DRY PORTS IN SWEDEN - ONE OF A KIND?

Alena Khaslavskaya[a] and Violeta Roso[a,*]

[a] Chalmers University of Technology, Department of Technology Management and Economics, Division of Service Management and Logistics, Gothenburg, Sweden

Abstract: *Swedish dry ports have been often used as cases in the transport research, however there is no comprehensive study that identifies and categorizes Swedish freight transport terminal facilities meeting the dry port definition "inland intermodal terminal with direct rail connection to a seaport where customers can deliver/collect their containers as if directly at the seaport". This study aims to describe those facilities and to analyze them focusing on several distinctive characteristic identified from the literature on dry port. The study used primary and secondary sources of data. The findings show description and analysis of identified dry ports in Sweden: not only the number of them grew from two in the year 2009 to 12 in the year 2022, there are similarities but also differences when it comes to their distance and location, functionality and services, direction of development, maturity level, dedication, geography of operations. One characteristic they all have in common is Inside-out directional development.*

Keywords*: Dry port, intermodal terminal, services, Sweden*

1. INTRODUCTION

One of the roles of dry ports is to serve the seaports to release the pressure of growing cargo volumes and to reduce CO_2 emissions by modal shift from road to rail. Dry ports are commonly described in the literature as important nodes of inland transportation system benefiting multiple actors of the system from different perspectives. One of the benefits is for the regions located in the hinterland of the seaports where dry ports are implemented so that the availability of dry ports with the services offered attracts new business and investments in the area (Božičević et al., 2021). Previous research on dry ports has been focusing on different thematic areas usually based on cases of dry ports, often from different geographic regions, that are sometimes difficult to justify as comparable (Khaslavslaya and Roso, 2020). Such research instances help to rather underline differences than the similarities. However, there are country-specific studies and even a global perspective on dry ports such as e.g. Monios and Wilmsmeier (2012), where the authors make conclusions from several cases from across Europe and the USA

* violeta.roso@chalmers.se

and point out the different strategies of ports and authorities regarding hinterland infrastructure development. Swedish dry ports appear frequently in the research; one of the studies with the similar focus identified only 2 dry ports in Sweden in 2009 (Roso, 2009). Since then, many things have changed in the transportation system in Sweden, and the number of dry ports grew significantly. Therefore, the purpose of this study is to qualitatively describe the facilities identified as dry ports and analyze them focusing on significant characteristics identified from the summary of the relevant literature. The contribution of the paper lies in the analysis of all dry ports in Sweden with respect to their distance and location, functionality and services, direction of development, maturity level, dedication, geography of operations, the paper provides an updated detailed description and qualitative analysis of the dry ports in Sweden.

This introduction of the paper is followed by overview of dry port literature and Swedish transport system. Method chapter concisely describes the research approach applied. Findings are presented in the chapter four where all identified dry ports in Sweden are briefly described. This is followed by analysis and discussion and finally, the paper conclusions are presented in the chapter six.

2. DRY PORT CONCEPT AND SWEDISH PERSPECTIVE

Dry port concept emerged due to increasing need for efficient intermodal transportation in the seaports' hinterland (Wilmsmeier et al., 2011, Roso et al., 2009). On one hand, seaports have been facing capacity issues due to rising volumes of international trade as well as the increasing sizes of the vessels calling to the seaports. On the other hand, the landlocked regions have been seeking development opportunities and have been developing intermodal infrastructure to facilitate access to the seaports and their transportation network. Together, it led to development of a dry port concept (Wilmsmeier et al., 2011), defined as an inland intermodal terminal directly connected to a seaport by rail, where customers can leave/pick up their standardized units, as if directly at the seaport (Roso et al., 2009). The main idea behind the concept is to serve as the seaport interface inland which implies a presence of infrastructure that allows efficient transport of consolidated containerized cargo as well as frequent, scheduled, and reliable high-capacity transportation (ibid). Often the research on dry ports highlights the availability of rail infrastructure and rail shuttles as an element of dry port concept e.g. Bergqvist and Woxenius (2007), Chang et al. (2018), Rodrigue and Notteboom (2012), Roso (2008), and Roso and Russell (2018). Furthermore, dry port being a seaport's interface inland implies that the shippers/customers have an opportunity to handle their cargo at a dry port in the same way as if they would do it in a seaport i.e. that the services typical to a seaport are expected to be available at the dry port (Roso et al., 2009, Khaslavskaya et al., 2021). Dry port concept has a positive effect on sustainability components. Firstly, cost-efficient hinterland transportation by high-capacity transport modes (rail, inland waterways) compared to business-as-usual alternatives (road) could bring economic benefits to the whole supply chain (Khaslavskaya and Roso, 2019). Secondly, intermodal setup (hinterland transportation through a dry port) has lower environmental impact (especially if the rail is electrified) (Khaslavskaya and Roso, 2019, Henttu and Hilmola, 2011, Roso, 2007).

Finally, development of dry ports could stimulate regional development since availability of functional logistics solutions attracts new businesses to the area, which results in new job opportunities (Roso, 2009). The research on dry ports branched out in multiple focus

areas; among others, several scholars focused on identifying unique significant characteristics of dry ports that distinguish them from other inland terminals and classifying them. The summary of these is adapted from Khaslavskaya and Roso (2020), see the table 1.

Sweden has been used as a case in many research papers focusing on dry ports; and the researchers have focused on various aspects, starting with concept development (Roso et al., 2009) to much more specific aspects e.g. evaluating of the concept from an environmental perspective (Roso et al., 2009, Henttu and Hilmola, 2011, Roso, 2007), dry ports directional development (Bask et al., 2014), a potential of dry ports in Sweden to mitigate supply-chain disturbances on the example of a labor conflict (Gonzalez-Aregall and Bergqvist, 2019), role of dry ports in supply chains (Khaslavskaya and Roso, 2019). All the aspects risen in the research include several actors that influence operations and sustainability of the implemented concept. Those actors have been contributing to sustainable development of inland freight transportation (Monios and Bergqvist, 2016, Dooms, 2019) such as e.g. government authorities have required greener transportation.

Table 1. Dry port characteristics identified in literature

Criteria	Dry port types	Authors
Location and function	Close, midrange, distant Seaport-based, city-based, border	Roso et al. (2009) Beresford et al. (2012)
Development direction	Outside-in, Inside-out; Bidirectional Land-driven, sea-driven	Wilmsmeier et al. (2011) Bask et al. (2014) Monios (2011)
Maturity level	Pre-, start-up, growth phase	Bask et al. (2014)
Dedication	Shared (public), dedicated to an enterprise or cargo	Ng and Cetin (2012)
Geography of operation	Domestic, international	Do et al. (2011)
Transport mode	Rail-based, barge-based	Rodrigue and Notteboom (2012)
Service portfolio	Basic services; basic and value-added services; basic, value-added and customized services	Khaslavskaya et al. (2021)

The Port of Gothenburg, together with other major business actors, tried to significantly reduce carbon emission associated with its business by 70% by 2030. So-called “The Tranzero initiative” concerns electrification of large trucks and sea transport (Tranzero, n.d.). Earlier, the port has also been focusing on efficient hinterland transportation network under the “Railport Scandinavia” initiative, which implies electrification of rail lines and promotes a network of hinterland terminals connecting the hinterland with the

port [25]. In addition, regions in their development strategies have been driving infrastructure construction to reach out to the seaport and their established international transportation network (Khaslavskaya and Roso, 2019, Bergqvist and Monios, 2021).

3. METHOD

The data for this study has been collected from primary and secondary sources; by interviewing representatives of the dry ports and other actors related to their business but also from available reports/literature. In addition, student reports about intermodal terminals in Sweden from the course Freight Transport Systems thought at Chalmers University of Technology in the fall 2021 were used as an extra source of data. For each dry port a document with a summary was written, which also included a list of open questions when desired data was missing. The summaries were sent to the dry ports with the request for verification. In most cases the verification was handled vie e-mail correspondence, in few cases there were additional phone and Teams calls. Descriptive analysis has been applied on the data collected. Finally, identified and analyzed dry ports have been compared based on the criteria previously recognized and mentioned above.

The initial list of inland intermodal freight terminals was collected from sources of the Port of Gothenburg, which is promoting hinterland network of so-called Railports. The list was taken as a basis and then assessed together to the experts and limited to those that fit into the definition of dry port. The main criteria to include an inland intermodal freight terminal in the final list for the further research steps was an established regular train connection to/from a seaport (i.e. existing volumes to handle) and extra services available at the facility.

4. SWEDISH INLAND INTERMODAL TERMINALS IDENTIFIED AS DRY PORTS

This chapter briefly describes all identified dry ports in Sweden that are shown on the map in Figure 1.

Eskilstuna Intermodal Terminal is fully owned by the municipality through Eskilstuna Logistik och Etablering AB which initiated the development of the terminal which is a part of the logistics center. The terminal has rail connection to seaports by Green Cargo, GDL and TX-Logistics. It was established in 2003, first it was operated and managed by Green Cargo, since 2004 the daily operations at the terminal are performed by M4 with their own equipment and personnel – a consortium owned by 270 different transport and construction equipment companies from the Mälardalen region. The biggest customers are H&M, BSH Home Appliances, ICA, Volvo and Coop.

Jönköping Kombiterminal AB was inaugurated in December 2010. The land is owned by the real estate company Catena and the terminal itself is initiated and owned by the Municipality of Jönköping. The operations are managed by Bring Linehaul AB that is responsible for all the services available at the terminal. The largest customers are IKEA and Elgiganten, while there are some smaller companies also using the service of transporting their goods by train between Torsvik and Årsta, Stockholm.

Figure 1. Dry ports in Sweden

Umeå terminal was initiated due to Bothnia Line – rail link connecting the north and the south of Sweden – which was introduced in 2010. The terminal is also connected to Stambanan that allows access to the entire railway network of Sweden. Most inbound goods are transported by train from terminals located in Göteborg, Malmö, Helsingborg and Nässjö. Umeå Combi terminal is established and owned by Trafikverket and then leased to Infrastruktur i Umeå AB (INAB). INAB in turn has hired Sandahls Goods & Parcel (a private company) to handle the daily operations. The main customers are Volvo, IKEA, Biltema and Carlsberg.

Hallsberg Terminal was built in 2003, actors that were involved in the implementation were the Hallsberg municipality, Rail combi, Green Cargo and Euroshuttel. Logent AB took over the operation of the company in 2012 and started to run rail shuttle to the port of Gothenburg. The terminal is now owned by Catena AB a real estate company and has around 40 different customers. The terminal is directly connected to the Nordic region's largest marshaling yard is within a radius of 20 miles to over 50% of the country's population and over 60% of businesses.

Vaggeryds terminal was initiated in 2009 by PGF Terminal AB and they started the rail shuttle to and from the Port of Gothenburg. It began with signing an agreement between a paper company, municipality, and themselves to test the concept of a dry port. By April 2010 the terminal was ready, and the first containers arrived. Initially the terminal competitiveness was low due to risks of missing a time slot and thus delaying goods. However, the industry was interested and over time the terminal gained competitive advantage and reduced risks of delays. Now the terminal is owned by the municipality of Vaggeryd and is leased and operated by PGF Terminal AB, a part of the PGF Group.

Katrineholms Logistikcentrum is a development area of 1 000 000 square meters of land for the establishment of logistic operations. The site is strategically placed in the crossing of two of Sweden's main rail lines, the West and the South mainline. Its position also reaches a third of Sweden's population within a 15 miles radius. The terminal has been operating partly since 2010 and fully since 2011. The terminal initially was owned by the municipality, however, after obtaining municipal shares GDL became the major owner. The terminal has only one customer, that is GDL and they manage the operations to their own customers like e.g. Amazon Web Services, Bosab, Catena, Postnord AB.

Stockholm Årsta Kombiterminal is located six km from the Stockholm city center and serves more than three million customers through rail and road combined. It is Årsta Kombiterminal is owned by Jernhusen AB, and is since January 2017 operated by Väte Trafik. The implementation of the terminal was initiated by Jernhusen since they wanted to increase the value by developing the properties and the terminal. Jernhusen was also the main investor of the implementation. Green Cargo is the main rail operator, the terminal itself does not work with goods' owners, only with the operator.

Kombiterminal Gammelstad (Luleå) was inaugurated in 2003 and is owned by the Luleå municipality that together with Swedish transport administration works on the development of the terminal. The municipality owns the ground and the Swedish transport administration owns the tracks. The operator of the terminal is Sundahls Goods & Parcel AB. Main customers are Polarbröd and Scania, but also the forest industry and other companies established in Västerbotten and Norrbotten.

Sundsvall Combi Terminal, the existing combi terminal in operation is located centrally and is operating at the of the maximum capacity and the opportunity to expand is strongly limited due to vicinity of residential area. Existing flow of goods consist of a large proportion of hazardous goods that create heavy traffic through the city center. Therefore, new combi terminal is planned to be completed in 2024, location is north of the city close to the Tunadals port and with connection to the rail network. The process of building this new terminal begun in 2008 when the municipally of Sundsvall created the company Sundsvall Logistikpark AB and in year 2011 the zoning plan was adopted by the City Council. Sundsvall combi terminal works with many customers such as DSV, DHL, Noyroun, IKEA and Biltema.

Dry Port Falköping – Skaraborg Logistic Center was initiated by Falköping municipality in 2000. The terminal has a close collaboration with the Port of Gothenburg and has gone through a big improvement and expansion during the last years. The terminal started with operations in 2007 but had issues with volumes handled until Jula AB started to use the terminal in 2013. After contracting Schenker AB, Jula AB purchased the terminal from the municipality in 2018 and started to work on attracting more volumes to the terminal. Jula logistics is now the Owner and operator of the dry port. Transports are contracted to Schenker who are responsible for the transport by truck and Tågfrakt who are responsible for the trains. Even though the ownership transferred from the municipality to Jula there is still a close collaboration between the actors in the future plans of the dry port.

Insjön Kombiterminal is located in Leksand municipality which plays an important role for the large companies such as Clas Ohlson, Bergkvist Siljan AB, Tomokuhus and Ejendals. The development of the dry port was initiated in 2002, when Bergkvist-Insjön AB wanted

to secure their export of timber products to Asia. The terminal is operated by Vänerexpressen that connects the port of Gävle and the port of Gothenburg.

5. ANALYSIS AND DISCUSSION

5.1 Distance and location

According to Roso et al. (2009), dry ports functionality to some extent correlates with their location (or distance) in respect to the seaport that they serve; close, mid-range and distant. Another way to classify dry ports based on location/distance is to distinguish seaport-based, city-based, border-based dry ports (Beresford et al., 2012). In this study in the respect of location and function the dry ports were analyzed based on their functionality and distance from the port of Gothenburg. The distance from the Port of Gothenburg by rail is taken from the port's report, while the road distances are taken from the Google maps and the same are shown in Figure 2. Only three dry ports are located very far, more than 800km and those clearly benefit from use of rail. Five are on "medium" distance of 200-600 km away from the port and three are closer than 200 km to the port and therefore feasible for use of road but volumes and frequencies make the rail viable. The dry port in Nässjö is located 230 km away by rail while just 190 km by road and thus can be classified in different ways; it is classified to be close-range one in this paper which is closely related to its functionality discussed in the next chapter.

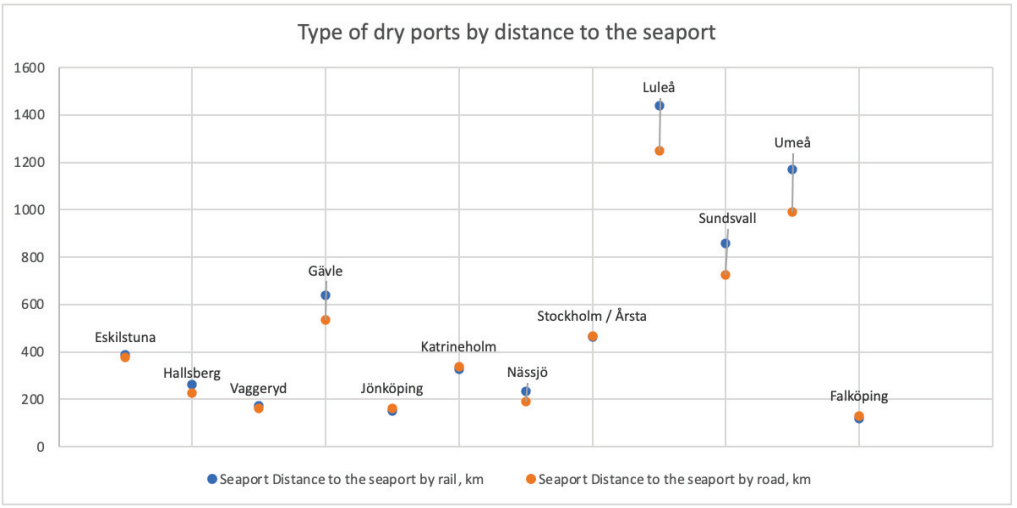

Figure 2. Distances to the seaport

5.2 Functionality and services

As per available services, the dry ports in Sweden have quite similar service portfolio which always consists of basic services and different set of value-added and customized ones. While if demanded, the dry ports are ready to add a requested service even if the volumes are not very significant and there is a competition between the dry ports especially located in relative proximity to each other. The most frequent services at dry ports are depot, handling of dangerous goods, reefer plugs, stuffing, transhipment, handling of empty and loaded containers, road haulage. Less frequent services are

container consolidation, online booking, safe parking for trucks / trailers, customs clearance, forwarding, warehousing, tracking and tracing, material control, subassembly, kitting and sequencing cross-docking, repacking and relabeling, quarantine, quality and inventory control, and repair. It is challenging to count exact frequency of services because some of them are available by request but not listed online.

Figure 3 shows services importance evaluated by stakeholders (transport operators, municipality, shippers, seaport). The importance is evaluated from 0 (not important) to 5 (very important), the graph allows to see the important per each stakeholder as well as it indicates the common perception of the importance per each service.

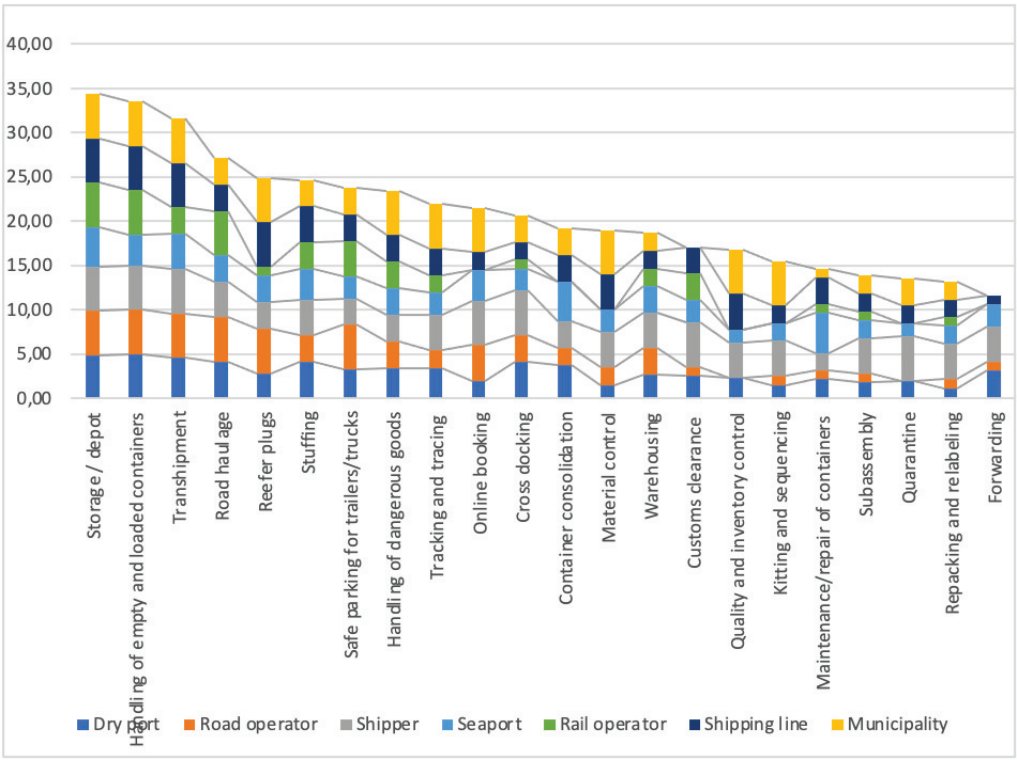

Figure 3. Dry ports services' importance according to the stakeholders

5.3 Directional development

Dry ports in Sweden are initiated by a several stakeholders located in the hinterland. The roles of actors change over the time together with the development of terminals. The findings show that all dry ports included in this study have followed the Inside-out model of the development, that means that the initiation of dry ports development came from actors located in the hinterland. Moreover, there has mostly been a common interest of the municipality to develop the region and at least of one large shipper with sufficient for a regular train volume. For example, The Eskilstuna Intermodal Terminal was initiated by the municipality when H&M in 2002 moved distribution center to the area. While the development was possible due to initiative or a great support from municipality, the

initial investments were financed jointly by municipalities, large shippers and in some cases by external grants aiming to support low emitting transportation solutions. For example, half of the finances for the dry port development in Luleå came from the Swedish Agency for Economic and Regional Growth. Vaggeryd dry port investments were financed by the municipality, EU grants, Traffikvärket and many other smaller investors. Sundsvall Combi Terminal obtained the investment from the Swedish Transport Administration, Svenska Cellulosa AB (SCA) and the county administrative board.

The role of the municipality in dry ports development steadily decreases as the terminal moves further along the developmental phases. It has been noted, a start-up stage of dry ports development (Bask et al., 2014) has always involved a respective municipality, on the later stages the municipality may have retreat in order to hand it over to the private actors. It has happened with Katrineholms Logistikcentrum where GDL became the owner of the terminal after obtaining municipal shares; Dry Port Falköping was purchased from the municipality by a large retailer company Jula AB who started to operate the terminal, obtained own rolling stock as well as established close cooperation with the rail operator Schenker AB. This being an exceptional case in Sweden, is also a case of success of a dry port operations. In Vaggeryd the terminal is leased and operated by PGF Terminal AB; in Umeå while Trafikverket (public authority) owns the facility, it is operated by Sandahls Goods & Parcel AB; M4 rents the terminal from the Eskilstuna municipality and owns machines and has own employees.

Interesting, that while the role of the Port of Gothenburg in the initiation and development of any dry ports in Sweden is minimal, the port is nevertheless promoting its "Railport Scandinavia" concept that encompasses all the possible dry ports and established rail network connecting to all of them. During interviews with other sea container terminals in Sweden it became evident, that the other seaports are not agreeing with such position. From the findings, a dry port in Sweden is a terminal with an established rail traffic. In line with this, there is another viewpoint that seaports as operators do not conduct such activities as hinterland distribution, while in fact the dry ports are part of the traffic arrangements that the railway operators offer to the market on equal terms. It became evident, that the biggest port enjoys its competitive advantage and perhaps to some extent does not let others into the business that it does not directly possess. It echoes the conclusions by Monios and Wilmsmeier (2012), where the authors point out only an assisting role of seaports in dry ports development. Similarly, Bask et al. (2014) pointed that the seaports' role not going beyond marketing of the dry port concept with the impalpable/unmeasurable positive effect on cargo flows and service demand at the dry ports.

5.4 Maturity level

In some cases we could observe similar patterns to the ones identified by Bask et al. (2014), that of the terminals are often initiated by an inland actor (municipality or an entrepreneur-minded person or a group of people and by joining the effort and obtaining (often municipal or private funds) the terminal is built constructed. For the current moment, there were no identified cases of a start-up phase of constructing a brand-new terminal, all the identified ones have passed the phase. It is fair to say that most terminals are in the growth phase which is recognized by operations and infrastructure development and capacity utilization of about 20-60% (where known). Many dry ports in Sweden have plans of extending the territory, operational areas, tracks, some of them have recently completed the same extension. There is also an interesting case which is not

simple to classify in the same terms – the dry port in Sundsvall – which in a way is undergoing a rebirth, or a metamorphose. The old intermodal terminal in Sundsvall was built about 50 years ago and has been operating on the maximum of its capacity; for the moment of this study there was an ongoing project of building a brand-new terminal to be completed by 2024 which would substitute the old one in its function. Somewhat similar phenomenon was observed in the case of Vaggeryd, where prior to the terminal construction operations with minimal needed investments were conducted at the old terminal adjusted for the needs of a dry port. After it had proved to be feasible the actual dry port terminal was constructed. While the cases are not identical, they have a similarity in their "metamorphosis".

5.5 Dedication

Officially dry ports are not dedicated to any enterprise in Sweden regardless of ownership: by a municipality or a private company. Most of them have contract with rail transport operators, not directly with the cargo owners. Most of the dry ports, however, poses information about the largest cargo owners and can name a few such as IKEA, Volvo, Elgiganten. Despite not being dedicated to a single shipper, trains between Jönköping and Gothenburg are popularly called "IKEA-pendeln (commuter train)" and between Falköping and Gothenburg – "Jula-pendeln" (commuter train). It does not mean that they transport goods only of those companies, but they do mainly. Interestingly, after the acquisition of the dry port by Jula AB in Falköping, the new owner would allow the containers of other companies to the train prior to their own to establish trustful and reliable relationships with new clients in new business area. It is out of authors' knowledge whether this is still the case of today.

5.6 Geography of operations

As it was previously mentioned, dry ports enjoy the benefits of the established rail network of Swedish rail operators such as Green Cargo AB, GDL, Real Rail, Schenker AB, Vänerexpressen AB. All the dry ports have rail traffic to/from the port of Gothenburg, some of them work with the cargo originating from/destined to other container seaports of Sweden i.e. Mälmö, Trelleborg, Stockholm, Gävle, Helsingborg. There are international trains going to/from Germany, Biebersheim. There is always a hard work involved in assuring the backload of the trains, detailed information was not possible to obtain, however, there was indication that a backload of 65% can be sometimes stably assured and meets the expectations of the dry ports. The backload is easier to provide with the trailers and sometimes reaches up to 100% in those cases.

6. CONCLUSION

According to the purpose of this study, detailed qualitative descriptive data about the dry ports in Sweden were collected and analyzed with focus on distance and location, functionality and services, direction of development, maturity level, dedication and geography of operations. The results of the analysis indicate that the dry ports in Sweden are homogeneous in many respects. All the dry ports in Sweden are initiated by the actors in hinterland and thus are initially constructed to meet the goals of municipalities and local businesses; and as such fit into Inside-out directional development model. Majority of the dry ports are "mid-ranged" that means that they are located 200-600 km from the Port of Gothenburg; yet there are close and distant dry ports as well. To defiantly state the

dependance of the service offerings and location further study is needed, however, it is evident that there are frequent services at dry ports all around the country including depot, handling of dangerous goods, reefer plugs, stuffing, transshipment, handling of empty and loaded containers, road haulage. As per development, there were no identified cases of a start-up phase, most of the identified dry ports are in the growth phase which is recognized by operations and infrastructure development and capacity utilization of about 20-60% (where known). The analysis of the involvement of actors through the developmental phases highlights minor role of a seaport in the beginning which increases along the maturity of the dry port (from establishment to operations). Privately initiated and owned dry ports may pursue otherwise not common strategies such as close collaboration and integration of business with large shippers or rail operator. Further research is needed to confidently state whether the dry ports in Sweden compete, are in co-opetition with each other, or cooperate, however, it is evident that they depend on the same established rail network and enjoy its benefits in terms of geographical coverage and reach to the seaport terminals. One of the major issues is unbalanced flow of containers which is addressed by the dry ports to different degrees. The conducted data analysis contributes to the dry ports concept by elaborating on pre-existing classifications of dry ports, discussing the classifications with regards to the case of dry ports in Sweden.

ACKNOWLEDGEMENTS

This research was funded by EU Interreg Öresund-Kattegat-Skagerrak Value2Sea project and LTS project Kartläggning av dry ports i Sverige.

REFERENCES

[1] Bask, A., Roso, V., Andersson, D., Hämäläinen, E. (2014). Development of seaport-dry port dyads: Two cases from Northern Europe. Journal of Transport Geography, 39, 85–95.

[2] Beresford, A., Pettit, S., Xu, Q., Williams, S. (2012). A study of dry port development in China. Maritime Economics and Logistics, 14(1), 73–98.

[3] Bergqvist, R., Monios, J. (2021). Drivers for migration of an intermodal network hub from a port to an inland terminal. Journal of Transport Geography, 91, 1-9.

[4] Bergqvist, R., Woxenius, J. (2011). The development of hinterland transport by rail - The story of Scandinavia and the port of Gothenburg. Journal of Interdisciplinary Economics, 23(2), 161–175.

[5] Božičević, J., Lovrić, I., Bartulović, D., Steiner, S., Roso, V., Pašagić Škrinjar, J. (2021). Determining Optimal Dry Port Location for Seaport Rijeka Using AHP Decision-Making Methodology. Sustainability, 13(11), 64-71.

[6] Chang, Z., Yang, D., Wan, Y., Han, T. (2018). Analysis on the features of Chinese dry ports: Ownership, customs service, rail service and regional competition, Transport Policy, 82, 107-116.

[7] Do, N.-H., Nam, K.-C., Le, Q.-L. N. (2011). A consideration for developing a dry port system in Indochina area. Maritime Policy & Management, 38(1), 1–9.

[8] Dooms, M. (2019). Chapter 4 - Stakeholder Management for Port Sustainability: Moving From Ad-Hoc to Structural Approaches, in Green Ports, 63–84. Publisher Elsevier.

[9] Gonzalez-Aregall, M., Bergqvist, R. (2019). The role of dry ports in solving seaport disruptions: A Swedish case study. Journal of Transport Geography, 80, 102499.

[10] Henttu, V., Hilmola, O.-P. (2011). Financial and environmental impacts of hypothetical Finnish dry port structure. Research in Transportation Economics, 33(1), 35–41.
[11] Järnväg - Railport Scandinavia. https://www.goteborgshamn.se/railport (accessed Mar. 28, 2022).
[12] Khaslavskaya, A., Roso, V. (2019). Outcome-Driven Supply Chain Perspective on Dry Ports, Sustainability, 11(5), 1492.
[13] Khaslavskaya, A., Roso, V. (2020). Dry ports: research outcomes, trends, and future implications. Maritime Economics and Logistics, 22(2), 265–292.
[14] Khaslavskaya, A., Roso, V., Sanchez-Diaz, I., Altuntas Vural, C. (2021). Value-Added Services at Dry Ports: Balancing the Perspectives of Different Stakeholders. Transportation Journal, 60(4), 406–438.
[15] Monios, J. (2011). The role of inland terminal development in the hinterland access strategies of Spanish ports. Research in Transportation Economics, 33(1), 59–66.
[16] Monios, J., Bergqvist, R. (2016). Intermodal freight terminals: a life cycle governance framework. Publisher Routledge, London.
[17] Monios, J., Wilmsmeier, G. (2012). Giving a direction to port regionalisation. Transportation Research. Part A: Policy and Practice, 46(10), 1551–1561.
[18] Ng, A.K., Cetin, I.B. (2012). Locational characteristics of dry ports in developing economies: some lessons from Northern India. Regional Studies, 46(6), 757–773.
[19] Rodrigue, J.-P., Notteboom, T. (2012). Dry ports in European and North American intermodal rail systems: Two of a kind? Research in Transportation Business and Management, 5, 4–15.
[20] Roso, V. (2007). Evaluation of the dry port concept from an environmental perspective: A note. Transportation Research. Part D: Transport and Environment, 12(7), 523–527.
[21] Roso, V. (2008). Factors influencing implementation of a dry port. International Journal of Physical Distribution and Logistics Management, 38(10), 782–798.
[22] Roso, V., (2009). The emergence and significance of dry ports: The case of the Port of Goteborg. World Review of Intermodal Transport, 2(4), 296–310.
[23] Roso, V., Russell, D. (2018). Adoption of the Dry Port Concept: a Diffusion of Innovation Assessment. Presented at the NOFOMA, Koldning, Denmark.
[24] Roso, V., Woxenius, J., Lumsden, K. (2009). The dry port concept: connecting container seaports with the hinterland. Journal of Transportation Geography, 17(5), 338–345.
[25] Tranzero initiative. https://www.portofgothenburg.com/the-project-of-the-port/tranzero/ (accessed Mar. 28, 2022).
[26] Wilmsmeier, G., Monios, J., Lambert, B. (2011). The directional development of intermodal freight corridors in relation to inland terminals. Journal of Transportation Geography, 19(6), 1379–1386.