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Regional Survey Study from Dry Port Concept in South-East Finland


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I appreciate the possibility to be part of the Mobile Port project. So far it has given me great opportunity to be part of interesting and important research concerning seaport related transportation. Luckily my work at this project will continue and I look forward to see what my next challenges in the Mobile Port project are.

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ABSTRACT

This is a survey study concerning dry port concept, intermodal transport and environmental impacts of transport. The survey is regional and target logistics companies are located in South-East Finland. The research is conducted with a web-based questionnaire.

Literature review is about greenhouse gases and reductions of them with different emission trading systems. In addition, congestion is studied to find out, what is the dependence between congestion and emissions originating from transport, and furthermore to see if emission levels could be reduced by reducing congested traffic.

Dry port concept is seen as a possibility with many advantages and disadvantages. One interesting benefit is that road transport companies can follow driving and resting time regulations more easily with dry port implemented transportation system, because road-driving distances become shorter with the dry port concept. One main disadvantage is that transportation system gets more complex with implemented dry ports.

Intermodal transport is used in Finland with small share i.e. some of the companies employ intermodal transport as their main transport mode and some of the respondents use intermodal transport as their secondary transport mode, while majority of the companies utilize only traditional road transport. Some of the companies have plans to increase the use of intermodal transport.

According to the results of the questionnaire research, environmental impacts are increasing their role in road transportation companies' strategies. Some of the respondent companies take decreasing environmental impacts into account with considerable respect, while majority of the companies have not yet focused on green values at all. It is though clear that in practice every company will increase their attention towards reducing external costs (e.g. different emissions, accidents, noise, congestion). In addition, respondent companies believe that green values are important to some of their customers.

Main export cities, import cities and seaports were asked in the questionnaire. Two most used cities for export and import are Kouvola and Lappeenranta. Three most important seaports are Port of Kotka, Port of Hamina and Port of Helsinki.

Keywords: Questionnaire, South-East Finland, dry port concept, intermodal transport, environmental impacts

TIIVISTELMÄ

Tutkimus on toteutettu kyselytutkimuksena. Selvityksen kohteena ovat kuivasatamakonsepti, yhdistetyt kuljetukset sekä kuljetusten ympäristövaikutukset. Kohdeyrityksinä ovat logistiikkayritykset, jotka sijaitsevat Kaakkois-Suomen alueella. Kyselytutkimus on toteutettu Internet-kyselyinä.

Kirjallisuuskatsauksessa on tutkittu eri kasvihuonekaasuja sekä päästökauppoja ja niiden tapoja vähentää saasteiden määrää. Lisäksi on tarkasteltu kirjallisuutta ruuhkautumisen ja päästöjen riippuvaisuudesta.

Kuivasatamakonsepti nähdään mahdollisuutena, jolla on paljon etuja, mutta myös heikkouksia. Yksi mielenkiintoinen konseptin etu on se, että tieliikenteen kuljettajat voivat noudattaa ajo- sekä taukoaikadirektiiviä paremmin, koska kuivasataman avulla tieliikenteen välimatkat lyhenevät. Yksi tärkeimmistä haitoista on se, että kuljetusjärjestelmästä tulee monimutkaisempi kuivasatamien takia.

Yhdistettyjä kuljetuksia käytetään Suomessa muutamissa logistiikkayrityksissä pääkuljetusmuotona, sekä joissain yrityksissä toissijaisena kuljetusmuotona. Suurin osa tutkimukseen vastanneista yrityksistä käyttää pelkkää tiekuljetusta. On kuitenkin huomattava, että osa yrityksistä on harkinnut lisäävänsä yhdistettyjen kuljetusten määrää.

Kyselytutkimuksen perusteella ympäristöön kohdistuvat vaikutukset lisäävät rooliaan kuljetusyritysten strategioissa. Muutama kyselyyn vastanneista yrityksistä on ottanut kuljetuksista aiheutuneet ympäristövaikutukset huomioon erittäin tarkasti, kun taas suurin osa vastanneista ei ole tehnyt suuria muutoksia pienentääkseen ympäristövaikutuksia. Tutkimuksen perusteella on kuitenkin selvää, että käytännössä jokainen kyselyyn vastannut yritys aikoo vähentää ulkoisia kustannuksia (esim. saasteet, onnettomuudet, ääni sekä ruuhkautuminen) tulevaisuudessa. Yritykset myös uskovat, että vihreät arvot ovat tärkeitä osalle asiakkaista.

Kyselyssä tutkittiin myös tärkeimpiä vienti- sekä tuontikaupunkeja sekä satamia. Tärkeimmät vienti- sekä tuontikaupungit ovat Kouvola sekä Lappeenranta. Tärkeimmät satamat ovat Kotka, Hamina ja Helsinki.

Avainsanat: Kyselytutkimus, Kaakkois-Suomi, kuivasatamakonsepti, yhdistetyt kuljetukset, ympäristövaikutukset

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1 INTRODUCTION

Problems concerning environmental issues have received more and more attention during the last decades. Transportation sector is one of the major polluting sectors and it is the only sector that has not yet been able to reduce its emission levels if compared to earlier years (Aronsson and Brodin, 2006). In addition, transportation sector is the only sector with increasing carbon dioxide emission amounts (European Commission, 2009; UIC, 2009).

Dry port concept is seen as one possibility to decrease emission levels originating from transportation sector. In the dry port concept majority of freight is transported by rail between seaport and inland intermodal terminal, which is called dry port. Only the final leg of transportation is accomplished by road i.e. main transport mode of the dry port concept is rail. According to many scientific articles (e.g. Roso, 2009a, 2009b and 2007), dry port concept can improve the capacity and cost-efficiency of a transport system; especially seaport's inland access. Furthermore, the concept improves transport system's environmental friendliness. The concept decreases different external costs (e.g. congestion and emission costs), since rail is environmentally friendlier transport mode than road. (Roso 2009a)

This research report is a survey research concerning dry port concept. Dry port concept is mainly researched by asking regional companies their opinions about dry port concept, intermodal transport and environmental impacts of transport. In addition information management systems are studied briefly as well as most important seaports and import and export cities. Main target of this research is to find out opinions of regional logistics companies about dry port concept, intermodal transport, environmental impacts, information systems and important geographical locations. Survey research was conducted with a web based questionnaire. Target companies operate at the transportation sector and they are located at South-East Finland.

The research report is part of Mobile Port project in which Lappeenranta University of Technology Kouvola Unit is part of. The main goal of the Mobile Port project is to

create an information system and research how to implement it to seaport dependent transport system. Lappeenranta University of Technology Kouvola Unit is one of three different research parties. The other two are Centre for Maritime Studies, University of Turku and Kymenlaakso University of Applied Sciences. Centre for Maritime Studies is the coordinating research party for Mobile Port project. Aim of the Kouvola Unit is to study the dry port concept i.e. benefits and disadvantages of it and could it be implemented cost-efficiently in the Kymenlaakso region, more specifically in the city of Kouvola. Kouvola Unit has finished the previous research report for the Mobile Port project in summer 2010, and it concerned dry port concept theories and possibility of the concept to be used in city of Kouvola to support ports of Hamina and Kotka (these ports will merge in year 2011). In addition, road and rail transport modes were compared by cost accounting. Both the internal and external costs (external costs are e.g. emission costs) were included. Different gravitational models were also created to compare the location of Kouvola with other locations to find out whether or not city is in good location for a dry port implementation. Title of the previous research report is "*Financial and Environmental Impacts of a Dry Port to Support Two Major Finnish Seaports*" and it can be found from different sources e.g.: Merikotka (2011) or LUT Kouvola (2011). This survey research is a follow-up for the previous dry port research. This research aims at explaining the opinions of logistics companies about dry port concept, intermodal transport, green values and information systems and also to find out, if there are more advantages or disadvantages in the concept than that was found in the literature review. In addition, the most important export and import cities and seaports are sorted out.

The dry port concept is mainly researched by researching intermodal transport. The intermodal transportation is transport of goods in standard load-units, which can be transshipped between different transport modes (e.g. road, rail, sea and air transport) (Rutten, 1998; Hayuth, 1987). At least two different transport modes are deployed during transportation (Rutten, 1998; Hayuth, 1987). Furthermore, the process of intermodal transport is seamless i.e. products do not last long in intermodal terminals. (Rutten, 1998; Hayuth, 1987). Intermodal transport is researched through different questions e.g. the utilization rate of intermodal transport and its future. Survey study tries to find out whether or not the intermodal transport is widely used in the

respondent companies and what are the advantages and disadvantages of intermodal transport.

Transportation and climate change are in connection with each other (Calvin *et al.*, 2009; Stanley *et al.*, 2009). Transportation is the only sector with increasing environmental impacts, while all the other major sectors have either decreased their or maintained their emission levels (European Commission, 2009; UIC, 2009). Many studies have tried to find ways on how to decrease pollution originating from transportation, while at the same time the amount of transportation is increasing. There are many studies concerning environmental impacts of transportation and its different modes (e.g. Ahn and Rakha, 2008; He *et al.*, 2005; Kousoulidou *et al.*, 2008; Smit *et al.*, 2008; Stanley *et al.*, 2009; Volvo Trucks, 2010; Zanni and Bristow, 2010). According to Roso (2007, 2009a and 2009b). According to Roso (2009a, 2009b and 2007) environmental impacts can be reduced by implementing dry port concept. That is why environmental impacts of transport are one focus of this research. Respondent companies are asked different topics about transport and environment mainly concerning present moment and near future. Emissions originating from transportation can be decreased by various strategies. One is to decrease the use of transport modes that pollute the most and increase the use of less polluting transport modes. Another way is to decrease emission amounts in most polluting modes by developing technology. In addition, the driving style and smoothness of traveling have effect on external costs of transport.

1.1 Research Problem and Limitations

Survey study mainly concerns dry port concept through examining intermodal transport, environmental impacts of transport and finding out the most used export and import cities and seaports. In addition, information systems are examined briefly. All the results are based on regional respondent logistics companies opinions i.e. the results are based on a web survey. Main research question of this study is:

- What advantages and disadvantages there are in the dry port concept according to regional logistics companies?

Main research question can be divided into smaller sub-questions concerning intermodal transport, environmental impacts of transport, most important export and import cities and seaport cities and information systems. All the sub-questions concern target logistics companies and their opinions are listed below:

- What is the utilization rate of intermodal transport in Finland?
- How is the future of intermodal transport seen in Finland?
- Do regional logistics companies pay attention to environmental impacts and their significance?
- What information management systems do regional logistics companies use?
- What are the most important export and import cities for South-East Finland logistics companies?
- What are the most important seaports for South-East logistics companies?

Transport is limited to intermodal transport, which means that all the questions relating to transport are about intermodal transport, not about unimodal road transport. Since the aim of the study is to research dry port concept, the main transport modes are rail and road. Respondent companies are mainly road transport companies, because there are no active rail transport companies yet in Finnish market except one governmentally owned company. All the respondent companies are situated in the Hamina, Kotka, Kouvola, Lahti and Lappeenranta region, which means that geographical area of the research is limited to South-East Finland. 350 logistics companies were asked to answer the questionnaire, of which 27 answered with reasonable answers were obtained. Answer rate is approximately 8 percent.

1.2 Structure of the Research

The report is constructed as follows: First chapter is introduction of the research report. Chapters 2 and 3 are about the literature review. They concern environmental impact of transport and emission trading systems, impacts of driving style in environmental impacts and the act of resting and driving time. Furthermore, congestion and its relation to emission amounts is studied. Methodology of this study is briefly explained in Chapter 4. In Chapter 5, the results of the survey research are described and analyzed. Two final Chapters 6 and 7 discuss and conclude this

research work. Chapter 7 also gives insight of the possible further research avenues concerning this area.

2 CO₂ EQUIVALENTS AND EMISSION TRADING

Many researchers claim that global surface temperature rises mainly, because economic activities of humans release greenhouse gases (GHGs) in increasing amounts (E.g. Calvin *et al.*, 2009; Stanley *et al.*, 2009). Therefore, there has to be strict limitations on how much GHGs can be released into atmosphere to stop the climate change. In year 2006 transportation sector emitted almost 20 percent of all CO₂ equivalents (European Commission, 2009). (Sekiya and Okamoto, 2009)

Carbon dioxide is by far the most studied GHG mainly, because it is so common. At the same time other GHGs created by human increase the emission amounts globally, and accelerate the climate change. The other GHGs need to be taken into account also, when studying how to decrease GHG levels. (Weyant *et al.*, 2006)

Carbon dioxide is used as a reference gas in many different GHG emission calculation systems e.g. carbon dioxide equivalent (CDE) and equivalent carbon dioxide (CO₂e). Different GHGs are compared with the reference gas, which is usually previously mentioned CO₂. One way to compare GHG emission from different gases is to use global warming potential (GWP). (Gohar and Shine, 2007)

Most considerable GHGs are water vapour, carbon dioxide (CO₂), ozone (O₃), methane (CH₄) and nitrous oxide (N₂O) (Gohar and Shine, 2007). Table 1 below summarizes some of the most important GHGs and their GWP values. All the other GHGs are compared with the reference gas, which in this case is CO₂.

Table 1 Global warming potential (GWP) table for some greenhouse gases.

Greenhouse gas	Chemical formula	100-year GWP (SAR)	100-year GWP (AR4)
Carbon dioxide	CO ₂	1	1
Methane	CH ₄	21	25
Nitrous oxide	N ₂ O	310	298
Sulphur hexafluoride	SF ₆	23,900	22,800
Hydrofluorocarbons (HFCs)			
HFC-23	CHF ₃	11,700	14,800
HFC-32	CH ₂ F ₂	650	675
Perfluorocarbons (PFCs)			
Perfluoromethane	CF ₄	6,500	7,390
Perfluoroethane	C ₂ F ₆	9,200	12,200
Perfluoropropane	C ₃ F ₈	7,000	8,830
Perfluorobutane	C ₄ F ₁₀	7,000	8,860
Perfluorocyclobutane	c-C ₄ F ₈	8,700	10,300
Perfluoropentane	C ₅ F ₁₂	7,500	13,300
Perfluorohexane	C ₆ F ₁₄	7,400	9,300

Source: Climate Change Connection (2010) and Forster *et al.* (2007)

There are two different GWP values for each different GHG in Table 1 above. SAR values are from the Intergovernmental Panel on Climate Change (IPCC) Second Assessment Report, while the AR4 values are from the IPCC Fourth Assessment Report. AR4 values are more recently studied, but SAR values are also included, because they are still used in many old and recent literature and research reports. GWP values represented in Table 1 above are for 100 years. In addition, GWP values are calculated for different time periods than 100 years e.g. 20 or 500 years. Each GHG has its own unique GWP value. The higher the GWP value is the more powerful the GHG is i.e. it lasts longer in the atmosphere and affects more in the global warming. CO₂ has a GWP value of one, because it is the reference gas. GWP values (AR4) for example for methane (CH₄) and nitrous oxide (N₂O) in time horizon of 100 years are 25 and 298 respectively. It means that one million tons of CH₄ affects in climate as much as 25 million tons of CO₂ in 100 years and one million tons of N₂O affect the climate as much as 298 million tons of CO₂ in 100 years. It can be seen from Table 1 that all the other GHGs except CO₂ have reference value higher than

one. It means that all GHGs presented in Table 1 affect the climate change with higher intensity than CO₂ itself. (Climate Change Connection, 2010; Forster *et al.*, 2007)

Main idea of GWP valuing is to make different GHGs comparable with each other. With GWP it is possible to find out those gases that have the largest impact on the environment. Companies and institutes can globally decrease the most polluting GHGs instead of concentrating in decreasing not so important emissions. Transportation sector is one of the major polluters of GHGs (European Commission, 2009; UIC, 2009). Table 2 summarizes emission amounts originating from electric train and semi trailer combination for some of the earlier in Table 1 mentioned GHGs. (Gohar and Shine, 2007)

Table 2 Some GHG amounts per ton-kilometer originating from electric train and semi trailer combination.

Vehicle type / Emission type [g/tkm]	CO ₂	CH ₄	N ₂ O	HC (total hydrocarbons)	NO _x (nitrogen oxides)	SO ₂ (sulphur dioxide)
Electric train	7.2	0.00024	0.00021	0.00048	0.011	0.0082
Semi trailer combination	45	0.00035	0.0015	0.0039	0.31	0.00028

Source: Modified from LIPASTO (2009)

CO₂ has the lowest GWP value of one. However, it is the most common emission originating from electric train and semi trailer combination as can be seen from Table 2 (Semi trailer combination pollutes 45 grams of CO₂ per ton-kilometer, while the second most polluted GHG is NO_x with 0.31 grams per ton-kilometer). According to LIPASTO (2009) CO₂ emissions from electric train are 7.2 grams per ton-kilometer. CO₂ emissions from semi trailer combination at road transport are 45 grams per ton-kilometer. The second and third most common GHGs are CH₄ and N₂O. CH₄ and N₂O have GWP values (100-year AR4) of 25 and 298 respectively i.e. one ton of N₂O affects climate change with the impact of 298 tons of CO₂. Total GWP value from electric train and semi trailer combination from CO₂, CH₄ and N₂O emissions is calculated in Table 3.

Table 3 Some GHG emissions from road and rail transport inverted to GWP values.

Vehicle type / Emissions in GWP amounts	CO ₂	CH ₄	N ₂ O	Total emissions in GWP values
Electric train	7.2	0.006	0.06258	7.27
Semi trailer combination	45	0.00875	0.447	45.46

Source: Modified from LIPASTO (2009), Climate Change Connection (2010) and Forster *et al.*, (2007)

Table 3 shows that CO₂ emissions have the most significant impact on environment if compared to CH₄ and N₂O even though two latter GHGs have larger GWP values. The reason is that CO₂ amounts are considerable higher than CH₄ and N₂O amounts routed from road and rail transport. By halving CO₂ emissions from road and rail transport both transport modes became environmentally friendlier than by halving both the CH₄ and N₂O emissions. Even by totally eliminating both the CH₄ and N₂O total emissions in GWP values from road and rail transport decrease percentually one and four percents respectively.

2.1 The Acid Rain Program

Four different trading schemes or protocols to decrease emissions are reviewed in this literature review. Different protocols are The Acid Rain Program, The European Union's Emissions Trading Scheme, Kyoto Protocol and Montreal Protocol. The Acid Rain Program is first described briefly, because it is the oldest of these four programs. In addition it can be said to be predecessor to some newer schemes or protocols e.g. The European Union's Emissions Trading Scheme (EU ETS) in a way that EU ETS has followed some of the Acid Rain Program's protocols. (Ellerman *et al.*, 2010)

The Acid Rain Program is created by congress of U.S. Environmental Protection Agency (EPA) and it concerns only U.S. states. The aim of the Acid Rain Program is to decrease certain type of emissions to decrease the overall amount of acid rains. Target emissions are sulphur dioxide (SO₂) and nitrogen oxides (NO_x). The goal is to achieve environmental and public health benefits by reducing previously mentioned emissions, the main causes of acid rain. The Acid Rain Program concerns American companies, mainly electric power generation companies that create energy by burning fossil fuels. The Acid Rain Program is based on cap-and-trade scheme. It means that

certain amount of allowances are created that can be bought, sold or banked. A company that is part of The Acid Rain Program, can pollute as much as it has allowances. If it pollutes less than it has allowances it can sell its additional allowances to another interest group that pollutes more than it has allowances. Each allowance equals one ton of SO₂. There are no rules of which interest groups can be part of the program. The Acid Rain Program was implemented into use in Phase I, which started in 1995. It affected 445 different units or interest groups of which 182 were voluntarily participated. Phase II started in 2000. Interest groups participated in Phase I reduced their SO₂ emissions by 40 percent more than their required level. Phase II differs from Phase I by setting more strict emission limits on large emitting plants. In addition, approximately 2,000 new small-scale units gained restrictions from The Acid Rain Program. (EPA, 2009)

EPA is in charge of the Allowance Tracking System (AMS). The aim of the AMS is to track and control different interest groups, their allowances and emission rates. In addition, EPA holds an annual allowance auction where different parties can sell or buy allowances. Different parties can also buy allowances from direct sale at a fixed price of 1,500 dollars. EPA allows such interest groups that need not be part of the program to take part if they want to. Same rules apply to these units. The idea here is that if the unit can maintain its emission levels under their allowances levels it can sell its additional allowances and gain revenue and at the same time have motivation to decrease SO₂ and NO_x levels. (EPA, 2009)

2.2 Kyoto Protocol

The Protocol aims at decreasing the GHGs in 37 industrialized countries including European community by setting binding targets. It entered into force in year 2005. It is a shared agreement that all participating countries are willing to follow. Different GHGs included in Kyoto protocol are:

- Carbon dioxide (CO₂)
- Methane (CH₄)
- Nitrous oxide (N₂O)
- Hydrofluorocarbons (HFCs)

- Perfluorocarbons (PFCs)
- Sulphur hexafluoride (SF₆)

Kyoto Protocol uses Global warming potential (GWP), when comparing different GHGs. Because CO₂ is the reference gas its GWP value is 1. Other GHGs are converted to GWP values by comparing their impact in climate change with CO₂. Some of the most important GHGs and their GWP values can be seen in Table 1 in previous chapter. (Gohar and Shine, 2007)

Participating countries have to meet their GHG demands mainly through national measures. In addition, the Kyoto Protocol includes three different mechanisms that countries can use to meet their local GHG targets. Mechanisms are called: Emissions trading, Clean development mechanism and Joint implementation. These mechanisms are briefly explained in next sub-chapters. (UNFCCC, 2008 and 2010)

2.2.1 Emission Trading

Different countries that have taken part in the Kyoto Protocol have accepted GHG target levels. The countries that are able to achieve their limits can sell their excess capacity to other countries that cannot meet their demands in reduction of GHGs. Emission trading is also known as carbon market, because it mainly concerns trading with CO₂ or other GHGs that have been converted to equivalent CO₂. In addition, there are other trading units than can be used in emission trading scheme e.g.:

- A removal unit (RMU) on the basis of land use
- An emission reduction unit (ERU) generated by a joint implementation project (this is explained in sub-chapter 2.1.3)
- A certified emission reduction (CER) generated from a clean development mechanism project (this is explained in sub-chapter 2.1.2) (UNFCCC, 2010b and 2008)

All in all, nations gain benefits if they can reduce their GHG levels under their own limitation levels. (UNFCCC, 2010b and 2008)

2.2.2 Clean Development Mechanism

Clean Development Mechanism (CDM) allows countries participating in Kyoto Protocol to create or invest in emission reduction projects in developing countries. That can be used in each countries' own target levels with positive impacts. Countries can earn certified emission reduction (CER) credits. One emission reduction credit is equal to one tonne of CO₂. It can be counted towards to meet country's own emission target level. An example for CDM could be a rural electrification project using solar panels. This way the country that invests in project could create more cost-efficient and environmentally friendlier electrification in the rural area. In addition, the country earns certified emission reduction credits, which it can use to meet its Kyoto Protocol GHG target levels. (UNFCCC, 2010c and 2008)

2.2.3 Joint Implementation

Joint Implementation (JI) has similarities with previously explained Clean Development Mechanism by being global. The exception is that Joint Implementation can be used in another Kyoto Protocol Annex B Party. A country with an emission reduction or limitation commitment under the Kyoto Protocol (Annex B Party) can earn emission reduction units (ERUs) by investing in emission reduction product in another Annex B Party. One ERU is equivalent to one tonne of CO₂ and it can be used to meet Kyoto Protocol emission reduction or limitation goals. With Joint Implementation and Clean Development Mechanism Annex B Party countries can invest in globally in emission reduction projects and meet their required demands. These two mechanisms encourage countries to invest but in their local projects to also in global projects. (UNFCCC, 2010d and 2008)

2.3 Montreal Protocol

The whole name of the Montreal Protocol is "*The Montreal Protocol on Substances that Deplete the Ozone Layer*". As the name says, the main target of the Montreal Protocol is to heal ozone layer. The protocol has been signed by more than 190

countries i.e. almost every country in the world is part of the Montreal Protocol. The entry into force of the Protocol was in year 1989. Aim of the Montreal Protocol is similar than the aim of Kyoto Protocol. Its goal is to replace ozone-depleting substances (ODS) with safer substances. Target is to reduce the ozone-layer thinning and eventually start to get it thicker. Reductions are done by a treaty that was accepted between countries that have signed the protocol. Thinner ozone-layer allows larger doses of ultraviolet radiation to reach the ground of Earth. Different ozone-depleting substances that are aimed to reduce in Montreal Protocol are:

- Halons
- Chlorofluorocarbons (CFCs)
- Carbontetrachloride (CCl₄)
- Hydrobromofluorocarbons (HBFCs)
- Methylchloroform (CH₃CCl₃)
- Chlorobromomethane (CH₂BrCl)
- Methylbromide (CH₃Br)
- Hydrochlorofluoro-carbons (HCFCs) (Ozone Layer Protection, 2010; UNEP, 2009)

Although Montreal Protocol aims at stopping the thinning of ozone-layer, many of the above mentioned ozone-depleting substances are in addition GHGs. It means that replacing them with safer substitutes in addition will reduce the amount of GHGs. Therefore, Kyoto Protocol and Montreal Protocol have some similarity in their goals. (Ozone Layer Protection, 2010; UNEP, 2009)

2.4 The European Union's Emissions Trading Scheme

The European Union's Emissions Trading Scheme is known as EU ETS. It is the largest carbon market at the moment. Main idea of the EU ETS is to create certain trading scheme for EU nations. EU ETS aims at decreasing levels of GHGs created by EU nations. The weighted GHG is CO₂. Core of the EU ETS is somewhat similar than the cores of previously mentioned Acid Rain Program, Kyoto Protocol and Montreal Protocol. Differences between all these different protocols are different geographical areas, different emissions that are limited and different countries of interest groups

that are part of the different protocols and different amounts of allowances. EU ETS is also a cap-and-trade program, where certain amount of allowances is created and the emission level has to be under the level of allowances. In year 2010 EU ETS covers approximately 11,000 power stations and industrial plants in 27 countries. EU ETS is divided into three different periods that are first trading period during years 2005 to 2007, second trading period during years 2008 to 2012 and third trading period that starts in year 2013 and it ends in 2020. (Ellerman *et al.*, 2010; European Commission, 2010a)

DG CLIMA aka Directorate-General for Climate Action has been established in February 2010. It develops and implements EU ETS and promotes it to be linked with other carbon trading systems (e.g. Kyoto Protocol) to create an international carbon trading market. The main target of the promoting is to merge different carbon trading systems as well as possible i.e. the ultimate goal would be to have only one world-wide carbon market instead of many smaller carbon markets. (European Commission, 2010b)

Each different EU country that is involved in EU ETS creates has to create their own national allocation plan (NAP) for each different period. NAP includes the amount of allowances for the EU country. The amount of allowances has to be in line with Kyoto Protocol i.e. the country has to achieve the limitations of emissions in both the EU ETS and Kyoto Protocol. NAPs will be eliminated in the third trading period, which starts in year 2013. In the third trading period the EU will decide the allocations. (European Commission, 2010c; Ellerman *et al.*, 2010)

Cap determines the maximum quantity of emissions allowed under the EU ETS. Cap is divided between different EU countries. Cap for 2013 (certain phase) is determined to be approximately 2.04 billion allowances. The cap will decrease circa 1.74 percent each year. In amount it is circa 37 million annually. Annual reduction will continue to year 2020 at least. Main idea is to actually decrease total GHG amounts instead of only maintaining their current level. Carbon allowances can be auctioned between different member states. Goal of auctioning is to balance allowances between different member states so that those countries, which emit less than they own

allowances can sell them to member countries that need more allowances. (European Commission, 2010d; European Commission, 2010e; Ellerman *et al.*, 2010)

When EU ETS first trading period was launched in 2005, it was implemented mainly for energy-intensive sectors in EU-25 countries. EU ETS limits only CO₂ emission levels in EU member countries. In addition there are many sectors that EU ETS do not limit e.g. agriculture, housing, waste management and transportation. Aim of the EU ETS is to grow larger by including more emissions and countries in upcoming trading periods. Third trading period starts in year 2012. Third trading period will be enlarged with aviation emissions. All emissions from airlines flying into and out of EU member countries' airports will become part of EU ETS. Other transport modes will not be part of EU ETS in the near future. Main reason is that regulating e.g. road transport is troubled. Car manufacturing lobbies are strong and they oppose additional emission limitations. Furthermore, there are many different fuel taxation programs mobilized or planned in EU member states. Sea sector emission levels are limited by International Maritime Organization (IMO). EU ETS has also plans to increase the geographical area e.g. including nations in European Economic Area (EEA). (Ellerman *et al.*, 2010; Entec, 2010)

Community Independent Transaction Log (CITL) is a central transaction log, which is run by the European Commission. CITL maintains a database that includes all transactions concerning EU ETS. Different countries and different groups and their allocation and emission levels and installation amounts can be summarized and compared with the database. In this literature review three different results of the database are presented. First one summarizes allocated and verified emissions of the EU-25 countries from year 2005 to 2009 (Figure 1). Second one illustrates allocated and verified emissions in Finland with the same time scale (Figure 2). Third result is about installation quantities in EU-25 countries with the same time scale as in two other results (Table 4). (EEA, 2010)

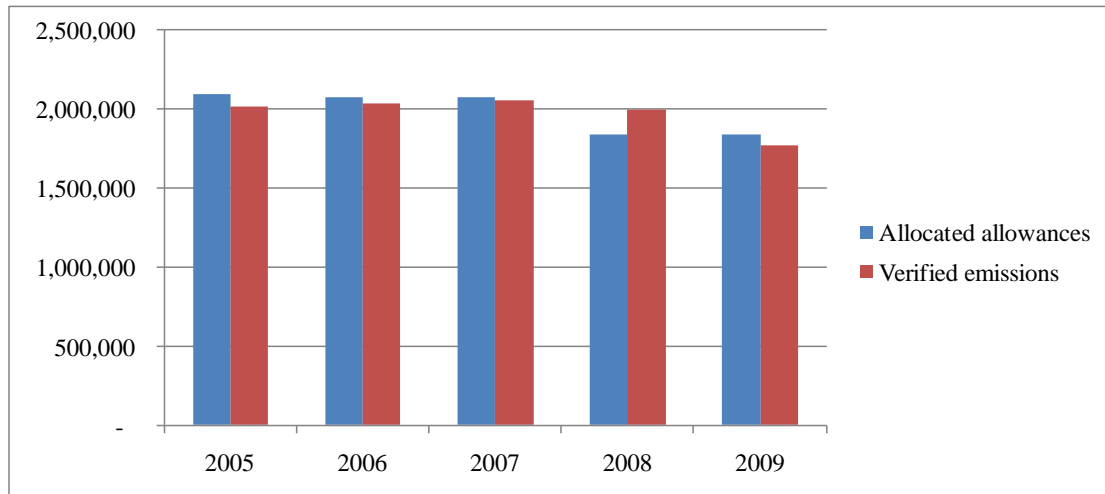


Figure 1 Allocated and verified emissions (1,000 emission units) in EU-25 countries from year 2005 to 2009.
Source: Modified from EEA (2010)

Figure 1 summarizes all the allocated and verified emissions in 1,000 emission units in EU-25 countries from year 2005 to 2009. It can be seen from Figure 1 that amounts of allocated and verified emissions have decreased in these years. Allocated emissions were about 2,100,000 kt CO₂-eq in year 2005, while they were about 1,800,000 in year 2009. In addition the verified emissions have decreased from approximately 2,000,000 kt CO₂-eq from year 2005 to 1,800,000 in year 2009. It seems that EU ETS has some impact in emissions amounts. In years 2005, 2006, 2007 and 2009 EU-25 countries have managed to keep their emission levels below allocated levels. In year 2008 emission levels were higher than the allocated level. A recession started in late 2008 or in year 2009 in many countries. That could be the main reason for the drop in verified emissions from your 2008 to 2009. As it can be seen in Figure 1, in year 2008 verified emissions were more than allocated emissions, but in year 2009 verified emissions were reduced so that allocated emissions were not exceeded. According to Koskinen and Hilmola (2010), the results of recession in Finland are e.g. industrial shutdowns. Koskinen and Hilmola (2010) researched how large-scale shutdowns at paper industry affect transportation logistics. According to Koskinen and Hilmola, all logistics service providers that were part of paper industry suffered large financial problems due to the paper mill shutdowns i.e. paper mill shutdowns do not only affect in their own employers but also in many other sectors such as logistics. A similar Figure 2 below illustrates allocated and verified emissions in Finland. (EEA, 2010)

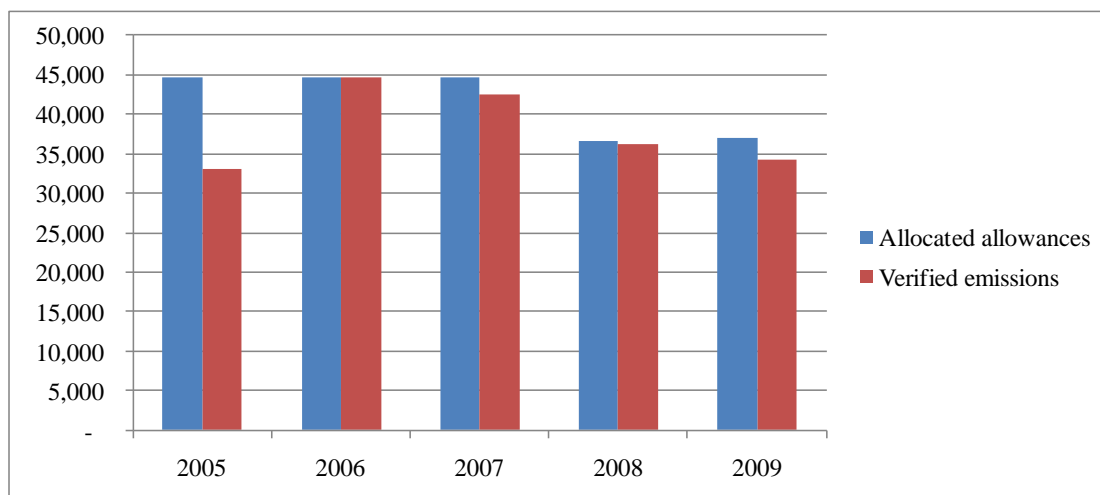


Figure 2 Allocated and verified emissions (1,000 emission units) in Finland from year 2005 to 2009.
Source: Modified from EEA (2010)

In Finland the trend is somewhat similar than in EU-25 countries. Finland has been able to maintain verified emission level below allocated emission level. A difference in Finland is that verified emissions increased from year 2005 to 2006 from approximately 33,100 kt CO₂-eq to 44,600 kt CO₂-eq. The main reasons for this is that from year 2005 to 2006 Finland increased its installations from 514 to 523 and there was a large scale lockout at paper industry sector in Finland. After year 2006 both the allocated and verified emissions have decreased steadily. If both Figures 1 and 2 are analyzed, it seems that EU ETS has positive impact in decreasing CO₂ emission amounts. Table 2 summarizes quantities of installations in EU-25 countries. (EEA, 2010)

Table 4 Number of installations in EU-25 countries and Finland in years 2005 to 2009.

	EU-25	Finland
2005	10,124	514
2006	10,500	523
2007	10,687	525
2008	10,421	527
2009	10,557	532

Source: Modified from EEA (2010)

As can be seen from Table 4 the level of installations has risen steadily from year 2005 to 2009. The rise from year 2005 to 2009 is circa 4.3 percent. In Finland the rise from year 2005 to 2009 is about 3.5 percent. Aim of the EU ETS is to increase the

amount of installations and widen the area of EU ETS. At the moment EU ETS covers power stations, combustion plants, oil refineries, coke ovens, iron and steel plants and other installations that produce cement, glass, lime, bricks, ceramics, pulp, paper and board. EU ETS currently covers only CO₂ emissions. The aim in the future is to cover other sectors as well and more GHGs than previously mentioned. (EEA, 2010; Ellerman *et al.*, 2010)

3 RELATION OF CONGESTION AND EMISSIONS

Many studies indicate that present transport policies will not be enough to reach the target emission reductions (e.g. targets of Kyoto and Montreal protocols) in the following decades. Many researchers claim that emission levels will increase during the next decades even in the most optimistic scenarios. One way to decrease emission levels is the make transportation flows smoother by decreasing congestion at road networks. (Zanni and Bristow, 2010; Kousoulidou *et al.*, 2008; He *et al.*, 2005; Hongfeng *et al.*, 2007)

Many researchers have studied, if increasing the use of intermodal transport could decrease congestion. Main idea in this theory is to shift transport off the road to other transport mode that is not as congested as road transport. The intermodal transportation is transport of goods in standard load-units, which can be transshipped between different transport modes (e.g. road, rail, sea and air transport) (Rutten, 1998; Hayuth, 1987). At least two different transport modes are deployed during transportation (Rutten, 1998; Hayuth, 1987). Furthermore, the process of intermodal transport is seamless i.e. products do not last long in intermodal terminals. (Rutten, 1998; Hayuth, 1987). Congestion is studied, because intermodal transport is in many cases offered to be the solution to decrease congestion. Furthermore, there are many researches that imply that reducing congestion can further reduce emissions amounts originating from transport. In the end of Chapter 3, there is a brief summary about the resting and driving time regulation, because many respondent companies assume, that dry port concept eases following of resting and driving time regulation. In addition, there is a brief recap about Oulu's Oritkari intermodal terminal, since it is the only intermodal terminal in Finland that is operated with large traffic in Finnish scale.

3.1 *Regional Congestion Studies*

There are many regional studies regarding transportation, congestion and emissions. Conclusions of the study of Zanni and Bristow (2010) are that current transport policies can potentially reduce emissions in the city of London, but current policies are not enough to meet the required emission level targets. Studies concerning same

topic in different geographic areas have very similar conclusions (e.g. He *et al.*,2005; Stanley *et al.*, 2009). In their study, Zanni and Bristow (2010) predict that CO₂ emissions from road transport will increase by 109 percent from year 2006 to year 2050 in the most optimistic scene. According to He *et al.* (2005), CO₂ emission levels from road vehicles in China will increase to approximately 800-1200 million tons of CO₂ until year 2030. Emission level of CO₂ in year 2005 is circa 300 million tons. The increase would be between 270 and 400 percent from year 2005 to year 2030. In addition, a research by Stanley *et al.* (2009) indicates that Australia has a similar problem. Emissions from transportation rise, although the level of emissions should reduce to meet emission restrictions. Road transport is the main emitter and it is predicted to increase in the future.

According to Ahn and Rakha (2008), there are major possibilities to decrease the pollution from road transportation through education of drivers. In their study, Ahn and Rakha (2008) found out that minor portion of the entire travel time that used high engine load pollutes considerable amount of the total emissions of the whole trip. Education could be used e.g. to teach drivers to drive more smoothly.

According to literature review, congestion and air emission amounts are related. If congestion can be decreased, also the air emissions decrease. Results of the research by Barth and Boriboonsomsin (2008) are that CO₂ emissions can be reduced by up to 20 percent with three different strategies that affect congestion. First strategy is congestion mitigation strategy that reduces severe congestion, which allows smoother traffic flows. Second is to implement speed management techniques that reduce high free-flow speeds. Third one is to use shock wave suppression techniques, which reduces brakings and accelerations.

3.2 Ways to Decrease Congestion

Congestion at road network can be decreased with modal shift by decreasing the use of road transport and increasing the use of some different transport mode e.g. rail or inland waterway transport. One way is to increase the use of intermodal transport. Intermodal transport can be increased by increasing its attractiveness. Ways of doing

this are e.g. congestion charging on roads or reduced costs to use intermodal transport modes e.g. rail transport.

By reducing fuel consumption the emissions are also reduced, mainly the CO₂ emission amounts. There are many factors that have influence in the fuel consumption quantities e.g. the vehicle, the engine, the driver, the equipment and the weather. In addition, congestion will increase fuel consumption. According to Volvo Trucks (2010), smooth traffic can decrease fuel consumption. Ten stops and accelerations in 100 kilometers distance can increase the fuel consumption by 130 percent i.e. by decreasing congestion also the fuel consumption can be decreased. Congestion causes changes in driving smoothness by increasing braking and accelerating of vehicles. That also leads in increased emission levels of the vehicles. (Volvo Trucks, 2010; Smit *et al.*, 2008)

Many studies that have researched impact of congestion charging have found out that charging is a powerful tool to decrease the amount of congestion. In addition, some studies have found out that environmental impacts can be reduced by implementing congestion charging in hardly congested geographic locations. That's because smooth traffic flow pollutes less than congested traffic. By using congestion charging the number of road vehicles can be reduced, which leads in smoother traffic flow, and that leads in both reduced congestion and reduced emission amounts. In addition, congestion charging enables positive cash flow for the government. In year 2006, a charging trial concerning vehicle charging at congested roads in the center of Stockholm was studied. According to the study of Eliasson *et al.* (2009), the charging trial in Stockholm led to decreased travel times. Travel times decreased also in the areas that were not in the charging trial area. The trial had an immediate effect in the traffic i.e. the effect of the charging did not start late. In addition, the reduction in travel times and congestion led to decreased environmental impacts. (Eliasson *et al.*, 2009; Ubbels *et al.*, 2002)

In their study, Ubbels *et al.* (2002) have researched similar method to decrease the environmental effects of road transport. They studied impacts of a kilometer charge in Netherlands. Basically, current tax system would be transformed to more variable system. Results are that energy use can be decreased with 20-40 percent and

emissions can be decreased approximately by 20-70 percent depending on the chosen scenario. In addition, authors predict that considerable reduction in congestion levels could be expected.

According to Tonne *et al.*, (2008), London congestion charge had major effects in both congestion and pollution. Predicted benefits of the congestion charge are that 1,888 years of life could be gained. Basically congestion charge reduces congestion and pollution. Reduction of pollution increases average time of human life and that is the reason for gained life years.

Some countries give discount for companies that use intermodal transportation by using rail transport. It means that the companies are allowed to use rail tracks by smaller price than usually. According OECD/ITF (2008) Croatia and Hungary allow discount for freight companies that operate with intermodal transport. In Croatia the discount is 2/3 of express freight costs. In Hungary companies gain 20 percent discount for both the transit traffic and intermodal transport.

3.3 Driving and Resting Time

Driving and resting time regulations are briefly discussed, because some of the respondents see benefit of dry port concept in easier following of driving and resting times. Driving and resting time act concerning working hours is divided into five different parts: Daily breaks, daily resting periods, daily driving times, weekly maximum driving times and weekly resting times. (Regulation No 561/2006, 2006)

The act concerning driving and resting times for daily breaks is as follows:

Driver has to take a break after four and half hours of driving. The break has to be at least 45 minutes long. After that driver can drive four and half hours and take a 45 minutes break after that. The total break of 45 minutes can be divided into two smaller breaks. If the total break is divided into two smaller breaks, then the first break has to last at least 15 minutes and the second break has to last at least 30 minutes and there can be at most four and half hours of driving with two breaks. Examples of different breaks can be seen in Figure 3 below. (Regulation No 561/2006, 2006)

a)	Driving of 4 hours and 30 minutes	Break of 45 minutes	Driving of 4 hours and 30 minutes	Break of 45 minutes				
b)	Driving of 1 hour	Break of 15 minutes	Driving of 3 hours and 30 minutes	Break of 30 minutes	Driving of 1 hour	Break of 15 minutes	Driving of 3 hours and 30 minutes	Break of 30 minutes
c)	Driving of 2 hours	Break of 45 minutes	Driving of 3 hours	Break of 15 minutes	Driving of 1 hour and 30 minutes	Break of 30 minutes		

Figure 3 Daily breaks defined by Regulation 561/2006

Source: Modified from Regulation No 561/2006, (2006)

Resting times for every 24 hours are defined so that the driver can drive a total of 9 or 10 hours per 24 hours (two times a week daily driving time can be extended to 10 hours). Driver has to take breaks at least for 1.5 hours. In addition, driver can do some other work (e.g. loading or unloading) for 1.5 hours a day. Driver needs to have at least 11 hours of additional rest. 11 hours rest can be divided into two parts of at least three and nine hours. The rest time of 11 hours can be shortened to nine hours of rest three times a week. (Regulation No 561/2006, 2006)

Driving time per week can be 56 hours most. Driving time of two consecutive weeks cannot exceed 90 hours i.e. after one 56 hours week driver can drive only 34 hours during the next week. Length of weekly rest time has to be at least 45 hours. Weekly rest time can be reduced to 24 hours once during consecutive two weeks period. That reduction has to be compensated as a extra free time. (Regulation No 561/2006, 2006)

3.4 Case Oritkari Intermodal Terminal

In Finland there are only few intermodal terminals that can be called as dry ports. One of them is Oritkari intermodal terminal located in city of Oulu in Northern Finland. The terminal was launched in 2004. Oritkari intermodal terminal is situated next to Port of Oulu, which means that Oritkari intermodal terminal is situated next to sea. If the distance is measured from Port of Oulu, then Oritkari intermodal terminal is very short-distant dry port for Port of Oulu. Intermodal terminal has straight rail connection to different ports in Finland e.g. Port of Helsinki. In addition, intermodal terminal has road connection. Two most used rail transportation routes from and to Oritkari intermodal terminal are between cities of Pasila and Tampere. Pasila is situated next to Helsinki. Aim of the Oritkari intermodal terminal is to function as connection

between Southern and Northern Finland. The average transportation distance by rail from and to Oritkari intermodal terminal is approximately 590 kilometers. According to Karvonen *et al.* (2005), Oritkari intermodal terminal is one of the largest and most modern intermodal terminals in Nordic countries. In addition, the terminal has space around it to expand if necessary. The possible limitation is single rail connection between Oulu and Seinäjoki, which is currently under construction. (Karvonen *et al.*, 2005; Kuoppala, 2010)

Loading units used in Oritkari intermodal terminal are mainly semi-trailers. In addition rolling road is used. Both of the previously mentioned units are used approximately with same volumes. At the moment there is no container transport to and from Oritkari intermodal terminal. Some statistics about the Oritkari intermodal terminal in year 2009 can be seen in Table 5. (Kuoppala, 2010)

Table 5 Statistics about Oritkari intermodal terminal in year 2009.

Rolling road	6,350 units
Semi-trailer	5,870 units
Overall weight of cargo	503,400 tons
Loaded rail wagons	12,500 wagons
Overall amount of TEUs	35,862 TEUs
Average transport distance	592 km

Source: Kuoppala (2010)

Rail transport of different transport units is divided into two different modes: unaccompanied and accompanied. In the unaccompanied mode there is an intermodal loading unit (e.g. swap body, container or semi-trailer) at the rail wagon. In accompanied mode the whole road vehicle is driven to the wagon and it is accompanied by the driver. In Table 3 above there are two different main categories of transport units: Rolling road and semi-trailer. The rolling road is accompanied mode of transport, while semi-trailer is unaccompanied. Accompanied mode's distribution in Oritkari intermodal terminal is approximately 52 percent i.e. about half of the cargo from and to Oritkari intermodal terminal is accompanied traffic. International Union of combined Road-Rail transport companies (UIRR) maintains a database of its member companies' combined road-rail transport. The use of accompanied mode in UIRR member companies is circa 14 percent. Percentual

accompanied traffic level of Oritkari intermodal terminal is relatively high, if compared to UIRR member companies. (UIRR, 2008; Kuoppala, 2010)

4 METHODOLOGY AND DATA GATHERING

Used methodology in this research is survey. Logistics companies were sent email that invites them to answer a questionnaire, which is located at a web site <http://www.kuivasatama.fi/> i.e. the study employs the web survey method for data gathering. A 32-item questionnaire was developed in both Finnish and English. Used question types are open questions, Likert scale questions with scale from one to seven, yes or no questions and a unique type of question to rate different geographical locations regarding the use of seaports and import/export cities in Finland by the respondent companies. A copy of the questionnaire is shown in Appendix 1.

The questionnaire is divided into six different sections (basic information, dry port concept, intermodal transport, green values or environmental impacts of transport, information systems and most important export and import cities and seaports). First section is about basic information about the respondent company. Questions in this section are about the number of employees, revenue, estimate of transport modes and container traffic and what are the main categories and whether or not the respondent company operates domestic and/or international transports. Second section about the dry port concept was asked with one open question. Although the main aim of the survey study is to research dry port concept, it is mainly researched through intermodal transport and environmental impacts of transport. Reason is that dry port concept is fairly new concept. It is not well known in every logistics company and its meaning can be quite different between different companies and different actors. Third and fourth sections about intermodal transport and environmental impacts of transport were asked with Likert scale from one to seven by dividing the answers from “Strongly disagree” to “Strongly agree”. Section three consists of 15 questions and section four consists of six questions. Fifth section about information system consists of one question with Likert scale from one to seven and four small questions that clarify, what information systems respondent companies use in their information flow operations. Final section six studies most important export and import cities and seaports of the respondent companies i.e. the most important and attractive geographical locations for South-East logistics companies in Finland are researched. Questions used in this section allow respondent companies to choose five most

important export and important cities and seaports by using number one as their most important city or seaport and number two as their second most important city or seaport and so on until they have chosen up to five different export and import cities and seaports.

Questionnaire was performed as a web survey. The online survey was chosen, because aim was to get many companies to answer the questionnaire. Interviews with over 50 companies would have taken a lot of time. The questionnaire was available in English and Finnish. Both questionnaires were identical. Both the Finnish and English questionnaires were created using Aptual's Jalusta software. Even then every company answered with Finnish version. An invitation email was sent to local companies at the South-East area of Finland. The invitation email included info about survey and Mobile Port project. Mass emails to the logistics companies were sent using Aptual's Jalusta software. The companies are mainly located at cities of Lappeenranta, Kouvola, Hamina, Kotka and Lahti and their surroundings. Regions of Kotka and Hamina were kept in the same category, because those cities are located near each other and many companies operate at both cities. Furthermore, the ports of Kotka and Hamina will be united in year 2011. List of email addresses to logistics companies were mainly gathered through Internet search by searching different locistics companies and their homepages and contact information. Email addresses for companies in Kotka and Hamina region were obtained from Cursor Oy. Inviting emails included a unique answer code for each invited company. The reason to include a answer code was be sure that respondent companies really did answer the questionnaire and to eliminate possible abusers of the questionnaire. However, all the companies that answered to the survey used their unique answer code and there were no other answers. More specific distribution of different companies about their locations is shown below:

- 73 companies in Kouvola and its surroundings
- 145 companies in Kotka and Hamina and their surroundings
- 53 companies in Lappeenranta and its surroundings
- 45 companies in Lahti and its surroundings

First email for the companies in Kouvola region was sent in 26th of August. First reminder was sent in 2nd of September. Second reminder was sent in 8th of September and the last and the third reminder in 22nd of September. Kouvola region was sent three reminders overall. All the other regions were sent two reminders. Four companies located in the Kouvola region answered to the questionnaire.

First email to companies operating in Kotka and Hamina region was sent in 8th of September. First reminder was sent in 14th of September. Second reminder was sent in 22nd of September. 15 companies situated in the Kotka and Hamina region answered the questionnaire.

First email to companies at Lappeenranta region was sent in 9th of September. First reminder was sent in 14th of September. Second reminder was sent in 22nd of September. Four companies from Lappeenranta region answered the questionnaire.

First email to companies located in Lahti region was sent in 23rd of September. First reminder was sent in 29th of September. Second reminder was sent in 5th of October. Six companies from Lahti region answered the questionnaire.

Invitation emails and reminders were sent to different regions at different dates, because more regions were added during the questionnaire. First region was the Kouvola region. After that regions of Kotka, Hamina and Lappeenranta were added. The final added region is the Lahti region, which was added last in the late September. The overall amount of companies that were invited to answer to the questionnaire was 316. The main industry area of the all companies is logistics, mainly road transport logistics. Overall amount of answers was 29 of which 27 are usable. Two of the not usable answers were only about respondent companies' names and answering codes. Response rate between different regions can be seen in Table 6.

Table 6 Response rates of different regions.

	Lahti region	Lappeenranta region	Kouvola region	Kotka and Hamina region
Sent emails	45	53	73	145
Answers	6	4	4	15
Response rate	13%	8%	5%	10%

Best response rate was at Lahti region with 13 percent. Second best is region of Kotka and Hamina with 10 percent. Lappeenranta and Kouvola regions had the worst response rates being 8 and 5 percent respectively. Survey was completed between late August and early October.

5 RESULTS OF THE QUESTIONNAIRE

This survey study is part of larger project called Mobile Port project. The main goal of the Mobile Port project is to create an information system and research how to implement it to seaport dependent transport system. Lappeenranta University of Technology Kouvola Unit is one of the research parties. The other two are Centre for Maritime Studies, University of Turku and Kymenlaakso University of Applied Sciences. Centre for Maritime Studies is the coordinating research party for Mobile Port project. Aim of the Kouvola Unit is to study the dry port concept i.e. benefits and disadvantages of it and could it be implemented cost-efficiently in the Kymenlaakso region, more specifically in the city of Kouvola. First research report (*“Financial and Environmental Impacts of a Dry Port to Support Two Major Finnish Seaports”*) by Kouvola Unit is already published and it can be found from different sources e.g.: Merikotka (2011) or LUT Kouvola (2011). First research report concentrated in dry port concept theories and earlier researches. In addition, road and rail transport modes were compared by cost accounting. Both the internal and external costs (external costs are e.g. emission costs) were included. Different gravitational models were also created to compare the location of Kouvola with other locations to find out whether or not city is in good place for a dry port implementation. This survey research is the second part of research concerning Mobile Port in LUT Kouvola.

Questionnaire is structured as follows: Basic information about transport modes, size of the companies and TEU volumes are shown first. Dry port concept is asked with one open question. After that intermodal transport is discussed with 15 different questions that are answered with Likert scale. Environmental friendliness of transport and its effects in strategies and customers are asked with six questions that are answered with Likert scale. In the end, used information systems and most important export and import cities and seaports are asked. Copy of the whole questionnaire can be seen in Appendix 1.

5.1 Basic Information

Distribution of answers between different regions can be seen in Figure 4 below. Regions are Lahti, Kotka/Hamina, Lappeenranta and Kouvola. Kotka and Hamina are one large region, because list of companies in that region was obtained from one source, which is a local development company called Cursor Oy. Furthermore, ports of Kotka and Hamina will merge later in year 2011.

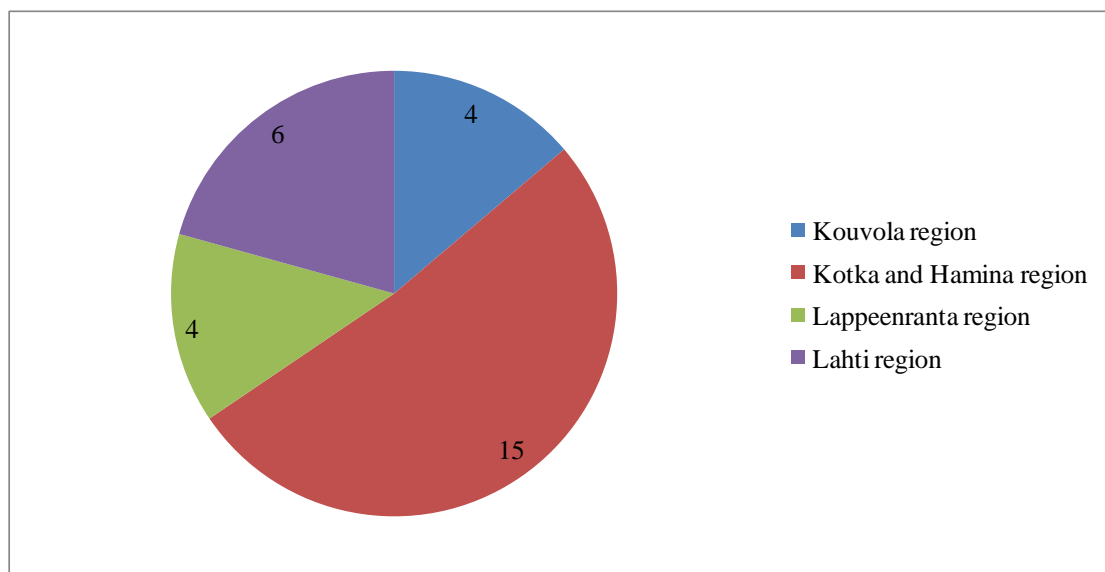


Figure 4 Distribution of answers between different regions.

As can be seen from Figure 4, region of Kotka/Hamina was the most active region with 15 respondents. Approximately half of all the answers are from companies situated in Kotka/Hamina region. It has to be noted though that region of Kotka/Hamina consisted of the largest number of logistics companies. Almost half of the companies were from this region (there were total of 316 companies of which 145 were from Kotka/Hamina region). The second most active region was Lahti with six respondents. There were four respondents in both Kouvola and Lappeenranta region.

Questionnaire included a question about the size of the respondent company. Different answer alternatives are 1-5 employees, 6-10 employees, 11-20 employees, 21-30 employees, 51-100 employees and over 100 employees. Most common size of the company among all the respondents is 1-5 employees. 6-10 is the median value for company size. Average is between 6-10 and 11-20 employees. Figure 5 explains the

answers from respondent companies regarding their sizes measured by the number of employees.

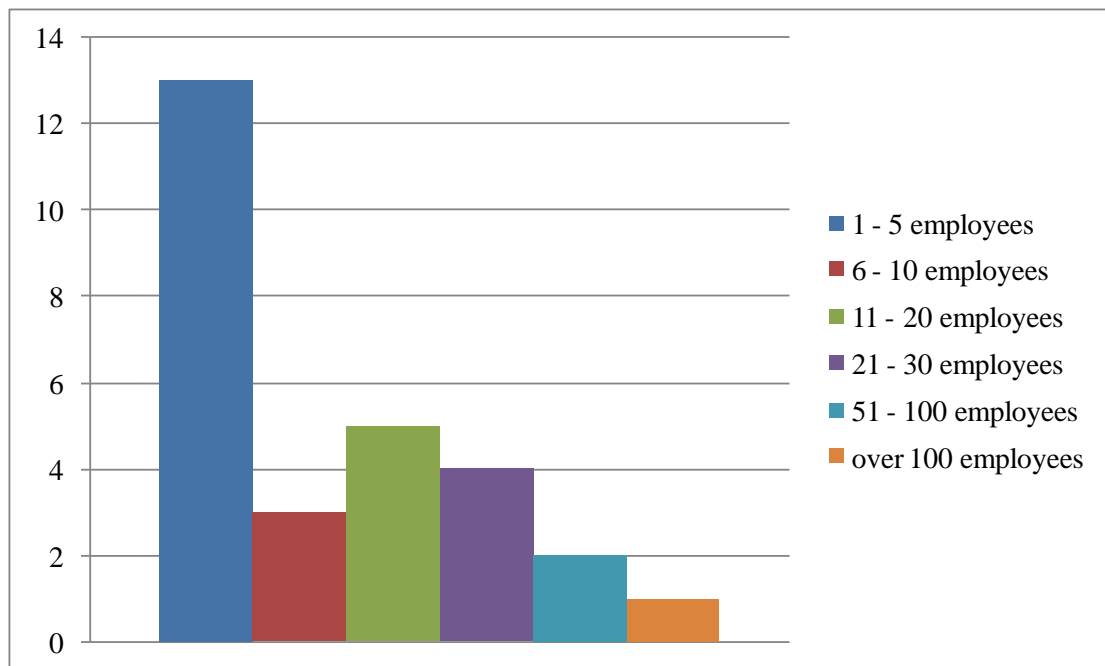


Figure 5 Sizes of the companies that have answered to the survey.

It can be seen that smallest category (1-5 employees) is the main category for the respondent companies. 13 out of 28 have chosen this answer, which is almost half of the respondents. Second largest category is the one with 11-20 employees. Five of the companies have chosen that selection. Only one of the companies has over 100 employees. According to SKAL (2009) there were 11,064 road transport companies in Finland, which employed total of 42,471 employees in year 2007. Estimate value according to statistics by SKAL (2009) is approximately 3.8 people per one road transport company. Sizes of the respondent companies are very similar with statistics of SKAL (2009).

In addition companies were asked about the size of their turnover. Different answer alternatives are 10,000 - 50,000 euros, 50,001 - 100,000 euros, 100,001 - 200,000 euros, 200,001 - 500,000 euros, 500,001 - 1,000,000 euros and over 1,000,000 euros. Median value and the most used answer (n=13) for turnover is over 1,000,000 euros, while the average value for turnover is approximately the answer of 500,001-1,000,000 euros. Turnover estimates of the respondent companies are summarized in Figure 6.

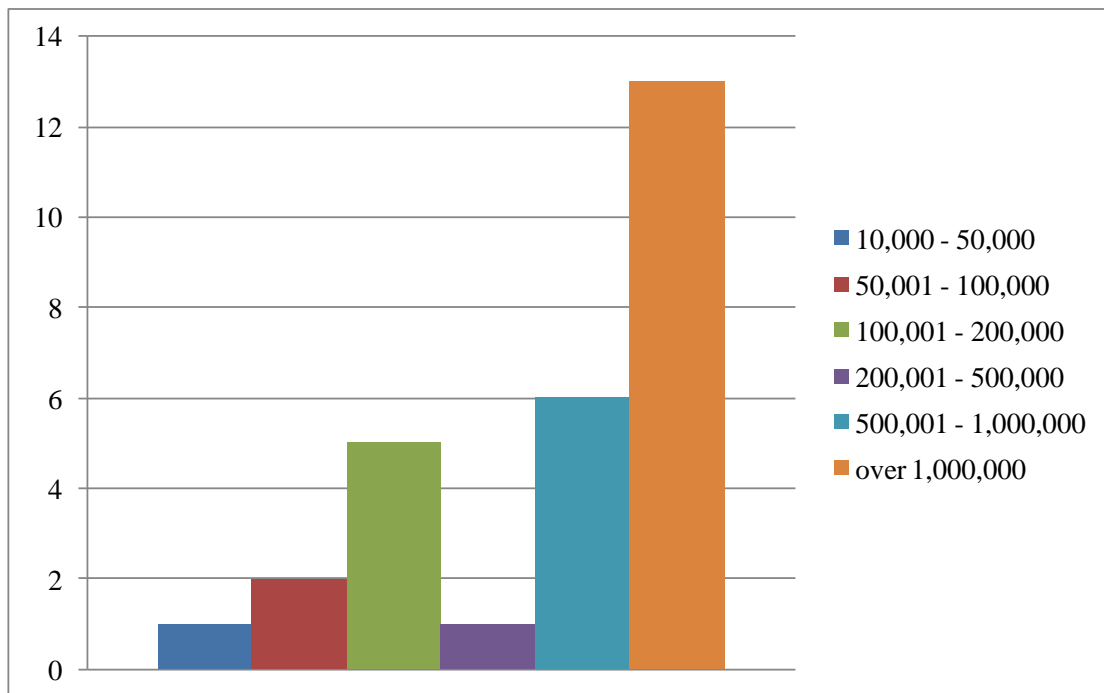


Figure 6 Turnover of the companies.

Almost half of the companies (n=13) have turnover of over 1,000,000 euros. Second largest category is the one with 500,001 – 1,000,000 euros with 6 respondents. The respondent companies are mainly small if the number of employers is counted, but they are medium-sized if turnover is calculated. Furthermore turnover per one employee for almost each respondent company is at medium level.

Respondents were asked about their main product categories. Different alternatives are general cargo, dry bulk and liquid bulk. Figure 7 recaps the answers of the companies.

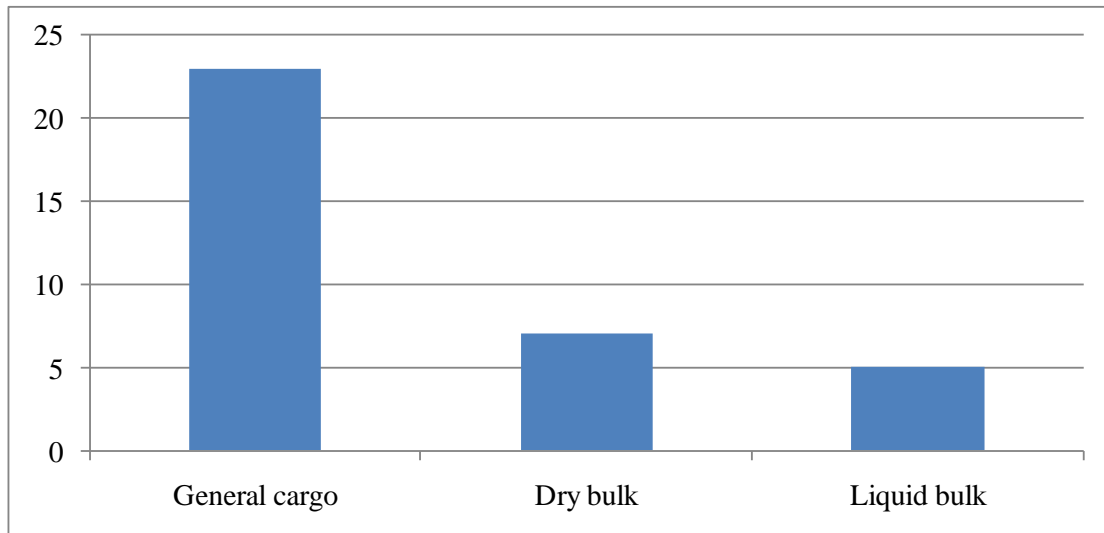


Figure 7 Product categories of respondent companies.

Figure 7 shows that almost all respondents transport general cargo (n=23). It is the most important product category. Dry bulk and liquid bulk are transported more seldom. Seven companies notified that one of their main product category is dry bulk, and five companies deliver liquid bulk as one of their main category.

Next question was about the geographical scope of South-East companies. The companies were asked do they operate in Finland and/or internationally. Summary of the answers is represented in Figure 8.

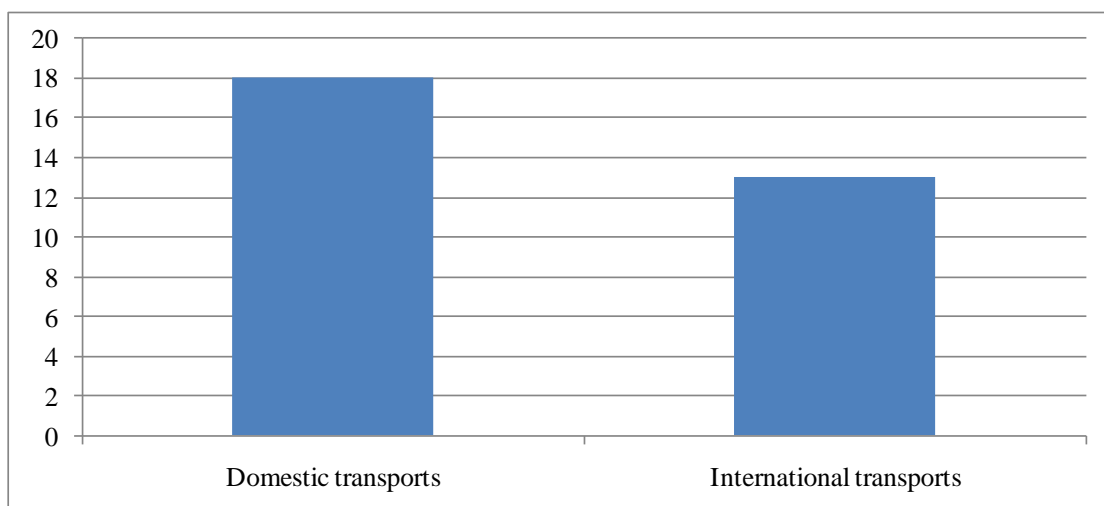


Figure 8 Geographical area of operating.

As can be seen in Figure 8, most of the companies operate at least in Finland (n=18). 13 logistics companies operate also internationally. There are 27 companies overall, which means that seven companies have told that they do not operate in Finland. These companies are operating mainly internationally.

5.1.1 Development of Modal Split of Respondents

Road transport is the dominating transport mode of the companies at the moment and in the near future that have answered to this questionnaire. However, the trend is that road transport will be reduced slightly among respondents in the future. Only one respondent is intending to increase its road transport's share in the next 10 years period, while all the other respondents will either reduce their road transport volume or maintain their current level. Average percentual distribution of road transport in years 2009, 2015 and 2020 are 66, 63 and 60 percent respectively. Median values for road transport's distribution in years 2009, 2015 and 2020 are 100, 100 and 100 respectively. Median values indicate that there are many such logistics companies that operate only at road transport sector. Both the average and median values indicate that there will be reduction in modal share of road transport, but it will maintain its largest market share in future. The possible reasons for decreasing trend are environmental impacts of road transport and cost-efficiency possibilities of other transport modes e.g. intermodal transport. Development of road transport and other transport modes can be seen in Figure 9.

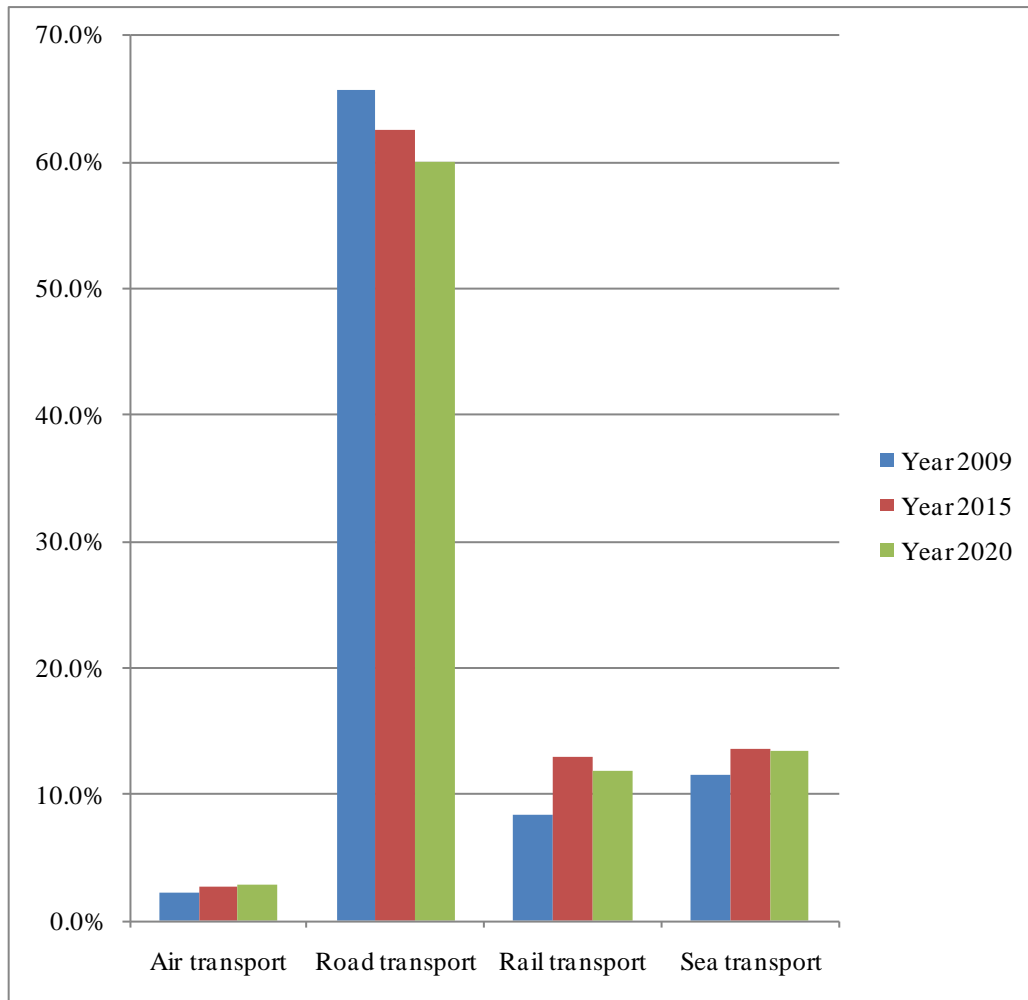


Figure 9 Development of modal share among different transport modes

Rail transport has second lowest market share after air transport among respondent companies. It seems though that rail transport will increase its market share in the next ten years. Five respondents have plans to increase the usage of rail transport. As can be seen from Figure 9, the difference between rail and sea transport is minimal. Rail transport's percentual distribution in year 2009 is approximately eight percent. Respondent companies predict that the share of rail transport will increase to about 11 or 12 percent in the near future.

Only one company of all the respondents uses air transport as its major transport mode. Three other companies use air transport with very small modal share. All the other respondents do not use air transport at all. Because of this only minor conclusions can be drawn about the air transport. One conclusion is that air transport has not high volumes at Lahti, Kouvola, Lappeenranta, Kotka and Hamina regions.

Whether or not air transport will increase its percentual share cannot be estimated in this study, because only one company uses air transport with high volume.

Sea transport is second popular mode of transport between the companies that answered to the questionnaire. Development of modal share of sea transport seems to be very stable during the next 10 years. Percentual amount of sea transport is approximately 11 to thirteen percent at year 2009 and in near future. Figure 9 summarizes the answers of the respondents of their modal share between different transport modes and their estimates in the future. Levels of sea transport and rail transport between respondent companies are almost the same.

From Figure 9 it can be seen that road transport by far has the majority of the modal share among four main transport modes now and in the future. Rail and sea transport have almost similar market shares. Air transport has the smallest market share of few percent. Estimated developments of different transport modes do not show significant differences. Either companies will not change distribution of their used transport modes or predicting future is not easy. Figure 10 summarizes all the average and median values of all the different transport modes.

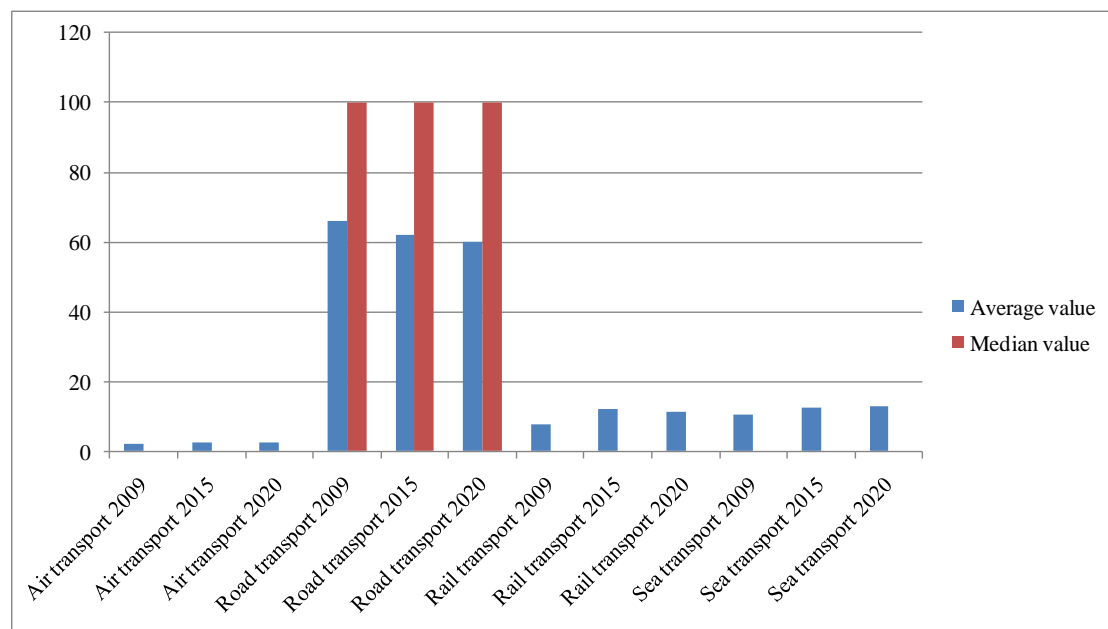


Figure 10 Average and median values of transport mode distribution.

Figure 10 above illustrates average and median values for each transport mode at each different time period (years 2009, 2015 and 2020). It can be seen from Figure 10 that there are only two different median values and they are zeros and hundreds. Hundreds are at road transport only and all the different transport modes and time periods are zeros. It means that there are many logistics companies (16 out of 27 companies are full scale road transport companies) that have 100 percent modal share on road transport, and there are only also some companies that do not use road transport at all or use it only a little. Majority of the companies operate only at road transport sector and majority of the companies do not use different transport modes than road transport.

5.1.2 Development of Container Traffic

Questionnaire included a question about container traffic volumes in year 2009 and in near future (estimates in years 2012 and 2015). Different answer alternatives for each different time periods are 0-100 TEU, 101-200 TEU, 201-500 TEU, 501-1,000 TEU, 1,001-2,000 TEU, 2,001-5,000 TEU, 5,001-10,000 TEU and over 10,000 TEU. Majority of the companies have small volumes of container traffic i.e. 10-12 respondents answered 0-100 TEU a year in each different time zone. In addition, there are few companies that have volume of over 10,000 TEUs a year (n=2 in year 2009). Figure 11 summarizes the development of container traffic among respondent companies.

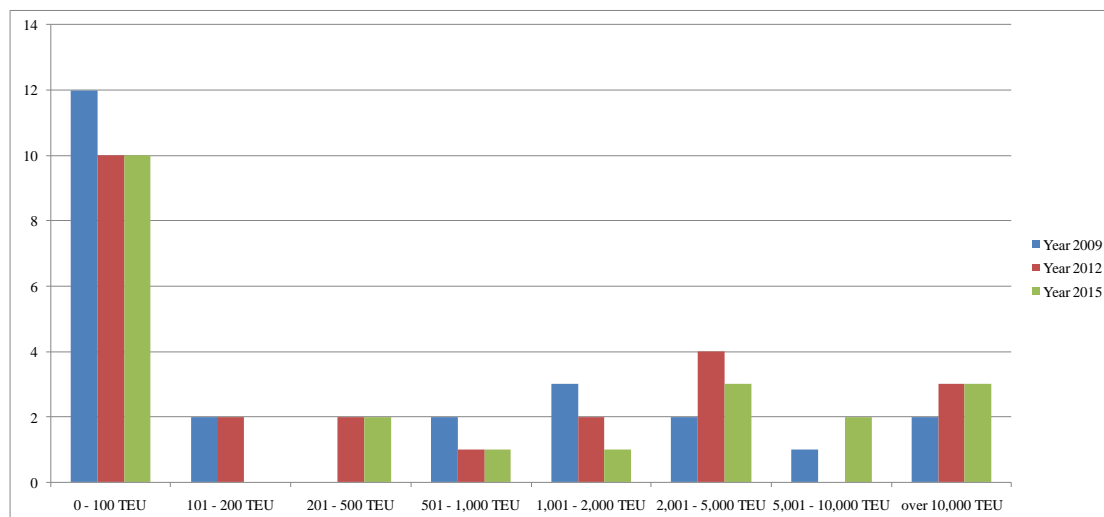


Figure 11 Development of container traffic among respondent companies from year 2009 to 2015

Changes in development of container traffic among respondent companies seem to be minor in the near future. Two companies from the smallest category of 0-100 TEU estimate that their container traffic will rise in the future. The most used answer alternative for each different year is 0-100 TEU. All the other alternatives have been used 0-4 times, which means that container traffic is not highly used in many of the respondent companies. Some of the respondents though (n=2 in year 2009, n=3 in years 2012 and 2015) have answered with the highest alternative of over 10,000 TEU.

5.2 *Dry Port Concept*

Dry port concept was covered by one open question. Dry port concept was explained with approximately 10 lines of text. In addition, a figure was showed to explain the concept more specifically. The whole questionnaire and the question concerning dry port concept can be seen in Appendix 1. This question was answered with lowest answer rate. 11 companies answered question about the dry port concept, while all the other respondent companies gave no answer i.e. 43 percent of the companies answered the open question regarding the dry port concept. Majority of the respondents answered with very short answer of one or two lines, while few companies answered the open question very broadly. Almost all respondents saw both advantages and disadvantages about the dry port concept.

5.2.1 Advantages of the Dry Port Concept

Different statements listed below are straight conversions from Finnish to English from respondent companies. Statements are categorized in different categories according to their nature. Different advantages the companies have found about the dry port concept are explained below:

Capacity and efficiency of the transport system can be increased by implementing dry port concept:

- By using dry port concept companies can take advantage of higher container capacity of railroads.
- Significant amount of containers can be transported more rapidly to hinterland by using one train instead of numerous trucks.
- Pressure in the seaport can be reduced by using dry port concept and balancing stress with seaport and dry ports.
- Dry port near Russian border improves transit traffic.
- Road distance for picking up the containers shortens.
- Returning empty container accelerates.
- Empty container traffic decreases.
- Efficiency of truck traffic improves.
- Logistics concentrates in nodes of railways and roads e.g. in Kouvola.
- Efficiency to answer local transportation needs increases by decentralizing seaport operations.
- Concept improves attainability of rail transport by increasing the use of rail transport in smaller cities.

More versatile and cost-efficient services can be achieved with dry port concept:

- Companies operating at hinterland can offer services that are traditionally offered at seaports.

Environmental impacts of the transport system can be reduced:

- Environmental impacts can be lowered by using Finnish electric railways, because rail traffic is environmentally friendlier mode of transport than road transport.

Following driving and resting time regulations gets easier:

- Dry port concept eases drivers to follow driving time directive, because truck driving distances become shorter.

Warehousing needs of customers can be reduced:

- Customers can invest lower amounts in their own warehouses, if compared to direct road transports.

As it can be seen from benefits respondent companies assume that dry port concept could have, the most obvious benefit is the increased efficiency and capacity of the transport system. According to respondents, there are in addition benefits in better and more versatile services, reduced environmental impacts, reduced warehousing needs for customers and easier following of road transport regulations. Driving and resting time can be followed easier with the dry port concept, because road travel distances become shorter. With dry port concept one driver can with greater probability deliver his or hers freight. Without dry port concept driving distances can develop so long that driver has to take his or hers daily break without managing to deliver the freight in one day. This advantage is higher in smaller companies, since larger companies usually have arranged their road network terminals so that a different driver can continue to deliver the freight, if previous driver has to take his or hers daily break. Some of the companies also mentioned that the image of road freight transport as a job can get more attractive with dry port concept, because drivers can more often return home after the workday, instead of having daily breaks at intermission location during delivering freight.

5.2.2 Disadvantages of the Dry Port Concept

All the disadvantages that companies found about dry port concept are listed below. All the statements are categorized in different categories by their nature:

The complexity of transport system increases:

- Navigation of the containers gets more complicated, especially if there are many dry ports.
- The number of loadings and unloadings will increase.
- Additional transshipments and loadings.

Lead-times increase:

- Lead-time of containers increases if compared to direct road deliver.
- Every terminal increases lead-time by one day.
- Fast deliveries cannot be accomplished with dry port concept.

Implementing dry port concept will be expensive:

- Present infrastructure is designed for road traffic. Dry port concept would not be cost-efficient.
- Who will pay for the maintenance?

Dry port concept does not allow benefits for certain geographically located companies:

- Truck companies near seaport do not find advantages for them in the dry port concept.
- Slowness and reliability of rail transport.

Many respondent companies believe that transport system will get more complex to organize, if a dry port concept is implemented. In addition, many companies believe that dry port concept will increase lead-times. Three respondent companies suppose that one intermodal terminal increases lead-time by one day. The dry port concept will not allow benefits for all different companies regarding their geographical location i.e.

road transport companies near seaports will not gain benefits of the dry port concept. Implementing dry port concept will be expensive according to some respondents.

5.3 Intermodal Transport

All the questions about intermodal transportation were asked using questions with Likert scale from number one to seven. One means that the respondent disagrees totally and seven means that it agrees totally. Number four in the middle means that company is neutral about the question. It is important to notice that some questions are not answered with every different answer number i.e. there are some figures, which do not include all the answers. One example is Figure 14, which does not include answer number five at all. Figures explain distribution of answers. The leftmost column shows the amount of answers that are number one (if at least one of the respondents has answered with number one) and rightmost column shows amount of answers that are number seven. Y-axis describes the number of answers for each different answer alternative. In the Figure 12 below answer number one is answered nine times. There are 15 different questions about the intermodal transport and topics related to it.

Figure 12 below illustrates the answers of respondents on the topic whether or not respondent companies operate at transit traffic sector. Distribution of the answers is emphasized on the one and seven, which means that nine companies do not operate at transit traffic at all, while six of the companies are concentrated only at transit traffic. All the other twelve companies use transit traffic with variable amount. Average value for distribution between answers is ~3.52 and the median value is 3. Overall it can be seen from Figure 12 that transit traffic is quite common at the region where respondent companies are situated, but slight majority of the companies either do not operate at all in transit traffic sector or operate only with low lever. Basically, transit traffic in Finland is about traffic between Finnish and Russian border.

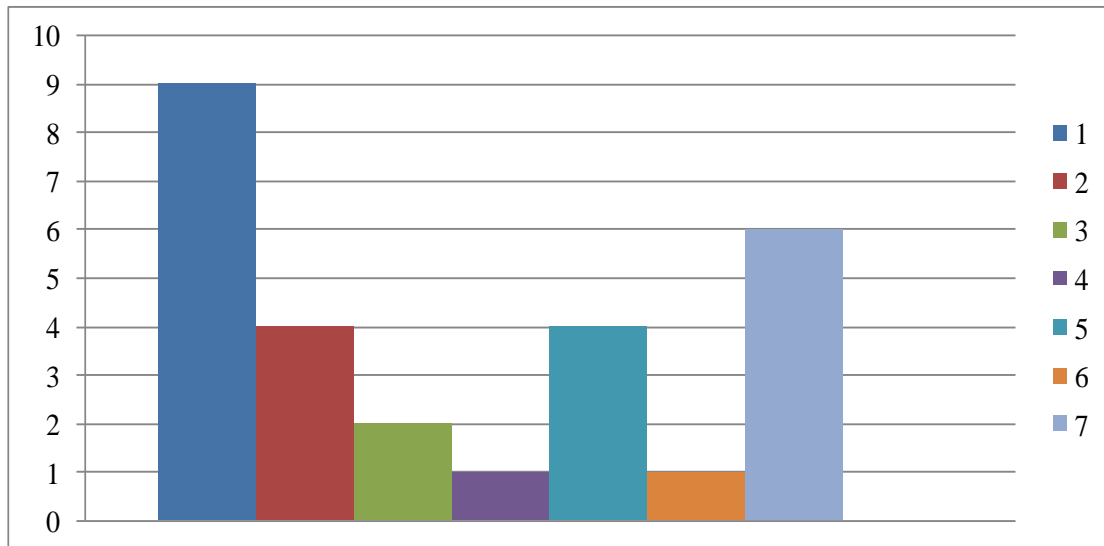


Figure 12 Use of transit traffic in respondent companies.

Use of intermodal transportation is not yet widespread in Finland. Almost half of the respondents (n=12) do not use intermodal transport at all in their transport operations, and only a few of the companies use intermodal transport with high volumes. Most of the companies use intermodal transport once in a while and only two or three respondents use only intermodal transport. Average value for the utilization rate on intermodal transport in Finland is ~ 2.78 . Median value for the same topic is 2. Answers are summarized in Figure 13.

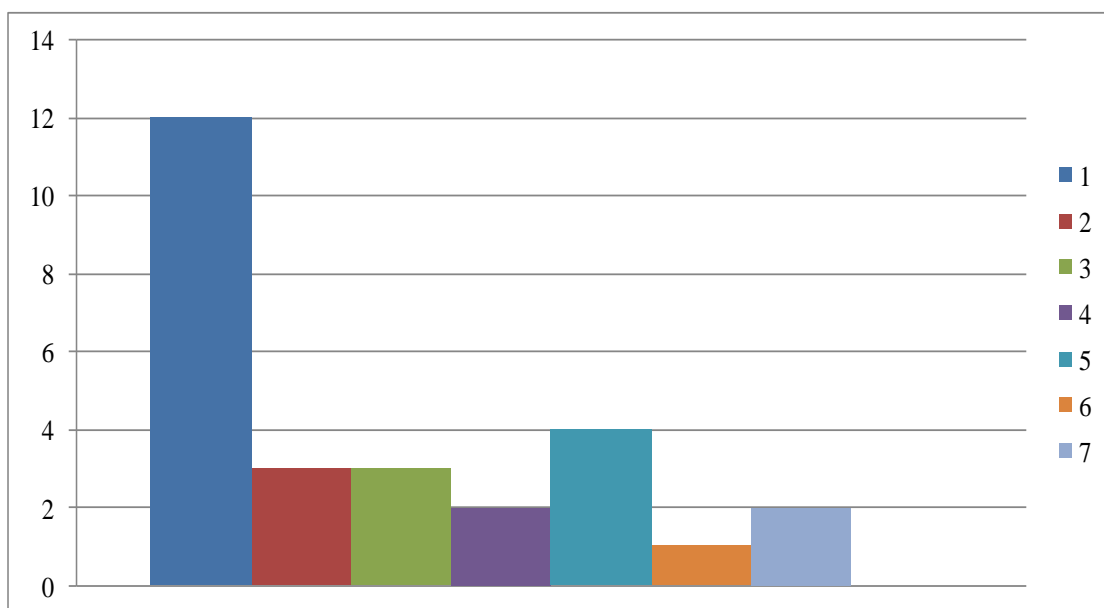


Figure 13 Utilization rate of intermodal transportation in Finland.

Companies that answered to the questionnaire use intermodal transport more rarely outside the Finnish borders. Answers might be distorted, because all except one company has answered to this question, while not all companies offer their services abroad i.e. those companies most certainly do not use intermodal transport abroad that do not operate at any level abroad. Average value whether or not the respondent companies use intermodal transport abroad is approximately 2.04 and median value is 1. 17 companies have answered that they do not use intermodal transport abroad at all. Summary of the answers can be seen in Figure 14 below.

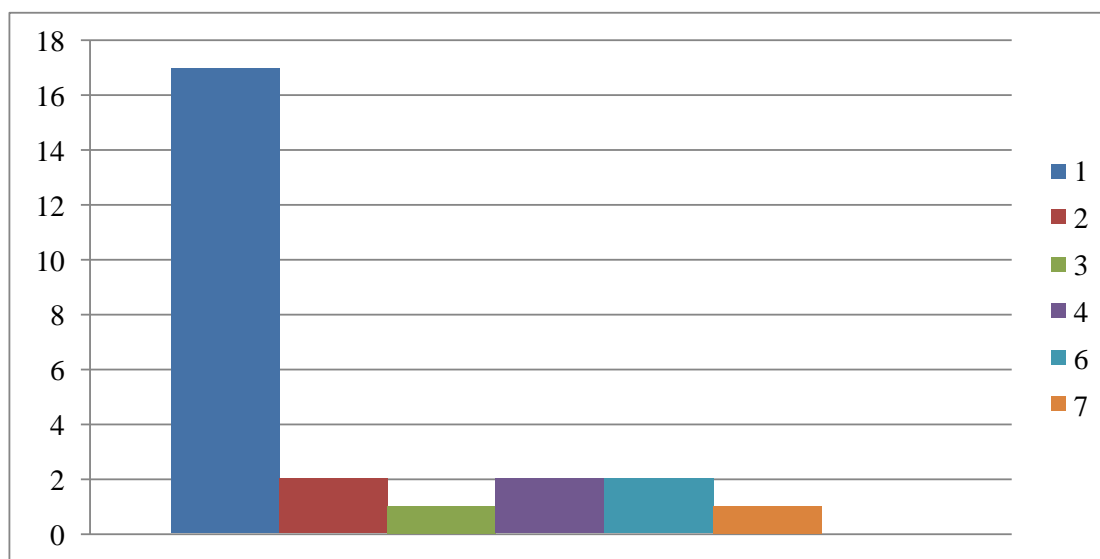


Figure 14 Use of intermodal transportation outside Finland by respondent companies.

Slight majority of the respondents do not think that intermodal transport is widely used in other countries than Finland. As can be seen from Figure 15 distribution is somewhat even between different answer alternatives. Basically though, this means that Finnish companies believe that intermodal transport is more used elsewhere than in Finland. Average value for this topic is ~3.8 and median value is 4. The most used answer alternatives are one and five. Figure 15 represents distribution of different answers among companies.

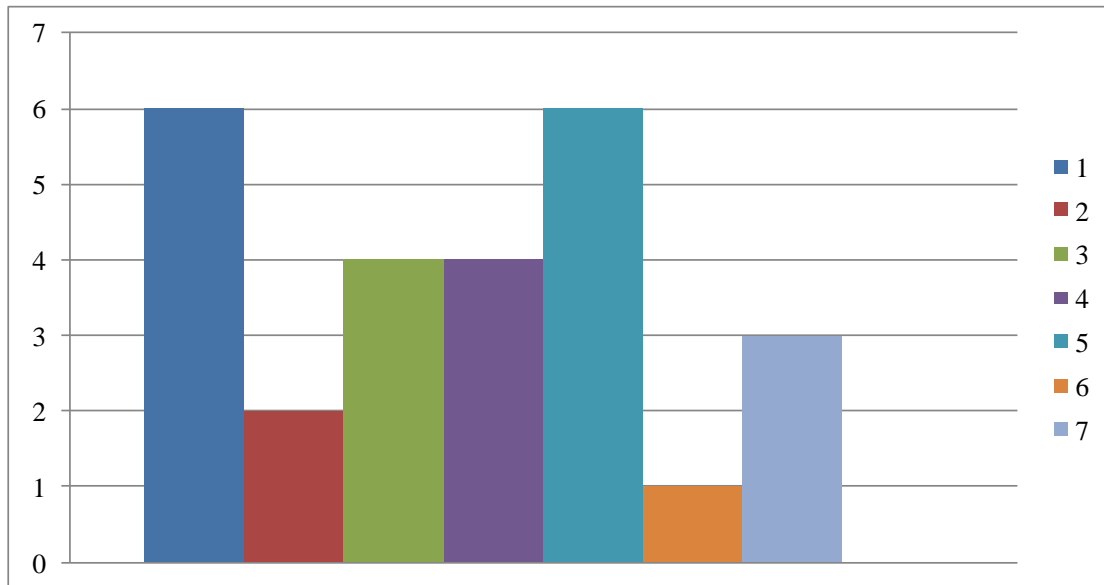


Figure 15 Estimated use of intermodal transportation outside Finland.

Question regarding Figure 16 was formulated to ask if companies think that the rail transport will increase its modal share in the near future. Majority of the companies have used answer alternatives smaller than four, which means that they think that rail transport will not increase its proportion of the modal share. Those companies, which have chosen answer alternative one, two or three actually assume that rail transport will lose some of its market share. In addition, it can be seen in Figure 16 that not one company is totally sure that the proportion of rail transport will increase, because not one company has chosen alternative six or seven. Average value for this topic is about 3.07 and median value is 3. The most used answer is four. Those respondents think that the proportion of rail transport will maintain its current state i.e. rail transport will not increase or decrease its modal share. Not one company has answered with answer alternative six or seven i.e. not one company is sure that rail transport will increase its modal share in near future.

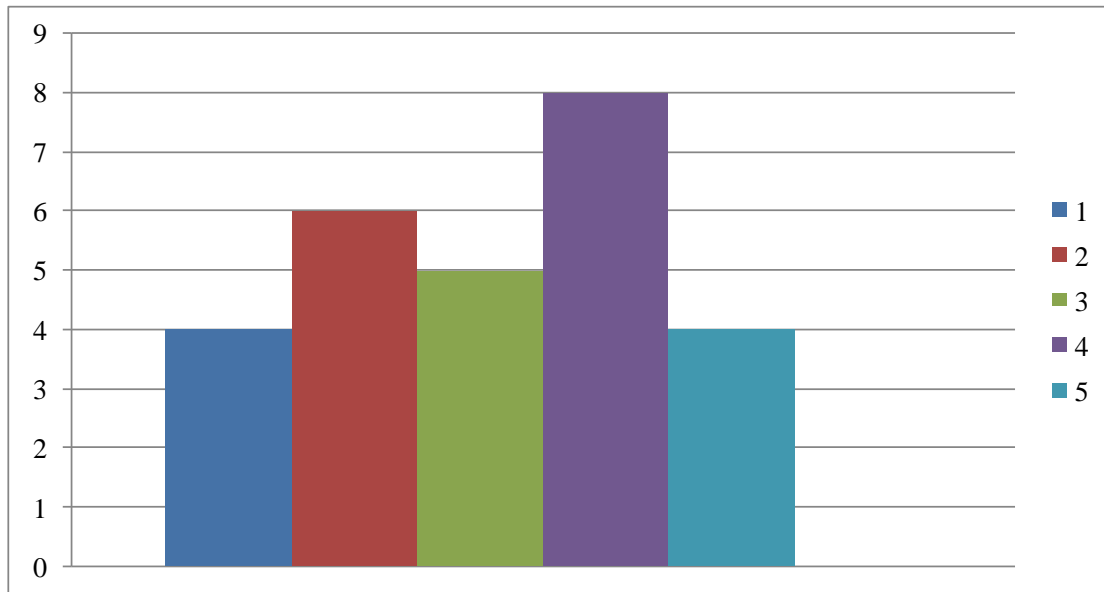


Figure 16 Estimate whether or not the rail transport will increase its proportion of the modal share.

In addition, companies believe that the share of road transport will probably maintain its proportion in the next 10 years. Figure 17 shows that number three is the most used answer. Smallest and largest numbers are not used many times. Respondent companies think that both the rail transport and road transport will maintain their modal share by certain reliability. Some of the companies though believe that rail transport will lose some of its market share. Average value for road transport is circa 3.65 and median value is three. Average value for this topic is slightly higher than the previous topic concerning the increase of rail transport. It means that respondent companies suppose that road transport will increase its modal share with higher possibility than rail transport i.e. the difference between road and rail transport is not assumed to tighten up in the near future. All the answers concerning the topic of estimation whether or not the road transport will increase its modal share can be seen in Figure 17.

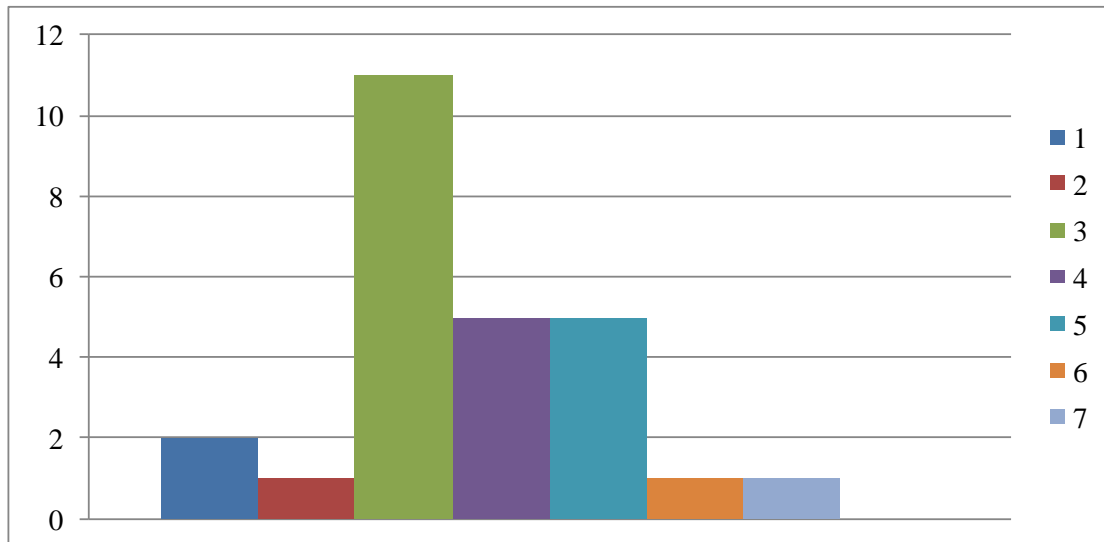


Figure 17 Estimation of the respondents if the road transport will increase its modal share.

Four companies are absolutely sure that possible changes in Russian customs will not increase the use of intermodal transport between Finland and Russia. Only six respondents believe that the rate of intermodal transport will increase because of possible changes in Russian customs. Average value for the topic about changes in Russian customs is approximately 3.44 and median value is four. The results of this question are represented in Figure 18.

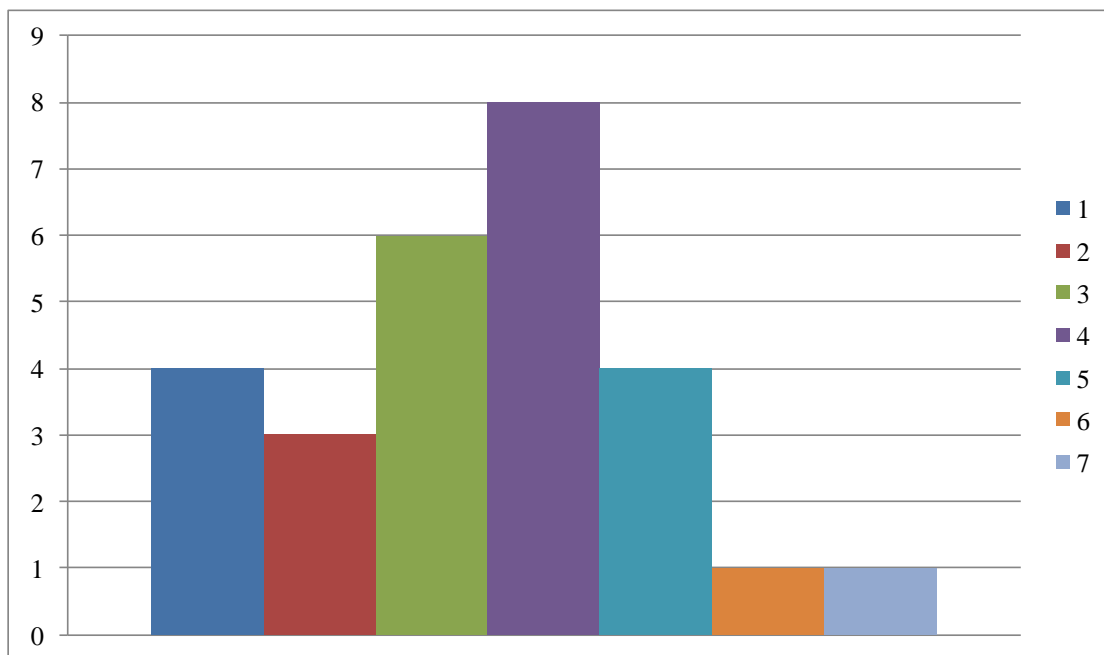


Figure 18 Will changes in Russian customs clearance legislations increase the use of intermodal transportation.

Six companies are sure that they will not increase the use of intermodal transport in the near future. All the other companies have had at least minor thoughts of increasing the use of intermodal transport. 12 companies have answered by 4 or higher, which means that they have major thoughts of increasing the use of intermodal transport in the coming years. As can be seen from Figure 19, distribution between answers of one to five is very similar. Answer number seven is not used a single time and answer number six is used only one time i.e. not one single respondent company is totally sure to increase the use of intermodal transport. The average value for this question is about 3.07 and median value is 3. The average and median values indicate that intermodal transport will not increase in Finland in near future.

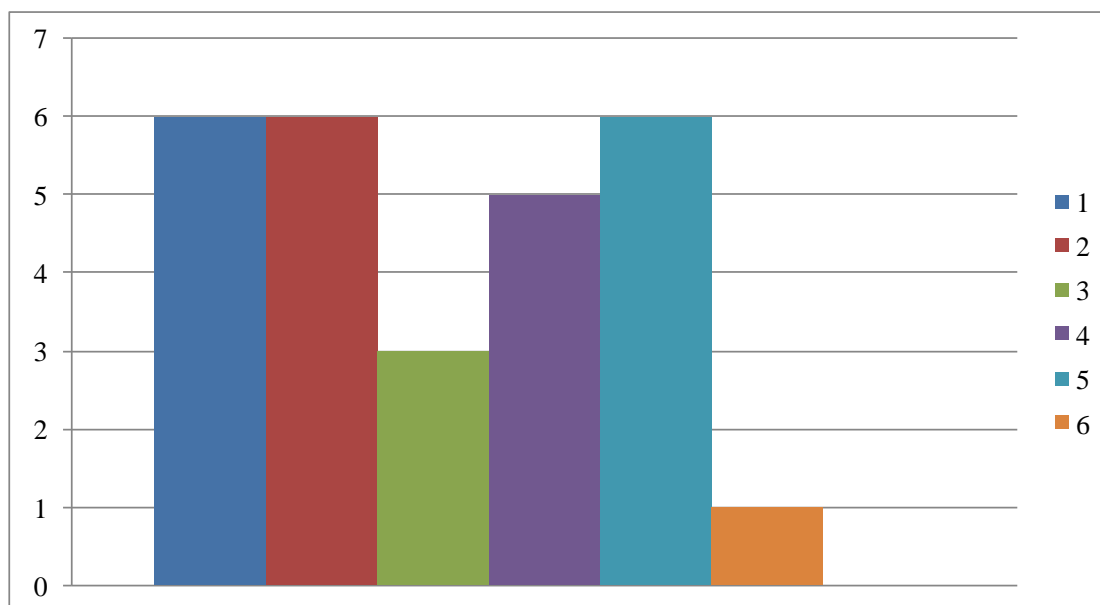


Figure 19 Have companies had plans to increase the use of intermodal transport.

Approximately half of the companies have not at any circumstance considered increasing their modal share of rail transport i.e. 13 companies have used alternative one as their answer to the question about the topic. The other half has weighted whether or not to expand their business to rail transport. Seven of the respondents have answered five or above to this question, which means that they will most certainly expand their business by increasing rail transport. Figure 20 shows that most of the respondents have answered with number one. Average value is approximately 2.7. Median value is 1, which is also the most used answer alternative.

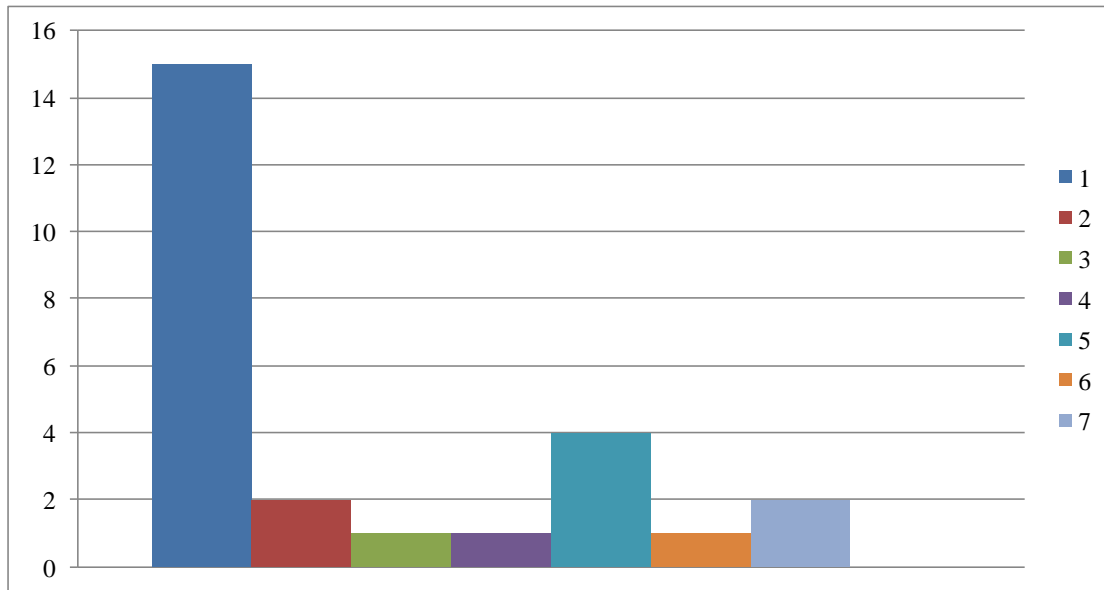


Figure 20 Plans of increase the share of rail transport in respondent companies.

General opinion regarding the complexity of intermodal transport is that intermodal transport is slightly more complex to organize and plan than traditional unimodal road transport. Seven companies have answered with six or seven to this question. They believe that intermodal transport is much more complicated to organize than unimodal road transport. Only two of respondents disagree totally, and think that intermodal transport is easier to organize than traditional unimodal road transport. Figure 21 illustrates the distribution between different answers and it shows that alternatives four, five and seven are used five times each. Average value for this question is approximately 4.36 and median value is four.

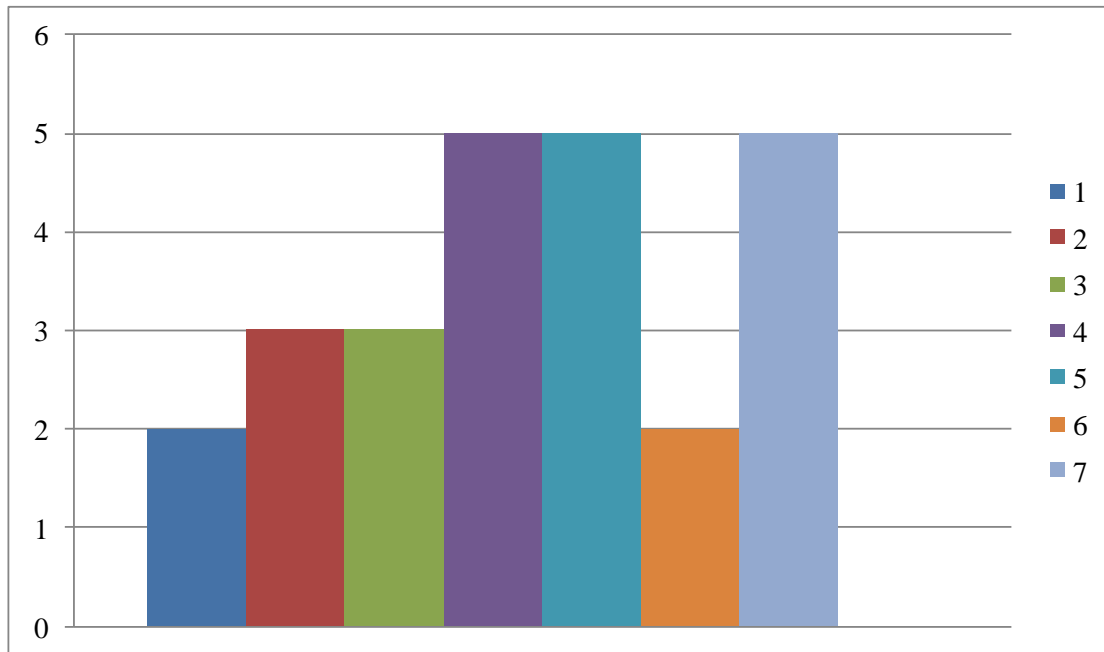


Figure 21 Is intermodal transport more complex to organize than conventional road transport.

Whether or not the intermodal transport is more expensive than conventional road transport splits the opinions in two pieces. Answer number one means that respondent supposes that intermodal transport is not more expensive and number seven means intermodal transport is more expensive. Slight majority of the companies assume that intermodal transportation will not be more expensive than traditional unimodal road transport. Only two of the respondents assume that intermodal transportation is surely more expensive than traditional road transport, while three of the companies assume that intermodal transport is not at all more expensive than traditional road transport. Figure 22 explains that distribution between different answers is emphasized a little on the left side. Average value for this topic is circa 3.31. Median value is three, which is also the most used answer alternative (n=7).

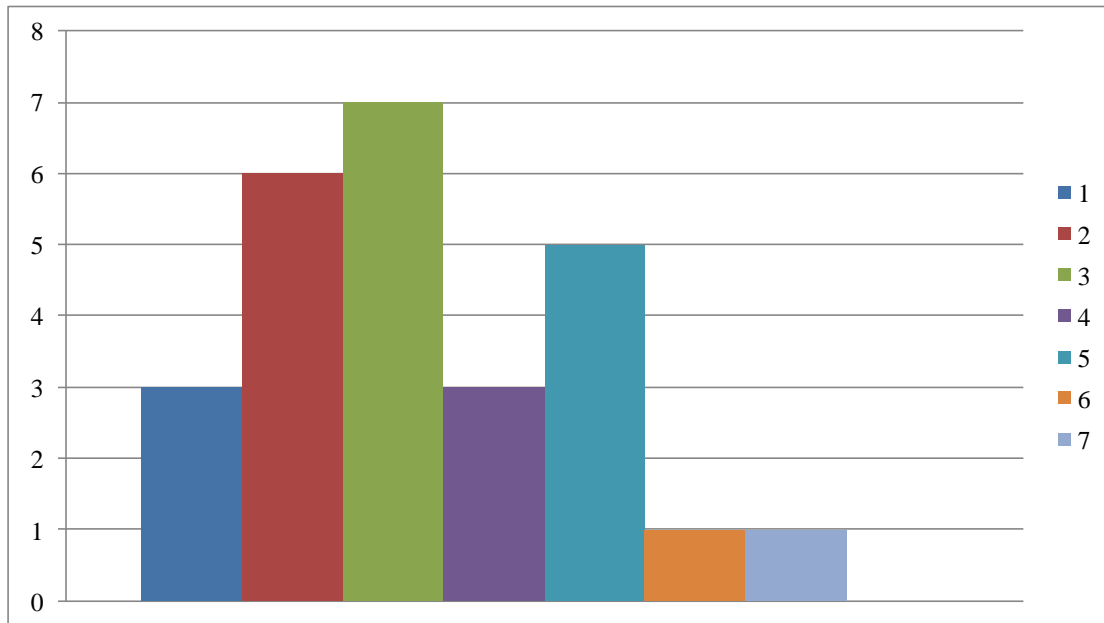


Figure 22 Whether or not the intermodal transport is more expensive than conventional road transport.

Majority of the companies suppose that intermodal transport is suitable to use with transit traffic. Five of the respondents have answered seven and another five have answered six, which means that they are sure that transit traffic is most cost-efficient by using intermodal transport. Only four of the respondents have used one, two or three as their answer. The average value is circa 4.65 and median value is four. In addition, number four is the most used answer alternative with nine replies. These companies assume that intermodal transport and road transport are as good modes for transit traffic. Slight majority of companies believe that rail or sea transport would be more usable and cost-efficient transport modes than road transport in transit traffic. Summary of the answers can be seen in Figure 23.

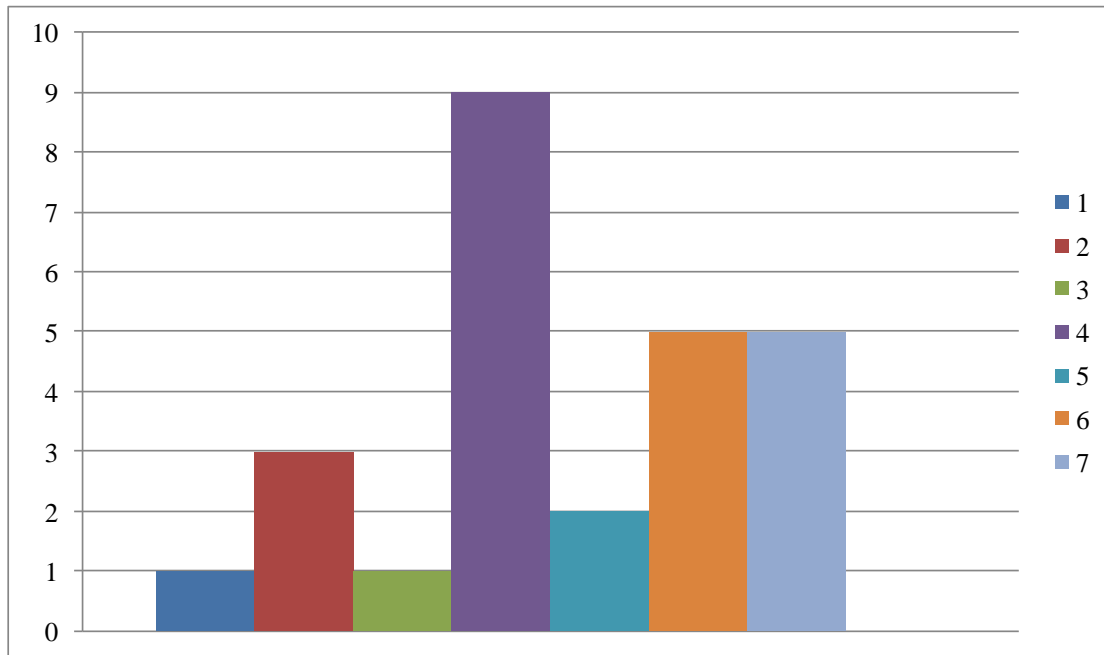


Figure 23 Suitability of intermodal transport for transit traffic.

Considerable part of the companies has no plans to expand their business e.g. by expanding warehousing areas or by employing more staff. All the alternatives have been used except alternative number six. Only two of the respondents have used answer seven as their expanding strategy. It means that two of the respondents will surely expand their business in the near future. 11 of the respondents are sure that they will not expand by answering with alternative one. Average value for this subject is approximately 2.78 and median value for the same matter is 2. Figure 24 illustrates all the answers between different companies about the topic of expanding plans.

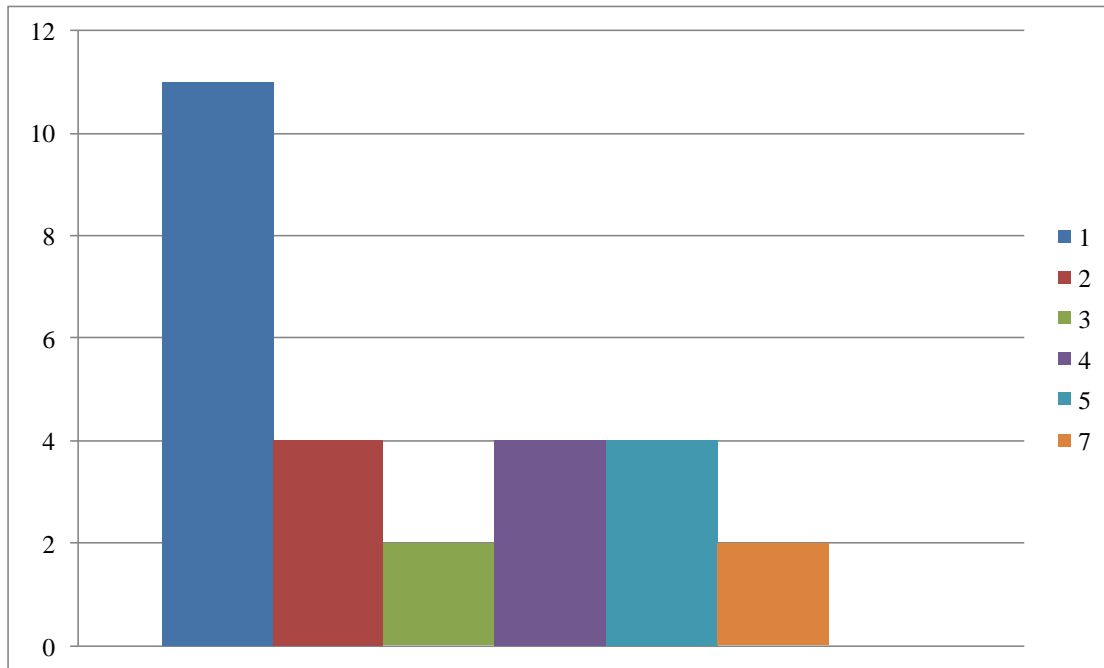


Figure 24 Expanding plans of the respondent companies.

Majority of the respondents share same opinion about the costs of expanding near or in the seaport area. They suppose that expanding in the seaport area is more expensive than by expanding farther from seaport in hinterland. Four respondents have answered with number one. This is quite surprising, because seaport areas are nearly always seen as very expensive area to expand. Answer five is the most used one with eight answers. Five of the respondent totally agree with the statement and have answered with number seven. Average value is clearly higher than in previous questions about intermodal transport, which indicates that seaport area is more expensive. The average value is ~ 4.37 and median value is five. Distribution of different answer alternatives are summarized in Figure 25 below.

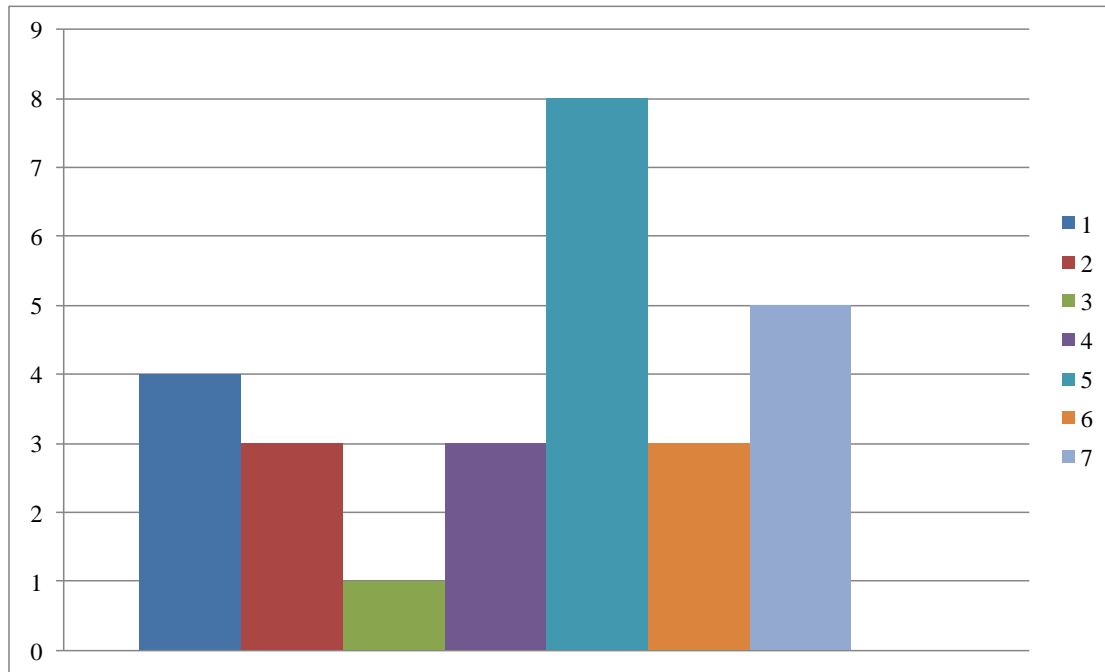


Figure 25 Is expanding at the seaport area more expensive than expanding inland.

All in all, logistics companies from regions of Lahti, Kouvola, Lappeenranta, Kotka and Hamina are aware of intermodal transport and its possibilities. Some of the respondent companies use intermodal transport in their transport operations. Some of those companies that have not yet used intermodal transport have had plans to start using it. Majority of the respondent companies do not use intermodal transport or use it with minor effect i.e. most of the companies are pure unimodal road transport companies. Though, many of the companies think that intermodal transport has potential. One of the surprising answers is that not all companies suppose that intermodal transport is more expensive form of transport than unimodal road transport.

5.4 Environmental Impacts of Transport

Environmental impacts of transport have been asked from respondents with similar Likert scale questions as was used in previous sub-chapter about intermodal transport. The scale is from one to seven, where one is “Strongly disagree” and seven is “Strongly agree”. There are six different questions about this topic in this sub-chapter. Different questions concern environmental impacts and their significance and difference of significance at present time and in near future.

First question is about whether or not the respondent company appreciates green values i.e. do the respondents operate their logistics so that environmental impacts are minimized. Decreasing environmental impacts is e.g. investments in reducing CO₂ volumes, congestion or accidents. Minimum value for the question if the company values green values e.g. by investing in decreasing of CO₂ emissions is 2. It means that not one company totally disagrees. Eight of the companies have used answer alternative six or seven. They invest largely to reduce environmental impacts. Average value being approximately 4.42 is high. It can be seen that importance of environmental impacts are important for logistics companies. Median value for this question is four, which is in addition the most used answer (n=8). These eight respondents have neutral opinion about green values. Figure 26 summarized the distribution of answers about this topic.

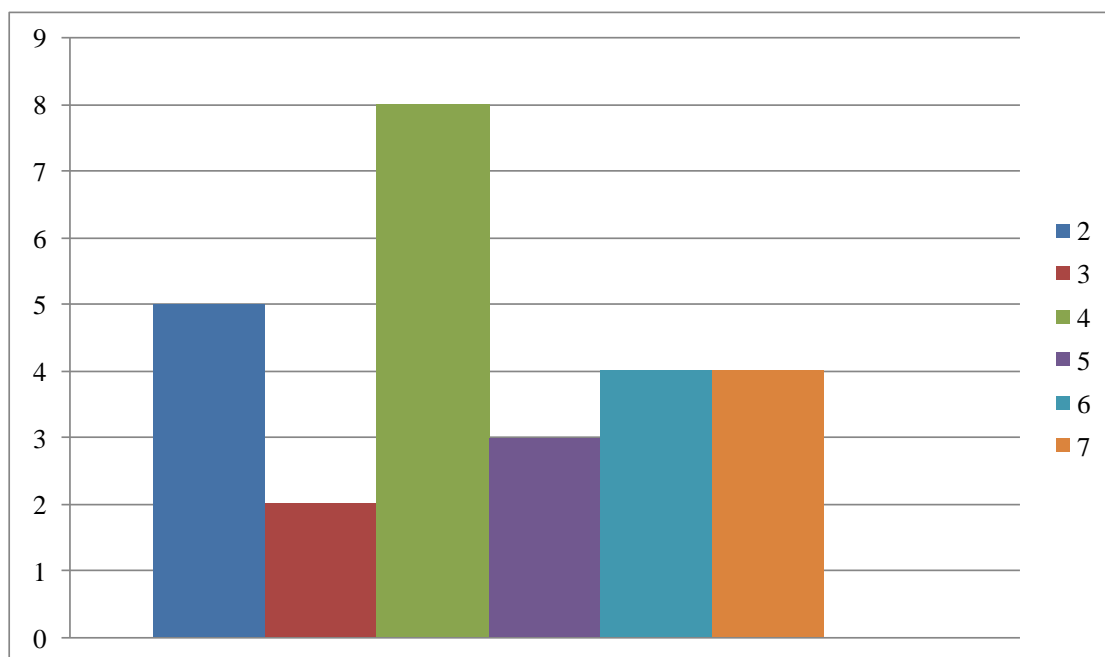


Figure 26 Do the respondent companies respect green values.

Although it can be seen that green values are in important role for logistical companies, the majority of the companies have not yet invested creating calculations about their external costs (e.g. concerning CO₂ emissions, noise, accident and congestion), which is the subject of next question about environmental impacts of transport. Five of the respondent companies have answered six or seven, which means that they have done specific research regarding their external costs. Almost all the other companies have answered with numbers one, two or three. They haven't

calculated their external costs either at all or even inaccurately. There are though four respondents, which have answered with alternative seven. They have made considerable investments in calculating their external costs. Average value for this topic is approximately 2.93 and the median value is two. According to average and median values the calculation of external costs is not widely used in South-East Finland. The results of this question are illustrated in Figure 27.

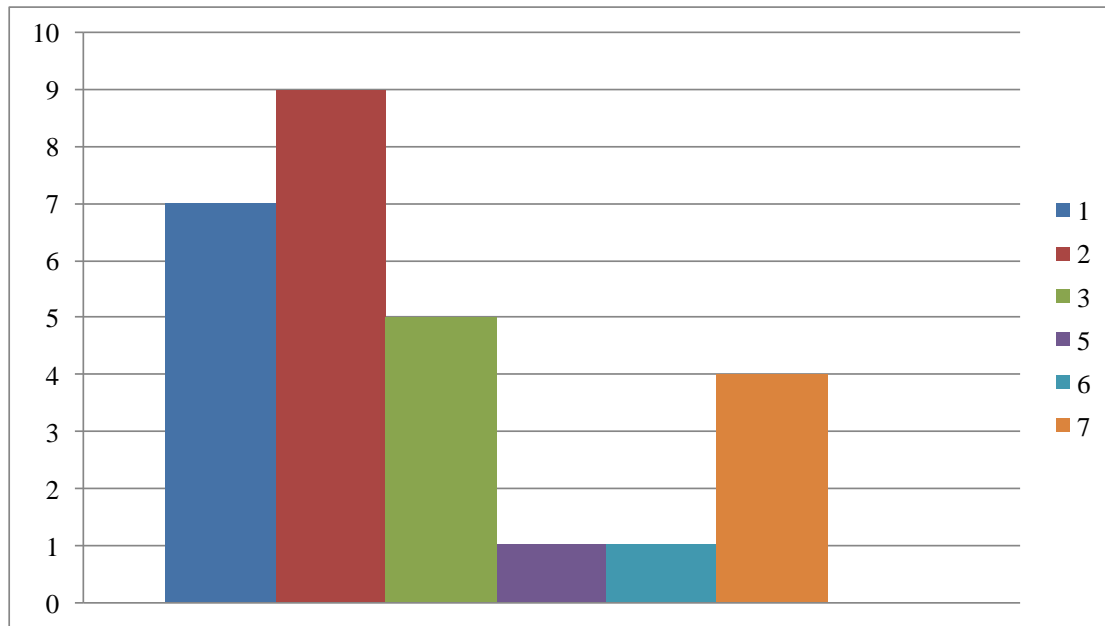


Figure 27 Calculations regarding external values in respondent companies.

Environmental impacts occurred from transport has had some effect in the strategies (e.g. increasing the use of environmentally friendlier transport modes) of regional logistics companies. Only three respondents have answered by using alternative one, which means that they have not changed strategies at all. Average value is approximately 3.37 and median value is four for this question. Average value is under four, which means that minor majority of the respondents have not changed their strategies to decrease environmental impacts. There are however five companies that have answered with number six or above. These companies have changes their strategies radically to have a positive impact in decreasing different environmental impacts. Distribution of answers between different companies can be seen in Figure 28.

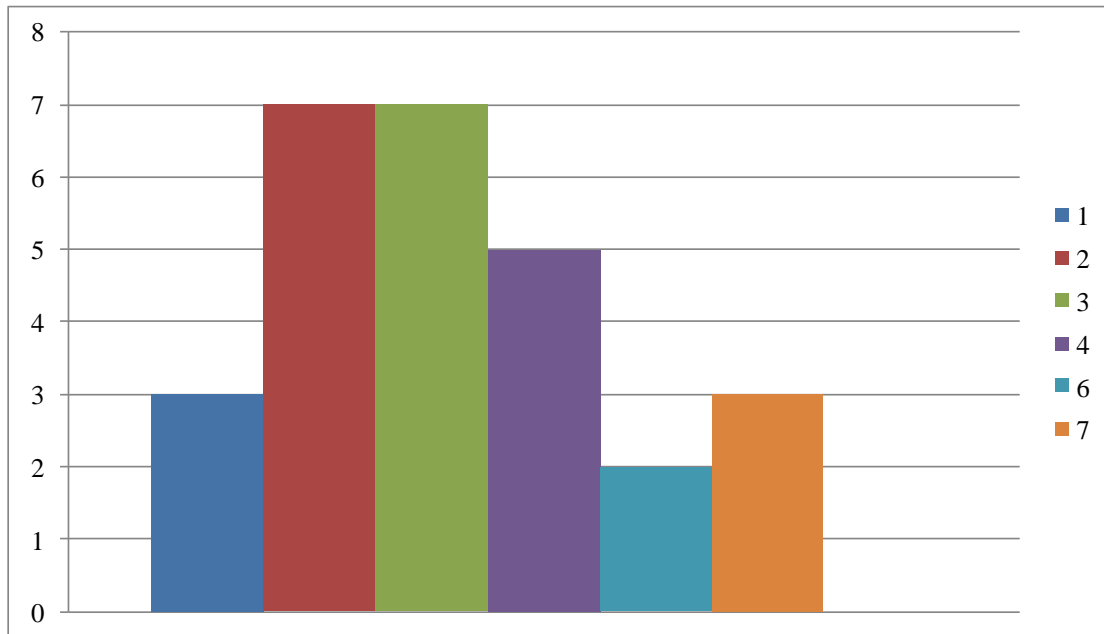


Figure 28 Has the green values had effects in the strategies of respondent companies.

Nearly every company believes that green values increase their importance in the near future i.e. companies assume that they will change their strategies in the near future to reduce different environmental impacts occurred directly from transportation e.g. CO₂ emissions. Only four respondents have answered using alternative one, two or three. All the other companies have answered by larger answer numbers, which means that these companies will most certainly change their strategies towards environmentally friendlier way. Average value for this subject is circa 5.11. Median value is five. Answers are summarized in Figure 29. If these answers are compared with previous question's answers it is clear that environmental friendliness is increasing its significance substantially in near future.

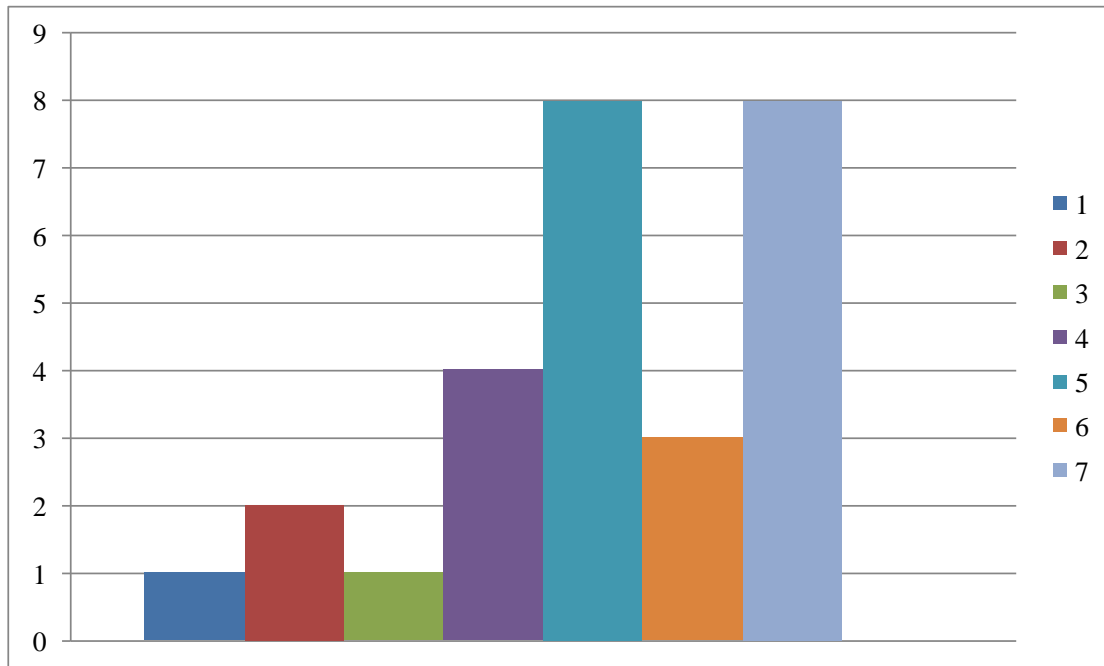


Figure 29 Will green values increase their importance in near future.

Whether or not the intermodal transport is environmentally friendlier mode of transport than conventional road transport is mainly answered with numbers three or four. Five respondents have used answer alternative six or seven. It seems that companies are not sure, if intermodal transport has benefits in reducing environmental impacts of transport, although small majority has answered by assuming that intermodal has advantages in decreasing environmental impacts. Answers are very normally distributed. Average value is circa 4.04 and median value is four. This question and answer distribution is summarized in Figure 30.

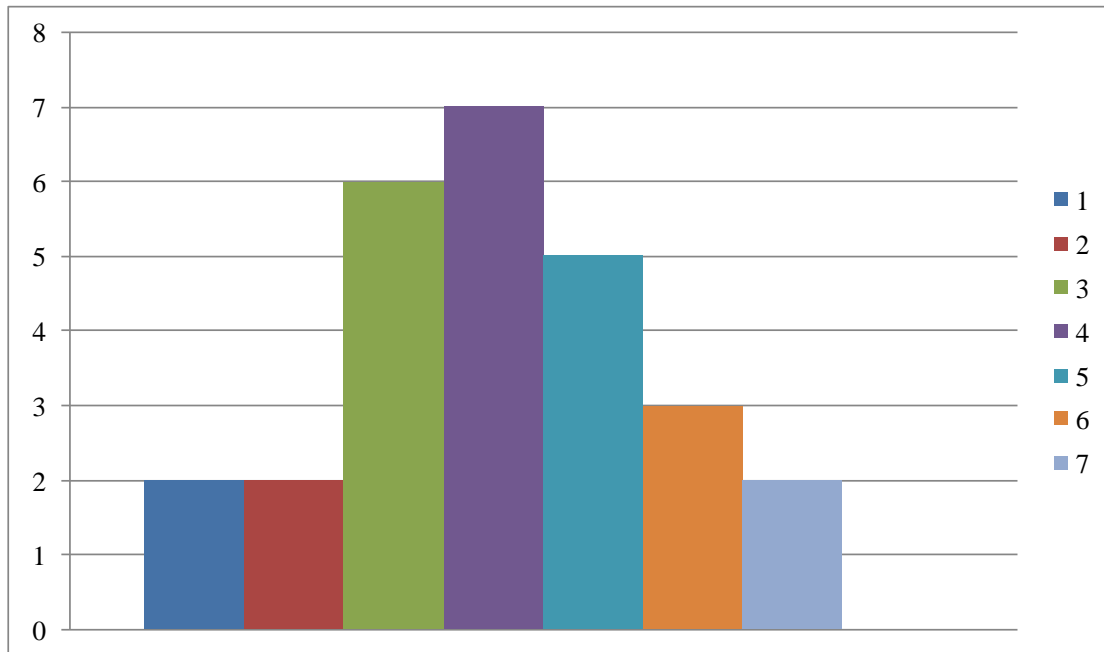


Figure 30 Are intermodal transportations environmentally friendly.

A light majority of the respondent companies believe that green values are very important for their customers. Eight companies have used answer alternative two, which means that their customers do not give green values large importance value. Nine respondents have answered with alternative five, which means that they think that green values have small importance for their customers. Three of the respondents assume that green values are very important for their customers. Average value for this subject is four. The median value is also four. According to this question, it seems that some customers take environmental issues into account, when making decisions about logistics. The answers of respondents are illustrated in Figure 31.

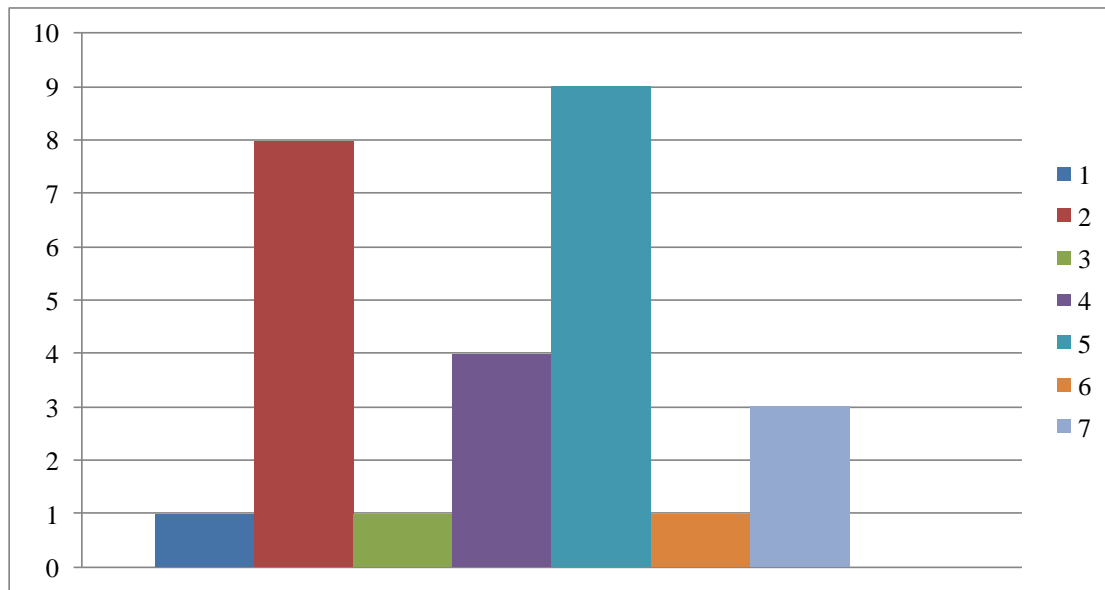


Figure 31 Importance of green values for respondents' customers.

Overall it seems that green values are increasing their importance in the transport business and they will most certainly continue increasing their importance in the future. Answers got from different questions concerning green values are not surprising. Trend is that green values are respected for the meantime, and the respect for them will rise. Different external cost limitations e.g. carbon markets will increase their role. It will lead to less polluting forms of transportation by modal shift to more environmentally friendlier transport mode or improving road transport.

5.5 Information Management

Information management was included in the questionnaire in short (i.e. with two different questions), because information management in focus of the whole Mobile Port project. Questionnaire included a question about what different systems companies have for information management. Different alternative answers for this question are email, fax, own data system (e.g. SAP) and a common data system (e.g. Intranet with customers). All the alternative information systems and the answers between respondent companies are illustrated in Figure 32 below. Respondents could answer either yes or no to each alternative.

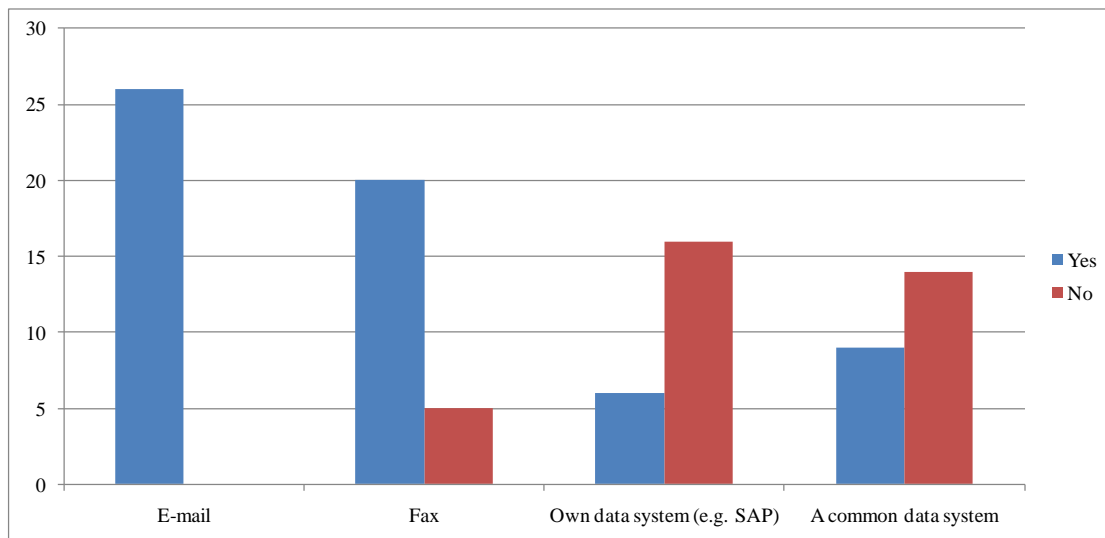


Figure 32 The use of different information systems.

Figure 32 sums up answers of respondent companies about their information systems. All the companies use email for information flows so the utilization rate is 100 percent. Fax is used by 20 respondents, while five of the companies do not use fax. Utilization rate for fax is 80 percent. Only six respondent companies have invested in own data system. 16 companies have answered that they do not own data system. Other respondents have left this answer blank. Utilization rate between companies that have answered to this question is approximately 27 percent. Nine of the respondents use a common data system e.g. with their customers or some other interest group. 14 companies do not use a common data system. Utilization rate of a common data system between respondents that answered the question is circa 39 percent. Overall it seems that email still is the dominant information system used to communicate between different interest groups, and although fax is old and restricted communication route, it still is being used by many companies.

The other question about information management was asked with Likert scale about information flows. The scale is from one to seven, where one is “Totally disagree” and seven means “Totally agree”. The question was about whether or not the intermodal transport increases or decreases the complexity of information flow management. Answers are illustrated in Figure 33 below.

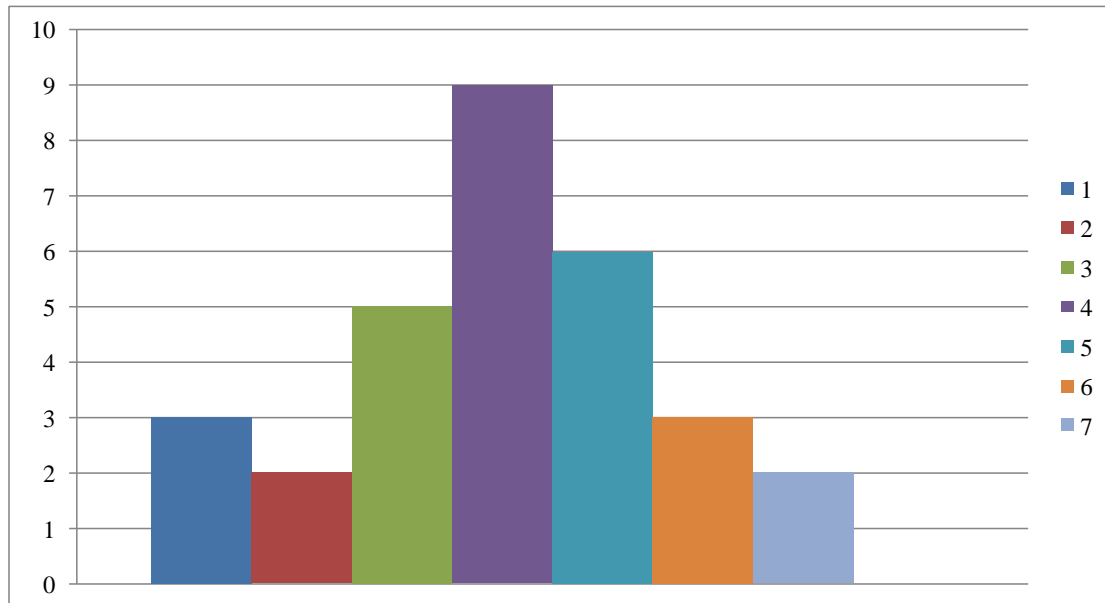


Figure 33 Is intermodal transport more complex in information flows than traditional road transport.

It can be seen from Figure 33 that answers follow normal distribution. Average and median values are both four. Majority of the companies believe that intermodal transport is as complex as is conventional road transport in information flow management. Average answer value for this subject is four, which is also the median value. Answer alternative four is in addition the most used alternative. According to average and median values a slight majority of the respondents believe that intermodal transport increases the information management complexity.

5.6 Main Import and Export Cities

South-East Finnish logistics companies were asked about their main import and export cities. The most important import and export cities were asked to be marked with number one. Second most important was asked to be marked with number two and so on until five most important import and export cities were defined. Goal of the question was to gather information about connections between respondent companies and different import and export cities and in addition to find out if some export and import cities are more important than others.

Figure 34 shows the connections between different regions and cities in Finland. Regions consist of companies in Lahti, Lappeenranta, Kouvola and Kotka/Hamina. Import cities and export cities that have the most connections are located in the center

of Figure 34. Import and export cities that have few or only one connection are located in the edge of Figure 34. In this Figure import and export connections are not separated.

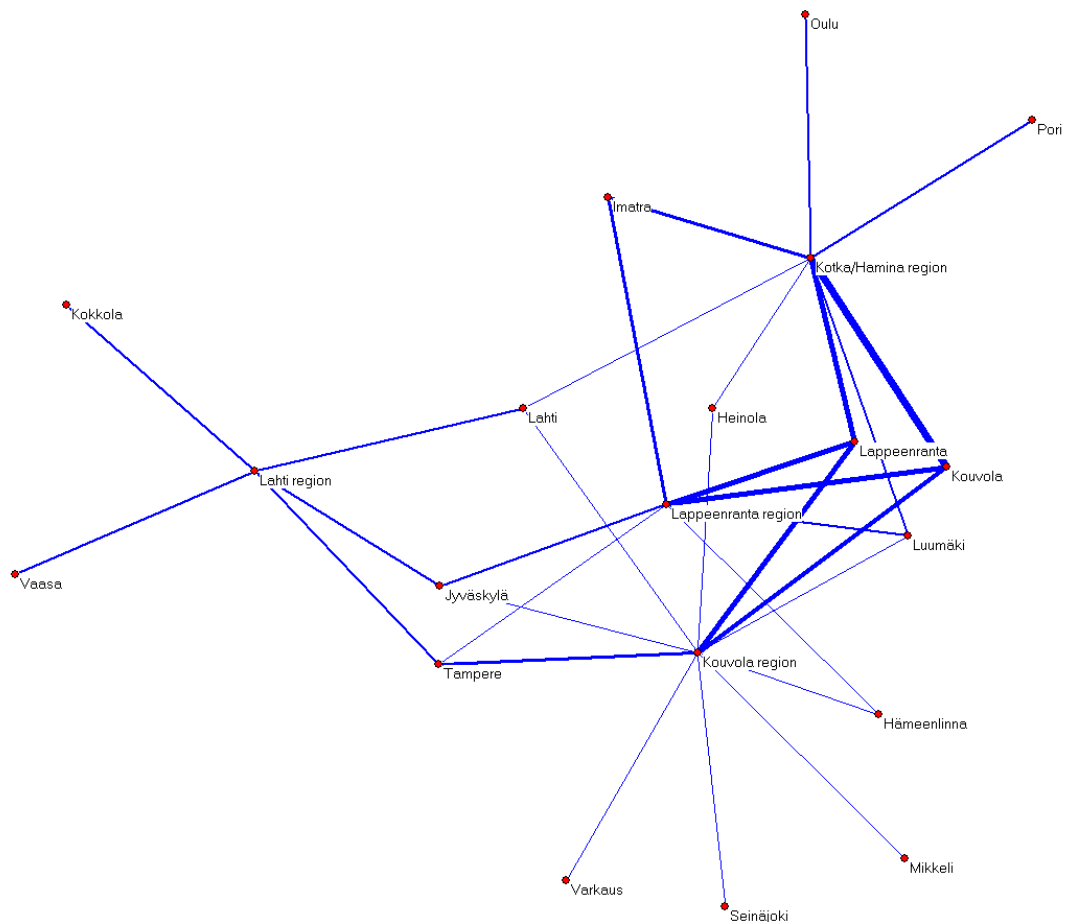


Figure 34 Connections between respondents and Finnish cities

Lahti region, Kotka/Hamina region, Lappeenranta region and Kouvola region consist of respondent companies. All the other cities illustrated in Figure 34 are cities in which respondent companies have logistics connections. The thinnest lines describe one connection between region and city. The thickest lines describe several connections between region and city. The regions and cities in the center of Figure 34 are the ones with most connections and the regions and cities in the surrounding of the Figure 34 are the ones with fewest connections. Only Lahti region is located in the surrounding of the Figure and all the other regions are situated near the center of the

Figure, which means that they have many connections to different cities. Cities of Kouvola and Lappeenranta have the thickest lines between different regions and it signifies that those cities have the most connections between respondent companies. Furthermore, there are cities that have some connections (more than one) and they are Tampere, Jyväskylä, Lahti, Imatra, Oulu, Pori, Kokkola, Vaasa and Luumäki. All the other cities in Figure 34 have only one connection between one respondent company. Regions of Kouvola and Hamina/Kotka have the most cities connected to them. Figure 35 illustrates the total connection amounts between respondent companies and import and export cities.

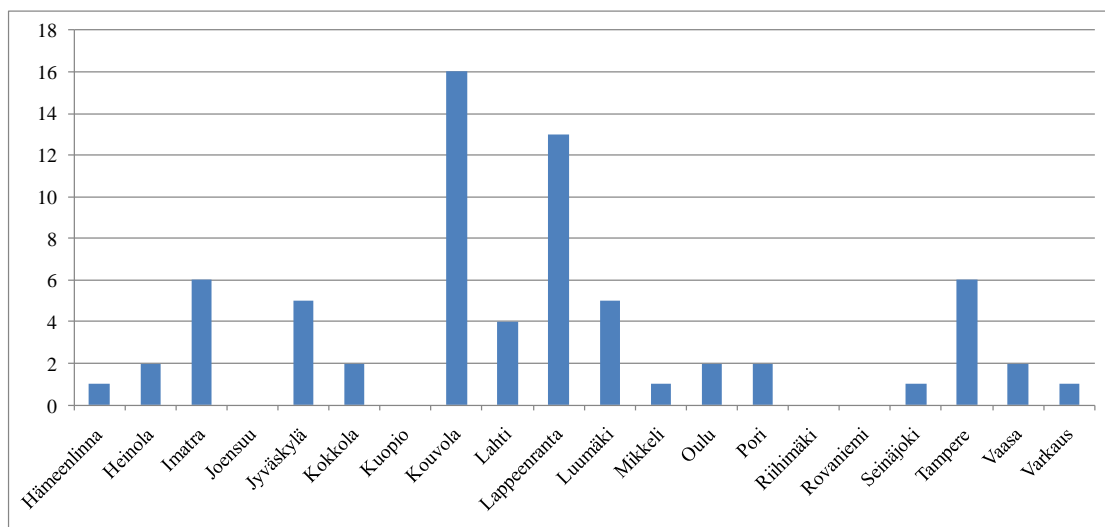


Figure 35 Number of connections between different import and export cities and respondent companies.

Cities of Kouvola and Lappeenranta have the most connections. Kouvola has 16 connections and Lappeenranta 13. Next most used cities are Imatra, Jyväskylä, Lahti, Luumäki and Tampere with connections between four and six. All the other cities have few to zero connections between respondents. Cities with four or more connections are illustrated in Figure 36 below. In addition, import and export cities are represented in their own columns.

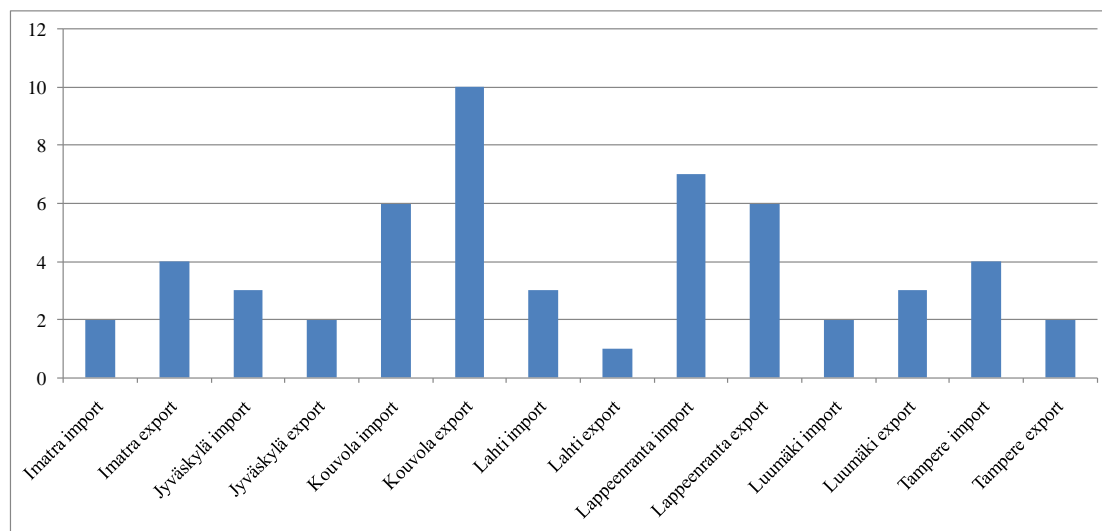


Figure 36 Import and export connections between respondent companies and most used import and export cities.

City of Kouvola has more export ($n=10$) than import connections ($n=6$). In Lappeenranta the situation is more balanced, because there are seven import connections and six export connections. The main export city is Kouvola. The most used import city is Lappeenranta. All the other cities in Figure 36 have at most four import or export connections.

Respondent companies were also asked to mark the most important, second most important, third most important, fourth most important and fifth most important ports in the web-based questionnaire. Only cities of Kouvola and Lappeenranta were classified as the most important ports more than one times. So it seems that cities of Kouvola have the most connections and they are also the most important import and export cities for majority of the respondent companies.

5.7 Most Important Seaports

Question concerning most used and most important seaports was similar than previous question about most important export and import cities. Respondents were asked to mark their most important seaport with number one, second most important with number two and so on until they have marked not more than five most important seaports. Goal of the question was to gather information about connections between respondent companies and seaports and in addition to find out if some seaports are more important than others.

According to this survey research, seaports divide into not used, rarely used and greatly used. It has to be noted that all the respondents are situated near Southern ports of Finland. Ports of Hamina, Kotka and Helsinki are ports that are greatly used. Approximately half of the respondent companies use all of these ports. Respondents estimated the order of superiority of the different seaports by using different numbers when choosing the superiority of different used seaports. Of the three major ports Port of Kotka was clearly the most popular, Port of Hamina in the second place and Port of Helsinki as the third popular. All of these seaports had approximately as many users, but Port of Kotka had the most number one answers. Number one was the most important port, while number two was the second important port. None of the respondents use ports of Kemi, Kokkola, Naantali, Oulu, Raahе, Sködvik, Tornio and Raahе. Geographically it makes a lot of sense, because all the mentioned ports are situated far from respondent companies. Ports of Hanko, Lappeenranta, Loviisa, Pietarsaari, Pori, Rauma and Turku are the ones that have only one or few connections between respondents. Figure 37 illustrates total connections between different seaports and respondent companies.

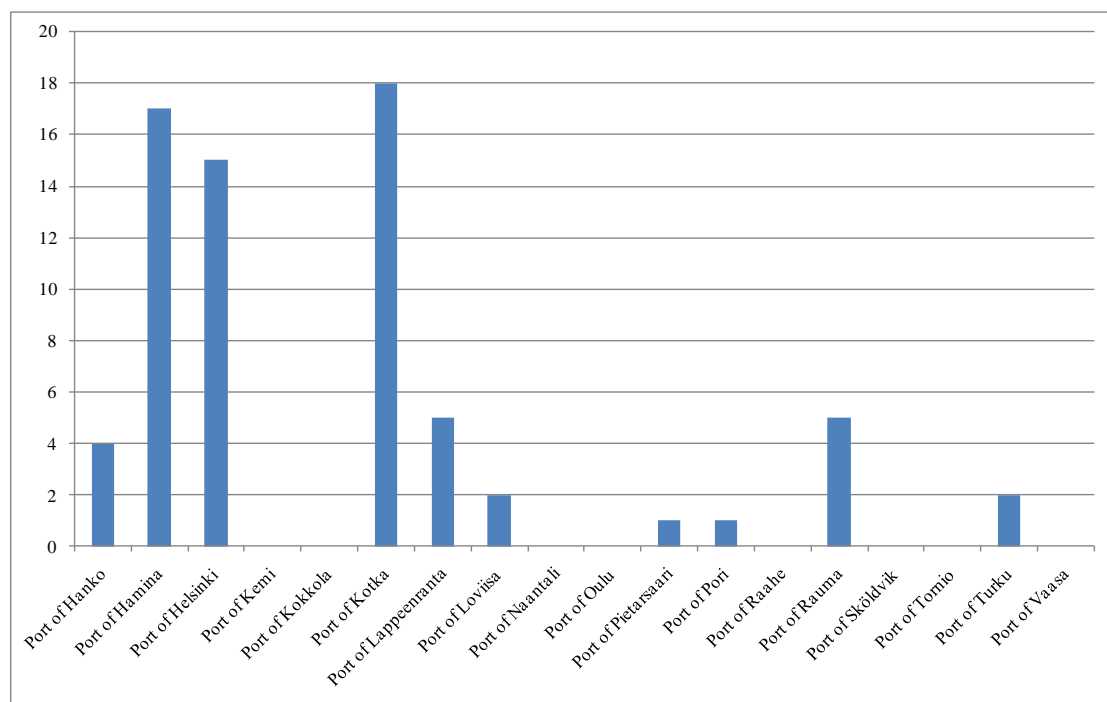


Figure 37 Transport connections between respondent companies and Finnish seaports

Figure 37 clearly shows what ports are the most important for companies that answered to the questionnaire if the number of connections is counted. Ports of Kotka, Hamina and Helsinki have at least 15 connections each. All the other ports have at most five connections.

Figure 38 shows connections between ports and respondent companies. In addition, most important ports to fifth most important ports are shown. Only three most important ports (ports of Hamina, Helsinki and Kotka) are included in this version.

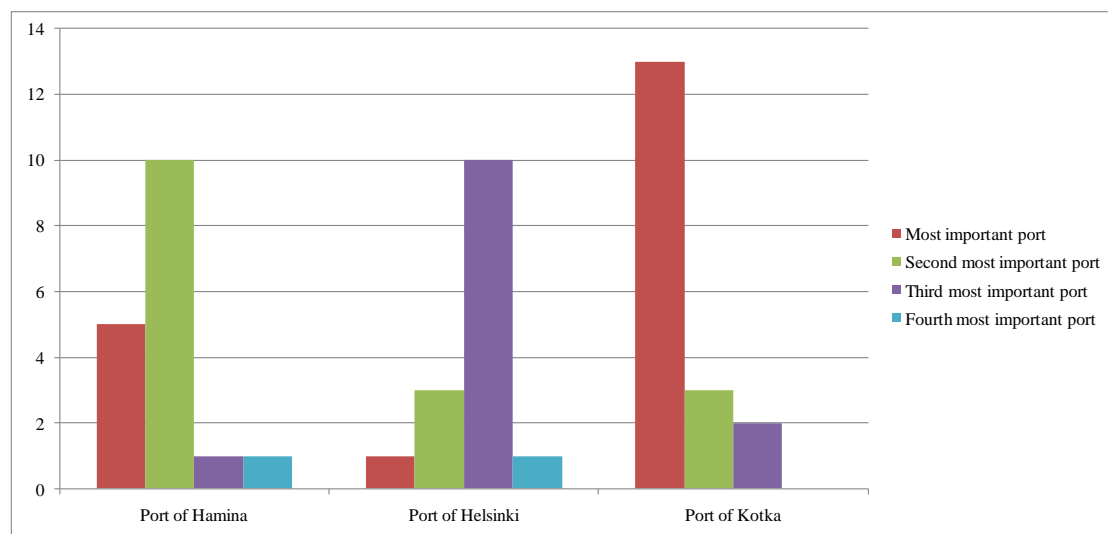


Figure 38 Port connections between respondents and importance of ports.

As can be seen from Figure 38, three most important ports for respondents are ports of Hamina, Helsinki and Kotka. Difference in three ports that have most connections is that Port of Kotka has majority of its connections rated as most important connections. Most of Port of Hamina's connections are rated as second most important, while most of Port of Helsinki's connections are rated as third most important. In this way three most important ports can be categorized in order of superiority as follows: Most important is Port of Kotka. Second important is Port of Hamina and Port of Helsinki is third important.

6 DISCUSSION

The results showed in the previous Chapter 5 are similar with literature. In this Chapter some of the respondent companies are divided into two groups corresponding to their characteristics. There was a question about the use of transit traffic earlier in the sub-chapter 5.3 concerning results of intermodal transport. The question asked whether or not the respondent company operate in transit traffic. That question divides most of the respondents in two different categories. Large part of the respondents either does not operate at transit traffic at all or they operate only in transit traffic. First group includes mostly companies that operate domestic transport in Finland. The second group consists of transit traffic companies that operate between Russia and Finland. 13 respondent companies used answer alternative one or two, which means that they do not use transit traffic. Seven respondents choose alternative six or seven and that means that their main transportation area is transit traffic. These two groups are separated and their answers in areas of intermodal transport and environmental impacts of transport are analyzed in this Chapter. Aim is to find out if there are differences in transit traffic companies and companies that do not operate at transit traffic. Figure 39 below summarizes questions about intermodal transport. All the statements and answers are listed in Figure 39. Red columns are average answer values from the companies that mainly operate at transit traffic. Blue columns are average answer values from companies that do not operate at transit traffic.

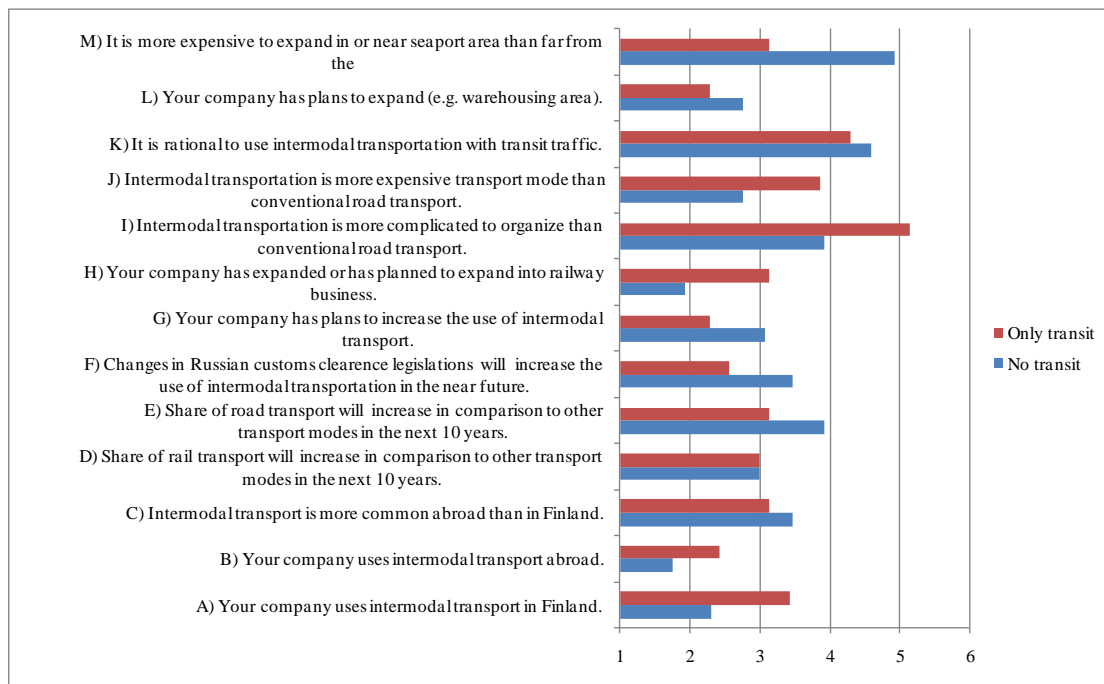


Figure 39 Comparison of transit traffic companies and domestic transport companies in intermodal transport.

Figure 39 shows that many questions do not differ between transit traffic companies and domestic companies that do not operate in transit traffic. Both groups most probably do not plan to expand their business e.g. by warehousing area investments. Minority of both groups assume that intermodal transport is the most suitable transport mode for transit traffic. Both groups believe that rail transport will not increase its modal share in the near future.

Largest differences between transit traffic companies and companies that do not operate in transit traffic are in five different questions. Minority of the transit traffic companies believe that expanding near seaport is not more expensive than by expanding hinterlands, whereas majority of the other group believe that expanding near seaports increases costs considerable. In addition, there are differences in four other topics, which are:

- Intermodal transportation is more expensive transport mode than conventional road transport
- Intermodal transportation is more complicated to organize than conventional transport
- Your company has expanded or has planned to expand into railway business

- Your company uses intermodal transport in Finland

Transit traffic companies have answered with larger average answer values to all the different statements listed above. Green values and decreasing environmental impacts are concerned next in Figure 40. The respondent companies are divided into same groups as they were divided previously (transit traffic companies and domestic transport companies).

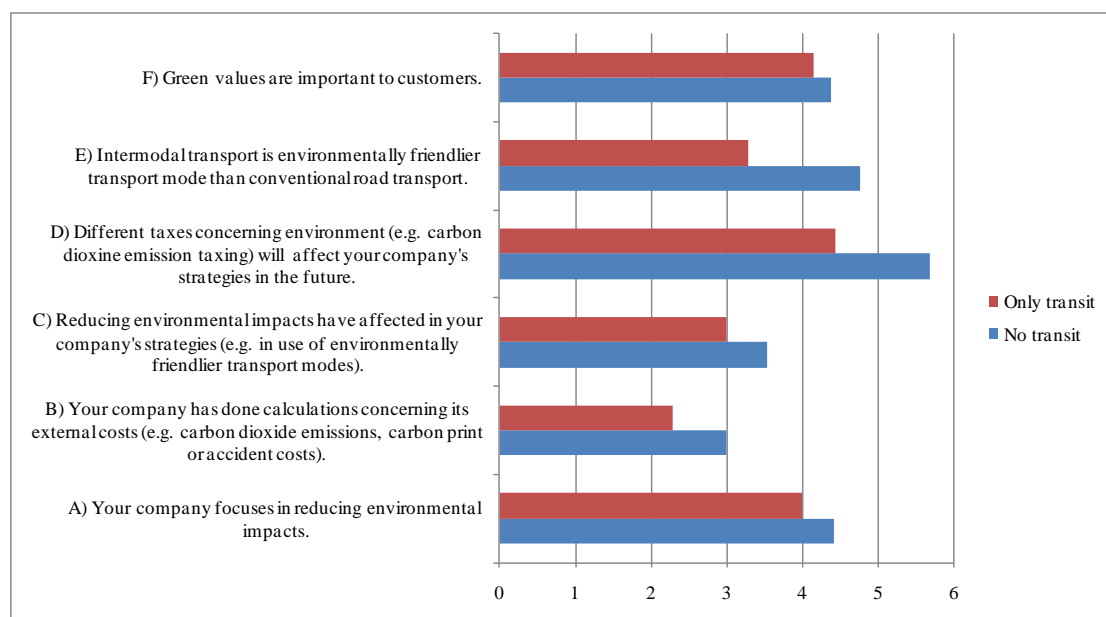


Figure 40 Comparison of transit traffic companies and domestic transport companies in environmental impacts of transport.

Figure 40 summarizes differences between transit and traditional domestic companies. As can be seen from Figure 40 above, most of the questions that discuss the topic of environmental impacts and reduction of them are answered with similar average value in both groups. Two different statements do have some difference between both groups. Statements are:

- Intermodal transport is environmentally friendlier transport mode than conventional road transport
- Different taxes concerning environment (e.g. carbon dioxide emission taxing) will affect your company's strategies in the future

Small majority of the transit traffic companies propose that intermodal transport is not environmentally friendlier transport mode, whereas small majority of the domestic transport companies assume that intermodal transport is environmentally friendlier mode than traditional road transport. Small majority of the transit traffic companies will change their strategies in the near future to become environmentally friendlier, whereas large majority of domestic companies will change their strategies to become environmentally friendlier. All seven statements were tested with Mann-Whitney U test to find out if differences between both groups are statistically significant. The results are summarized in Table

Table 7 Mann-Whitney U test for different statements.

	Test Statistics ^b						
	Expanding near seaport is more expensive than inland	Intermodal transport is more expensive than conventional road transport	Intermodal transport more complex to organize than road transport	Your company has expanded in rail transport	Your company uses intermodal transport in Finland	Different taxes concerning environment will affect your company's strategy in the near future	Intermodal transport is environmentally friendlier mode of transport than road
Mann-Whitney U	26,500	28,000	36,000	32,000	32,500	29,500	27,000
Wilcoxon W	54,500	106,000	127,000	123,000	123,500	57,500	55,000
Z	-1,540	-1,201	-,771	-1,209	-1,083	-1,305	-1,489
Asymp. Sig. (2-tailed)	,124	,230	,441	,227	,279	,192	,137
Exact Sig. [2*(1-tailed Sig.)]	,135 ^a	,261 ^a	,485 ^a	,311 ^a	,311 ^a	,211 ^a	,157 ^a

a. Not corrected for ties.

b. Grouping Variable: Has

Although transit traffic group and domestic transport group had quite different average answer values for some statements, not one difference is statistically significant, since all significances in Table 7 are over 0.05. So it seems that differences are not large enough to be statistically significant. Or the reason might be that sample size has been too small. And by increasing sample size differences could be statistically significant.

7 CONCLUSIONS

Regional logistics companies around Hamina, Lahti, Lappeenranta, Kotka and Kouvola can find many benefits and disadvantages in dry port concept. It seems that with fairly large investments dry port concept could be used to improve capacity of the transport system. In addition, cost-efficiency can be improved with properly implemented dry port solution i.e. the dry port concept has to be seamless to operate so that lead-times will not increase heavily. One surprising benefit is that road transport companies can follow driving and breaking time regulations more easily with dry port solutions. Main reason for this are reduced road distances with a dry port implementation. Truck drivers can take their breaks after delivering their consignment. After the break they can pick up next consignment and deliver it to other location. With more distant road transport distances truck drivers have to take breaks during delivering the consignment and that increases road transport lead times. Other possible benefits of the dry port concept are more versatile and cost-efficient services, reduction of environmental impacts and reduced warehousing needs of customers. According to respondents, there are also disadvantages of the dry port concept. Companies believe that transport system gets more complex by implementing the dry port concept. The reason for this is the increased transport modes. And because of increased transport modes, respondents assume that tracking and tracing of freight becomes harder. Some of the companies assume that the concept could increase lead-times mainly because of intermodal terminals and the change of transport mode. Many companies believe that change of transport mode will increase lead-time with one day. In addition, some of the respondents imagine that implementing the dry port concept will be expensive. Respondents also wonder which interest groups are willing to invest in dry port concept. Respondents also suppose that not all road transport companies gain any benefits of the dry port, because some of the companies are located near seaport and there would be no benefits for them to use dry ports.

Intermodal transport in Finland is not used widely at the respondent companies. Only some of the companies that answered to the questionnaire use intermodal transport by daily basis. Finnish companies use intermodal transport even more rarely abroad

outside Finnish borders than in Finland. Some of the respondent companies have however had plans to increase the use of intermodal transport. One possible reason for this is possible changes in Russian customs clearance regulations that could make intermodal transport more attractive. In addition, respondent companies believe that intermodal transport has higher market shares in global transport companies outside Finnish borders (e.g. in USA and Central Europe). Only minority of companies assume that both the road and rail transport will increase their modal share in the near future, but the estimations are that increase will not be large for both of the transport modes. A slight majority believes that road transport will increase its share slightly more than rail transport. Intermodal transport is assumed to be suitable for transit traffic and it is assumed to increase its share a little, because of changes in Russian legislations in customs clearance. Large majority of respondents assume that intermodal transport is more complex to organize than traditional unimodal road transport.

It seems that environmental friendliness of transport is increasing its importance in Finnish logistics companies and the significance of environmentally friendly transport will increase heavily in the near future (10-20 years). However, the effort in decreasing environmental impacts is not yet at high level i.e. only some respondents have made large investments to decrease their environmental impacts, while most of the companies will increase their effort in the future. The trend seems to be that environmental friendliness will gain more importance in the near future. Respondents also believe that environmental impacts are gaining importance at their customers and some of the customers can take environmental friendliness of transport into account when making decisions about logistics. Most probably, significance of decreasing environmental impacts by choosing environmentally friendlier transport mode will be more important to customers in the near future. Some respondents think that environmental impacts can be reduced by using intermodal transport and by decreasing the amount of road transport, but approximately 50 percent of the respondents do not believe that intermodal transport is environmentally friendlier mode of transport.

Main used information systems are traditional email and fax. Email is used in 100 percent of the respondent companies and fax is used approximately in 80 percent of

the respondent companies. More expert information management systems e.g. a common data system or own data system are used rarely in Finnish South-East logistics companies. This hinders the implementation of more sophisticated information management systems in new companies, because integration between other interest groups is not easy or even possible, because majority of other interest groups use only traditional systems e.g. email. Furthermore, respondents assume that intermodal transport is not more complex to operate in information flow aspect than unimodal road transport. This is a somewhat surprising result, because intermodal transport is usually supposed to be more complex transport mode. In addition, transit traffic companies and traditional domestic companies were compared between. It seems that these groups could have some differences, although they are not statistically significant in this research.

Main import and export cities for logistics companies situated in South-East Finland are cities of Kouvola and Lappeenranta. 16 respondent companies have connections with Kouvola and 13 respondent companies have connections with Lappeenranta, while there were 27 respondents overall in this survey study. In addition, respondent companies have few connections with cities of Imatra, Jyväskylä, Lahti, Luumäki and Tampere. Main seaports that respondent companies use are ports of Kotka, Hamina and Helsinki. In addition ports of Hanko, Lappeenranta, Loviisa, Pietarsaari, Pori, Rauma and Turku have one or few connections between respondent companies. All the other ports in Finland had no connections between respondent companies. All the most important three ports (ports of Kotka, Hamina and Helsinki) are used by more than half of the respondents so that they have at least 14 connections between different respondents. Companies were asked to mark different seaports with different numbers to gain information about the most important, second most important and third most important ports if many ports gain as many connections. The difference in importance is clear. Port of Kotka is by far the most important port. Port of Hamina is second important and Helsinki is third important of the three most used seaports of respondent companies.

Further research avenues could be to research costs of intermodal transport more deeply in Finnish transportation network. Dry port concept related intermodal transport was compared with unimodal road transport in the first research report.

Costs of changing transport mode from road to rail transport or vice versa was not included. Only the costs of transporting freight by road or rail were included. Comparison of intermodal transport and conventional road transport would get more realistic, if costs of changing transport mode would be included in cost accounting. Another possible research avenue could be to deepen this survey study by doing interviews with local logistics companies and logistics decision-makers.

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APPENDIX 1: WEB QUESTIONNAIRE/SURVEY 1/10

Questionnaire about Intermodal Transport, Environmental Impacts of Transport and Dry Port Concept

Following questionnaire concerns intermodal transport, environmental impacts of transport and dry port concept. Aim of this questionnaire is to find out, if Finnish companies have used intermodal transportation or have plans to use it. In addition, purpose of this questionnaire is research, whether or no environmental friendliness of transport affects business operations of logistics companies. Another goal is to find out, what kind of issues have to be taken into account, when creating dry ports e.g. concerning information flows.

Intermodal transportation is defined as follows in this questionnaire: Freight is being transported in load-units from consignor to consignee. Contents of load-units must stay untouched during the shipping. At least two different transport modes (e.g. road, rail, sea and air) are deployed during the transportation. Therefore, one or more transshipments take place between consignor and consignee.

Please use the answering code mentioned in the e-mail in the beginning of the questionnaire.

Questionnaire

Answering code (mandatory):

Name of the company:

1. Number of employees

- 1 - 5 employees
- 6 - 10 employees
- 11 - 20 employees
- 21 - 30 employees
- 31 - 50 employees
- 51 - 100 employees
- over 100 employees

2. Turnover of the company

- 0 - 10 000 euros
- 10 001 - 50 000 euros
- 50 001 - 100 000 euros
- 100 001 - 200 000 euros
- 200 001 - 500 000 euros
- 500 001 - 1 000 000 euros
- over 1 000 000 euros

APPENDIX 1: WEB QUESTIONNAIRE/SURVEY 2/10

3. Estimate of your company's modal share between air, road, rail and sea transport in year 2009 and in the future:

	2009	2015	2020
Air transport	<input type="text"/> %	<input type="text"/> %	<input type="text"/> %
Road transport	<input type="text"/> %	<input type="text"/> %	<input type="text"/> %
Rail transport	<input type="text"/> %	<input type="text"/> %	<input type="text"/> %
Sea transport	<input type="text"/> %	<input type="text"/> %	<input type="text"/> %
Overall	100 %	100 %	100 %

4. Estimate of the total container traffic (in TEU) in your company in year 2009 and in the near future:

2009	2012	2015
<input type="radio"/> 0 - 100 TEU	<input type="radio"/> 0 - 100 TEU	<input type="radio"/> 0 - 100 TEU
<input type="radio"/> 101 - 200 TEU	<input type="radio"/> 101 - 200 TEU	<input type="radio"/> 101 - 200 TEU
<input type="radio"/> 201 - 500 TEU	<input type="radio"/> 201 - 500 TEU	<input type="radio"/> 201 - 500 TEU
<input type="radio"/> 501 - 1 000 TEU	<input type="radio"/> 501 - 1 000 TEU	<input type="radio"/> 501 - 1 000 TEU
<input type="radio"/> 1 001 - 2 000 TEU	<input type="radio"/> 1 001 - 2 000 TEU	<input type="radio"/> 1 001 - 2 000 TEU
<input type="radio"/> 2 001 - 5 000 TEU	<input type="radio"/> 2 001 - 5,000 TEU	<input type="radio"/> 2 001 - 5 000 TEU
<input type="radio"/> 5 001 - 10 000 TEU	<input type="radio"/> 5 001 - 10 000 TEU	<input type="radio"/> 5 001 - 10 000 TEU
<input type="radio"/> over 10 000 TEU	<input type="radio"/> over 10 000 TEU	<input type="radio"/> over 10 000 TEU

5. Your company's main product categories are...

	Yes	No
General cargo	<input type="radio"/>	<input type="radio"/>
Bulk (dry)	<input type="radio"/>	<input type="radio"/>
Bulk (liquid)	<input type="radio"/>	<input type="radio"/>

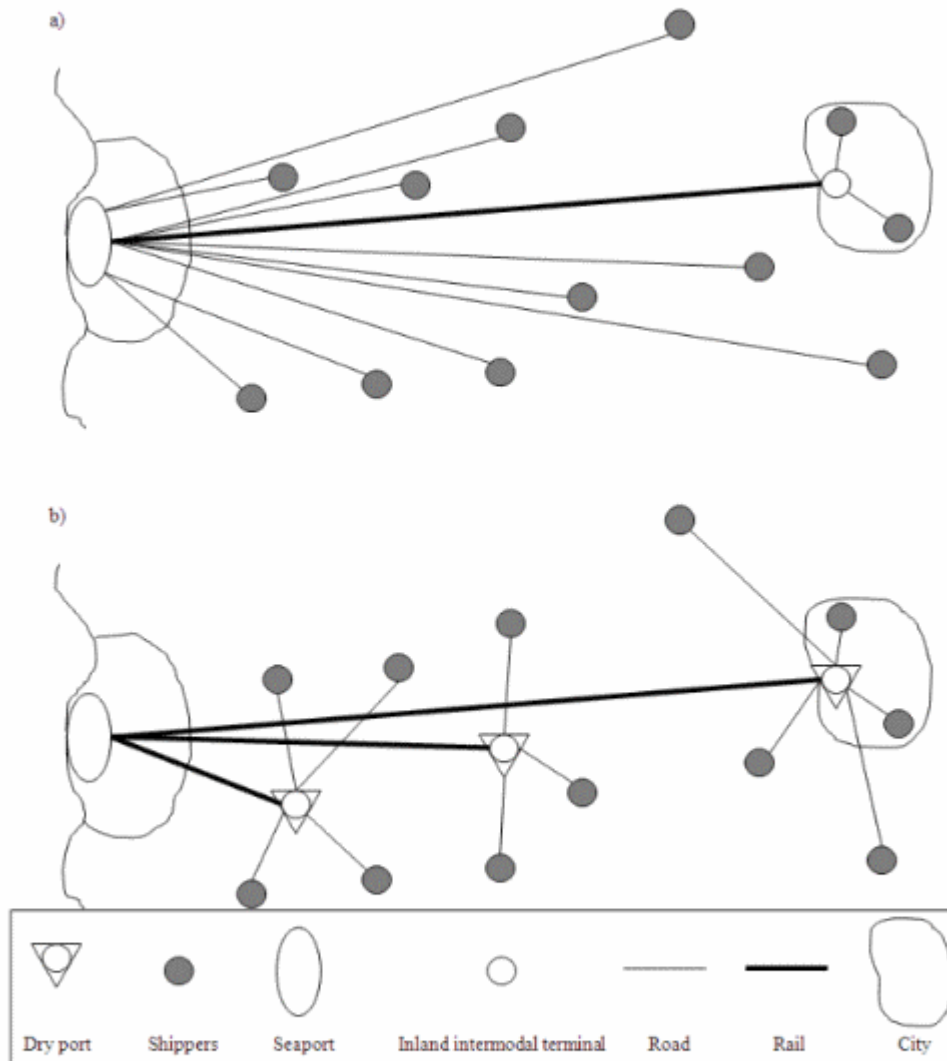
6. Does your company operate in...

	Yes	No
Domestic transports	<input type="radio"/>	<input type="radio"/>
International transports	<input type="radio"/>	<input type="radio"/>

APPENDIX 1: WEB QUESTIONNAIRE/SURVEY 3/10

7. Dry port concept

In dry port concept freight traffic between seaport and dry port (an inland intermodal terminal) is accomplished by rail. The Figure below illustrates the difference in traditional road transport and transportation that uses dry port concept. The upper part of the Figure illustrates traditional transport, where most transport from and to seaport is performed by road transport. The lower part of the Figure illustrates transport that uses dry port concept. There are three different dry ports implemented in the lower part. Transportation between dry ports and seaport is done by rail transport.



Source: Roso, V. (2009), "Emergence and significance of dry ports – The case of the Port of Göteborg", *World Review of Intermodal Transportation Research*, Vol. 2 No. 4, pp. 296-310.

What kind of advantages and/or disadvantages do you see in the dry port concept illustrated in the Figure above?

APPENDIX 1: WEB QUESTIONNAIRE/SURVEY 4/10

Intermodal transport:

Please rate following statements on a scale of 1 to 7, where 1 = "Strongly disagree" and 7 = "Strongly agree".

8. Large part of your company's business is based on transit traffic.

Strongly
disagree

Strongly
agree

1	<input type="radio"/>	2	<input type="radio"/>	3	<input type="radio"/>	4	<input type="radio"/>	5	<input type="radio"/>	6	<input type="radio"/>	7	<input type="radio"/>
---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------

9. Your company uses intermodal transport in Finland.

Strongly
disagree

Strongly
agree

1	<input type="radio"/>	2	<input type="radio"/>	3	<input type="radio"/>	4	<input type="radio"/>	5	<input type="radio"/>	6	<input type="radio"/>	7	<input type="radio"/>
---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------

10. Your company uses intermodal transport abroad.

Strongly
disagree

Strongly
agree

1	<input type="radio"/>	2	<input type="radio"/>	3	<input type="radio"/>	4	<input type="radio"/>	5	<input type="radio"/>	6	<input type="radio"/>	7	<input type="radio"/>
---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------

11. Intermodal transport is more common abroad (e.g. in the center of Europe or USA) than in Finland.

Strongly
disagree

Strongly
agree

1	<input type="radio"/>	2	<input type="radio"/>	3	<input type="radio"/>	4	<input type="radio"/>	5	<input type="radio"/>	6	<input type="radio"/>	7	<input type="radio"/>
---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------

12. Share of rail transport will increase in comparison to other modes in the next 10 years.

Strongly
disagree

Strongly
agree

1	<input type="radio"/>	2	<input type="radio"/>	3	<input type="radio"/>	4	<input type="radio"/>	5	<input type="radio"/>	6	<input type="radio"/>	7	<input type="radio"/>
---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------

13. Share of road transport will increase in comparison to other modes in the next 10 years.

Strongly
disagree

Strongly
agree

1	<input type="radio"/>	2	<input type="radio"/>	3	<input type="radio"/>	4	<input type="radio"/>	5	<input type="radio"/>	6	<input type="radio"/>	7	<input type="radio"/>
---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------

APPENDIX 1: WEB QUESTIONNAIRE/SURVEY 5/10

13. Share of road transport will increase in comparison to other modes in the next 10 years.

Strongly disagree

Strongly agree

1 2 3 4 5 6 7

14. Changes in Russian customs clearance legislations will increase the use of intermodal transportation in the near future.

Strongly disagree

Strongly agree

1 2 3 4 5 6 7

15. Your company has plans to increase the use of intermodal transport.

Strongly disagree

Strongly agree

1 2 3 4 5 6 7

16. Your company has expanded or has planned to expand into railway business.

Strongly disagree

Strongly agree

1 2 3 4 5 6 7

17. Intermodal transportation is more complicated to organize than conventional road transport.

Strongly disagree

Strongly agree

1 2 3 4 5 6 7

18. Intermodal transportation is more expensive mode than conventional road transport.

Strongly disagree

Strongly agree

1 2 3 4 5 6 7

APPENDIX 1: WEB QUESTIONNAIRE/SURVEY 6/10

19. It is rational to use intermodal transportation with transit traffic.

Strongly
disagree

Strongly
agree

1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>	4 <input type="radio"/>	5 <input type="radio"/>	6 <input type="radio"/>	7 <input type="radio"/>
-------------------------	-------------------------	-------------------------	-------------------------	-------------------------	-------------------------	-------------------------

20. Your company has plans to expand (e.g. warehousing area).

Strongly
disagree

Strongly
agree

1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>	4 <input type="radio"/>	5 <input type="radio"/>	6 <input type="radio"/>	7 <input type="radio"/>
-------------------------	-------------------------	-------------------------	-------------------------	-------------------------	-------------------------	-------------------------

21. It is more expensive to expand in or near seaport area than far from the seaport.

Strongly
disagree

Strongly
agree

1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>	4 <input type="radio"/>	5 <input type="radio"/>	6 <input type="radio"/>	7 <input type="radio"/>
-------------------------	-------------------------	-------------------------	-------------------------	-------------------------	-------------------------	-------------------------

22. Your company has concentrated on using only one seaport. (Don't answer to this question, if your company does not use seaports.)

Strongly
disagree

Strongly
agree

1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>	4 <input type="radio"/>	5 <input type="radio"/>	6 <input type="radio"/>	7 <input type="radio"/>
-------------------------	-------------------------	-------------------------	-------------------------	-------------------------	-------------------------	-------------------------

APPENDIX 1: WEB QUESTIONNAIRE/SURVEY 7/10

Green values:

Please rate following statements on a scale of 1 to 7, where 1 = "Strongly disagree" and 7 = "Strongly agree".

23. Your company appreciates green values (e.g. company focuses in decreasing carbon dioxide emissions).

Strongly disagree

Strongly agree

1	<input type="radio"/>	2	<input type="radio"/>	3	<input type="radio"/>	4	<input type="radio"/>	5	<input type="radio"/>	6	<input type="radio"/>	7	<input type="radio"/>
---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------

24. Your company has done calculations concerning its external costs (e.g. carbon dioxide emissions, carbon print or accident costs).

Strongly disagree

Strongly agree

1	<input type="radio"/>	2	<input type="radio"/>	3	<input type="radio"/>	4	<input type="radio"/>	5	<input type="radio"/>	6	<input type="radio"/>	7	<input type="radio"/>
---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------

25. Green values have affected in your company's strategies (e.g. in use of environmentally friendlier transport modes).

Strongly disagree

Strongly agree

1	<input type="radio"/>	2	<input type="radio"/>	3	<input type="radio"/>	4	<input type="radio"/>	5	<input type="radio"/>	6	<input type="radio"/>	7	<input type="radio"/>
---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------

26. Different taxes concerning environment (e.g. carbon dioxide emission taxing) will affect your company's strategies in the future.

Strongly disagree

Strongly agree

1	<input type="radio"/>	2	<input type="radio"/>	3	<input type="radio"/>	4	<input type="radio"/>	5	<input type="radio"/>	6	<input type="radio"/>	7	<input type="radio"/>
---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------

27. Intermodal transport is environmentally friendlier mode than conventional road transport.

Strongly disagree

Strongly agree

1	<input type="radio"/>	2	<input type="radio"/>	3	<input type="radio"/>	4	<input type="radio"/>	5	<input type="radio"/>	6	<input type="radio"/>	7	<input type="radio"/>
---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------

28. Green values are important to customers.

Strongly disagree

Strongly agree

1	<input type="radio"/>	2	<input type="radio"/>	3	<input type="radio"/>	4	<input type="radio"/>	5	<input type="radio"/>	6	<input type="radio"/>	7	<input type="radio"/>
---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------	---	-----------------------

APPENDIX 1: WEB QUESTIONNAIRE/SURVEY 9/10

31. The most important import and export cities of your company in Finland

Please rank the top 5 Finnish cities your company uses for import and export. If the particular city is not listed, then use the city that is located near it. 1 = "1st highest", 2 = "2nd highest", 3 = "3rd highest", 4 = "4th highest" and 5 = "5th highest".

Example: If your company uses three different Finnish cities for import and five different cities for export, then mark the most used import city with "1", second used with "2" and third used with "3". After that mark most used export city with "1", second used with "2" and so on until you have marked the fifth used export city with "5".

City	Import ranking	Export ranking
Hämeenlinna	<input type="text"/>	<input type="text"/>
Heinola	<input type="text"/>	<input type="text"/>
Imatra	<input type="text"/>	<input type="text"/>
Joensuu	<input type="text"/>	<input type="text"/>
Jyväskylä	<input type="text"/>	<input type="text"/>
Kokkola	<input type="text"/>	<input type="text"/>
Kuopio	<input type="text"/>	<input type="text"/>
Kouvola	<input type="text"/>	<input type="text"/>
Lahti	<input type="text"/>	<input type="text"/>
Lappeenranta	<input type="text"/>	<input type="text"/>
Luumäki	<input type="text"/>	<input type="text"/>
Mikkeli	<input type="text"/>	<input type="text"/>
Oulu	<input type="text"/>	<input type="text"/>
Pori	<input type="text"/>	<input type="text"/>
Riihimäki	<input type="text"/>	<input type="text"/>
Rovaniemi	<input type="text"/>	<input type="text"/>
Seinäjoki	<input type="text"/>	<input type="text"/>
Tampere	<input type="text"/>	<input type="text"/>
Vaasa	<input type="text"/>	<input type="text"/>
Varkaus	<input type="text"/>	<input type="text"/>

APPENDIX 1: WEB QUESTIONNAIRE/SURVEY 10/10

32. Your company's most used seaport or seaports

Please rank the top 5 Finnish seaports your company uses for import and export. 1 = "1st highest", 2 = "2nd highest", 3 = "3rd highest", 4 = "4th highest" and 5 = "5th highest". If your company does not use any seaports, then leave blank. If your company uses only one seaport, then mark that one only.

Seaport	Ranking
Port of Hamina	<input type="text"/>
Port of Hanko	<input type="text"/>
Port of Helsinki	<input type="text"/>
Port of Kemi	<input type="text"/>
Port of Kokkola	<input type="text"/>
Port of Kotka	<input type="text"/>
Port of Lappeenranta	<input type="text"/>
Port of Loviisa	<input type="text"/>
Port of Naantali	<input type="text"/>
Port of Oulu	<input type="text"/>
Port of Pietarsaari	<input type="text"/>
Port of Pori	<input type="text"/>
Port of Raahе	<input type="text"/>
Port of Rauma	<input type="text"/>
Port of Sköldvik	<input type="text"/>
Port of Tornio	<input type="text"/>
Port of Turku	<input type="text"/>
Port of Vaasa	<input type="text"/>

33. Would you like to receive the research report, when it is ready?

Yes	No
<input type="radio"/>	<input type="radio"/>

[Send your answers](#)

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