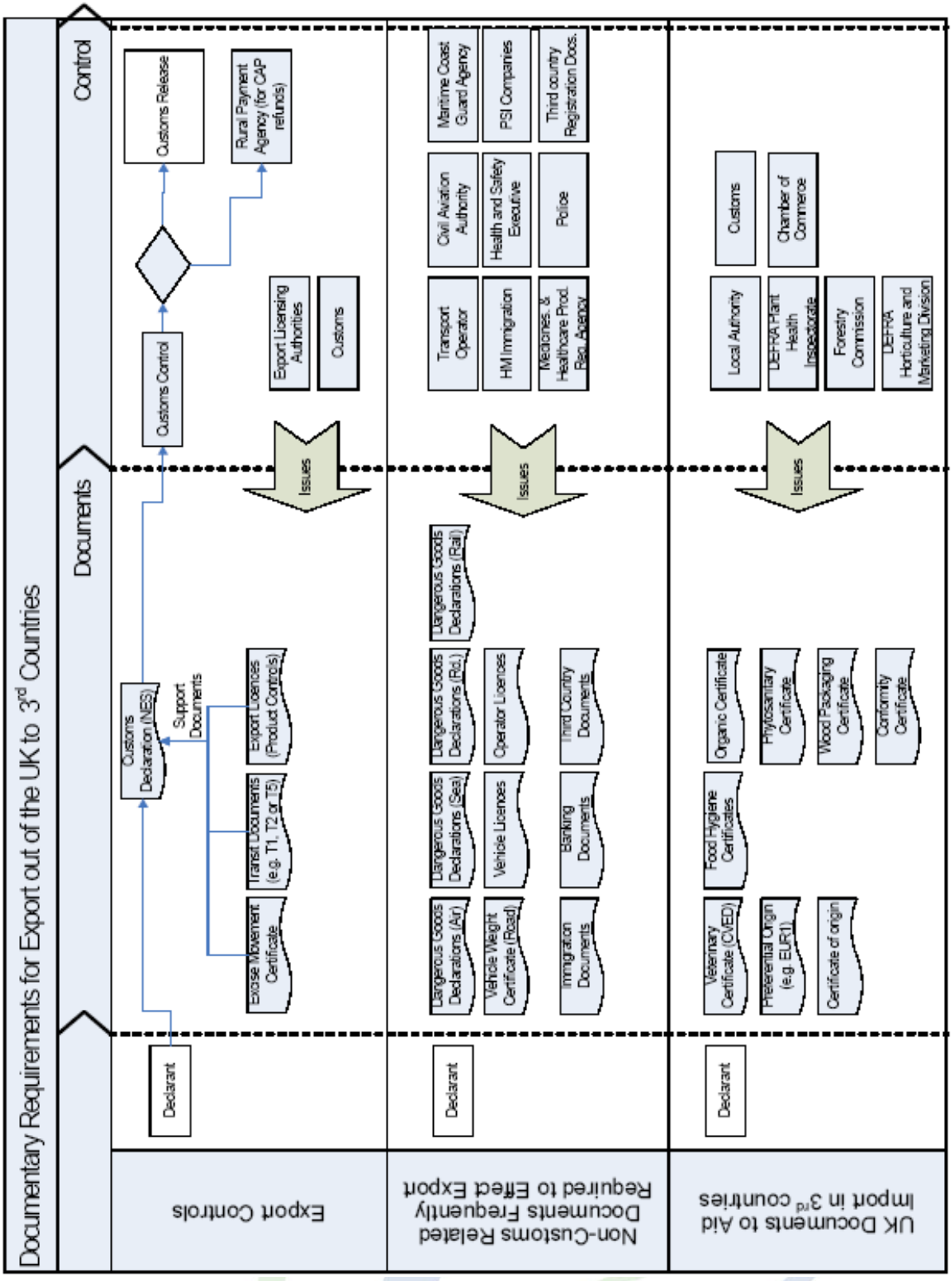
- the territory of the principality of Monaco;
- the territory of the United Kingdom Sovereign Base Areas of Akrotiri and Dhekelia, in Cyprus.

Source: EC, Taxation and Customs Union, Customs Glossary. Retrieved from http://ec.europa.eu/taxation_customs/common/glossary/customs/index_en.htm on 05-06-2009

Annex 4 – Documentation Requirement for imports and exports in UK

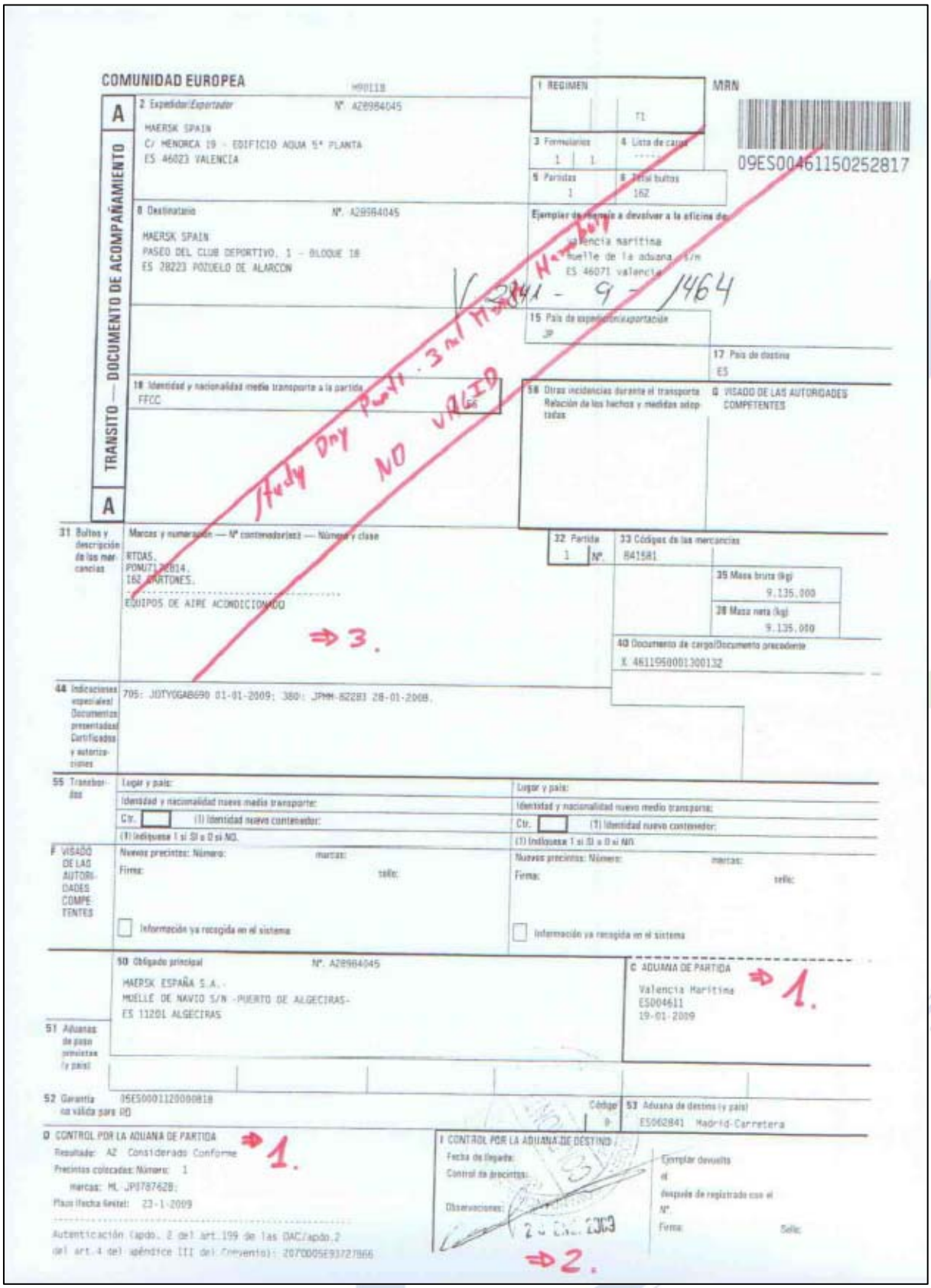


(Grainger, 2008, p.8)



(Grainger, 2008, p.8)

Annex 5 – T1 transit document



COMUNIDAD EUROPEA

TRANSITO — DOCUMENTO DE ACOMPAÑAMIENTO

A

2 Expedidor/Exportador N° A28984045
MAERSK SPAIN
C/ MENORCA 19 - EDIFICIO AQUA 5ª PLANTA
ES 46023 VALENCIA

1 REGIMEN T1

MRN 09ES00461150252817

3 Formularios 1 | 1

4 Lista de cargas

5 Partidas 1

6 Total bultos 162

8 Destinatario N° A28984045
MAERSK SPAIN
PASEO DEL CLUB DEPORTIVO, 1 - BLOQUE 18
ES 28223 POZUELO DE ALARCON

Ejemplar de ejemplo a devolver a la oficina de:
Valencia Maritima
Muelle de la aduana S/n
ES 46071 valencia

15 País de expedición/exportación
JP

17 País de destino
ES

18 Identidad y nacionalidad medio transporte a la partida
FFCC

19

59 Otras incidencias durante el transporte
Relación de los hechos y medidas adoptadas

G VISADO DE LAS AUTORIDADES COMPETENTES

31 Bultos y descripción de las mercancías
Marcas y numeración — N° contenedor(es) — Número y clase
RTDAS.
PONUT120814.
162 CARTONES.
EQUIPOS DE AIRE ACONDICIONADO

32 Partida 1 N°

33 Códigos de las mercancías 841581

35 Masa bruta (kg) 9.135,000

38 Masa neta (kg) 9.135,000

40 Documento de cargo/Documento precedente
X 461195000130013Z

44 Indicaciones especiales/Documentos presentados/Certificados y autorizaciones
705: JOTYOGAB690 01-01-2009; 380: JPHH-82283 28-01-2008.

55 Transbordos

Lugar y país:
Identidad y nacionalidad nuevo medio transporte:
Ctr. (1) Identidad nuevo contenedor:
(1) Indíquese 1 si SI o 0 si NO.

Lugar y país:
Identidad y nacionalidad nuevo medio transporte:
Ctr. (1) Identidad nuevo contenedor:
(1) Indíquese 1 si SI o 0 si NO.

F VISADO DE LAS AUTORIDADES COMPETENTES

Nuevos precintos: Número: marcas:
Firma: sello:
Información ya recogida en el sistema

Nuevos precintos: Número: marcas:
Firma: sello:
Información ya recogida en el sistema

50 Obligado principal N° A28984045
MAERSK ESPAÑA S.A.-
MUELLE DE NAVIO S/N -PUERTO DE ALGECIRAS-
ES 11201 ALGECIRAS

C ADUANA DE PARTIDA
Valencia Maritima
ES004611
19-01-2009

51 Aduanas de paso previstas (y país)

52 Garantía no válida para RO
05ES0001120000818

Código 0

53 Aduana de destino (y país)
ES002841 Madrid-Carretera

D CONTROL POR LA ADUANA DE PARTIDA
Resultado: AZ Considerado Conforme
Precintos colocados: Número: 1
marcas: ML JP1787628:
Plazo (fecha límite): 23-1-2009
Autenticación (apdo. 2 del art.199 de las DAC/apdo.2 del art.4 del apéndice III del Convenio): 207005E93727866

I CONTROL POR LA ADUANA DE DESTINO
Fecha de llegada:
Control de precintos:
Observaciones:
Cumplir devuelto el después de registrado con el N°
Firma: Sello:

1. 2. 3.

Annex 6 – German ports and their hinterland development

Forthcoming. This report will be written by TUHH and added to this document at the beginning of September 2009.