

Impact of the Fixed Fehmarn Belt Link on the Transport of Ferrous Metals and from Northern to Central Europe

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Abbreviations

BSR	Baltic Sea Region
FBFL	Fehmarn Belt Fixed Link
GDP	Gross Domestic Product
kt	thousand tonnes

Literature

No.	Title
[1]	EUROFER: ECONOMIC AND STEEL MARKET OUTLOOK 2018-2019, FIRST QUARTER, 2018, 6 FEBRUARY 2018,
[2]	National action for metallic materials - A STRATEGIC RESEARCH AND INNOVATION AGENDA (Nationell samling kring metalliska material - EN STRATEGISK FORSKNINGS- OCH INNOVATIONSAGENDA), Stockholm 2013
[3]	JP. Birat: Global Technology Roadmap for CCS in Industry, Draft Steel Sectoral Report, Prepared for the UNIDO Global Technology Roadmap for CCS in Industry, ArcelorMittal Global R and D, Maizières-lès-Metz, France, 2010
[4]	Fehmarnbelt Forecast 2014 - Update of the FTC-Study of 2002 for Femern A/S 2014
...	...

0 Summary

Steel is the most widespread base material with applications in all fields of human activity. Globally, steel as a construction material will continue to grow for the foreseeable future. The centre of world steel production is in Asia, close to half of the world production in China.

Crude steel production in the European Union oscillated after a drop by 5% in 2012 between 162 and 169 million tonnes in the following years. The share of Nordic countries in EU crude steel production was about 5% standing around 8 million tons. Crude steel production in Sweden and Finland stands at 2.8% and 2.5% respectively of EU-28 production.

Nordic countries foreign trade in iron and steel showed in the last decade pronounced ups and downs following the world market development (Figure 4). Total turnover changed in course of ten years only marginally. Trade with geographic groups showed different dynamic (Table 3), intercontinental trade was the most dynamic (China, Japan and South Korea). In Europe trade with eastern countries was most dynamic.

Sweden's main trading partners by total volume are Germany, Finland, Norway, United Kingdom and Italy. Finland's exports were mainly destined for Netherlands, Germany Sweden, while 40% of imports came from Russia.

Transport of iron and steel between Nordic countries and the continent is conducted by sea, rail and road. The estimated share of sea transport in metals transport amounts to considerably more than half of metals cargo volume. Biggest single flows in inner-Baltic transport were from Russian Baltic ports to Poland and Denmark. There are no big volume iron and steel break bulk flows from Sweden to continental Baltic ports.

Biggest flows in breakbulk sea transport from Sweden in 2016 were reported going to Spain and Belgium and coming from the Netherlands, Finland and Belgium. Main Nordic ports for breakbulk iron and steel are Tornio, Frederiksværk Havn, Oxelösund and Raahe (Table 10). Main continental Baltic and North Sea ports handling iron and steel in Nordic countries trades are Rotterdam, Duisburg, Antwerp and Amsterdam.

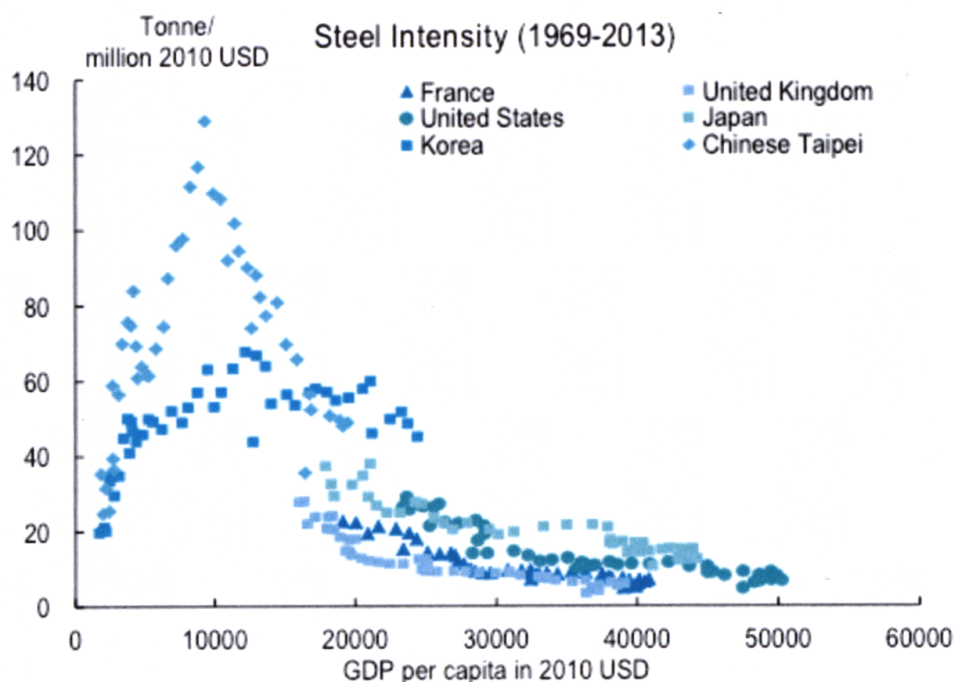
The Fixed Femern Belt Crossing (FBFL) is to create a further high-capacity land route between Central Europe and Southern Sweden for road and rail transport in competition to existing land, sea and combined routes. Total cargo volume is expected to grow to 43.9 or 49.2 million tonnes respectively in 2035 in the two scenarios studied, while metals' flows are forecasted to grow to 5.8 or 6.1 million tonnes in 2035 at a slightly lower rate. Metals had a share of 13.4% in 2011, expected to stand at 13.3% or 12.5% in 2035.

Given the slightly decreasing trend since 2011, in order to reach the metals traffic volumes forecasted for 2035, in the remaining years 2017-2035, average yearly growth of metals traffic between Scandinavia and Continental Europe of 3.0% in Case A and 3.3% in case B would be required. This sharply contrasts with the long term average stagnation of Scandinavian iron and steel trade with Continental Europe in the period 2005-2016.

1 Objective and goal

Steel is the most widespread base material with applications in all fields of human activity. Globally, steel as a construction material will continue to grow for the foreseeable future. Steel production and consumption is a basic indicator for economic activity. The steel intensity of economic activity measured by steel consumption per unit of GDP as well as the steel elasticity of economic growth (growth rate of steel consumption in relation to economic growth rate) are indicators of the type and quality of economic growth.

All countries have exhibited a very similar pattern of use of steel - at a per capita GDP of approximately 5 000 USD steel consumption rises rapidly, then flattens out at 15 000 USD per capita and decreases slightly after that (Figure 1).



Source: Worldsteel

Figure 1: Steel intensity and economic growth

Some long term trends in steel production and consumption

- The centre of world steel production is in Asia. Close to half of the world production of finished steel products is produced in China, while the share of the EU-28 is about 10% (Figure 2).
- Crude steel production in the European Union oscillated after a drop by 5% in 2012 between 162 and 169 million tonnes in the following years. The share of Nordic countries in EU crude steel production was about 5% (7.9 ... 8.7 million tons).

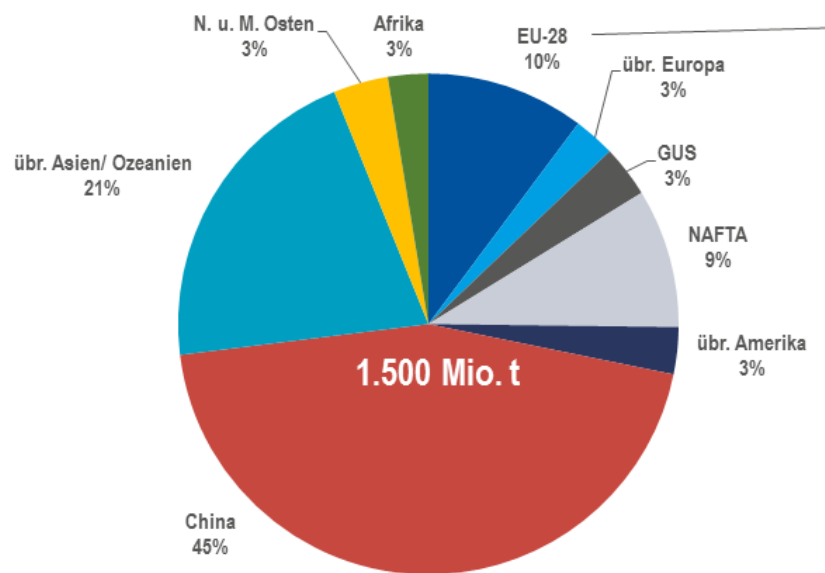


Figure 2: World production of finished steel products by regions in 2015

- Capacity build ups in newly emerging economies (e.g. India, Iran, Saudi Arabia) cause concern in the industry.
- Inter-material competition and more efficient use of steel reduce steel market expansion potential.
- The industries focus is increasingly on value creation rather than expansion.
- An increasing share of steel production from ore is expected to be via direct reduction. This is partly because the method has CO₂ benefits and can make use of natural gas. As a result of large, newly discovered deposits and the introduction of new methods of gas extraction the price of gas has dropped in recent years.
- The share of arc furnace steel in total production is expected to increase due to the growing availability of scrap iron. For high quality steels the blast furnace process is still indispensable.

An analysis of the various published estimates, which in turn are based on different scenarios for costs and limitations of CO₂ emissions, predicts that steel demand will increase to 2050. The need for new pig iron will, however, peak around 2030 and return to current levels by 2050. Around 2090 it is expected that almost all of the world's need for new steel will be met through re-melting of scrap iron. [3].

Total output of EU steel using industry in 2017 is estimated to have risen by 4.7%, the strongest annual growth since 2011. Demand of EU steel-using sectors is forecast to grow by 2.2% in 2018 and by 1.8% in 2019 (Table 1). Steel intensity exerts a slightly negative influence on real consumption growth in Europe. [1, p.13]

Main sectors of steel consumption in Europe are construction, automotive and metal goods industries and mechanical engineering (Table 1).

Table 1: Year-on-year %-change EU Steel Weighted Industrial Production (SWIP) index

	% share in total Consumption	Year 2017	Year 2018	Year 2019
construction	35	4.3	2.6	2.2
mechanical engineering	14	4.9	3.1	1.9
automotive	18	3.7	1.7	1.1
domestic appliances	3	3.7	2.7	2.6
other transport	2	2.3	2.8	2.9
tubes	13	8.3	.0.5	0.7
metal goods	14	5.0	2.9	2.3
miscellaneous	2	2.9	2.0	3.0
TOTAL	100	4.7	2.2	1.8

Source: ECONOMIC AND STEEL MARKET OUTLOOK 2018-2019, FIRST QUARTER, 2018, Eurofer

In 2016 steel products of about 8 million tonnes in total were traded between Northern and Continental Europe. Of this, more than 4.2 million tonnes flow in a southern direction, the sources of which are almost entirely in Sweden and Finland. Products are carried by ship, rail or road.

The planned Fehmarn Belt Fixed Link (FBFL) is relevant for the transport of iron and steel from Sweden and Denmark to Central Europe (Figure 3). The FBFL is an alternative to the existing railway and road transport routes which either run through Jutland or use the ferry connections across the southern Baltic Sea. Compared with the Jutland route, the connection over the Fehmarn Belt is about 160 km shorter. In particular, railways expect volume increases caused by:

- shift from road to rail,
- the expansion of the catchment areas of the railways on the one hand towards central Sweden and on the other to Western Europe, so that shifts from sea transport to railways are possible;
- rail transport capacity increase per se.

In addition, the two remaining rail ferry connections Rostock-Trelleborg and partly also Swinoujscie-Ystad are expected to lose cargo after the commissioning of the FBFL.



Figure 3: Fehmarn Belt Fixed Link in the Trans-European Transport Network (sector)

The aim of this investigation is to assess the current developments in Nordic countries metallurgical industry with focus on its connections with Continental Europe. Of special interest is the impact expected on the FBFL with respect to cargo volumes and modal split in the transport of iron and steel products. In addition, consequences for ferry lines and ports in the southern Baltic Sea are to be discussed as well as possibilities for how maritime transport and ports can secure their market shares.

2 Foreign trade of iron and steel of Northern Europe

Key figures on Northern Europe's crude steel production and foreign trade in steel products are presented in Table 2. Figure 4 shows the dynamics of exports and imports volumes. After the recession 2008/2009 total exports recovered to pre-crisis levels while imports still lag behind.

There is a significant crude steel production only in Sweden and Finland (2.8% and 2.5% respectively of EU-28 production). There are structural differences in the steel industries in both countries reflected in considerably higher foreign trade intensity¹ in Sweden with 77% against 37% in Finland. In both countries in average exports are higher priced than imports. The relative price differential is in Sweden much higher than in Finland (31% against 6%). Crude steel as well as semi-finished and finished steel production in both countries is closely interrelated as the Swedish SSAB is the dominating producer owning all full cycle plants in both countries.

As Sweden is the main exporter and importer of iron and steel in Northern Europe and because of its dominant role in respective transport flows between Scandinavia and Continental Europe in the following this country will be given special attention.

Remarkable is the position of Finland as one of the main producers of stainless steel in Europe. Finnish Outokumpu Oyj is the leading producer of stainless steel in Europe with production in Finland, Sweden, Germany and Great Britain. More than half of Finnish exports of warm rolled steel are stainless steel.

Production in Denmark is limited to hot rolled products manufactured in one plant (NLMK DanSteel A/S in Frederiksværk). Plates are imported from Russia.

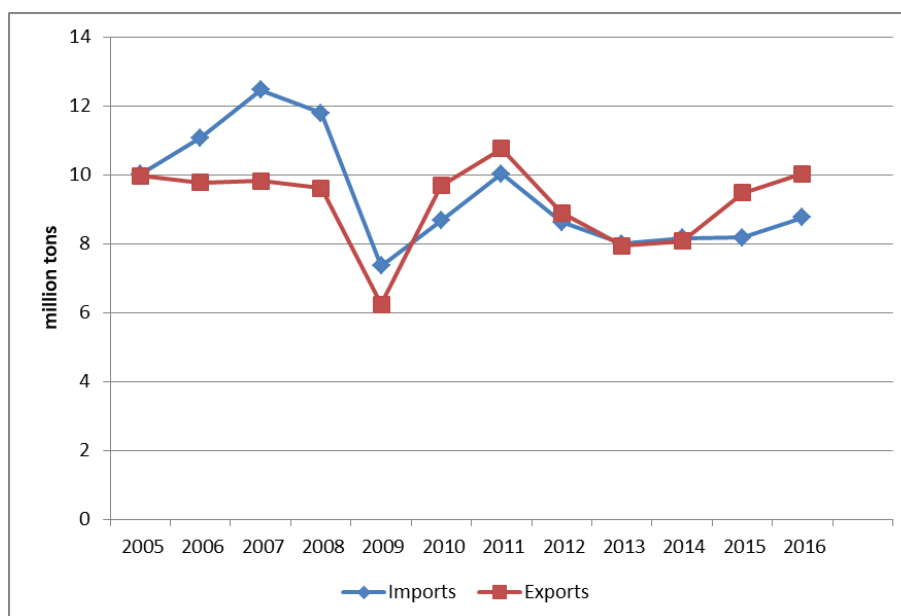
In Norway one factory produces crude steel in electric furnaces and rolled products.

Table 2: Key figures for Northern European steel production and trade in 2016 (1.000 tons)

	Crude steel production	Exports	Imports
		of Semi-finished and Finished Steel Products	
Sweden	4.617	3.650	3.433
Finland	4.101	1.948	1.078
Norway	620	571	1.001
Denmark		946	2.535
<i>European Union (28)</i>	<i>162.024</i>	<i>140.587</i>	<i>148.210</i>

Data: STEEL STATISTICAL YEARBOOK 2017, Worldsteel

¹ measured as average of export and import volume against crude steel production volume



Data: EUROSTAT, Statistics Norway

Figure 4: Nordic countries - Imports and exports of iron and steel, million tons

Nordic countries foreign trade in iron and steel showed in the last decade pronounced ups and downs following the world market development (Figure 4). In the sum total turnover changed in course of ten years only marginally.

Table 3 shows the growth of Nordic iron and steel trade volume by geographic orientation. Trade with European countries is grouped in an Eastern and a Western direction, where Germany, Austria and Italy are the border countries of the western group. The countries of Western Europe clearly are the main trading partners in iron and steel, followed by the Nordic countries themselves and the countries of Eastern Europe.

Trade with geographic groups showed different dynamic (Table 3). In a 10-years-perspective intercontinental trade was the most dynamic, where trade growth with China, Japan and South Korea is most remarkable. In a European perspective trade with eastern countries was most dynamic, although on a rather low level. Turkey and Russia contributed most to this development, while in the 5-year-perspective also trade with Poland increased considerably.

Table 3: Nordic iron and steel trade by geographic orientation

Trade corridor	2016 [1000t]	Distribution	CAGR 2016/2006	CAGR 2016/2011
east	2.893	15%	-0,2%	0,2%
west	8.641	46%	-0,5%	-1,6%
intra-Nordic	3.974	21%	-2,7%	-2,3%
others	1.898	10%	2,6%	-1,5%
trading partner not disclosed	1.374	7%	12,7%	-7,4%
Total	18.780	100%	0,0%	-2,0%

Data: EUROSTAT, Statistics Norway

In the following production and foreign trade is characterized by countries with special attention to Sweden as the main producer.

Sweden

has a centuries old tradition as iron and steel producer and exporter, based on rich and high quality iron ore deposits. After a serious structural crisis with losses in market position and production volume in the 1970s Swedish steel industry underwent a modernization and restructuring process and production recovered [2]. The 2009 crisis affected Swedish steel production severely. It stagnated since 2012 at about 4.5 million tons yearly and started to grow again in 2016 and 2017 (4.8 and 4.9 million tonnes crude steel).

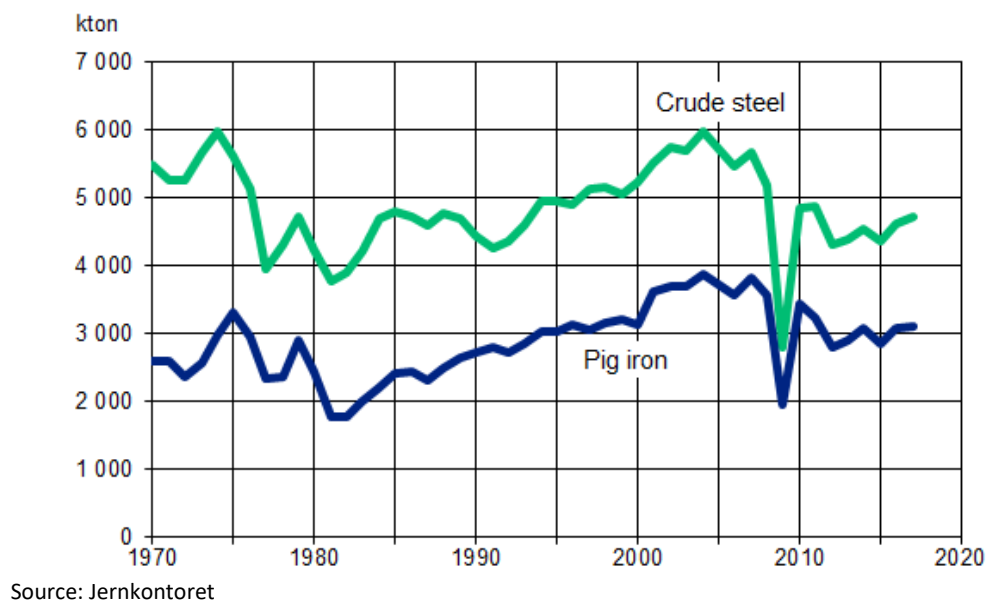
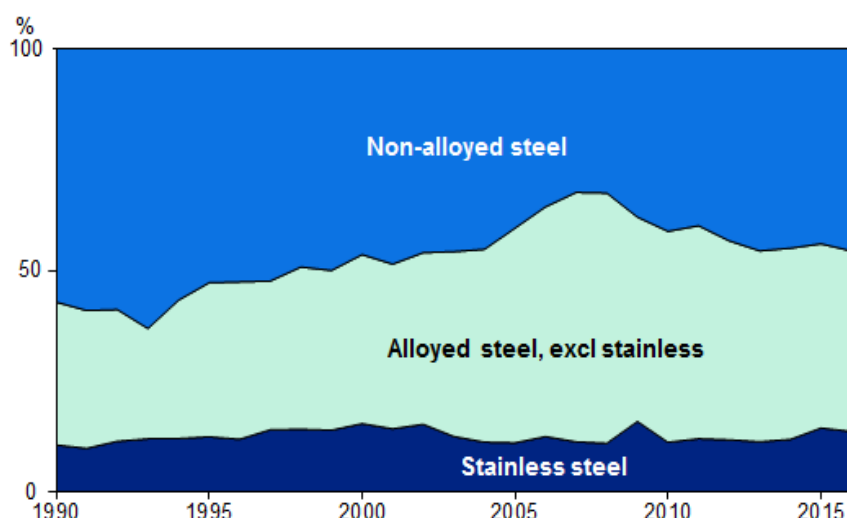


Figure 5: Swedish production of pig iron and crude steel

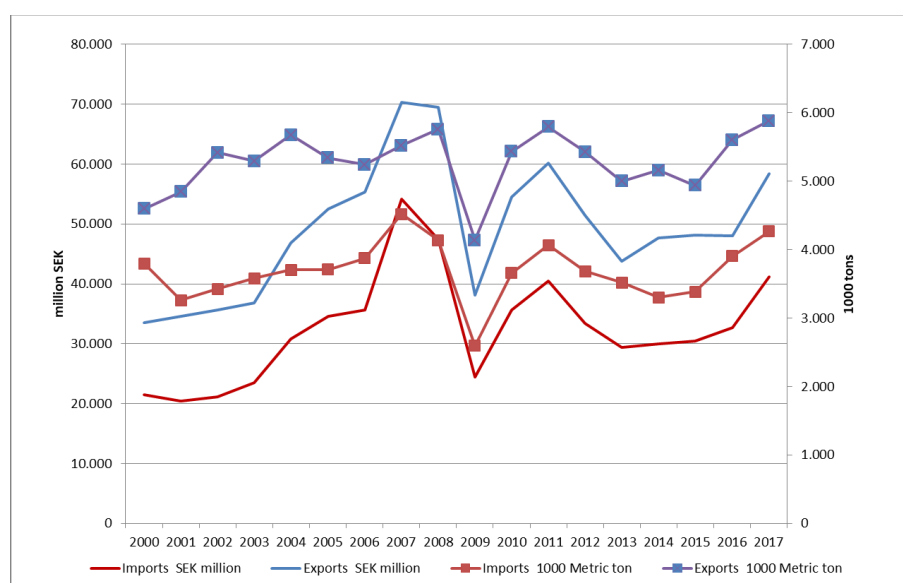
Swedish steel companies, as part of their reconstruction process, have focused their production on advanced steel qualities. This has meant that the share of alloy steel (including stainless steels) has steadily increased in the 1990s and 2000s (see Figure 6). At present, more than 50 per cent of the total production comprises alloy steel as compared to 10–15 per cent in the rest of the EU, as in the USA and Japan. This is again reflected in the situation of Swedish foreign trade in steel, where the per-unit-value of exports exceeds the figure of imports by 30% (based on EUROSTAT data 2016).



Source: <http://www.jernkontoret.se>

Figure 6: Swedish crude steel production by quality

Swedish foreign trade of iron and steel shows a similar dynamics. Volumes of exports and imports exceeded in 2017 first time the 2008 pre-crisis levels, while values still lagged far behind these marks.



Data source: Swedish Statistics

Figure 7: Sweden - Imports and exports of iron and steel, value and volume

Main trading partners by total volume are Germany, Finland, Norway, United Kingdom and Italy (all countries with foreign trade turnover of more than 400.000 tons and 500 million EUR in 2016, see Table 4).

Table 4: Sweden – foreign trade of iron and steel by countries in 2016

Country	EXPORT		IMPORT	
	1000 EUR	1000 tons	1000 EUR	1000 tons
GERMANY	1.048.062	828	700.863	778
UNITED STATES	406.659	306	25.962	10
ITALY	381.510	292	176.783	123
CHINA (PEOPLE'S REPUBLIC OF)	274.272	144	32.802	29
NORWAY	254.789	174	190.464	304
UNITED KINGDOM	229.183	233	327.258	224
DENMARK	227.595	226	147.153	136
FINLAND	227.426	173	512.598	612
POLAND	212.861	216	54.418	64
FRANCE	199.093	124	214.946	192
NETHERLANDS	154.022	131	329.448	310
SPAIN	141.396	203	74.027	61
BELGIUM	123.724	102	127.667	161
TOTAL	5.322.294	4.284	3.625.141	3.808

Data: EUROSTAT

Swedish steel industry is highly concentrated with SSAB AB being the biggest company. It is mainly owned by Swedish, Finnish and US investment funds. The group is now internationally positioned with 55% of gross fixed assets in the US, 26% in Finland, and 16% in Sweden. All blast furnaces in Scandinavia are operated by SSAB.

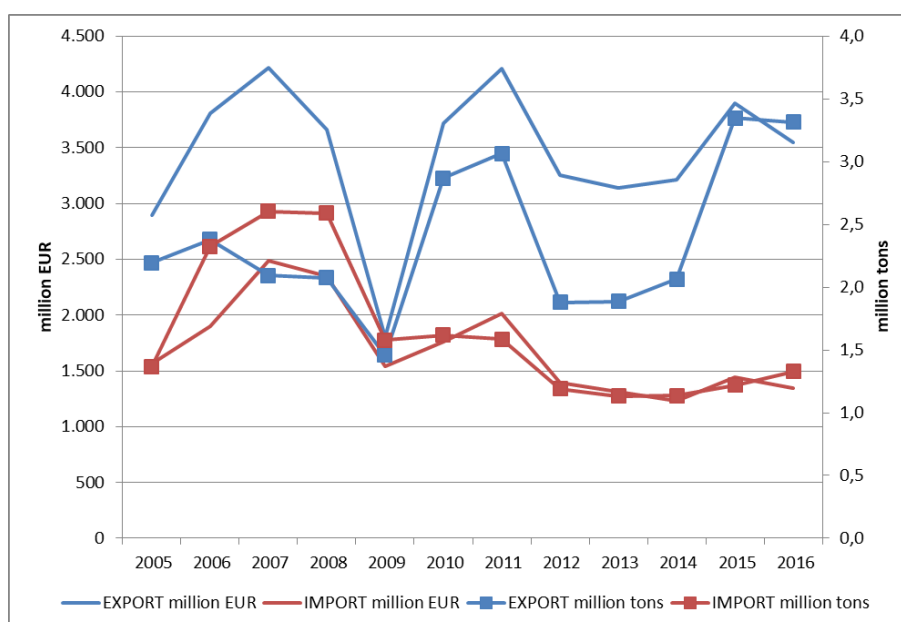
Table 5: Sweden – steel industry by main companies

Company	Processes	Employees	Sales 2015 (million EUR)
SSAB AB	M,O,C,V	6910	6.079
AB Sandvik Materials Technology	E, A, C, V,F	3680	1.487
LKAB, Luleå		3450	1.580
Ovako AB	E, C, V, F	2130	834
Outokumpu Stainless AB	E, A, C, V	1760	n.a.
Uddeholms AB	E,V,F	850	n.a.
Höganäs AB	E,P	830	713

M=Blast furnace, P= Sponge iron furnace, E=Electrical furnace, O=Oxygen converter, A=AOD converter (argon oxygen decarburization), C=Continuous casting, V=Hot rolling-mill, F=Forging press

Finland

The main Finnish steel factories in Raahе (steel production in blast furnace, heavy plates and strip products) and Hämeenlinna (strip products and tubes) are part of the SSAB Europe division. The Outokumpu plant in Tornio is an integrated stainless steel mill including melt shop, hot rolling mill, cold rolling mill and ferrochrome smelter.



Data: Eurostat

Figure 8: Finland - Imports and exports of iron and steel, value and volume

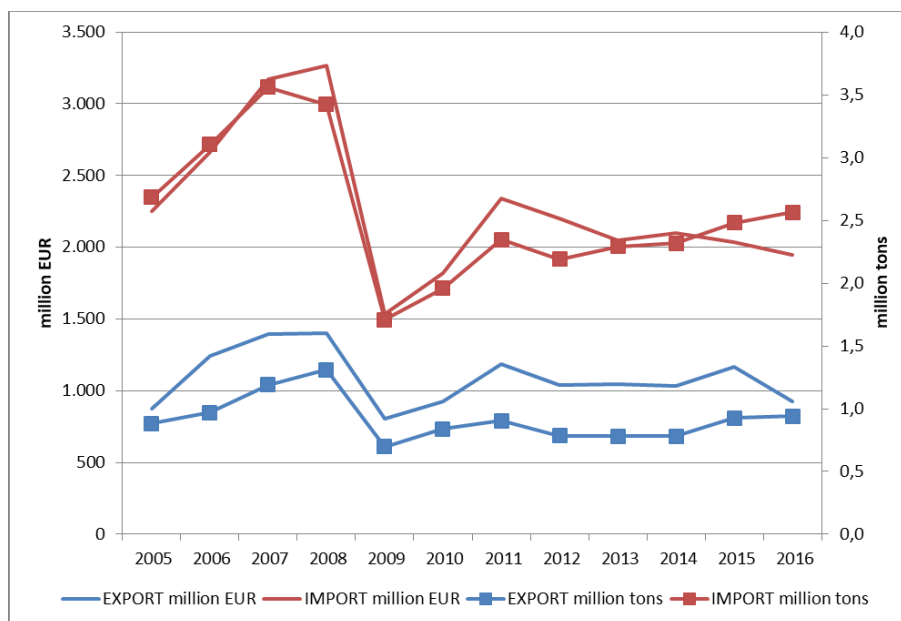
Data on the geography of Finnish trade are not fully disclosed. "Countries not specified" in Table 6 include a large part of trade with Sweden. According to Finland's customs statistics in 2017 29% of exports value was destined for Netherlands, 16% for Germany and 15% for Sweden, while 40% of imports came from Russia, 9% from Germany, 8% from Sweden and 5% from Norway as the respective main trading partners.

Table 6: Finland – Foreign trade of iron and steel by countries in 2016

Country	EXPORT		IMPORT	
	1000 EUR	1000 tons	1000 EUR	1000 tons
NETHERLANDS	1.064.327	613	58.305	40
COUNTRIES NOT SPECIFIED, INTRA-EU TRADE	542.713	939	82.920	79
GERMANY	517.691	470	192.963	182
SWEDEN	277.275	283	223.338	139
ITALY	164.075	145	72.803	37
TOTAL	3.545.947	3.316	1.345.248	1.327

Data: EUROSTAT

Denmark



Data: Eurostat

Figure 9: Denmark - Imports and exports of iron and steel, value and volume

Steel production in Denmark is limited to hot rolled products manufactured in the plant of NLMK DanSteel A/S in Frederiksværk, a subsidiary of Russian Novolipetsk Steel (NLMK). Plates are imported from Russia by sea, delivered mainly from the mother company. The yearly production is about 500 thousand tonnes. Figures on Danish steel imports clearly reflect this situation (see Table 7).

Table 7: Denmark - Foreign trade of iron and steel by countries in 2016

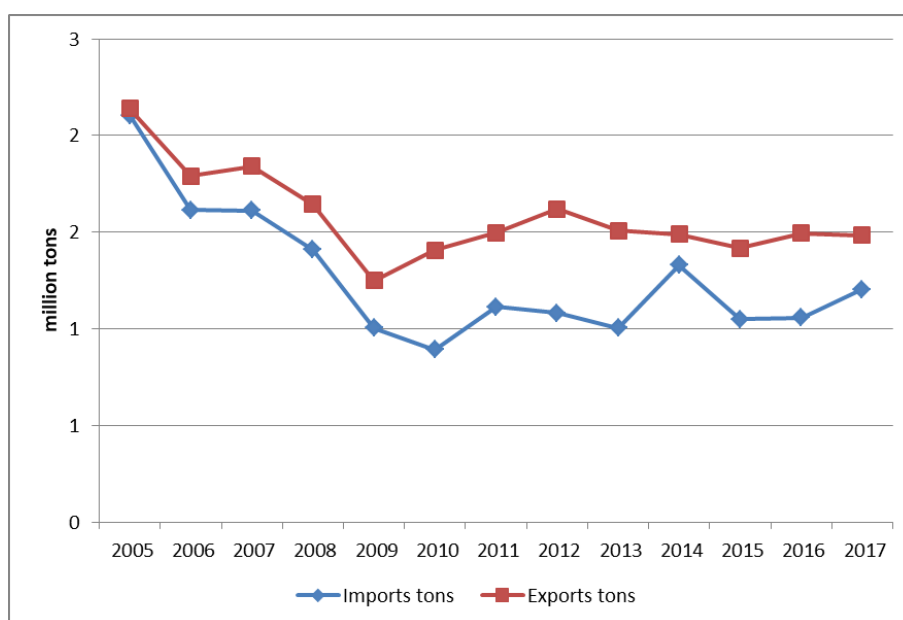
Zeilenbeschriftungen	EXPORT		IMPORT	
	1000 EUR	1000 tons	1000 EUR	1000 tons
RUSSIA	1.249	0	239.362	767
GERMANY	233.412	323	426.315	492
SWEDEN	178.782	190	264.590	283
NORWAY	83.044	47	58.879	109
FINLAND	37.062	45	102.708	106
POLAND	58.931	80	90.715	92
Gesamtergebnis	927.846	939	1.949.632	2.566

Data: EUROSTAT

Norway

Norwegian production of crude steel amounted in 2016 to 620 thousand tons according to Worldsteel. The respective plant Celsa Armeringsstål AS consists of electric arc furnaces and a combined rolling mill for the production of reinforcing bars and wire rods based on scrap iron. It is located in Mo I Rana in Northern Norway and is part of the Spanish Celsa group.

Total exports of iron and steel amounted in 2017 to 1.5 million tons and imports to 1.2 million tons. Throughout the 2010s there is now clear development trend visible (Figure 10). Main trading partners are Sweden, Germany and Finland (Table 8).



Data: Statistics Norway

Figure 10: Norway - Imports and exports of iron and steel, volume

Table 8: Norway - Foreign trade of iron and steel by countries in 2016

	Imports	Exports	Total
All countries	1.057	1.495	2.553
SWEDEN	155	293	449
GERMANY	177	186	363
FINLAND	115	180	295
NETHERLANDS	40	158	198
POLAND	22	109	131
DENMARK	42	101	143
UNITED KINGDOM	40	99	139

Data: Statistics Norway

3 Transport flows of iron and steel between Northern and Continental Europe

Transport of iron and steel between Nordic countries and the continent is conducted by sea, rail and road. Statistics on railway and road traffic are scarce. In [4, p.78] there are provided data on the modal split in land transport between the Nordic countries and Continental Europe (without Russian Federation). Total traffic amounted in 2011 to 28.8 million tons, thereof metals made up for 3.8 million tonnes with a modal share of 59% road and 41% rail transport. The share of metals in total cargo transport was 13.4%. For this year EUROSTAT reported a volume 4.3 million tonnes iron and steel carried by sea transport as breakbulk cargo between Denmark, Sweden and Finland and Continental Europe respectively. The share of sea transport in metals transport thus amounts to considerably more than half of metals cargo volume. In the following sea transport is dealt with more in depth.

Table 9 provides in an origin-destination matrix the figures on the respective flows as reported by EUROSTAT in the category “Other cargo - Iron and steel products” combined with data reported by Russian port administration. These data provide only incomplete information, as the recorded volumes of i.e. the Swedish trade volume are well below the amounts recorded in foreign trade statistics. Considerable flows of iron and steel products are carried in containers and on ro-ro units and recorded in the respective cargo categories. Nevertheless, the figures provided by EUROSTAT allow for a judgement on size and directions of cargo flows in the Baltic and on the main Baltic ports handling iron and steel as breakbulk cargo.

The biggest cargo volume of ferrous metals is reported by Russian ports, close to the total of all remaining Baltic Sea ports, followed by Finland, Sweden and Poland. Biggest single flows in inner-Baltic transport were from Russian Baltic ports to Poland and Denmark. There are also remarkable shipment volumes between Sweden and Finland in both directions and from Finland to Denmark. There are no big volume iron and steel break bulk flows from Sweden to continental Baltic ports.

Biggest outgoing flows from Sweden in 2016 were reported going to Spain (206 kt) and Belgium (199 kt) followed by United States and UK. The biggest incoming flow came from the Netherlands (293 kt), followed by Finland (170 kt) and Belgium (140 kt). Although Germany is Sweden’s most important trading partner in iron and steel, German ports did not report major break bulk shipments of iron and steel in the period 2013 – 2016. The biggest single cargo flow was reported by the river port Duisburg with 158 kt outward. Given the insignificant share of rail transport and the modest role of Dutch and Belgian ports, it seems plausible to assume, that the biggest share of Swedish – German metals trade is carried on ro-ro vessels and ferries.

Denmark reported 157 kt iron and steel shipments with Germany as the main continental partner widely spread over Baltic and North Sea ports. Finland’s trade in iron and steel was mainly directed to the Netherlands (1.052 kt outward).

Table 9: Maritime transport flows in Baltic Sea shipping of iron and steel (2016, 1000t)

Partner:	Reporter									Sum
	Germany Baltic	Denmark Baltic	Sweden	Finland	Estonia	Latvia	Lithuania	Poland	Russia Baltic	
	TOTAL									
Germany Baltic	8	102	26	149	-	12	120	15	55	487
Denmark	40	117	124	200	16	8	74	52	629	1.260
Sweden	6	43	51	257	27	14	12	21	53	484
Finland	10	78	210	9	8	4	49	133	23	524
Estonia	1	-	7	9	-	2	10	3	6	38
Latvia	35	9	33	-	2	-	5	-	249	333
Lithuania	34	13	56	22	74	-	-	22	4	225
Poland	12	65	28	97	-	4	20	12	741	979
Russia Baltic	55	629	53	23	6	249	4	741	n.a.	1.760
Total	761	1.635	2.204	2.791	206	402	1.176	2.036	10.080	21.291
inner-Baltic	201	1.056	588	766	133	293	294	999	1.760	6.090
out-of-Baltic	560	579	1.616	2.025	73	109	882	1.037	8.320	15.201
incoming										
Germany Baltic	2	26	4	36	-	8	2	7	54	139
Denmark	24	49	102	47	16	8	1	40	629	916
Sweden	1	13	32	40	26	-	-	5	53	170
Finland	7	58	170	4	-	-	10	71	6	326
Estonia	1	-	4	4	-	-	-	-	6	15
Latvia	35	-	24	-	-	-	1	-	249	309
Lithuania	34	8	41	17	-	-	-	16	4	120
Poland	6	9	20	14	-	4	3	7	718	781
Russia Baltic	54	629	53	6	6	249	4	718	n.a.	1.719
Total	488	1.104	1.189	444	96	350	28	1.187	n.a.	4.886
inner-Baltic	164	792	450	168	48	269	21	864	n.a.	4.495
out-of-Baltic	324	312	739	276	48	81	7	323	n.a.	391
outgoing										
Germany Baltic	6	76	22	112	-	4	118	9	-	347
Denmark	17	108	22	154	-	-	72	12	-	385
Sweden	5	29	47	215	-	14	12	16	-	338
Finland	3	19	41	8	8	4	40	62	18	203
Estonia	-	-	3	6	-	2	10	3	-	24
Latvia	-	9	9	-	1	-	3	-	-	22
Lithuania	-	5	15	4	74	-	-	6	-	104
Poland	7	56	8	84	-	-	17	14	24	210
Russia Baltic	-	-	-	18	-	-	-	24	n.a.	42
Total	273	571	1.042	2.349	110	53	1.148	861	n.a.	6.407
inner-Baltic	38	302	167	601	193	77	1.420	1.007	n.a.	8.082
out-of-Baltic	235	269	875	1.748	n.a.	...

Data: Eurostat, Russian port statistics

Nordic ports for breakbulk iron and steel shipping handling more than 100 thousand tons each in 2016 are given in Table 10. With the exception of Sölvesborg and Göteborg all important Swedish ports are located in the vicinity of major metallurgical plants, as well as the Finnish ports of Tornio and Raahe and Danish Frederiskværk Havn. There are in all Nordic countries many other, often small, ports handling breakbulk iron and steel (23 in Sweden, 10 in Finland, 5 in Denmark, 12 in Norway).

Table 10: Nordic countries – breakbulk iron and steel shipping by ports (2016, 1000 tons)

	TOTAL	IN	OUT
Sweden	2191	1181	1042
Oxelösund (ports)	790	195	595
Halmstad	324	324	
Sölvesborg	264	247	17
Göteborg	154	117	38
Luleå	150	5	146
Denmark	1580	1054	565
Frederiskværk Havn	983	705	276
Aalborg	180	57	123
Kolding	143	65	79
Odense	107	35	72
Finland	2790	447	2348
Tornio	1071	46	1025
Raahe	557	22	535
Hanko	289	56	233
Kokkola	231	4	227
Turku	192	76	117
Helsinki	128	68	56
Norway	1364	581	796
Borg	317	150	169
Floroe	222	117	106
Drammen	187	42	146
Oslo	169	99	70
Trondheim	166	90	76
Bergen	147	18	130

Data: Eurostat

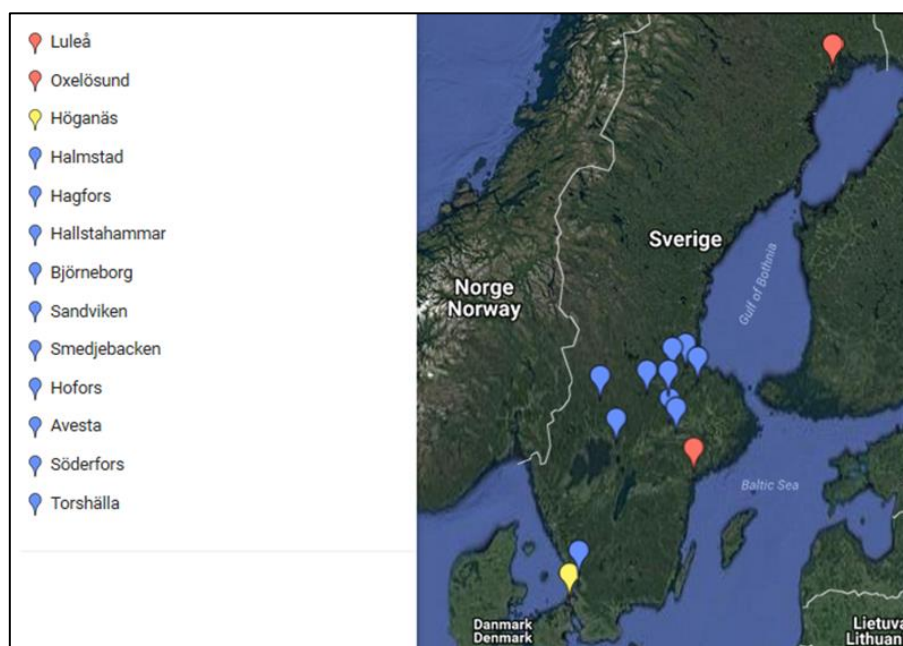
Main continental Baltic and North Sea ports handling iron and steel in Nordic countries trades are listed in Table 11 (all ports handling >100 kt). The figures highlight the prominent position of Dutch and Belgian ports in this trade, corresponding to their strong position in metals trading in Europe. Imports and exports are rather balanced, except of Klaipeda due to Russian transit flows in export.

Table 11: Main continental ports in Nordic countries iron and steel sea transport (2016, 1000t)

Reporting Port	TOTAL	IN	OUT
Rotterdam	1116	644	471
Duisburg	616	204	412
Antwerp	423	347	76
Amsterdam	400	390	8
Klaipeda	162	11	151
Szczecin	110	68	43

Data: Eurostat

The location of Swedish steelmaking plants (Figure 11) reflect the occurrences of iron ore although currently only the mines in the Kiruna district in Norrbotten province north of the polar circle are in operation.



Source: Jernkontoret

Figure 11: Location of Swedish steelmaking production sites

There are no data on Swedish railways border crossing transport available. Total railway transport of metals and metal products amounted to 4.9 million tons in 2016 following a slightly decreasing trend in the last decade.

In Denmark international rail transport of metal products amounted to 462 kt in 2016 (after 369 kt in 2015), thereof 386 kt imports and 76 kt exports. These numbers are far below the reported for sea transport. According to these figures there are actually no significant railway transit flows across the Oresund and through Denmark. International railway transport of metal products picked up by 2.4% from 2011 to 2016.

In Finland because of the gauge difference there is practically no border-crossing railway transport with EU countries, total rail cargo being low and further decreasing.

4 The position of the FBFL in the Scandinavia -Central Europe transport system and the development of ferrous metals shipments by 2035

The Danish straits connecting the Baltic Sea to the North Sea through the Kattegat and Skagerrak constitute also the main connection between Scandinavia and Continental Europe. With the construction of bridges and tunnels, the last completed being the Oresund Crossing, direct road and railway traffic between Scandinavia and Continental Europe became possible. Furthermore, a number of ferry lines cross the southern Baltic Sea between Southern Scandinavia and the continent, two of which also carry freight wagons (Figure 12). Likewise, the continental North Sea ports are connected to Scandinavian ports by ferry and ro-ro services.

Parallel to the existing route across the Great Belt and the Oresund, the FBFL is to create a further high-capacity land route between Central Europe and Southern Sweden for road and rail transport. For rail transport the FBFL shortens the route between the railway junctions Malmö and Maaschen (south of Hamburg) by 160 km.

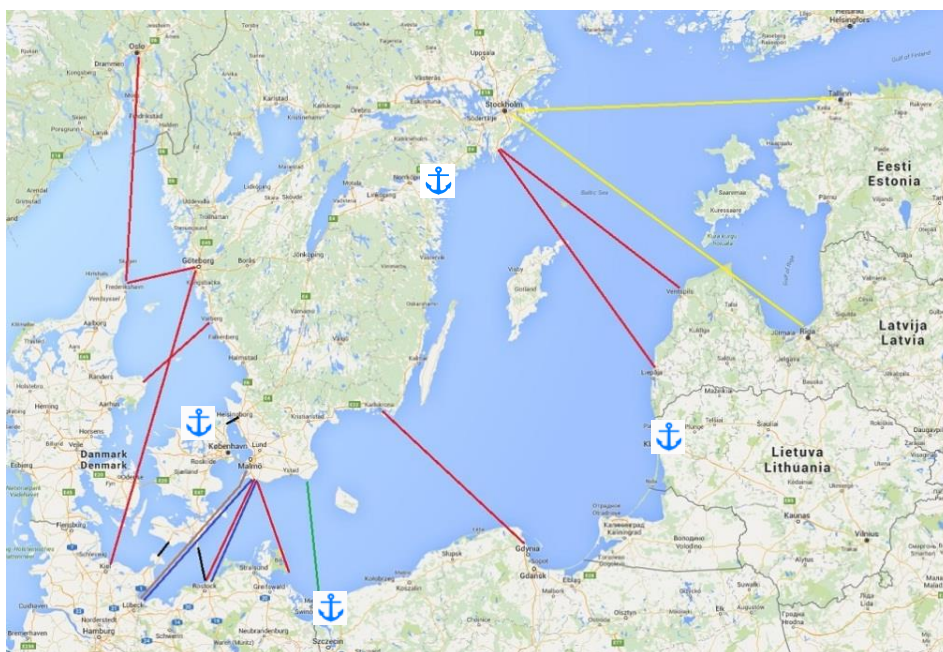


Figure 12: Ferry connections and main breakbulk metals ports in the southern and central Baltic Sea

In the course of the FBFL's planning and approval procedure traffic forecasts were elaborated and amended. The basis is the so-called FTC forecast of 2002, updated in 2014 and 2016 respectively. In the traffic forecasts the study area for the FTC study was defined quite large, that is considering all traffic flows between Eastern Denmark, Sweden, Norway and Finland on the one side and the whole continent including the Mediterranean and Southeast England on the other side. The 'core study area', which roughly can be defined as Eastern Denmark and Sweden on the one side and Germany on the other side, generates the bulk of traffic demand.

According to the last study the total volume of goods transported between Scandinavia and continental Europe by road and rail in 2011 amounted to 28.8 million tonnes, thereof 13.4% or 3.8 million tonnes metals (Table 12). The total volume is expected to grow to 41.3 or 45.8 million tonnes by 2030 and 43.9 or 49.2 million tonnes respectively in 2035 in the two scenarios studied, while metals' flows are forecasted to grow to 5.8 or 6.1 million tonnes in 2035 at a slightly lower rate [4, 118].

Table 12: Traffic forecast for a Fixed Femern Belt Crossing 2011-2030

Cargo group		2011	2030	2035	CAGR 2011-2035
Metals	Case A	3.844	5.482	5.789	1,7 %
	Case B		5.737	6.129	2,0%
Total	Case A	28.774	41.184	43.672	1,8 %
	Case B		45.766	49.144	2,3%

Source: Fehmarnbelt Forecast 2014 - Update of the FTC-Study of 2002 for Femern A/S 2014, Intraplan & BVU, p.118

In the currently ongoing plan approval procedure, the forecasted quantity of goods, which is traded between Scandinavia and the continent, as well as the forecasted share of FBFL in total traffic, is regarded as overoptimistic by FBFL critics. As pointed out in section 2, foreign trade in iron and steel was slightly decreasing in the period 2011-2016. In order to reach the metals traffic volume forecasted for 2035 in the remaining years 2017-2035, average yearly growth of metals traffic between Scandinavia and Continental Europe of 3.0% in Case A and 3.3% in case B would be required. This sharply contrasts with the long term average growth, or rather stagnation, of Scandinavian iron and steel trade with Continental Europe of -0.1% yearly in the period 2005-2016 (exports 0.0%/y; imports -0.3%/y).

5 Recommendations for the maritime industry to secure their modal share

Exports of metal products from Nordic countries to continental Europe pass through the ports in the southern Baltic Sea as well with direct truck, trailer and rail transport using the ferry connections as with breakbulk shipments. For railway freight transport, the FBFL is a cost-effective alternative to the Jutland route. The railways will make good use of this option up to their capacity limit in order to minimize cost, shifting freight traffic to the FBFL, both from the Jutland route and the ferry line Rostock - Trelleborg. This assumption is based on the high capacity of the FBFL in relation to the projected growth and the low growth rate of metal products shipments.

Structural change in the steel industry, particularly the further growing product differentiation, leads to an increasing number of single shipments with decreasing average volume of shipments. These developments, together with higher demands with respect to delivery period and timeliness result in an increasing use of road transport at one hand and a growing role of so called “steel service centres” in the supply chain.

Steel service centres in Germany are an important sales channel realizing about one third of total sales. They combine traditional trading and logistics services with a wide range steel processing activities. Important iron and steel ports in Western Europe (e.g. Antwerp) use to host several steel service centres.

Strengthening the services offered to the metal industry, in particular by performing the local and regional distribution, where appropriate, to the wider hinterland of the ports and by the establishment of companies specialized in these tasks. Ports are still favourable distribution centres due to their generally excellent transport connections to the hinterland. An efficient combined transport service offer is becoming increasingly important.

The large Scandinavian corporations of the metal industry are increasingly bundling their diverse transport and distribution activities from a global perspective. Various types of vessels and other means of transport are used. Ports have to adapt to these requirements by widening their range of services offered at one hand and by improving quality of facilities and services offered.

Ports in the southern Baltic Sea are, in our opinion, in a good position to become major ports for Nordic metal products industries. The stronger growth of Nordic countries’ metals trade with Central and East European countries compared to Western Europe seems to offer possibilities for market gains.

Annex 1: Swedish steel producers and factories

(Members of the Association of Swedish steel producers Jernkontoret)

Company/plant	Employees in Sweden ^{a)}	Metallurgical equipment (steel prod.)	Main products	Main owners ^{b)}
CO-OWNERS (owner of manufactories holding shares in Jernkontoret):				
Celsa Steel Service AB	185			Celsa Group, Spain
Halmstad	135		Manufactured reinforcement products	
Västerås	25		Manufactured reinforcement products	
Vännäs	15		Manufactured reinforcement products	
Erasteel Kloster AB	385			Eramet, France
Långshyttan	115	V	Wire rod and drawn wire of high speed steel	
Söderfors	225	E, F	Billets and powder of high speed steel	
Vikmanshyttan	45		Cold rolled strip of high speed steel	
Fagersta Stainless AB, Fagersta	240	V	Stainless wire rod and drawn wire	Outokumpu Stainless (50), Sandvik (50)
Outokumpu Stainless AB	1760			Outokumpu, Finland
Avesta	750	E, A, C, V	Semis, hot and cold rolled coil, plate, sheet and strip of stainless steel	
Degerfors	550	V	Stainless hot rolled plate, bars and billets	
Torshälla	235		Stainless cold rolled sheet and strip	
Ovako AB	2130			Triton Fund III (83)
Ovako Bar AB				
Smedjebacken	335	E, C, V	Bars of alloy and non-alloy steel	
Boxholm	195	V	Bars of alloy and non-alloy steel	
Ovako Sweden AB				
Hofors	1000	E, V F	Semis, bars, tubes, rings of rolling bearing/alloy engineering steels	
Hälsjöfors	445	V	Bars of rolling bearing & alloy engineering steels	
Ovako Bright Bar AB, Stockholm				
Ovako Forsbacka AB, Forsbacka	65		Manufactured bars	
Ovako Cromax AB				
Ovako Hallstahammar AB, Hallstahammar	65		Bright bars and hard chromium plated bars and tubes	
AB Sandvik Materials Technology, Sandviken	3680			Sandvik
Primary Products, Sandviken		E, A, C, V	Stainless bars and billets, rock drill steel	

Company/plant	Employees in Sweden ^{a)}	Metallurgical equipment (steel prod.)	Main products	Main owners ^{b)}
Tube, Sandviken		F		
Strip, Wire and Heating Technology, Sandviken		V	Stainless seamless tubes and special alloys	
Sandvik Heating Technology AB , Hallstahammar		V	Stainless precision strip & wire, hardened strip, welding consumables	
Sandvik Powder Solutions AB , Surahammar		E, A, V	Wire, strip, heating systems (electrical resistance materials)	
Scana Steel Björneborg AB , Björneborg	186	E, F	Open die forgings	Scana Industrier, Norway
Scana Steel Booforge AB , Karlskoga	60	F	Open die forgings, lifting forks, heat treatment	Scana Industrier, Norway
SSAB AB	6910			Listed on the stock exchange
SSAB Special Steels , Oxelösund (and others)	2330	M, O, C, V	Semis, heavy plate, HS structural & wear resistant steels	SSAB AB
SSAB Europe	3525			SSAB AB
Luleå	1180	M, O, C,	Slabs for sheet of high-strength & ultra HS steel	
Borlänge	2025	V	Sheet, hot/cold rolled, coated. ~45% high-strength steel	
SSAB Tubes AB , Borlänge	10		Welded tubes of high-strength steel	SSAB AB
Ruukki Sverige AB , Virsbo	95		Welded tubes of non-alloy steel	SSAB AB
SSAB Merox AB , Oxelösund, Luleå, Borlänge	60		Biproductions, i.e. hyttsten (ABS) and hyttsand (GBS), fertilizer,	SSAB AB
och Grängesberg			binders and och iron oxides	
Steeltec Boxholm AB , Boxholm	65		Cold-drawn bars of automotive & construction steel	Steeltec AG, Germany [Schmolz+Bickenbach]
Surahammars Bruks AB , Surahammar	80		Cold rolled silicon alloyed electrical sheet	Cogent Power, Storbritannien [Tata Steel]
Suzuki Garphyttan AB , Garphyttan	335		Oil tempered valve spring wire of alloy steel, stainless spring wire	Nippon Steel & Sumikin SG Wire Co. Ltd., Japan
Uddeholms AB , Hagfors	850	E, V, F	Products of tool steel	voestalpine AG, Österrike
voestalpine Precision Strip AB , Munkfors	260		Cold rolled precision strip steel of non-alloy & alloy steel	voestalpine Precision Strip GmbH, Österrike
STAKEHOLDERS COMPANIES:				
Befesa Scandust AB , Landskrona	75	S	Recycled metals	Befesa Medio Ambiente SA, Spain

Company/plant	Employees in Sweden ^{a)}	Metallurgical equipment (steel prod.)	Main products	Main owners ^{b)}
Boliden Group, Stockholm Mines: Bolidenområdet Aitik, Gällivare Garpenberg Melters: Rönnskär, Skelleftehamn Bergsöe, Landskrona	2935		Concentrate (zinc, copper, silver, gold, lead, tellurium) Concentrate (copper, silver, gold) Concentrate (zinc, silver, lead, gold, copper) Copper, lead, gold, silver, sulphuric acid, zinc clinker Lead alloys	Listed on the stock exchange
Carpenter Powder Products AB, Torshälla	45	E	Gas atomized metal powder	Carpenter Technology Corp, USA
FNsteel Hjulbro AB, Linköping	40		PC-strand	Mahler Investment B.V., Holland
Höganäs AB Halmstad Höganäs	830 90 740	E P	Atomized iron powder Iron and steel powders	H Intressenter
LKAB, Luleå Mines, refining plants: Kiruna Malmberget Svappavaara Luleå	3450		Pellets for blast furnaces/direct reduction, specialfines, pellets fines Pellets for blast furnaces, sinter fines, special fines, pellets fines Pellets for blast furnaces, pellets fines Slag from experimental blast furnace	Swedish state
Ramnäs Bruk AB, Ramnäs	85	F	Chains for offshore installations	Vicinay Marine, Spain
Vargön Alloys AB, Vargön	180		High-carbon FeCr	Yildirim Group, Turkey [ETI Investments]

a) Number of employees rounded to the nearest 5. b) Figur in brackets indicates ownership in per cent

Equipment: M=Blast furnace, P= Sponge iron furnace, E=Electrical furnace, O=Oxygen converter, A=AOD converter (argon oxygen decarburization), C=Continuous casting, V=Hot rolling-mill, F=Forging press