

Oslo Case Study #2

GoA 3.3 Fostering Modal Shift

Work Package	WP 3 – Multimodal Transport				
Activity	WP 3.3-1 – Oslo region case				
Responsible Partner	Eastern Norway County Network				
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Version	3	Date	28.08.2018	Status	final

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Executive Summary

The present "Oslo Case Study #2" has been elaborated in the course of the project Scandria[®]2Act that deals with measures fostering the sustainable and multimodal transport of freight and passengers along the Scandria[®]Corridor. The aim of the study is to analyse the potential for modal shift for long distance lorry transit through Southern Sweden crossing the Norwegian-Swedish border with origin or destination in the Greater Oslo region, whereupon freight transport from Oslo to Northern Germany and Poland is of main interest.

Firstly, the transport flows from and to Norway have been analysed. Overall, EU countries are the most important trade partners of Norway cumulating 70 % of the Norwegian foreign trade value in the year 2017. In view of the transport corridor considered in the study, focus was set on transport relations with Denmark, Germany, Italy and Poland. The most important findings are as follows: Even after excluding fuels from the examination, there is a significant imbalance between Norwegian exports and imports. The export surplus is particularly distinctive in sea transport, whereas the distribution of volumes in the land-based transport modes road and rail is opposite (import surplus). The top three commodity groups in import by lorry from Denmark, Germany, Italy and Poland are manufactured goods, chemicals and food; in export by lorry to the four countries the largest volumes are assigned to food (particularly fish), manufactured goods and crude materials. Based on the assumption of an average truckload of 20 tonnes per lorry, the number of lorries in Norwegian import and export in the year 2017 can be calculated as shown in the following table.

	Denmark	Germany	Italy	Poland
Export from Norway [no. of lorries]	16.127	20.084	6.394	16.773
Import to Norway [no. of lorries]	28.225	30.492	11.508	22.692
Import-export ratio	1,8	1,5	1,8	1,4

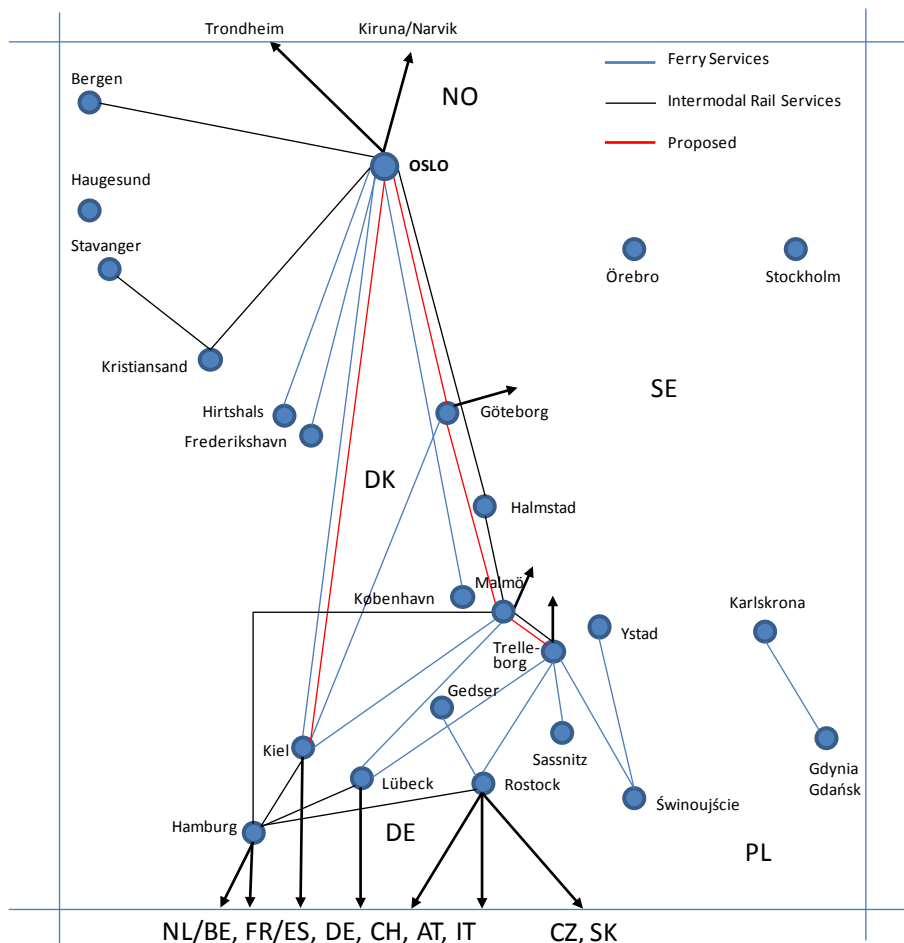
Source: KombiConsult

Secondly, the existing multimodal connections from/to the Oslo region abroad have been considered. There are regular intermodal train services from the terminal Oslo Alnabru to Halmstad, Malmö and Trelleborg in southwest Sweden. Via Malmö and the Öresund fixed link, Denmark and Germany can be reached by rail and road. From Trelleborg, which has the largest RoRo port in Scandinavia, there is the opportunity to use ferry services to Germany (Travemünde, Rostock, Sassnitz) and Poland (Swinoujście). Moreover, several ferry lines connect the ports in the Oslo region directly to Denmark (Hirtshals, Frederikshavn, København) and Germany (Kiel). Another ferry service relevant to Oslo-related transports, Göteborg - Kiel, can be reached by road. Thanks to a dense intermodal network, in particular in the hinterland of the German Baltic Sea ports, various destinations on the European mainland can be reached.

By the help of interviews with transport experts, a qualitative assessment of opportunities for shifting existing road volumes to rail and sea could be carried out. In Chapter 4.1 of the report, the findings out of these interviews are summarized. In a nutshell, the preconditions for multimodal sea freight trans-

port from and to Norway are well and allow for competitive transport offers compared to road transport. On the ferry line Oslo - Kiel, capacity constraints were reported, in particular during the summer holiday period. Therefore, the development of dedicated freight capacity on this ferry connection is recommended, either on a combined Ro/Pax ferry with extended load metres or in terms of a pure (Ro/Ro) freight ferry¹. Regarding rail transport, the Oslo - Göteborg intermodal service should be re-established or, depending on an in-depth market analysis, the existing Oslo - Malmö/Trelleborg service should be upgraded. Two daily train pairs could be adapted to (1) the "standard" requirements of dry cargo, tank and bulk containers; and (2) the needs of more challenging freight such as temperature-controlled goods and time-sensitive dry cargo.

The following figure displays the main existing ferry and intermodal train services connecting the Oslo region as well as the proposed improvement of services.



Finally, the Norwegian aid scheme for short sea shipping has been examined in view of the suitability for border-crossing services from and to the Oslo region.

¹ After the study was finished, Color Line has purchased the Ro-Ro ship M/S Finncarrier in order to put it into operation between Oslo and Kiel in January 2019 (Color Line press release, 16 July 2018).

Sammendrag

Den foreliggende "Oslo Case Study #2" har blitt utarbeidet som et ledd i prosjektet Scandria[®]2Act. Denne delstudien omhandler tiltak som fremmer bærekraftig og multimodal transport for gods og passasjerer i The Scandria[®]Corridor. (Transportkorridor mellom Oslo regionen - Sør-Sverige - Danmark - Nord -Tyskland og Polen) Målet med studien var å analysere potensialet for modal shift/ overføring av langdistanse transitt lastebiltrafikken gjennom Sør-Sverige som passerer den norsk-svenske grensen med gods enten fra eller til ulike destinasjoner i Stor Oslo Regionen. Det har blitt satt særlig fokus på gods transport til/fra Oslo til Nord -Tyskland og Polen.

Innledningsvis analyserte man godstransport volumene til og fra Norge. EU landene er de viktigste handelspartnere for Norge med til sammen 70 % av den norske verdibaserte utenrikshandel i 2017. Med utgangspunkt i godsstrømmene i den analyserte transportkorridoren ble fokus satt på transportforbindelsene med Danmark, Tyskland, Italia og Polen.

De viktigste analyseresultatene ble som følger: Selv etter uttrekk av olje og oljeprodukter i analysen, så er det en betydelig ubalanse mellom norsk import og eksport. Overskuddet i eksport er spesielt betydelig for sjøtransport, mens det for de landbaserte distribusjonsvolumer på veg og med jernbane er i en motsatt situasjon (import overskudd). De tre topp varegruppene for import med lastebil fra Danmark, Tyskland, Italia og Polen er industriprodukter/ bearbeidede varer og varer til konsum, kjemiske produkter og matvarer. Når det gjelder eksport med lastebil til de samme fire landene er de viktigste produktene, mat (primært fisk), industriprodukter/ bearbeidede varer og varer til konsum samt råvarer.

Basert på en antagelse om gjennomsnittlig vekt på 20 tonn per lastebil, kan man beregne antall lastebiler benyttet til import og eksport for 2017. Dette er vist i tabellen nedenfor.

	Danmark	Tyskland	Italia	Polen
Eksport fra Norge [antall lastebiler]	16.127	20.084	6.394	16.773
Import til Norge [antall lastebiler]	28.225	30.492	11.508	22.692
Import-eksport forhold	1,8	1,5	1,8	1,4

Source: KombiConsult

De eksisterende multimodal forbindelsene til/fra Oslo region til utlandet ble grundig analysert. Det er i dag regelmessige intermodal togavganger fra Alnabru terminalen i Oslo til Halmstad, Malmö og Trelleborg i sydvest Sverige. Veg og togtrafikken kan derfor via Malmö og Øresundforbindelsen, komme videre til Danmark og Tyskland. Fra Trelleborg, som har den største RoRo havnen i Skandinavia, har man tilgang/ muligheter til å bruke flere ferge forbindelser til Tyskland (Travemünde, Rostock, Sassnitz) og Polen (Swinoujscie). Videre er det i dag flere direkte fergeforbindelser fra havner i Oslo regionen til Danmark (Hirtshals, Frederikshavn, København) og Tyskland (Kiel). Andre relevante fergeforbindelse for Oslo- relatert transport med lastebil er Göteborg – Kiel og Göteborg-Frederikshavn. Det er videre mulig å nå mange destinasjoner på det europeiske kontinentet takket

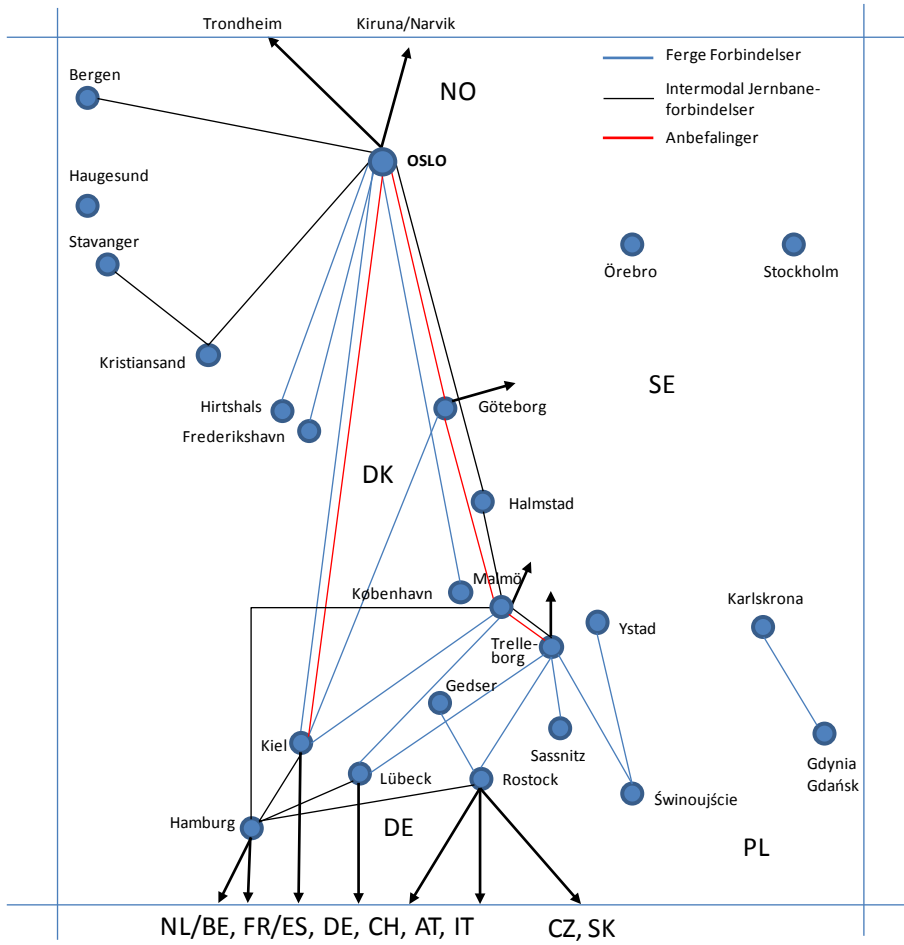
være et omfattende intermodal transportnett, særlig i tilknytning til det omkringliggende omlandet for de tyske-baltiske havnene.

Ved hjelp av resultatene fra intervjuer av trafikkeksperter, ble det utført en kvalitativ analyse av mulighetene for å overføre eksisterende godsvolumer fra veg til jernbane og sjø. I Kapittel 4.1 i rapporten er resultatene fra intervjuene vist. Dette viser at forutsetningene for multimodal sjø transport fra og til Norge er bra, og muliggjør konkurransedyktige transport tilbud sammenlignet med vegtransport. På fergeforbindelsen Oslo – Kiel ble det rapportert kapasitetsproblemer spesielt i ferietiden om sommeren. Det anbefales derfor at denne fergeforbindelsen for en forbedret kapasitet, enten med en kombinert Ro/Pax ferge med flere tilgjengelige «laste metere» eller innsetting av en ren (Ro/Ro) gods ferge.²

Når det gjelder jernbanetransport er det viktig å få reetablert et intermodalt tilbud mellom Oslo – Göteborg, eller avhengig av resultatene fra en mer dyptgående markedsstudie, bør det også vurderes om den eksisterende jernbaneforbindelsen Oslo - Malmö/Trelleborg også skal oppgraderes. To daglige togavganger kunne bli introdusert for (1) "Standard" krav for tørr last, tank og bulk containere; og (2) behovet for mer utfordrende gods som temperatur-kontrollert gods og tidssensitiv gods.

Den nedenforstående figuren viser de viktigste eksisterende fergeforbindelsene og de intermodale togforbindelsene til Oslo region samt foreslåtte forbedringer.

² Det kan her meddeles at Color Line nylig har gått til innkjøp av av RO-RO skipet M/S Finncarrier og planlegger å sette skipet i rute mellom Oslo og Kiel i januar 2019.



Den foreliggende studieanalysen har også undersøkt muligheten /relevansen av å benytte den norske statlige tilskuddsordningen med å overføre mer gods fra veg til sjø når det gjelder den analyserte grensekryssende godstrafikken i Scandria korridoren.

1 Background information

In light of a lasting extensive road transport and increasing awareness of the related threats - such as environmental and economic problems as well as disadvantages for the health of the residents -, often the regions and urban areas that are most affected become forerunners of a system change towards a more sustainable transport sector.

Transport, in particular freight transport, is nowadays an international issue that involves a variety of actors with different interests. Therefore, cooperation in terms of a common transport scenario is an important concern and success factor for several regions. The Eastern Norway County Network (ENCN), representing eight counties in the Oslo region, decided to take part in the Scandria[®]2Act project in order to deal with transport along the Scandria[®]Corridor (see Figure 1) together with 18 other partners from Scandinavia and Germany.

Scandria[®]2Act backs on strategic projects with more than 10 years of continuous cooperation between the Scandinavian and North-East German regions. The transnational project approach follows an initiative and action plans of regions located along the Baltic Sea Region and stretches to the Scandinavian-Mediterranean Core Network Corridor³.

The main objective of Scandria[®]2Act is to improve and foster the sustainable and multimodal transport of freight and passengers with special attention on spatial development in order to increase the connectivity and competitiveness of corridor regions whilst reducing environmental impacts caused by freight and passenger transport.

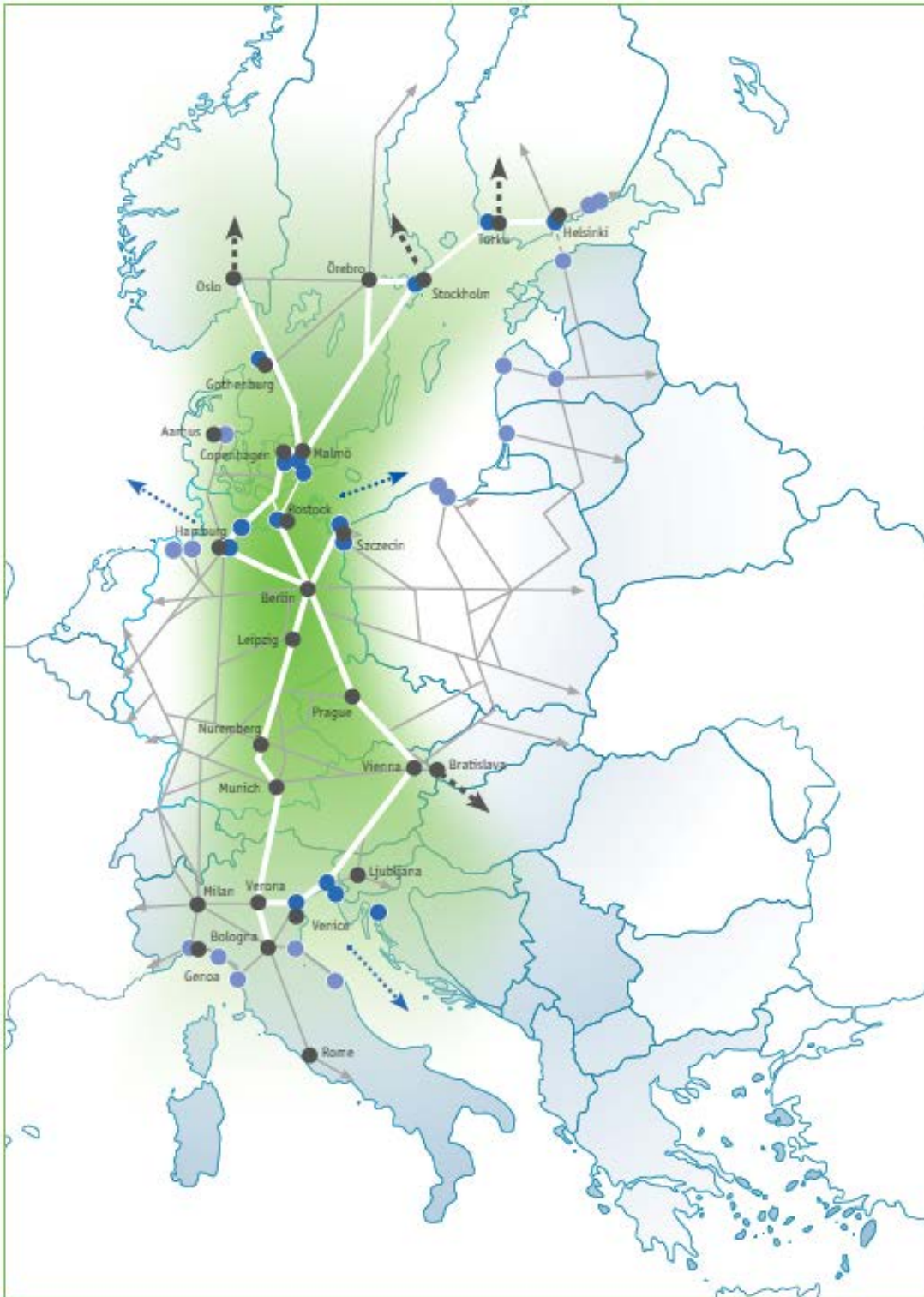
The present "Oslo Case Study #2" has been elaborated in the course of Scandria[®]2Act's Work Package 3 (Multimodal Transport) and is assigned to the Group of Activities 3.3 "Fostering Modal Shift". The aim of the study is to analyse the potential for modal shift for long distance lorry transit through Southern Sweden crossing the Norwegian-Swedish border with origin or destination in the Greater Oslo region. Freight transport from Oslo to Northern Germany and Poland is of main interest, but in order to make use of bundling effects, also destinations further south, e.g. in Northern Italy, have been considered.

The approach followed in this study mainly consists of:

- 1) the evaluation of relevant transport flows (Chapter 2);
- 2) the analysis of currently existing multimodal transport services (Chapter 3);
- 3) the derivation of the modal shift potential based on market experience and interviews with relevant experts (Chapter 4);
- 4) a rough analysis of the funding scheme for short sea shipping (Chapter 5).

³ The core and comprehensive TEN-T networks as well as the Core Network Corridors are defined in the TEN-T Guidelines – Regulation (EU) 1315/2013 and 1316/2013 respectively.

Figure 1: Alignment of the Scandria® Corridor



Source: www.scandria-corridor.eu

2 Goods transport from and to Norway

The first step of the Oslo Case Study #2 consists of an analysis of existing studies and data regarding goods transport from and to Norway. The two basic sources for this exercise are the reports compiled in preparation of the present study, namely:

- "Quality control of data basis for transfer from road in Norway traffic";
- "The Oslo case study - An analysis of the potential of new multimodal freight services for transport of goods by rail and sea between Greater Oslo and the rest of the Scandria® Corridor (Gothenburg - Copenhagen/Southern Sweden - Northern Germany/Poland)".

"Quality control of data basis for transfer from road in Norway traffic" reports on transport flows in the year 2013, mainly based on an evaluation of data provided by Statistics Norway (SSB), the results of interviews carried out with lorry drivers at the Norwegian-Swedish border crossing - the Svinesund analysis -, as well as ferry statistics. The information is mostly shown in form of diagrams indicating absolute transport volumes in tonnes. Data are separated by import and export, country of origin/ destination, commodity group, and mode of transport. Ferry volumes in trucks per year are separated by connection. Only those ferry lines between Sweden and Germany/Poland are considered, that means the ferries from and to Norway have not been evaluated.

The predecessor of the present study, "The Oslo case study", builds on the study mentioned first. The thorough analysis has an updated base year 2016. Due to the lack of proper transport statistics on regional level, the transport flows have been analysed regarding the origin/destination country, too. Solely, export flows from the Oslo region could only be estimated. In the final report, the evaluation is mostly expressed in relative numbers as to share of commodity groups in export and import and so on; absolute transport volumes are lacking to some degree. Therefore, in order to identify the theoretic modal shift potential equal to the absolute road transport volume, we have consulted the SSB database directly for the most recent statistical information from the year 2017.

Overall, EU countries are the most important trade partners of Norway cumulating 70 % of the Norwegian foreign trade value in 2017.⁴ The volumes transported from and to the countries along the Scandria® Corridor south from Norway (i.e. excluding Finland) are shown in Table 1, ordered by the volume transported on roads. By far the highest lorry volume (over 6 million tonnes) is transported between Norway and Sweden, followed by Germany, Denmark, Poland and Italy. In 2017, these countries each showed transport volumes with Norway of more than 100.000 tonnes per direction. The other Scandria® Corridor countries Czech Republic, Austria, Slovakia and Switzerland are below this level.

⁴ according to EC Directorate-General for Trade; <http://ec.europa.eu/trade/policy/countries-and-regions/countries/norway/>

Table 1: Transport volume between Norway and Scandria® Corridor countries 2017

	Transport volume to and from Norway 2017 [tonnes]						
	Total	thereof by lorry		Import	thereof by lorry	Export	thereof by lorry
Sweden	19.384.275	6.406.077	33%	6.913.893	3.809.768	12.470.382	2.596.309
Germany	59.467.967	1.024.062	2%	2.826.955	622.239	56.641.012	401.823
Denmark	13.468.273	889.814	7%	2.785.545	566.565	10.682.728	323.249
Poland	3.776.802	789.701	21%	1.067.897	454.238	2.708.905	335.463
Italy	1.795.817	358.587	20%	394.194	230.705	1.401.623	127.882
Czech Republic	219.573	138.108	63%	122.993	85.389	96.580	52.719
Austria	212.806	85.364	40%	111.071	64.584	101.735	20.780
Slovakia	82.215	61.427	75%	49.488	34.031	32.727	27.396
Switzerland	472.674	46.825	10%	114.857	21.913	357.817	24.912

Source: KombiConsult, based on data from Statistics Norway, table 08812

In view of the scope of the present study, which contemplates modal shift of long-distance road transport from and to the Greater Oslo region transiting Southern Sweden, we have focused our analysis to the following countries:

- Denmark;
- Germany;
- Italy;
- Poland.

These four countries show considerable amounts in export and import by lorry, as can be seen from Table 1. Undisputed, between Norway and Sweden there are by far larger road transport volumes in both directions, particularly of timber and other forest products, but we excluded it from the analysis. Due to the drawn-out land border (1.630 km) between the two countries, it is unclear what share of these transport volumes is related to the Oslo region, whereas for the four selected countries, transport by lorry will most likely cross the border to Sweden in the Oslo region and either transit Southern Sweden or head for one of the southwest Swedish ports.

Excluding the commodity group "fuels" from the further considerations, as also done in the Oslo case study, seems to be meaningful because of its overwhelming amount in particular in Norwegian export. Moreover, most of the fuels like crude oil, oil products and gas are transported by ships and pipelines and only a small part is transported by road so that they are not of main interest for the issue of modal shift.

In general, that applies to the whole analysis: The following considerations are led by the assumption that only the road transport volume on a certain relation is relevant for modal shift and that the current lorry volumes represent the potential amount to be shifted to rail and sea. Transports already done by ship and rail are thus not primarily relevant for the study and are shown in order to get an overview of the current relevance of the transport modes on the trade lanes considered.

The overall transport volume imported to Norway as well as the detailed import volumes from Denmark, Germany, Italy and Poland are given in Table 2. Furthermore, the table shows the breakdown of the volumes excluding fuels into the different modes of transport. The same kind of information for export from Norway can be seen from Table 3.

Table 2: Norwegian import volumes 2017 by mode of transport

Modes of transport	Import 2017 (in tonnes) from...				
	all countries	Denmark	Germany	Italy	Poland
Total	37.939.330	2.785.545	2.826.955	394.194	1.067.897
Total without fuels	29.254.253	1.646.893	2.694.259	393.010	724.838
Ships, foreign	15.408.098	542.366	962.347	51.542	134.235
Ships, Norwegian	4.521.954	260.343	869.089	34.624	101.151
Railway on ships	274	-	-	20	-
Lorry on ships	651.902	222.820	146.376	31.412	8.120
Trailer on ships	274.186	54.220	55.751	9.727	3.334
Railway	342.769	1.196	45.242	32.065	20.790
Lorry/trailer on railway	4.243	-	865	2.029	61
Lorry	7.966.408	564.484	609.848	230.155	453.833
Aircraft	46.049	1.119	2.685	1.260	443
By mail	1.602	152	338	26	18
Electronic transmission	-	-	-	-	-
Firm installations	-	-	-	-	-
Inland waterways	-	-	-	-	-
Other, own propulsion	36.768	193	1.719	151	2.852

Source: KombiConsult, based on data from Statistics Norway, table 08812

Table 3: Norwegian export volumes 2017 by mode of transport

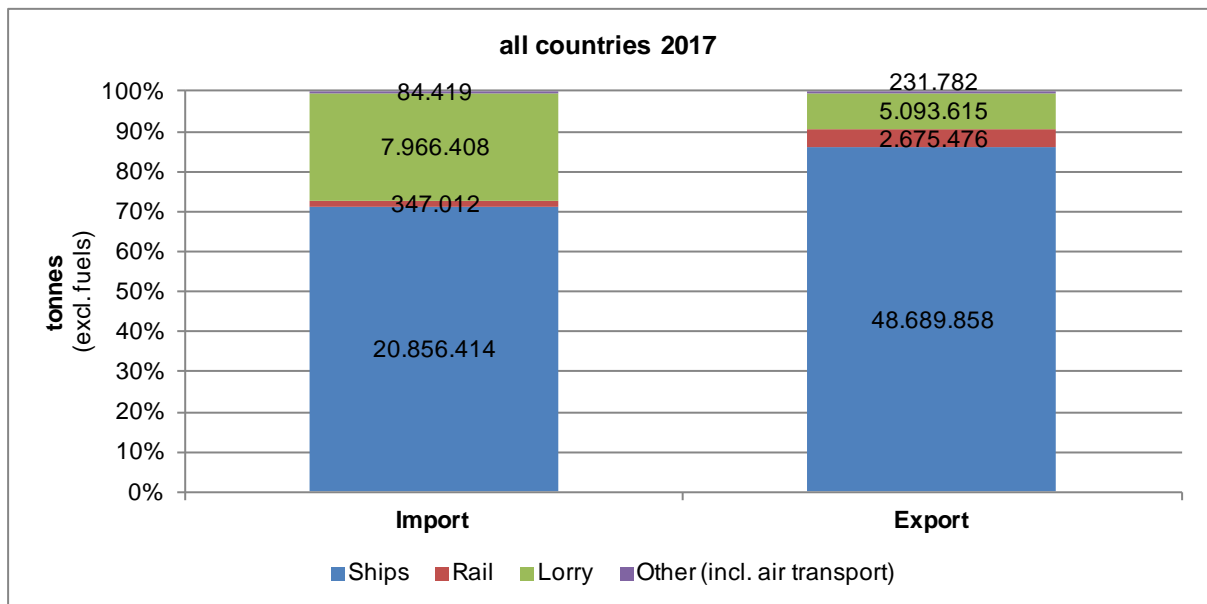
Modes of transport	Export 2017 (in tonnes) to...				
	all countries	Denmark	Germany	Italy	Poland
Total	242.851.643	10.682.728	56.641.012	1.401.623	2.708.905
Total without fuels	56.690.734	6.023.693	10.470.857	401.890	2.250.658
Ships, foreign	35.446.055	4.004.113	8.027.837	164.038	1.577.791
Ships, Norwegian	12.239.372	1.401.987	1.791.375	74.640	327.528
Railway on ships	221	5	-	-	-
Lorry on ships	762.546	247.450	196.834	18.116	7.807
Trailer on ships	241.664	46.194	30.171	2.021	763
Railway	2.660.049	1.011	22.410	10.781	55
Lorry/trailer on railway	15.427	46	132	4.174	-
Lorry	5.093.615	322.545	401.680	127.875	335.461
Aircraft	167.444	209	341	178	83
By mail	479	64	9	1	1
Electronic transmission	-	-	-	-	-
Firm installations	51.603	-	-	-	-
Inland waterways	-	-	-	-	-
Other, own propulsion	12.256	68	69	68	1.169

Source: KombiConsult, based on data from Statistics Norway, table 08812

Statistics Norway provides a remarkably accurate classification of the modes of transport used. In order to facilitate understanding the significance of the modes of transport for the different trade lanes, we have grouped the detailed modes into the four main categories ships, rail, lorry and other (including air transport). The following diagrams display the modal split for Norwegian import and export overall as well as from and to Denmark, Germany, Italy and Poland (see Figure 2 to Figure 6).

Regarding the overall import to Norway in 2017 (excluding fuels), about 70 % of the volumes were transported by ship. Almost all other volumes used road transport, as the share of rail and other modes is very low. In export from Norway, the share of ship transport is even higher (86 %), whereas lorry is about 10 %. The rail share is also rather low. When looking at the absolute values, it can be seen that globally the exports from Norway are above imports to Norway and thus also considerably more tonnes of freight are transported by rail abroad than in opposite direction.

Figure 2: Modal split in Norwegian import and export 2017



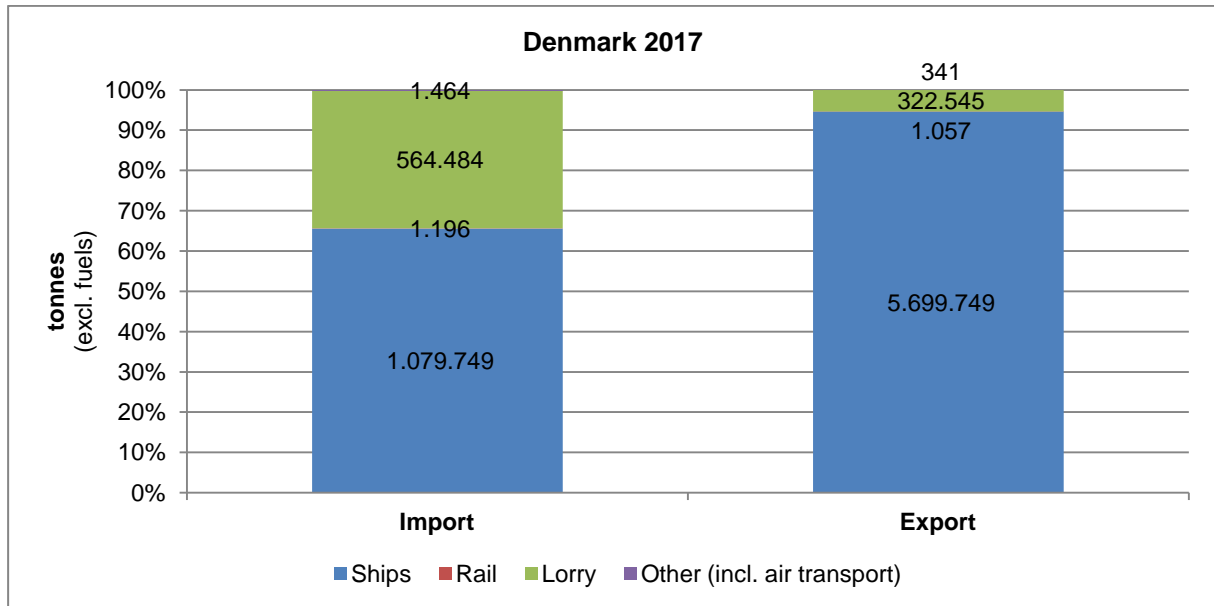
Source: KombiConsult, based on data from Statistics Norway, table 08812

The situation in Norwegian-Danish transports is as follows: rail and other modes practically play no role in both import and export. Most of the freight is imported (66 %) and exported (96 %) by ship, whereupon the absolute export volume is more than five times as large as the import volume. Export by lorry is in relative and absolute values much smaller than the import.

Apart from oil and oil products, gas and fertilizers which represent almost 85 % of the export from Norway to Denmark, the largest commodities are fish, wood and lumber, chemicals and iron, steel and other non-ferrous metals (mostly aluminium).

Around 40 % of the import volume from Denmark is allotted to oil products. Besides this, Norway imports a lot of Danish food products like fish, vegetables and fruit, cereals and sugar. Animal food stuff has also a relatively large share. Another large group are non-metallic, iron and steel and manufactures of metals. As a curiosity, the import of power generating machinery (windmills) is almost 32.000 tonnes.

Figure 3: Modal split in Norwegian import and export from/to Denmark 2017



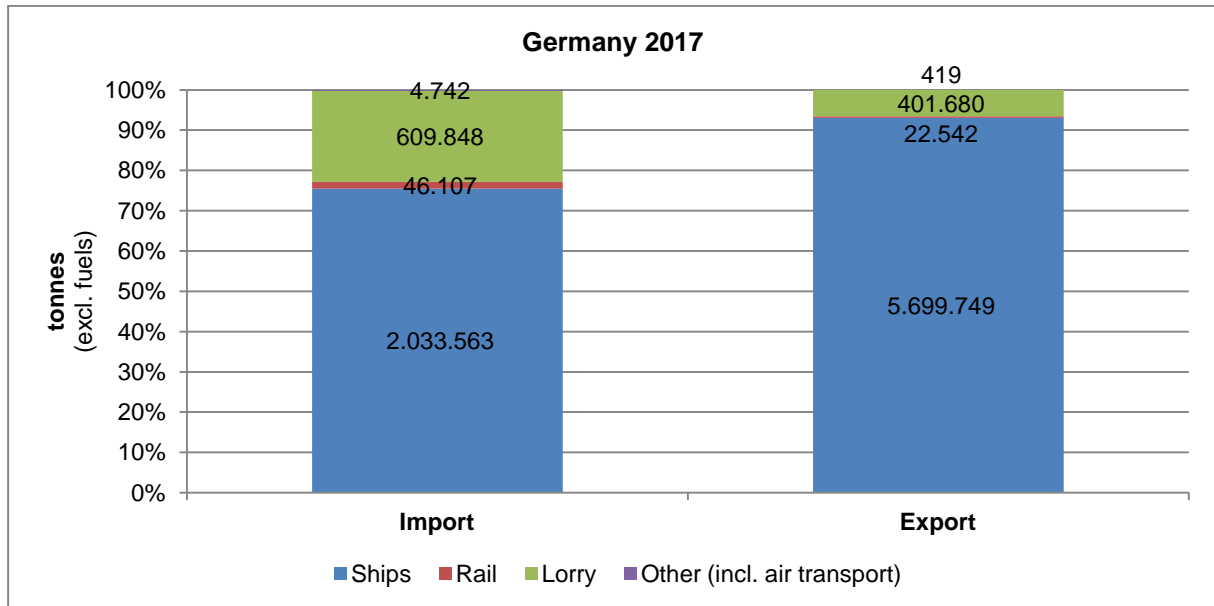
Source: KombiConsult, based on data from Statistics Norway, table 08812

For Germany, the modal split is in trend comparable to the findings described for transport between Norway and Denmark, but the rail share in import is higher.

The export volume from Norway to Germany consists mainly of crude oil and oil products, gas and fertilizers (altogether more than 80 % of the total export). The next group in volume is chemicals, followed by metals basically for the car industry. The fish export is around 80.000 tonnes.

The Norwegian import from Germany is more diversified, and consists of more manufactured goods, metals, food stuff for human and animal consumption, chemical products and new cars. Cars are basically transported by sea, while much of the other commodities are going by road.

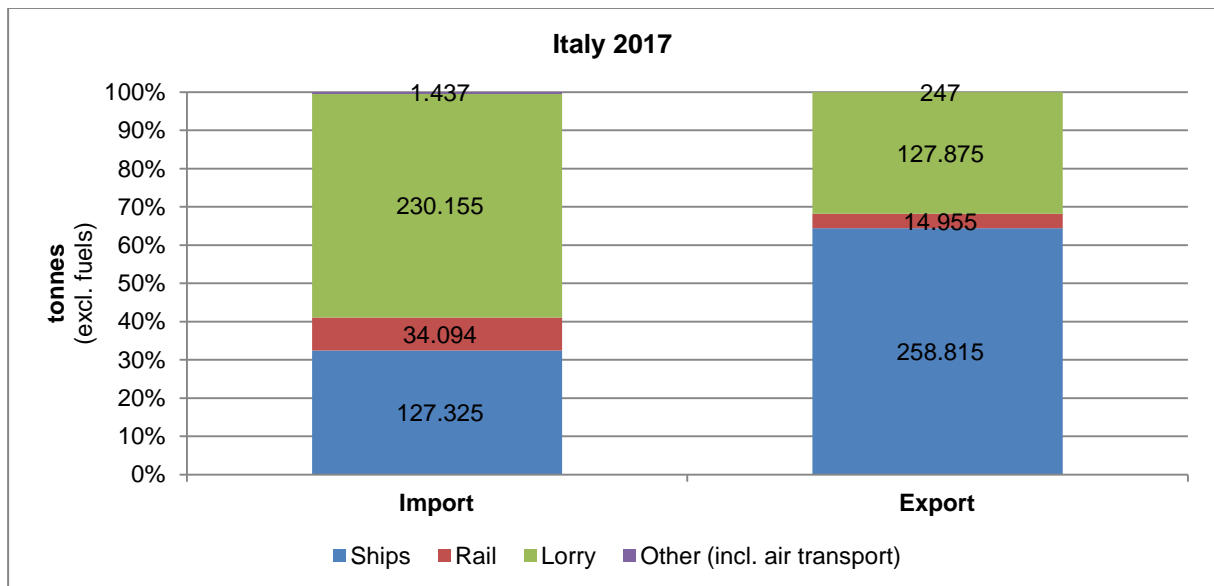
Figure 4: Modal split in Norwegian import and export from/to Germany 2017



Source: KombiConsult, based on data from Statistics Norway, table 08812

When looking at transports between Norway and Italy, it can be noted that the relevance of ships is much lower than for the other countries. In import, their share is only above 30 %; about 10 % of the volumes are transported by rail and almost 60 % by lorry. The shares of transport by sea and road in export from Norway are almost opposite (32 % vs. 59 %). Export by rail is relatively marginal and in absolute values less than half of the import volume.

Figure 5: Modal split in Norwegian import and export from/to Italy 2017



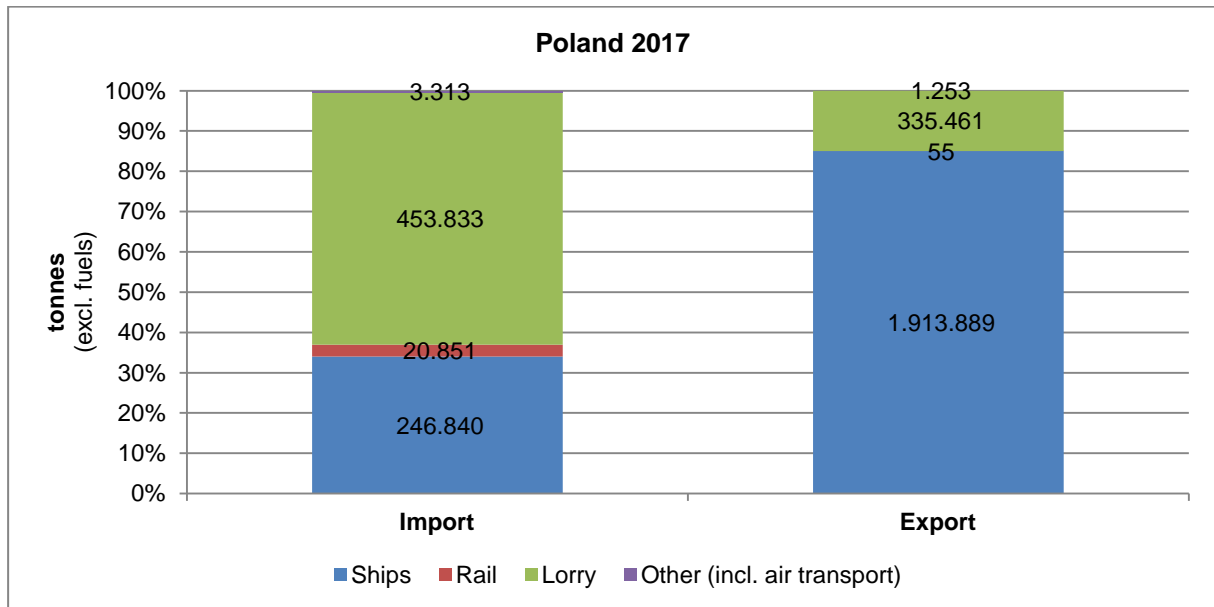
Source: KombiConsult, based on data from Statistics Norway, table 08812

Most of the import volumes from Poland are transported by lorry (63 %), the second largest mode is sea transport (34 %) and only a small share uses rail transport. In export to Poland, the relevant modes are sea (85 %) and road transport (15 %). The absolute export volume by ship is almost eight times as large as the import volume by ship.

The export to Poland is very concentrated to raw materials like fertilizers and oil which sum up to more than 2/3 of the total export. The second largest commodity is fish for consumption as well as processing for the European market including Norway.

The import from Poland is to a large extent manufactured goods and consumer products. One rather big group is furniture coming from factories owned by IKEA and other large furniture groups. The biggest commodity is although coal for the cement and some other process industries.

Figure 6: Modal split in Norwegian import and export from/to Poland 2017



Source: KombiConsult, based on data from Statistics Norway, table 08812

Summing up these findings, it is obvious that in total there is more export from Norway than import. This applies also to transport by ship, but not for the land-based modes of transport. There is significantly more import by lorry (and rail) than export.

The following Table 4 gives an overview of the split of lorry transport into commodity groups (SITC 1). The three largest groups per country have been highlighted yellow. Imported freight from all four countries is mostly manufactured goods, chemicals and food. In export from Norway to the four countries, the largest volumes are allocated to food (particularly fish), manufactured goods and crude materials.

Table 4: Norwegian import and export by lorry 2017, split by countries and commodity groups

Commodity group	Import 2017 (in tonnes) by lorry from...				Export 2017 (in tonnes) by lorry to...			
	Denmark	Germany	Italy	Poland	Denmark	Germany	Italy	Poland
0 Food and live animals	122.324	56.935	65.370	47.692	128.091	45.825	51.186	154.191
1 Beverages and tobacco	7.360	9.469	18.850	4.681	2.564	191	156	46
2 Crude materials, inedible, except fuels	27.766	26.723	3.230	12.532	72.714	148.412	11.201	26.705
3 Mineral fuels, lubricants and related mat.								
4 Animal and vegetable oils and fats	23.169	2.517	240	972	2.278	4.100	435	382
5 Chemicals	103.015	134.334	19.927	37.537	38.168	84.909	10.313	42.776
6 Manufactured goods classified by mat.	176.937	233.343	65.923	221.676	63.185	104.621	52.729	91.668
7 Machinery and transport equipment	26.532	104.815	39.951	59.305	5.450	10.970	1.617	18.508
8 Miscellaneous manufactured articles	77.384	41.711	16.668	69.438	10.089	2.652	236	1.185
9 Other commodities and transactions	3	1	-	-	-	-	-	-
Share of the largest commodity groups on total transport by lorry except fuels	71%	77%	74%	77%	82%	84%	90%	86%

Source: KombiConsult, based on data from Statistics Norway, table 08812

Finally, when assuming an average truckload of 20 tonnes per lorry, we can calculate the number of lorries in Norwegian import and export in the year 2017 (see Table 5). These numbers are the theoretic modal shift potential, or in other words, the basic volumes for modal shift efforts. However, transferring the entire road transport volumes to rail or sea is practically not possible.

The import-export ratio in Table 5 shows the mentioned imbalance, that means for one lorry in export from Norway, there would be 1,4 to 1,8 lorries required for import.

Table 5: Theoretic modal shift potential based an average truckload of 20 tonnes (assumption), 2017

	Denmark	Germany	Italy	Poland
Export from Norway [no. of lorries]	16.127	20.084	6.394	16.773
Import to Norway [no. of lorries]	28.225	30.492	11.508	22.692
Import-export ratio	1,8	1,5	1,8	1,4

Source: KombiConsult

3 Existing multimodal services from and to Oslo region

In this chapter, the currently existing multimodal services by rail and sea that connect the Oslo region in southward direction with the Scandria[®] Corridor are analysed.

3.1 Intermodal rail services

When looking at intermodal⁵ railway connections, the main operator in Norway is CargoNet AS. The company runs several intermodal terminals in Norway and offers regular train services between these locations. The Norwegian domestic network of CargoNet is monocentrically concentrated towards Oslo (Alnabru terminal), as can be seen in Figure 7.

Figure 7: Intermodal railway network of CargoNet



Source: CargoNet AS

⁵ Unaccompanied intermodal transport means the transport of intermodal loading units (containers, semi-trailers and swap bodies) by rail, sea or inland waterway on the main part of the route; only the first and last mile from and to a transshipment terminal are covered by road. The goods inside the intermodal loading units remain untouched during the whole transport process from sender to receiver.

Oslo Alnabru is the only intermodal terminal of CargoNet with international transport connections. Currently, there are regular intermodal train services - operated by CargoNet as well - towards Halmstad, Malmö and Trelleborg in Southwest Sweden, whereupon sets of wagons allocated to the three destinations are combined to one train departure. Detailed information about this train is listed in Table 6. During the summer period, the frequency of the services is to be reduced.

Table 6: International intermodal railway services from and to Oslo Alnabru terminal

From (terminal)	To (terminal)	Closing time	Pick-up time	Transit time [hours]	Frequency [departures per week]	Remarks
Oslo Alnabru	Halmstad	16:25	07:00	14,5	3	Mon, Wed, Thu
Halmstad	Oslo Alnabru	17:00 (Fri 15:30)	07:30	14,5	3	Tue, Thu, Fri
Oslo Alnabru	Malmö	16:25 (Sat 10:45)	06:00	13,5	4	Mon, Wed, Thu, Sat
Malmö	Oslo Alnabru	16:00	07:30	15,5	4	Tue, Thu, Fri, Sun
Oslo Alnabru	Trelleborg	16:25 (Sat 10:45)	06:00	13,5	4	Mon, Wed, Thu, Sat
Trelleborg	Oslo Alnabru	18:00	07:30	13,5	4	Tue, Thu, Fri, Sun

Source of information: CargoNet AS timetable; May 2018

The destination Halmstad is predominantly intended for loading units from and to Sweden instead of transfer to other Scandria[®]Corridor countries considered in this study.

From Malmö, the European mainland can be reached by ferry towards Travemünde (Germany), or via the Öresund fixed link using railway. Amongst others, the respective intermodal trains head for Herne and Köln in Germany where the European networks of intermodal operators such as Kombiverkehr, Hupac and TX Logistik allow for connections to various destinations in Germany, Austria, Switzerland, Northern Italy, France and Spain. A third option is using the Öresund Bridge by lorry from Malmö towards København.

The terminal in Trelleborg is located inside the port, which is the largest RoRo port in Scandinavia. Loading units can be transhipped to one of the ferries towards Travemünde, Rostock, Sassnitz (Germany) and Swinoujscie (Poland). Information about the intermodal hinterland connections from these ports are described below.

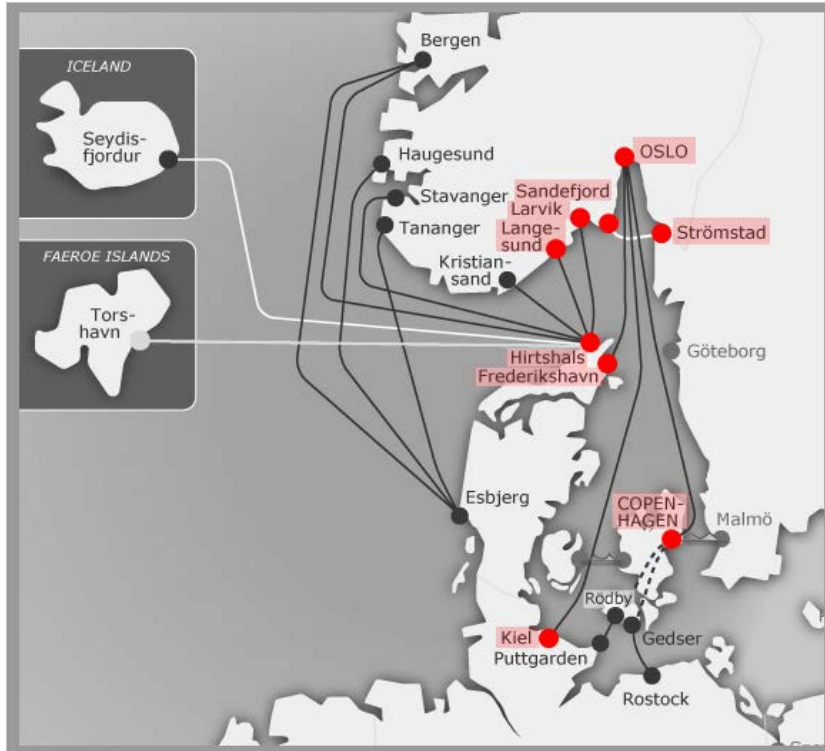
3.2 Ferry services

The following ports located in the Oslo region (ENCN territory) offer international ferry services for cargo transport along the Scandria[®]Corridor:

- Oslo;
- Sandefjord;
- Larvik;
- Langesund.

Figure 8 contains a map with the respective ports and their counterparts accentuated in red; the characteristics of the ferry services themselves are shown in Table 7.

Figure 8: International ferry services from and to Oslo region



Source: www.pique-ferry.de/truck-ferry-routes-norway-iceland-faroe-islands.html; modified by KombiConsult

Table 7: International ferry services from and to ports in the Oslo region

Operator	From (port)	To (port)	Departure	Arrival	Transit time [hours]	Frequency [departures per week]	Remarks
DFDS	Oslo	Copenhagen	16:30	09:45	17,25	7	trailers and ISO containers (both normal and reefer), lorries, dangerous goods
DFDS	Copenhagen	Oslo	16:30	09:45	17,25	7	
Color Line	Oslo	Kiel	14:00	10:00	20	7	loading metres: 1,270
Color Line	Kiel	Oslo	14:00	10:00	20	7	
Stena Line	Oslo	Frederikshavn	19:30	07:30	12	7	Mon Tue - Sun
Stena Line	Frederikshavn	Oslo	18:30	07:30	13	1	
Stena Line	Frederikshavn	Oslo	09:15	18:30	9,25	6	
Color Line	Sandefjord	Strömstad	7:00/10:00/13:30/17:00	9:30/12:30/16:00/19:30	2,5	28	loading metres: 462 - 490, depending on scheduled ship
Color Line	Strömstad	Sandefjord	10:00/13:40/17:00/20:00	12:30/16:10/19:30/22:30	2,5	28	
Fjord Line	Sandefjord	Strömstad	8:30/15:20	11:00/17:50	2,5	14	
Fjord Line	Strömstad	Sandefjord	12:00/18:30	14:30/21:00	2,5	14	
Color Line	Larvik	Hirtshals	8:00/17:30	11:45/21:15	3,75	14	loading metres: 2,036
Color Line	Hirtshals	Larvik	12:45/22:15	16:30/2:00	3,75	14	
Fjord Line	Langesund	Hirtshals	14:30	19:00	4,5	7	
Fjord Line	Hirtshals	Langesund	09:00	13:30	4,5	7	

Source of information: Shipping companies DFDS, Color Line, Stena Line, Fjord Line; May 2018

For the purpose of the present study, the ferry connection Sandefjord - Strömstad is not of particular interest due to its West-East direction. Furthermore, Strömstad is located very close to the Norwegian-Swedish border and therefore not feasible for long-distance multimodal transport. The Danish ports Hirtshals and Frederikshavn are mainly suitable for freight from and to Jutland (Denmark) due to the lack of appropriate hinterland connections by rail. In view of transit time and costs, for load units with origin/destination further south it is currently better to use one of the German ports instead of crossing Denmark by rail in order to reach the ports in the North. However, the intermodal terminal in Hirtshals has been upgraded recently so that in future the hinterland connection of the port could be improved.

In order to identify the actual time needed for a ferry ride on the connections listed in Table 7, a minimum amount of 30 minutes to two hours for check-in - depending on the port and shipping company - should be added to the transit times shown above.

Regarding the capacity, it has to be noted that all mentioned ferry services are offered to passengers and cargo; but during the summer holiday period, cargo capacity is often used for passenger vehicles. In particular on the ferry line Oslo - Kiel, there is practically no cargo capacity left in summer.

Besides the ferry connections from and to ports located in the Oslo region, there are other ferry services relevant for Norway-related transports, such as:

- Göteborg - Kiel;
- Malmö - Travemünde;
- Trelleborg - Travemünde/Rostock/Sassnitz/Swinoujście;
- Ystad - Swinoujście.

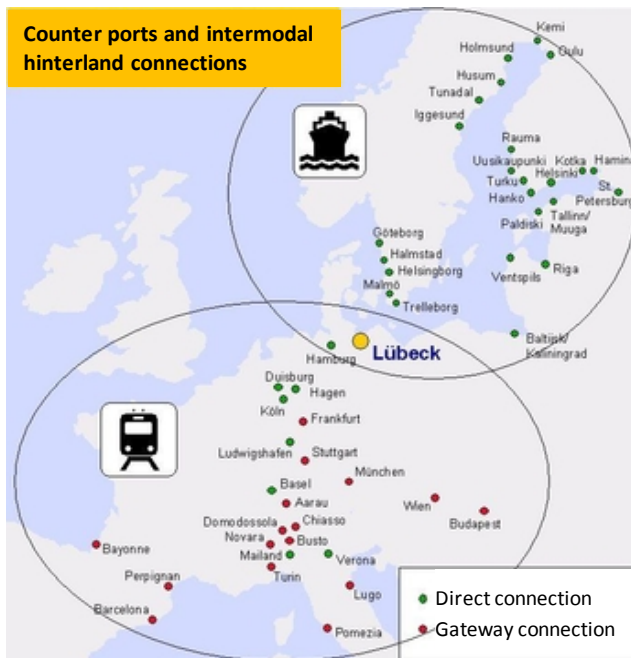
The ports of Kiel, Lübeck (Travemünde) and Rostock are connected to a wide intermodal hinterland railway network, as illustrated in the maps in Figure 9 to Figure 11.

Figure 9: Ferry and train connections, Port of Kiel



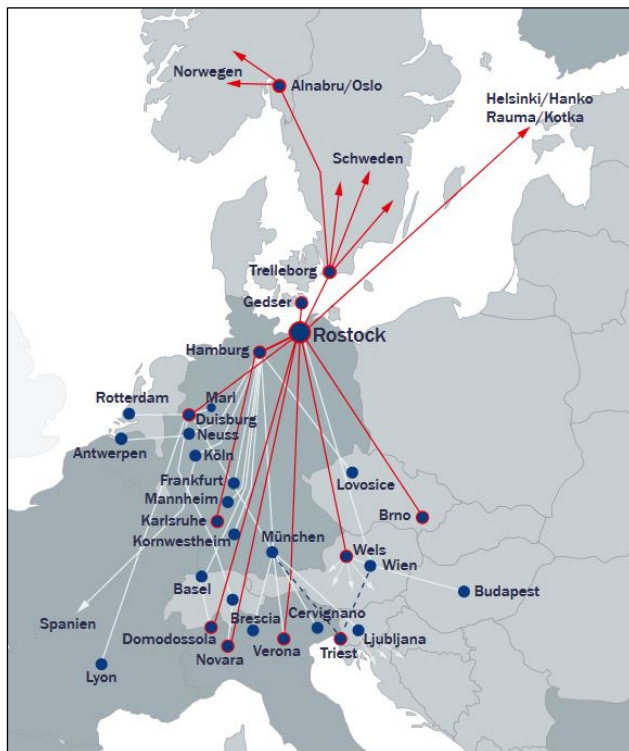
Source: Port of Kiel; modified by KombiConsult

Figure 10: Ferry and train connections, Travemünde (Port of Lübeck)



Source: Baltic Rail Gate GmbH; modified by KombiConsult

Figure 11: Intermodal connections, Port of Rostock



Source: Port of Rostock

4 Identification of modal shift potential

According to the approach, the theoretic modal shift potential identified in Chapter 2 (see Table 8) should be assigned to existing multimodal services from and to Norway (see Chapter 3) and new services deviated from the geographic allocation of origins and destinations. For this purpose, the very information about the origins and destinations of the transport flows, for example on a NUTS-2 level, would be required. This information, however, was not available due to a lack of proper public statistics. Nevertheless, the number of lorries leaving and entering Norway - the theoretic modal shift potential - is rather high so that there should be adequate opportunities to gain volumes for more environmentally friendly transport solutions involving rail and/or sea.

Table 8: Theoretic modal shift potential based an average truckload of 20 tonnes (assumption), 2017

	Denmark	Germany	Italy	Poland
Export from Norway [no. of lorries]	16.127	20.084	6.394	16.773
Import to Norway [no. of lorries]	28.225	30.492	11.508	22.692
Import-export ratio	1,8	1,5	1,8	1,4

Source: KombiConsult

In order to approximate to the “real” situation and thus partly close the statistical gap we have conducted several interviews with transport experts. This exercise allowed a qualitative assessment of opportunities for shifting existing road volumes to rail or sea.

4.1 Expert interviews

We have carried out six face-to-face interviews with logistics service providers (LSP), an intermodal operator and a seaport operator who are familiar with freight transport logistics from/to Norway. The experts cover almost the full scope of market segments of the Norwegian logistics market, as follows:

- Transport of dry cargo, mostly palletised;
- Transport of temperature-controlled goods;
- Transport of fluid and bulk goods mainly for the chemical industry.

Against this background, their statements and assessments can be considered as representative for the road and intermodal freight industry on trade lanes from/to Norway. The interviews delivered the following key findings:

(1) The experts clearly confirmed the analysis of the public transport statistics in particular as concerns the transport of **dry cargo, mostly palletised goods**, for which road operators overwhelmingly deploy semi-trailers. There is a substantial imbalance of Norwegian cross-border road freight traffic. The LSPs can ship considerably more full truckloads to Norway, especially the Greater Oslo region, than are leaving the country. They even consider that the imbalance has increased in recent years partly

owing to the closing of factories and the transfer of the production to other European or overseas locations as, for example, paper mills.

In order to ensure viable operations in this sector it is fundamental for road hauliers to have loads in both directions. Owing to the lack of sufficient export volumes in the Oslo region, a considerable percentage of lorries leave Norway empty and seek to get a backload in Sweden (triangle routing).

The imbalance of transport flows is reflected in the freight rates for full truckload shipments. For imports to Norway, LSPs can quote prices for door-to-door transports in the range of € 1.30 to € 1.50 per kilometre whilst, for North-South shipments, the demand side is in a position to push rates down to almost the half.

Thanks to the large volumes, the dry cargo sector is basically a preferable target market for intermodal rail/road services or potentially for sea/road or, respectively, sea/rail/road services from/to Oslo. Intermodal operators, however, would be faced with the impacts of the imbalanced traffic flows:

- If an LSP cannot obtain a backload in the Oslo region, in most cases, he will not use the northbound intermodal service since the total round trip costs likely exceed the costs of a full road journey and the triangle routing of intermodal units is extraordinarily complex. This situation constrains the market potential for a direct intermodal service from/to Oslo;
- Alternatively the LSP could return a load unit empty to the origin. But this would not be economic - paying the price of the intermodal journey but get no revenues - unless the intermodal operator would ship the unit for free. But then the viability of the intermodal service would be jeopardized.

(2) The market conditions for the transport of **temperature-controlled goods** distinguish from the dry cargo sector. According to the LSPs consulted, the flows are much more balanced. Imports consist of a wide range of foods such as fruits or vegetables but also chemical and pharmaceutical products, while fish is the main export cargo.

This segment therefore could be considered suitable for intermodal services also because shippers are prepared to pay higher prices than in the dry cargo sector. The service level requirements of this sector particularly as concerns the transit time and the reliability of service, however, are more severe than for the carriage of dry cargoes. As intermodal rail transport is notorious for not complying with the promised time schedules most LSPs are cautious to use their services. This is because if goods were often delivered delayed LSPs would be rated badly by shippers. Immediate consequences are reduced revenues but it may also result in the cancellation or refusal to extend contracts. Even though some LSPs specialised in the transport of temperature-controlled goods are already using intermodal rail/road services on the corridor, especially between Germany and Sweden, it is challenging to acquire and retain those clients for intermodal transport offerings.

(3) Chemicals represent the huge majority of the transport volume of **fluid and bulk goods**; the share of foodstuffs in bulk such as fruit juices is small. Over the road the goods are used to be carried with road tankers or silo vehicles whilst tank and bulk containers are deployed for multimodal services by rail or sea.

The logistics in this sector differ fundamentally from the other market segments described above. In most cases LSPs employ transport equipment dedicated to a single product or group of products. A large proportion of equipment is returned empty after a journey with freight since it is very unlikely that the same product can be shipped in the opposite direction. Though, a smaller share of equipment will be cleaned and deployed for conveying other goods.

What is important in respect of the intermodal market potential is that the logistics basically are the same if road-only or intermodal operations are chosen by the LSP. Thus multimodal services are at par with unimodal road transport despite empty return journeys.

The interviews with Europe's top two LSPs in this sector and another medium-sized company proved that they have already shifted the majority of their volumes from/to Norway on multimodal transport services. They use several services, operators, routes and combinations of transport modes such as road-rail-ferry-rail-road or road-ferry-rail-road.

In spite of that, they still provide some additional volumes, which are currently conveyed from/to Norway by road either fully or via Göteborg. Here they recognise a lack of appropriate services with Oslo particularly as regards the transit time and reliability, which prevent them from ensuring efficient and road-competitive round trips for the equipment, and less the costs.

(4) The interviews revealed a **further potential intermodal market**, which had not been considered ahead of the survey. An LSP pointed out that Norway is required to export a large part of the **litter** collected especially to Germany due to the lack of authorised dump or incineration sites. Waste and recycling materials are excellent target markets for intermodal rail services. These sectors represent a significant share of intermodal volumes, for example, on transalpine services. In order to assess the full market potential for services from/to Oslo a more detailed market analysis would be required.

(5) Virtually all Norwegian cities and economic centres are located at or close to the Atlantic. The transport by container feeder, Con/Ro or conventional vessels therefore is the most efficient and also often the fastest option in particular for transport flows with the Netherlands, Belgium or West Germany. Under current conditions these volumes are clearly missing for setting up more effective intermodal services by rail.

(6) In contrast to the above findings, one expert interviewed mentioned that in some more peripheral west coast regions shippers "desperately" call for road transport capacity but cannot get it. Consequently, they are "forced" to forward their products by vessels.

(7) Some participants to the survey forecast very good prospects for the transport corridor with and through Poland. Firstly, they expect a further strong growth of the transport volume between Norway and Poland as well as the Czech Republic, Slovakia, Hungary and Austria. Secondly, the route via Poland is to become increasingly beneficial as it follows almost a straight line compared to the commonly used corridor via Germany. Too, Poland and the other Central European countries pursue ambitious investment plans to extend and upgrade their motorway infrastructure whilst German roads grew increasingly congested.

The ports of Gdansk and Gdynia are considered as most favourable access points to Poland for shipments with Norway and Sweden due to their good hinterland connections.

Currently, intermodal services do not play a role on this corridor. Freight volumes are almost completely moved by road. This is owing to four key factors: low-cost road hauliers; good and steadily improving road infrastructure; only slowly improving infrastructure on many sections of Poland's rail network; and non-competitive intermodal service offerings. Big LSPs who are strongly involved in intermodal rail/road transport in Northern Europe are convinced that the corridor through Poland with other Central European countries will become a viable alternative within about the next five years.

4.2 Recommendations for improvement of existing or implementation of new multimodal services

Based mainly on the results of the survey among transport experts we have drawn conclusions on the opportunities or needs for enhancing multimodal services and on the need for economic or regulatory measures designed to incentivise modal shift. Our recommendations, first of all, refer to multimodal transport services, where the main leg is carried out by sea, and then to intermodal rail/road services.

The LSPs who contributed to the survey highlighted the importance of **multimodal sea freight transport** for Norwegian trade with "continental" regions located close to the sea or in the hinterland of ports such as the Netherlands, Belgium, Northern France or Northern and West Germany. All economic centres along the Norwegian west coast are at the same time sea ports. Sea transport both containerised and "conventional" therefore appears to be the prime option for many shippers and LSPs. The services are supposed to be competitive in terms of transit time and cost in comparison with long overland operations via Oslo and Sweden, eventually also including a ferry transport between a Swedish and a German Baltic Sea port.

A various range of intermodal railway hinterland connections contributes to the attractiveness of the ports in the southern Baltic Sea. But, quality deficits in the European rail transport sector in general disturb smooth multimodal freight transport of load units from and to Norway during the last two years. In particular if there is only one daily ferry departure, train delays can easily lead to a 24 hour delay at the receiver. If the buffer for such delays is integrated in the calculation, this causes an increase of the transport price and thus weakens the competitiveness of the multimodal transport option towards road transport.

In view of the freight transport capacity on ferries, some constraints were reported, in particular in the summer holiday period and on the ferry line Oslo - Kiel. Dedicated freight transport capacity - either on combined Ro/Pax ferries with extended load meters or in terms of pure (Ro/Ro) freight ferries - would help establishing stable and regular routings.

According to the LSPs interviewed there would basically be sufficient market potential for increased **intermodal rail/road services** from/to Oslo. The potential consists less of fluid and bulk cargoes, which are already moved on various multi- or intermodal services to a large part. The limited size of in-

interviews conducted for this study could also not fully clarify whether a part of the volumes presently shipped by multimodal sea/road services could be captured if the total chain of transport via Oslo and Baltic sea ports were enhanced, for example, in terms of transit time, performance and the cost of service. The rather quick suspension of the Oslo-Rotterdam service operated by TX Logistik a few years ago may not be encouraging for other service providers.

The transport of dry cargo and temperature-controlled goods make up the chief market potential for intermodal services as long as the volume of litter exports and the ability to catch it for intermodal operations could not be clarified. These market segments, however, are challenging to develop. The critical factors are the imbalance of flows in the dry cargo sector and the demanding service level requirements for temperature-controlled goods. In order to overcome these barriers and match the requirements of LSPs and their clients we suggest to examining the following actions in respect of intermodal operations:

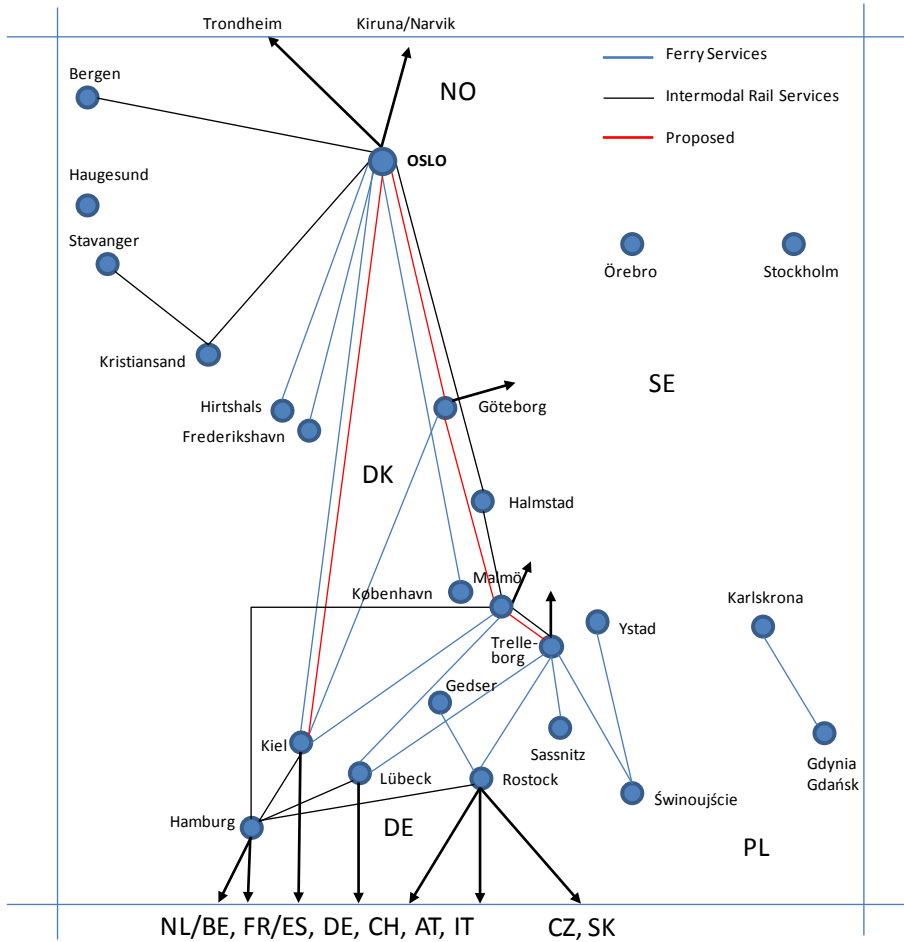
(1) Either the Oslo-Göteborg intermodal service should be re-established or CargoNet's existing Oslo-Malmö/Trelleborg service upgraded.

(2) Whichever trade lane would be preferred, likely depending on an in-depth market analysis, we propose to serve it by two daily train pairs five to six days per week:

- One daily service can meet the "standard" requirements of dry cargo and tank and bulk container transports. Freight rates should therefore be inexpensive. The service can be operated at the usual train speed but should be synchronized with the ferry time-tables at the corresponding Swedish ports. But what is paramount is that the service should enable LSPs who could not get a backload in Norway transferring their empty units to a Swedish economic centre. It must be emphasized that LSPs likely will only use the train if the rate is not higher than the costs for an empty road journey from Oslo to a point of loading in Sweden.
- The second daily intermodal train should primarily be designed to clients moving temperature-controlled goods or time-sensitive dry cargo such as groupage cargo. The service should be fast and synchronized with the ferry time-tables at the corresponding Swedish ports and ensure a high rate of punctuality of 95% or more. A quality guarantee should be part of the service package. Freight rates of this prime intermodal service can be higher than for the "standard" service.

(3) We expect that the capacity load factor of the intermodal services will not be sufficient to reach the break-even at least in the first six to 12 months after inauguration, or even later. Further, the rates for empty units will likely not cover the costs. We therefore recommend to consider granting a financial support for the provider of the intermodal service in the start-up phase, which would allow to compensate the economic losses from operations. The scale of support should decline over time (degressive) to provide incentives for marketing the service offerings and ensure a high quality of service. It is further suggested to avoid bandwagon effects, that is, that shipments or clients of the underlying intermodal services benefit from financial support that they do not need.

Figure 12: Existing services and proposed improvement of services from/to Oslo



Source: KombiConsult

5 Public financial support of modal shift from road to sea

In order to encourage modal shift from road to sea, the Norwegian government decided to compose a programme for the initial funding of sea-based transport services. The current aid scheme for short sea shipping started in February 2017 and will last until February 2020, thus eligible projects can be supported up to three years. Currently, the applications for 2018/2019 are about to be evaluated. Depending on funding, a new call for applications could be released at the end of 2018 or early 2019.⁶

The paramount precondition for receiving public funds is that the new service generates environmental and wider social benefits in Norway (summarized under the term "utility value" in the guidelines for aid to short sea shipping⁷). The utility value is defined as the difference between the total external costs for the road transport option and those caused by the alternative sea transport option. Furthermore, the applicant should demonstrate that he/she would not be able to implement the service without financial aid and that it will be commercially viable after the funding period.

The grant amounts to either 30 % of the eligible operating costs directly linked to the modal shift generated in the initial phase of the service or 10 % of the investment costs for transshipment equipment. If the actually generated utility value of the service is below the aforementioned share of costs, funding would be limited to this amount.

The funding programme is open to all persons and companies that equip and operate ships at their own expense (ship owners). Ship owners must be established in the European Economic Area (EEA) and the ships themselves registered under the flag of an EEA country. All sea-based transport services that lead to modal shift of freight from Norwegian roads to the sea are within the scope of the aid scheme. That could generally apply to both domestic and border-crossing services as confirmed by the National Coastal Administration (Kystverket)⁸, responsible for administration and management of the aid scheme. However, only the distance covered on Norwegian territory is relevant for calculation of the modal shift and subsequently the utility value.

In view of international transport from and to the Oslo region in southward direction, let us suppose an exemplary relation Oslo - Rostock, the Norwegian aid to short sea shipping would only consider the small part of the transport route within Norway for identifying the utility value. For road transport to be shifted, that would mean a distance of about 120 km from Oslo to the Norwegian-Swedish border (the Svinesund) compared to a total road distance of about 750 km from Oslo to the port of Gedser in Denmark where an existing ferry could be used for crossing the Baltic Sea to Rostock. The same applies for the sea route, where only the part within the Norwegian economic zone can be taken into account. Considering that the costs for vessels, personnel and so on are related to the entire section Oslo - Rostock, this would likely lead to an unfavourable cost-benefit ratio in the evaluation for funding.

⁶ Information by E. Støylen, Kystverket, e-mail of 28th June 2018.

⁷ See <http://www.kystverket.no/globalassets/veiledninger/guidelines---aid-to-shortsea-shipping-2018.pdf>.

⁸ See footnote 6.

Therefore, it must be doubted that this aid scheme is actually suitable for border-crossing services where the bigger part of the transport route is located outside Norway.

According to the interview-based findings of Chapter 4.2, the preconditions for sea transport in Norway are quite well. The survey delivered the indication that freight capacity should be improved on the existing connection Oslo - Kiel, in particular during the summer holiday period. The shipping company in question seems to be aware of this market requirement. However, the possibility of improving the service cannot be appraised by the authors.

In general, it seems as if the transport market works well and adapts itself to the market conditions in question. Vessel operators likely are capable of reacting to both an increasing and shrinking demand for transport capacities. The combination of sea and road is considered to deliver competitive services, which are also economically viable. Against this background any further financial support measure would not be justified currently.