

SUSTAINABILITY AND LOGISTICS CHALLENGES OF MODERN GLOBALIZATION, CASE FINLAND

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Abstract. The purpose of this paper is to discuss about the current situation and development of globalization at the sustainability and logistics points of view and then focus on the challenges presented on the Finnish economy and industry. Finland is relatively big country in Scandinavia with a total area of 338145 km² and one of the lowest density in Europe 18 inhabitants per dry land km². This causes logistic and also sustainability challenges, which Finnish companies have to deal with in order to be competitive in the global markets - how to compensate the extra cost caused by the 2000 km transportation to the main markets at the central Europe? During the last 60 years the Finnish economy and industry have been strongly dependent on foreign trade surplus. Since 2008 the quantity and value of the Finnish exports has experienced a dramatic change and the sustainability challenges will definitely change the markets further in the ever-globalizing world trade. In the future the Finnish exports industry will be required to face ever tightening productivity and cost efficiency challenges because of automatization, digitalization and low cost production. As the external productivity and costs pressure increases will the Finnish national economics be in turmoil because of chronically deficit national budget. The high living costs do not allow lower salaries without social support financed by government or municipalities. These lower salaries will cut automatically down the tax incomes and the vicious circle is appearing.

Keywords: transportation, sustainability, economics

JEL Classification: L91, Q01, R40

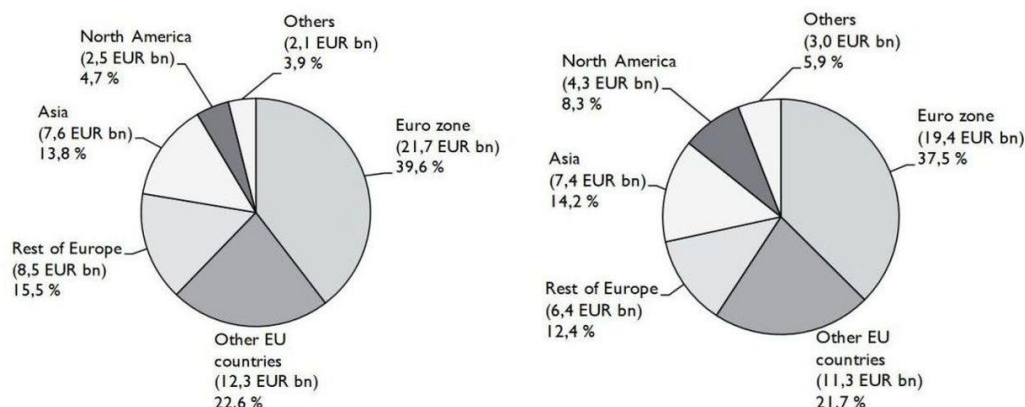
1. Introduction

Viewed from the continent of Europe, Finland is logistically an island. Despite of the fact that most of Finnish imports and exports are from and to Europe (Fig. 1) a large majority of The Finnish import and export transports are done seaways by ship (Fig. 2). Vast majority of Finland's foreign trade is carried on by ship, and the harbours are its principal traffic nodes. Finland has a direct railroad connection to Russia and railship connection to Sweden and Germany. Also direct truck transport connections exist to Russia and Sweden. (Mohammadi, 2017). Trucks are also transported by ferries to Sweden, Estonia, Poland and Germany. As the Finnish GDP was 2016 € 215,6 billion (Statistics Finland 2017) the value of Finnish imports is 25,4 % of the GDP and the value of Finnish exports is 24 % of the GDP, so the significance of global trade is without a doubt very important to the Finnish economy.

Figure 1: Structure of Finnish import and export 2016

INTERNATIONAL TRADE BY COUNTRIES IN 2016

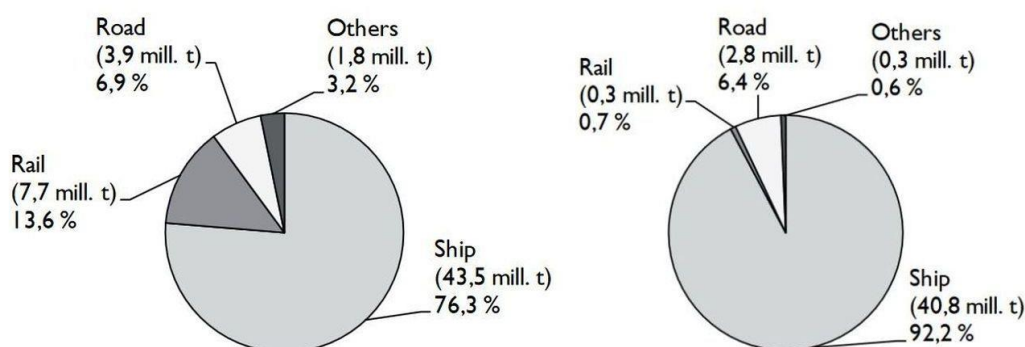
Imports by group of countries Exports by group of countries



Source: Finnish Customs (2017a), processed by the Author

Figure 2: Transports of Finnish import and export 2016, volume

Import transports in metric tons Export transports in metric tons

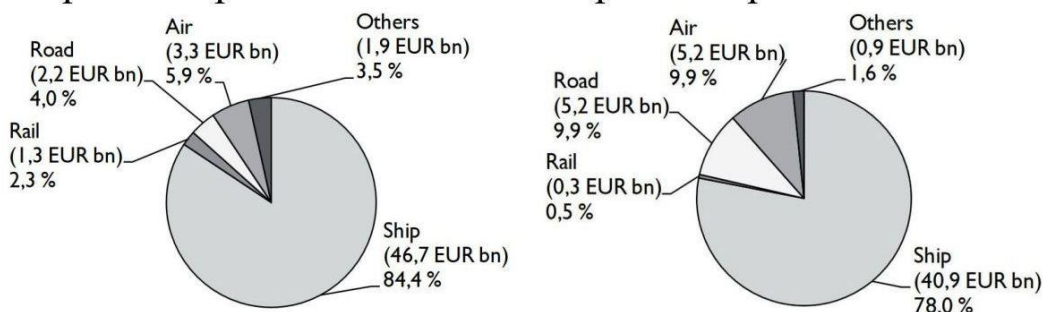


Source: Finnish Customs (2017b), processed by the Author

According to the latest customs statistics 76,3 % of Finnish import transports and 92,2 % of Finnish export transports are transported seaways by ship because of geographical, transport-economic and environmental reasons (Finnish Customs 2017a and 2017b).

Figure 3: Transports of Finnish import and export in 2016, value

Import transports in € billion Export transports in € billion



Source: Finnish Customs (2017b), processed by the Author

The average value of Finnish imports was at 2016 about 0,97 € per kg and the average value of Finnish exports was at 2016 about 1,17 € per kg (Finnish Customs 2017a and 2017b). These figures show clearly that transportation costs are a significant factor for the Finnish

globalization. Finland is almost 2 000 km away from the main European market area and of course import and export transportation costs outside EU are even more significant.

2. Import and export material flows of Finland

As Finland is located in Scandinavia it means that global transports mean de facto very long distances. The average distance to Russian destinations is about 1 000 km, to Central European destinations about 2 000 km, to North American destinations about 10 000 km and to South East Asian destinations about 8 000 km (by air) or 24 000 km (by sea). The logistic situation of Finland is illustrated at Figure 4.

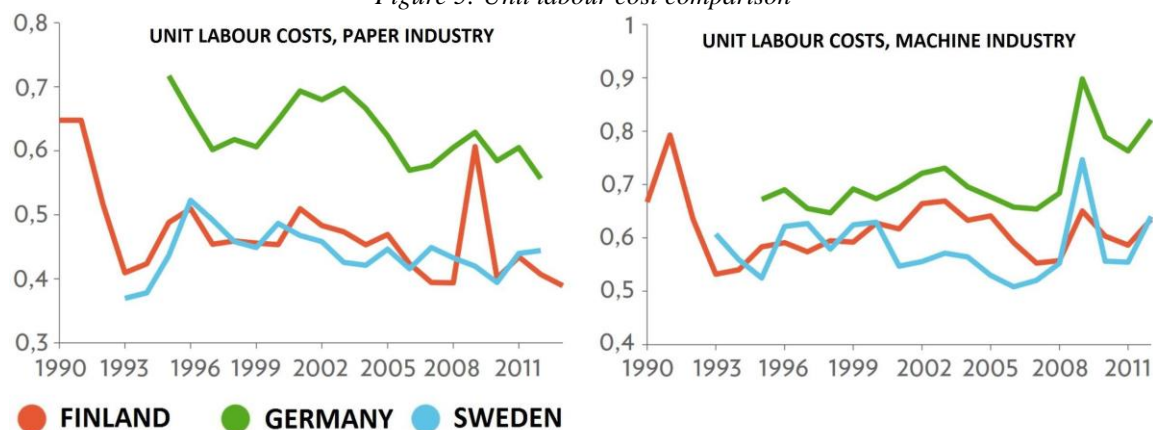
Figure 4: The global location of Finland and distances to main market areas.



Source: adapted from Jones (2009), processed by the Author

The main logistic and sustainability challenges are the long distance transportation need and low average value of our imported and especially exported goods. (Rubio and Jimenez-Parra, 2017) In order to maintain competitiveness at the main exports market area, the Central Europe, Finnish export industry has to compensate in average 2 000 km transportation. Historically the cheap electricity at Scandinavian countries has compensated the situation (especially with energy intensive industry), but recently this has changed. (Abbasi & Nilsson, 2016). The average market price of electricity for industry was at the first half of the year 2016 30,40 €/MWh in Finland and 25,00 €/MWh in Germany (Kuokkanen 2016). Also the unit labour costs of our paper industry have been lower than our Central European competitors' which has also compensated the situation.

Figure 5: Unit labour cost comparison



Source: adapted from Sauramo (2015), processed by the Author

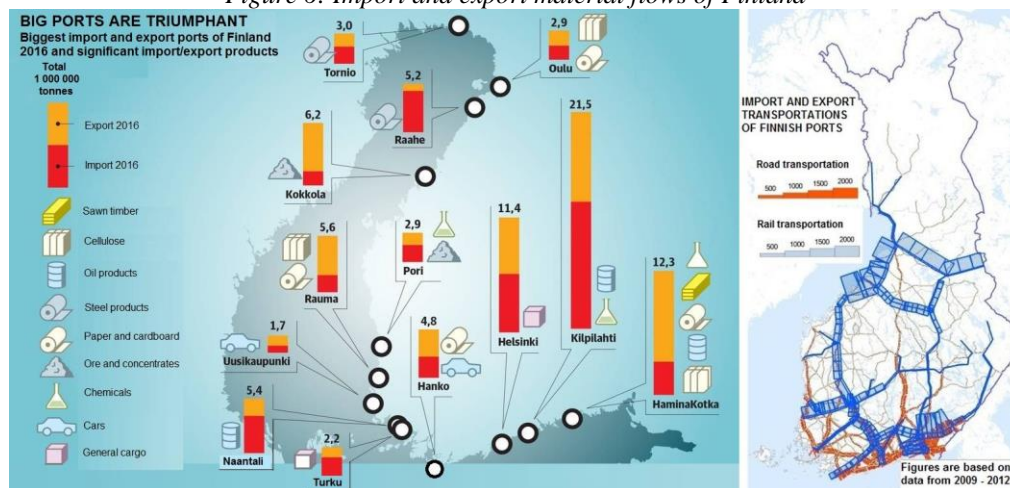
The figure 5 shows clearly, that especially the competitiveness of Finnish paper industry has been significantly better in Finland and our neighbouring competitor Sweden in important German markets. The labour costs gap between Finland and Germany is nicely compensating the earlier mentioned 2 000 km delivery handicap. In machine industry the labour costs difference has not been so significant, but it has been growing steadily for our benefit.

3. Logistic challenges

According to Corbett and Winebrake (2013) “marine transportation is an integral, if sometimes less publicly visible, part of the global economy. The marine transportation system is a network of specialized vessels, the ports they visit, and transportation infrastructure from factories to terminals to distribution centers to markets. Maritime transportation is a necessary complement to and occasional substitute for other modes of freight transportation. For many commodities and trade routes, there is no direct substitute for waterborne commerce.” As the average value per kg for both Finnish imports and exports is quite low (0,97 / 1,17 € per kg) freight cost is of course very critical factor.

As the marine transportation is the cheapest form of transportation in overseas import and export it is a natural choice for Finnish import and export. As described at paragraph 2, our geographical 2 000 km distribution “handicap” on important Central European export markets requires efficiency especially in logistics. All the distribution logistics costs exceeding the distribution costs of our competitors jeopardize our competitiveness.

Figure 6: Import and export material flows of Finland



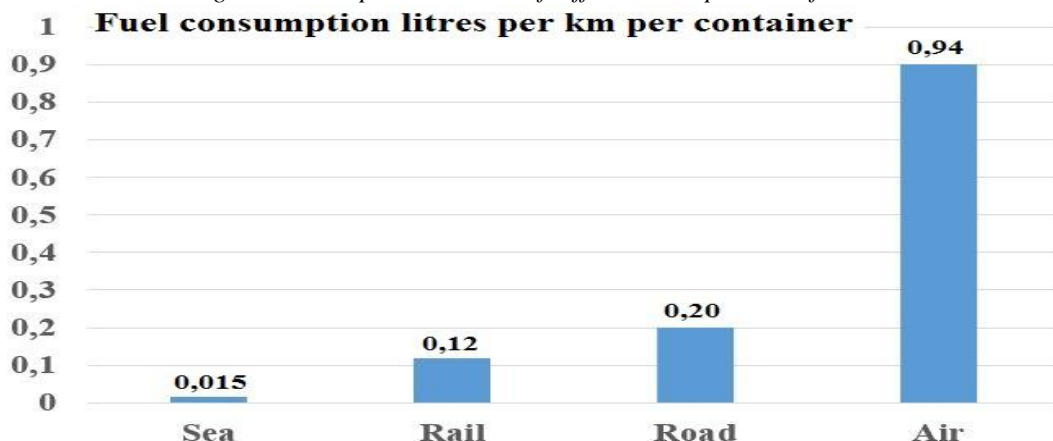
Source: adapted from Salanne (Undated) and Kankare (2017). processed by the Author

4. Sustainability challenges

According to IMO (2013) “Maritime transport is the backbone of world trade and globalization. Twenty-four hours a day and all year round, ships carry cargoes to all corners of the globe. This role will continue to grow with the anticipated increase in world trade in the years to come as millions of people are expected to be lifted out of poverty through improved access to basic materials, goods and products. World trade and maritime transport are, therefore, fundamental to sustaining economic growth and spreading prosperity throughout the world, thereby fulfilling a critical social as well as an economic function.”

As described earlier, the Finnish foreign trade is heavily dependent on sea transportation. Therefore the sustainability of sea transport is a significant factor of the sustainability challenge of Finnish globalization. The key question is how to organize the required import and export transports in a sustainable matter.

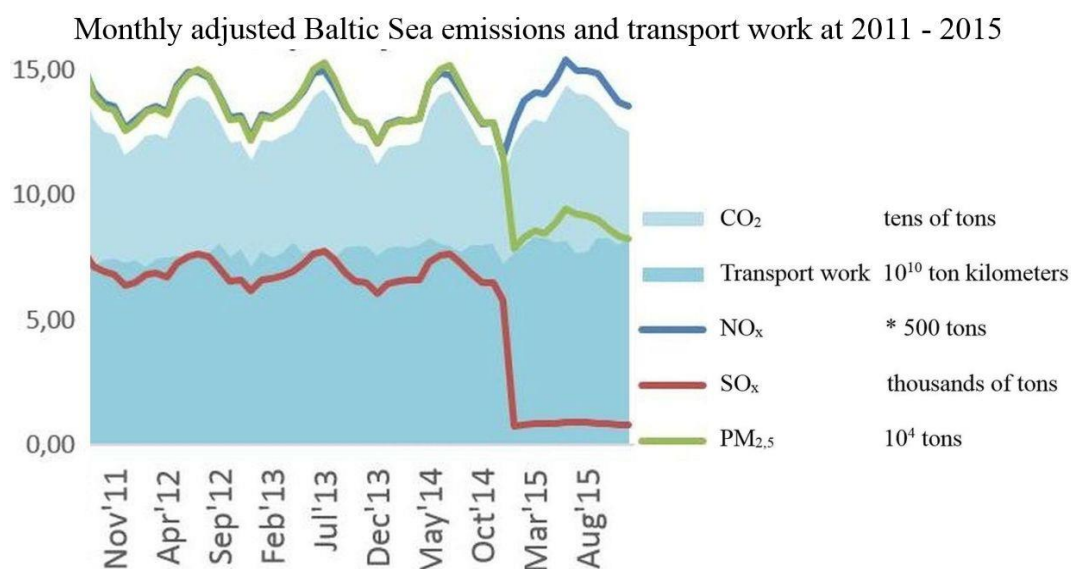
Figure 7: Transportation costs of different transportation forms



Source: adapted from Ballou (1998) and Torian (2012) and calculations made by the Author.

It is a well-known fact that sea transportation is the cheapest and the most fuel economic form of transportation per ton kilometer. Therefore the CO₂ emissions per ton kilometer are also the lowest. The problem lies with sulfur oxide (SO_x) emissions, which are of a total different category. As the cheapest available fuel for big diesel engines typically utilized in cargo ships is bunker fuel having very high sulfur content. 12th of September was the Rotterdam price of IFO380 bunker fuel (containing max. 3,5 % sulfur) 312 USD/metric ton and the price of ULSFO light fuel oil was 477 USD/metric ton (Ship & Bunker 2017a and 2017b). Environmentally better ULSFO fuel is more than 50 % more expensive than cheap and pollutant IFO380 fuel so it is no wonder, that shipping companies prefer IFO380 fuel – unless regulations stipulate otherwise.

Figure 8: Sea transport emissions at Baltic Sea area



Source: adapted from Johansson et.al. (2016). processed by the Author

Since 1st of January 2015 it has been forbidden to use fuel containing more than 0.1 % sulfur at the Baltic Sea area. Under this EU directive, carriers operating in the Baltic and North seas and English Channel can only use fuel with a mentioned maximum sulfur content of 0.1 percent (The Journal of Commerce 2015). The results have been dramatic – the PM_{2.5} (particles smaller than 2,5 µm) and SO_x emission values have decreased significantly. Therefore the Baltic Sea transport is currently relatively sustainable when compared to alternative forms of transportation to the Central Europe.

As for other sea areas, International Maritime Organization (IMO) aims to introduce a global 0.5 % sulfur limit in ship fuels by 2020, an emission control area (ECA) in the Mediterranean Sea might be introduced as part of the global sulfur cap (The Journal of Commerce 2015). Still the crucial decisions are not made and the emissions are practically uncontrolled in other sea areas than Baltic and North seas and English Channel, which makes the sea transportation relatively unsustainable because of the sulfur emissions.

It has been said that a big container ship emits more sulfur oxides than 50 million modern diesel cars and the reality is, that depending on the cruising speed of a big 14 000 TEU container ship, it's SO_x emissions are equal with the NO_x emissions of 20 to 60 million modern diesel cars (Aminoff 2017) – and this really means that the current fleet of diesel powered ships using IFO380 fuel are much bigger source of NO_x than all modern diesel cars together. Unsustainable indeed!

Is there any alternative? As illustrated in Figure 7 is the sea transportation the most fuel efficient and therefore most economical form of transportation. When the freight cost is a significant cost factor as it is in relatively low value overseas exports (on average 1,17 €/kg) of Finnish industry the logistics cost efficiency is of course crucial. So de facto there is no feasible alternative for sea transportation for Finnish imports or exports.

5. Conclusion

How to manage the sustainability and logistic challenges of a country so dependent on import and export like Finland having so challenging geographical location? (Zijm, 2016). The geography is something we cannot change, but the ways to manage sustainability and logistics are of course ours to decide. As Finland is highly dependent on global trade in both imports and exports are the sustainability and logistic efficiency things to take seriously (Wang, 2016). The global interest on sustainability has affected and will affect the maritime transport. Ever globalizing world has made countries and economies growingly dependent on international transportation and of course maritime transportation, because 90 % of all material flows are transported with it.

An efficient way to improve sustainability and logistics of global trade is to improve the fuel efficiency of vehicles and functionality of the global infrastructure. Essential improvement would be the adaptation of tighter SO_x and NO_x emission limits on ship engines, but so far the international agreement on the matter is not imminent. Of course each buyer of transportation services can select which service provider they prefer, but if the preferences are focused on freight cost only it is no surprise that shipping companies using the cheapest possible and pollutant fuel (like IFO380) get the orders.

If sustainability equals in global logistics lower competitiveness it will not attract companies competing with tight margins. The only way to improve sustainability in global

logistics is to uniform the emission limits worldwide and this way to make sustainability an economically feasible way of business.

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