Maritime Freight Transportation and the Impact of Regulatory Changes

A Comparison between Spain and Sweden

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Maritime Freight Transportation and the Impact of Regulatory Changes
- A Comparison between Spain and Sweden

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Abstract

Maritime freight is a sector of high importance in the field of international trade. During the last decades, maritime freight transportation has been growing progressively, nowadays, in order to transport large quantities of materials and save great distances, it is the most used transport system. The maritime freight transport involves a large number of companies, which generates a greater number of jobs and acquires an additional importance for the economy and trade of the country. However, in order to maritime transportation to be in optimal conditions, it must be accompanied by a network of infrastructures and strategic points that allow different companies to carry out their functions.

Nowadays, large quantities of goods are transported through the sea, this is why a regulatory framework is needed to control the various limitations and restrictions that must be imposed at sea. The organization in charge of this work is the so-called SOLAS (Safety of Life At Sea), which is part of the United Nations department. This organization is responsible, as mentioned above, for safety at sea for ships and goods, it acts according to the current situation and responding to different disasters. As a result of certain accidents, whether navigation or breakage, the last law that has implemented is known as Verified Gross Mass (VGM).

This thesis is divided into two parts, the first one analyses the importance of maritime transport for the countries of Spain and Sweden. It will show the repercussion it has on the country and its different connections to transport the goods through the country, as well as future trends to move these goods for each country as well. To conclude this part, a comparison will be made between both countries. Secondly, a study will be carried out on the effect of the law that was implemented dated back on 1 July 2016, the so-called Verified Gross Mass. A study is carried out in order to assess the challenges and opportunities generated by this law for the different stakeholders involved in maritime transport and how they have been acting in the countries of Spain and Sweden. Hence, final conclusions can be obtained regarding the conduct of each stakeholder in each country.

Finally, the importance of road transport as the large transport system will be highlighted in combination with the maritime transportation in both countries. On the other hand, regulatory changes will make a cooperation between stakeholders in order to reduce the impact in their activity.

Keywords: SOLAS, Maritime Freight Transportation, Spain, Sweden, Verified Gross Mass.
Sammanfattning


Slutligen kommer betydelsen av vägtransporter som det stora transportsystemet att belysas i kombination med sjötransporten i båda länderna. Å andra sidan kommer lagsföresändringar att lägga grunden till samverkan mellan intressenter för att minska dess inverkan på deras verksamhet.

**Keywords**: SOLAS, intermodala sjöfarttransporter, Spanien, Sverige, Verified Gross Mass (VGM).
Resumen

El transporte marítimo de mercancías es un sector de alta importancia en el ámbito del comercio internacional. Durante las últimas décadas, este medio de transporte ha ido creciendo progresivamente, tal es así que hoy en día para transportar grandes cantidades de materiales y salvar grandes distancias es el medio de transporte más utilizado para realizar dicha labor. El transporte marítimo de mercancías envuelve un gran número de empresas, lo cual genera un mayor número de puestos de trabajo y adquiere una importancia adicional para la economía y comercio del país. Sin embargo, para que el transporte marítimo de mercancías se de en óptimas condiciones ha de ir acompañado por una red de infraestructuras y puntos estratégicos que permitan a las distintas empresas desempeñar sus funciones.

La organización encargada de establecer el reglamento de seguridad en el mar es la denominada SOLAS (Safety Of Life At Sea), la cual forma parte como departamento de las Naciones Unidas. Dicha organización se encarga, como bien se ha mencionado, de la seguridad en el mar para los buques y mercancías, ésta actúa acorde a la situación del momento y dando respuesta a diferentes catástrofes. Como por ejemplo a raíz de ciertos accidentes, ya sea de navegación o roturas, en buques de transporte de mercancías se ha implantado la última ley que ha entrado en vigor denominada Peso Bruto Verificado (VGM – “Verified Gross Mass”).

La presente tesis se divide en dos partes, la primera de ellas se analiza la importancia del transporte marítimo para los países de España y Suecia. Donde se verá la repercusión que tiene sobre el país y sus diferentes conexiones para transportar la mercancía a través del país, así como las futuras tendencias para mover dichas mercancías en el país. Para finalizar dicho parte se realizará una comparación entre ambos países. En segundo lugar, se realizará un estudio sobre cómo ha afectado la implantación de la ley que entró en vigor el pasado 1 de julio de 2016, la denominada Peso Bruto Verificado. Se realizará un estudio para comprobar los problemas que ha generado esta ley en las distintas empresas que intervienen en el transporte marítimo y como ha sido la actuación de estas en los países de España y Suecia, para poder obtener unas conclusiones finales acerca del modo de actuar de cada país.

Finalmente, se destacará la importancia del transporte por carretera como sistema de transporte más importante en combinación con el transporte marítimo en ambos países y, a su vez la forma de actuar que tienen las distintas compañías frente a los cambios regulatorios teniendo un importante cambio de información entre ellas para facilitar la implantación y trancurrir de la ley.

*Palabras clave:* SOLAS, Transporte marítimo, Suecia, España, mercancías, Peso Bruto Verificado.
Resúm

El transport marítim de mercaderies és un sector d’alta importància a l’àmbit del comerç internacional. Durant les últimes dècades, aquest mitjà de transport ha anat creixent progressivament fins al punt en què avui a dia, per tal de transportar grans quantitats de materials i salvar grans distàncies, és el mitjà de transport més utilitzat. El transport marítim de mercaderies engloba un gran nombre d’empreses, el qual genera un major nombre de llocs de treball i adquireix una importància addicional per a l’economia i el comerç del país. No obstant, per a què el transport marítim de mercaderies es realitzi en unes condicions òptimes ha d’anar acompanyat junt amb una xarxa d’infraestructures i punts estratègics que permetin a les diverses empreses exercir les seves funcions.

Donat que al transport marítim de mercaderies es mouen grans quantitats d’una sola vegada, es necessari un reglament que reguli les diverses limitacions i restriccions que es deurien donar a l’hora de realitzar una travessia a través del mar. L’organització encarregada de dita tasca és la denominada SOLAS (Safety Of Life At Sea), la qual forma part a les Nacions Unides. Dita organització s’encarrega, com bé s’ha esmentat, de la seguretat al mar dels vaixells i mercaderies. Aquesta actua d’acord amb la situació del moment i dona resposta a diverses catàstrofes. Com a exemple, a partir de diversos accidents, ja sigui de navegació o ruptures, en vaixells de transport de mercaderies s’ha implantat la última llei que ha entrat en vigor denominada Peso Brut Verificat (VGM – “Verified Gross Mass”).

La tesi present es divideix en dos parts. En la primera d’elles s’analitza la importància del transport marítim de mercaderies per als països d’Espanya i Suècia. És aquest on es veurà la repercussió que té sobre el país i les seues diferents connexions per transportar la mercaderia a través del país, així com les futures tendències per moure dites mercaderies en el país. Per a finalitzar, es realitzarà una comparació entre ambdós països. En segon lloc, es realitzarà un estudi sobre com ha afectat la implantació de la llei denominada Pes Brut Verificat que entrà en vigor el darrer 1 de juliol de 2016. Es realitzarà un estudi per tal de comprovar els problemes que ha generat aquesta llei en les diverses empreses que intervenen en el transport marítim i com ha sigut la actuació d’aquestes en els països d’Espanya i Suècia, per tal d’obtenir unes conclusions finals sobre el mode d’actuació de cada país.

Finalment, es destacarà l’ importància del transport per carretera com a sistema de transport més important en combinació amb el transport marítim en aquests països i, al seu torn, la forma d’actuar que tenen les diferents companyies davant els canvis reguladors, tenint un important canvi d’informació entre elles per facilitar l’ implantació i trancurrir de la llei.

Paraules clau: SOLAS, transport marítim, Suècia, Espanya, mercaderies, Pes Brut Verificat.
Abbreviations & Definitions

Abbreviations

- SOLAS - Safety Of Live At Sea
- TEU - Twenty-Foot Equivalent Unit
- IMO - International Maritime Organization
- VGM - Verified Gross Mass
- RO-RO - Roll On Roll Off

Definitions

- TEU - As it has been defined, it is a unit of measurement to know the capacity of the vessels.
- Container - Main tool to transport goods in maritime freight transportation, there are different types of containers.
- Port Authority - Organization owner of the port. It manages the different business inside the port.
- Maritime routes - Track that vessels follow to transport the goods
- Beam - The width of the vessel, it is used to define the type of vessel (e.g. Panamax, Super-Panamax, Suezmax, etc)
- Stowage - Action of moving the container inside the vessel with and previous organization.
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Chapter 1

Introduction

1.1 Background

Over recent decades, maritime freight transportation has become increasingly important in the transport of goods. Nowadays, the great part of the goods are transported using the maritime freight transportation. Because it has become very important, due to its increasing importance, it requires the intervention of an organization to manage the safety of the vessels, the goods and environment. This organization is known as “International Maritime Organization” (IMO) that is a specialized agency of the United Nation and it was established in 1948. However, prior to the creation of this organization, it already existed a maritime treaty called “Safety Of Live At Sea” (SOLAS) that dates back to London 1914, after the Titanic disaster.

The SOLAS treaty was created to ensure that all ships that were marked by this agreement met minimum standards in terms of construction, equipment and operation. During the treaty’s various versions, more nations have become a part of this treaty. Furthermore, different maritime laws have been added too, for example the last one was Verified Gross Mass which states that the gross mass of a container must be verified in order to be transported.

Due to the importance of maritime freight transport and the existence of the SOLAS agreement, the different actors involved in maritime freight transport networks have been affected to a greater or lesser extent, having to make improvements in their management processes and logistics.

1.2 Aims and Objective

This thesis aims to carry out a study of the importance of maritime freight transport in both Spain and Sweden and will try to analyze the impact of changes in maritime legislation on the different actors involved in the transport of goods. This impact will be evaluated with reference to the most recent modification in international maritime law - VGM (Verified Gross Mass).

The objectives of this project has been to analyze the importance of maritime freight
transportation in both countries Sweden and Spain, and show the difference in impact of regulatory changes for different actors involved in maritime freight transport. More specifically, this study intends to find answers for the following questions:

Maritime Transportation

- How is the influence of the maritime freight transportation in the country?
- Spain vs Sweden: What is the best option for intermodal land transport for maritime flows?
  - If they are different: Would it be possible to change the option with the other country?

Regulatory changes (for each country)

- What actors have been involved with and affected by this measure?
- What are the main challenges for each actor i.e. forwarders, shippers and operators?
- Have they applied any solutions?

Finally, some comments and improvements will be added in this project as a conclusion of it.

1.3 Methodology

In order to achieve the objectives of this study; intensive literature review and expert interviews with the actors involved are perceived as pre-requisites. The methodology that will be used initially, will consist of an analysis of the maritime transportation for each country. It will be a study about the importance of this transport system for each country and doing a comparison of the best option for connecting the maritime flows to land based intermodal system. To do this, it will be necessary a literature review combined with recollected data and statistics.

The second part of the project on the other hand, considers the impact of the regulatory changes. This phase requires carrying out expert interviews with different actors affected in order to get a deeper understanding of their perspectives and see how they correspond to literature review and recollected data and statistics.

To do this, it will necessary have as an objective do intensive research combined with some interviews with some of the actors.

As a limitation for this project could be the lack of feedback of the in-depth experts interviews obtained from the companies. Multiple in-depth experts interviews will be carried out in order to improve the knowledge of the impact of regulatory changes in the different actors who have been involved with this measure.
1.4 Master Thesis Organization

The Master Thesis consists of several distinct parts. The first part is related to the maritime freight transport, it will develop the importance of this transport system for Spain and Sweden. Using different statistics for each transport mode in order to assess the relevance of maritime freight transport for each country. Furthermore, the interface towards land transport will be assessed as well, in order to know the common practices and the future trends in transport for each country.

The second part of this thesis is related to the regulatory changes and the impact of these for the different actors which are involved in the maritime freight transportation are also included in this part. To do this, the last law implemented called Verified Gross Mass (VGM) will be analyse. The results of the in-depth experts interviews with different actors involved in the different activities of maritime transportation will try to be done.

Finally, the last part of the thesis will provide conclusions and recommendations that have been obtained during the development of this Master Thesis.
Chapter 2

Theoretical Framework

Nowadays, as a result of international relations between countries and companies, there is an immense flow of freight transport, which is increasing every year. Therefore, more and more companies are engaged in logistics and transportation of goods and there is, a greater number of actors involved in the different processes of each part.

Due to the remarkable increase in freight transport, is necessary logistics system to ensure that everything goes according to the planned itinerary and that there are no problems. The logistic system can be defined in its simplest way as: [1]

\[ \text{Logistics} = \text{Material Management} + \text{Distribution} \]

The actors who participate in the logistics system are commonly suppliers, producers, wholesaler, distributor, etc. Therefore, for an optimum functioning of the supply chain, a good coordination between the different actors is necessary. The logistic system, where the different actors are involved, is constantly influenced by several extend factors affecting the services given, as can be seen in figure 2.1 [1]

![Image of Logistics Systems](image)

**Figure 2.1:** Pressures influencing logistics systems [1]

However, it may seem like a system in which actors depend only on themselves to perform the work optimally but it is also affected by external causes such as regulatory
changes. These regulatory changes are made in order to improve the safety of both the worker and the goods transported, however, on some occasions it can positively or negatively affect the supply chain.

2.1 Hinterland and Foreland

The development of ports is highly related to the territory with which it is linked. Both sites inland and outland the territory experience changes, evolutions, new questions to answer and new possibilities, generating big modifications in the port system. Ports are included in both maritime and terrestrial spaces and networks and, therefore, it is convenient to understand them as nodes rather than as interfaces. In order to better understand the work and development of maritime transport system, it is necessary to define the concepts of Hinterland and Foreland.

The Foreland can be defined as the maritime space of projection in which the port maintains commercial bonds, or even as the set of markets to which it is connected at each point. This definition is adapted to all maritime transport activities involving exchanges with other ports at regional, national and international levels. The external zone of influence of a port is formed by the rest of ports with which they are made regular exchanges, whether it be transport of passengers or merchandise. [17]

The Hinterland has a lot of definitions one of them is from Sargent who defines hinterland as: “the area which a port serves, which can be regard as a coherent whole in relation to an outlet or group of outlets” [18]. As it is possible to observe in figure 2.2, there are two different types of Hinterlands: main hinterland and competitive hinterland. Main hinterland is an area where the port has the main influence of cargo flows. On the other hand, competitive hinterland is an area where ports can compete between others in order to offer a service for this area. [2]

![Figure 2.2: Types of Hinterland](image)

On the other hand, the study of Notteboom and Rodrigue state that to understand
the concept of hinterland, three concepts can be applied. [3]

- Macro-Economic Hinterland related to transport demand.
- Physical Hinterland related to transport supply for both unimodal and intermodal transport.
- Logistical Hinterland related to traffic flows.

One of the major problems lies in the adaptability of the physical hinterland in changes in both demand and transport flows. Notteboom and Rodrigue describe four interrelated layers in which it is necessary to be fixed in order to avoid problems in the development of the hinterland. These layers, which can be observed in Figure 2.3, are: [3]

- Locational layer related to the geographical location of the port. Good geographical location is important to expand the market area of the port and increase the quantity of maritime routes.
- Infrastructure layer involves the provision and exploitation of basic Infrastructure for both links and nodes in the transport system.
- Transport layer involves the provision and exploitation of basic infrastructure for both links and nodes in the transport system.
- Logistical layer involves the organization of transport chains and their integration in logistical chains.

![Figure 2.3: Different Hinterland Layers](image-url)
2.2 Regulatory framework

Safety of Life at Sea treaty (SOLAS) covers all matters related to life-saving appliances and abandonment procedures. Its first version was approved in 1914 when the maritime nations met to elaborate an international regulation on the safety of the ships two years later of Titanic disaster. [19] [20]

SOLAS treaty has been revised and updated several times since 1914. International Maritime Organization (IMO), department from United Nations, assumed global responsibility for the safety of navigation at its first meeting in 1960. At that time, it was called the Intergovernmental Maritime Consultative Organization (IMCO). In 1960, the Maritime Safety Conference determined a great part of the different activities for IMO in the following years. Initially, it was planned to maintain the updated 1960 SOLAS treaty by amendments but due to the fast incorporation of several countries to this treaty, in 1974 a new version of SOLAS treaty was created in order to obtain a better and flexible management for all the members. [19] [20]

In December 2014, IMO approved a new modification of SOLAS treaty that will change the transport industry. This new regulatory change, which was implemented in 1st July 2016, is called Verified Gross Mass (VGM), where it is said that to move the container inside the vessel it will mandatory the verification of the gross mass of it. [19] [20]

2.3 Actors in maritime transportation

In order to know how a new regulatory change can affect the different actors involved in maritime freight transportation and the work that the do, it is necessary to know how the connection between these actors and to explain their work. In figure 2.4, the relation of these actors is showed.

As it is possible to observe, there are a lot of actors which are involved directly or indirectly in maritime transportation. The supply chain for maritime freight transportation is different of a simple one, it is due to the time, distance and the necessities for transport the goods. In figure 2.5, it is showed a simple supply chain.
Considering the different conditions that exist in maritime transportation a more common supply chain for it looks like the one shown in figure 2.6, extracted from Maersk Group.

In maritime transportation, the part of distribution considers both land and maritime transport, this is why a great coordination is needed between both transport industries in order to offer a good service for the customers and the other actors.

According to figure 2.4, the actors who have more relevance in maritime transportation are the following ones:

- **Shipper:** A shipper is a person who is entrusted with the responsibility of transportation of goods and commodities. In addition to transportation of goods are also responsible for the packaging and tagging of the goods and cargo appropriately. [21]

- **Forwarder:** Intermediaries between importers and exporters, seek out and then coordinate the most cost effective and fitting way to move goods between nations. [22]

- **Consignee Shipping Agents:** is the responsible of the vessel in the port. His function is to coordinate appropriately the arriving of the vessel and having all the necessary conditions to develop the work accurately. [4]

- **Vessel:** the actor who make sense the name of maritime transportation, is in charge of transport the goods through maritime routes to the different countries. [4]

On the other hand, there are more actors which are involved indirectly in maritime freight transportation and they have a really important functions.
• Custom’s Agency: is in charge of the different inspections to the goods, they can scan, open and test the goods from the container. If they detect any problem the goods will not be able to move from the port and police will be in charge of it. [4]

• Auxiliary services: provide of extra service to the different actors who work in the port. [4]

• Longshoreman society: they do the process of move the containers inside and outside of the vessel. [4]

• Maritime captaincy: control the different labours which are been carried out for the actors. [4]
Chapter 3
Transport System Characteristics

3.1 Maritime Freight Transportation

3.1.1 Background

Maritime freight transportation is the best option to transport a large quantities of goods in cost effective way between continents and even countries. This is because companies create their maritime routes to optimize the transport.

This transport system has been involved in a huge increment of importance during the last decades, as it has been commented before. Nowadays, vessels have increased their size having more TEUs capacity, more weight and emit more harmful emissions, this is why vessels are experiencing more limitations due to the new standards to minimize the impact on the environment.

The container, which is the basic load carrier used in maritime freight transportation, is, actually, used in all the world to transport goods. Before the container, the different systems to transport were expensive and time-consuming. The container is at the core of a highly-automated system for moving goods globally, with a minimum of cost and complication on the way. It creates a new economic geography; poor countries can take profit of this; e.g. through disposed of infrastructure and cheap taxes for the maritime freight transport actors creates the chance to increase their benefits from this transport system. Nevertheless, the location of the country is also one of the most important factors to attract the companies, good location means time-savings in transportation. [23]

Spain and Sweden have one similarity, their location. Spain is in the entrance of the Mediterranean Sea and, on the other hand, Sweden is in the entrance of the Baltic Sea. Both countries have a good strategic location for the transport of goods through the sea.

The following section will be about this transport system in Spain and Sweden, it will elaborate upon the importance and the most common combinations towards land transport used in maritime freight transportation for both countries. The research will be centralized in the container transportation due to that it has been affected for the regulatory changes.
3.1.2 Spain

Background

Spain is located on a Iberic Peninsula, so it is surrounded by water which creates the possibility to take a profit from it. Spain has an important port infrastructure, managed by 28 Port Authorities and 46 ports of general interest. In figure 3.1, the distribution of these Port Authorities is showed. [6]

These Port Authorities are mainly allocated throughout the littoral of Iberic Peninsula, moreover, Spain has two archipelagos which each one has a Port Authority to manage the maritime freight transportation to supply of goods to these islands, maritime freight transportation for these two archipelagos is very important because is the only way to supply their citizens of every kind of goods. [6]

Once the Port Authorities are defined, it is necessary to make a distinction in order to know which one are the most important in maritime freight transportation.

![Map of Spain with Port Authorities](image)

**Figure 3.1:** Port Authorities [6]

Leaving aside the importance of the Archipelagos Port Authorities, the two most important Port Authorities for maritime freight transportation are Bahía de Algeciras and Valencia. However, Spain not only has maritime freight transportation of general cargo, the north of Spain, e.g. Gijón and Bilbao, and in the south of Spain with the Port Authority of Cartagena have their main activity in liquids and solids bulk.

To provide an accurate service, the port authorities should maintain the different infrastructures according to the demand and conditions at the moment. The Spanish ports
have an updated network of infrastructures due to they have a lot of commercial activity.

In order to establish an adequate balance in the supply chain, ports must provide points to optimize the exchange of goods between the different transport systems, favouring intermodal transport and thus facilitating the work of the different actors involved in the supply chain of maritime transportation.

Maritime freight transportation: Containers

As it has been stated in previous sections, maritime freight transportation has become very important in all the world. Companies use this transport system to transport their goods to countries around the world. There are many factors for the companies to select certain ports (e.g. cost, location, infrastructure...) this is why they made their maritime routes to achieve less time from transportation and less cost with their operation in ports. Figure 3.3 shows how has been this increment through the last years in Spain.

![Container Transport](image)

**Figure 3.2:** Total Container Transport Spain (Tonnes) 5.1 [7]

![Transport in Spain (TEUs)](image)

**Figure 3.3:** Total Container Transport Port Authorities. Table 5.2 [7]

Spain has a good location for maritime freight transportation and Port Authorities to provide goods and updated infrastructures to the ports that they manage. Regarding the different factors for companies to select ports, the cost of their operation is an important factor, because the installations need to be updated e.g. crane with enough longitude to work with the actual vessels that are actually in navigation which have a beam of 60 m. In
Spain, ports are selected for their good locations and their infrastructures, nevertheless, it is necessary to know how is classifications for those ports which have a container terminal, there are a different kind of classifications. For this project, the categorization will be done in regard to the traffic:

- **Import/Export**: traffic consists in the entrance and exit of containers that will be loaded on a vessel of next arrival or either unloaded to leave the terminal by road or rail, e.g. Valencia Port. [24]
- **Transhipment**: traffic consists of containers being unloaded to be and then loaded on to another ship without leaving the terminal, e.g. Bahía de Algeciras Port. [24]

The following figure 3.4 illustrates the quantity of tonnes that are transported each year in some Port Authorities1 for containers transportation.

![Port Authorities Containers Transport](image)

**Figure 3.4:** Total Container Transport Spain. Table 3.3, Table 5.4 [7]

In terms of Maritime Freight Transportation Valencia and Algeciras are the main ports in Spain. This transport system, as it is possible to observe in figure 3.3 and 3.4, despite the hard-financial crisis of the last year it has continued growing, so it is an important source of income for the country.

**Economics**

International maritime freight transportation represents around the 90% of the total commerce of international freight transportation. It is efficient, safe and furthermore, allows to transport high amounts of freight with low cost. Maritime sector in Spain has become very important, to acknowledge this the Honor President of CME (Clúster Marítimo Español), Federico Esteve (2016) says: [25]

"The maritime sector in Spain creates 461,000 direct jobs, a gross added value of 27,000 million euros, a production of 52,000 million euros and a weight on the national gross added value of "3.24%." Taking into account the direct, indirect and induced effects, the impact of this sector on the national economy translates into 1,300,000 jobs, 68,000 million euros of gross value added, a production of 186,000 million and a weight on the national gross value added of 7.2%, making it the third largest economic sector in the

---

1Selection based on an article from "El Economista"
country, with a significant multiplier effect, since for each euro of expenditure generates 2.5 euros, and for each job, 2.8 jobs.* [25]

In addition, as it is possible to observe in figure 3.4 the maritime freight transportation of containers is continuously growing, so this is a sector to consider in the future.

**Common practices and future trends**

As maritime freight transportation is important to transport goods between countries the way to transport these goods towards inside the country is also very important. There are four alternative transport systems, road, rail, pipeline and the air transport. The preferences of selection of these systems resides in mainly in the cost, time and the flexibility.

The infrastructures for each transport system are also important to offer a cost effective way. In Spain, the road network is almost 10 times the rail network and the connections with the terminal’s ports are better for road transport than rail transport. About maritime flows connected to air transport and pipelines, the first is practically in-existent, the second one is just for gases and liquids bulk, which is not objective of this project.

Road and rail transportation are the main practice for an inter-modal connection with ports. In figure 3.5, it can be observed the percentage for each transport system.

![Figure 3.5: Import/Export for intermodal transport in ports](image)

According to figure 3.5, the road transport has a higher percentage than rail transport. However, it is necessary to observe the future trends for intermodal transport in ports in order to know the evolution for each transport system.

In figure 3.6, it can be observed that the intermodal transport in Spain with maritime transport had an important decrement in the year of 2008 when the financial crisis starts. Rail transport system during these years had experimented more increment than road transport. However, the tonnes transported by road are much larger than those for rail but this is an important data, it means that in Spain the rail transport is growing and could be one of the best possibilities, in recent years, for intermodal transport. [7]
3.1.3 Sweden

Background

As it has been said, Sweden is taking part in the group of countries which are in the entrance of the Baltic Sea. Different transport systems are used, depending on the types of goods that will be transported and the distances that will be covered. As Spain, Sweden, which is practically surrounded by water, has an important strategic position for the maritime freight transportation which has the major foreign long-distance goods flows, due to its location. Therefore, the main ports for maritime freight transportation are located in this area, as is possible to observe in figure 3.7.
Gothenburg port is located in the entrance of the Baltic Sea in Gothenburg city as well. This port has become the most important in terms of maritime freight transportation of all Nordic Countries. The goods that Sweden trades on the international market are dominated economically by products tied to traditionally strong Swedish heavy industries, such as machinery, appliances, and means of transportation. In terms of tonnage, the goods flows are dominated by goods from the forestry, lumber, and paper industry; iron ore and steel; crude oil, petroleum products, and coal; and high-value-added goods and chemicals [8]. The modal split for each freight segment for import and export can be observed in figure 3.8

![Figure 3.8: Freight transportation in thousand tonnes Sweden, 2014. [8]](image)

In order to have an accurate and reliable transport of goods inside and outside the country, an updated and sufficient infrastructures network is necessary to meet the relevant and current demand. In Sweden, road transport is the clear dominant over the rest, however, the other transport systems will be used as a complement to this, as will be seen in the following sections. [8]

Furthermore, the supply chain starting from the retailer, who sells the product, until the customer is produced optimally for all the actors involved in the freight transportation. [8]

**Maritime freight transportation: Containers**

Port of Gothenburg handles around 60% of Swedish container traffic according to the data presented by Port of Gothenburg. So it is a good indicator about the evolution of this transport system. It is possible to observe from the statistics that the container flow have had a fall of 3% due to some problems with the Dockworker’s Union. [16]
<table>
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</table>

Maritime freight transportation for Sweden, through the last 15 years, has experienced an increment of their transportation in containers traffic. Comparing table 3.1 and figure 3.9, Port of Gothenburg, as it has been said before, has major quantity of container traffic. [16]

![Swedish Container Traffic](image)

**Figure 3.9:** Total Container Transport Sweden. Table 5.6 [9]

This dominant position of Port of Gothenburg is due to the infrastructures of the port (Cranes, terminals, machinery, etc) and its good connections with the rail transport with the dry ports and even the connections for road transport systems. Port of Gothenburg is a great part of the city of Gothenburg. This port, according to the definitions showed of the category of Import/Export ports because through this port supports of goods a great part of Sweden due to the connections with dry ports.

**Economics**

Firstly, Sweden has a strong heavy industry, as it has been commented previously. The previous section was about the container traffic in Sweden, now the importance of maritime freight transportation is analysed to know the influence to economics. To do this, will be necessary know the different volume for each type of freight transportation in maritime freight in Sweden, which will be showed in figure 3.10.
Container traffic is the lowest freight volume transported in Sweden, having the greatest importance the liquids and Ro-Ro goods. Sweden’s foreign trade has increased year by year, accounting for an increasing share of GDP. In Sweden, the transportation industry’s net sales increased by approximately 80 percent between 1997 and 2007. The total turnover of the transport industry about 239 billion kr and had nearly 126,400 employees in 2007. In addition, approximately 30,000 people in support services to the transport sector. As it has been commented, Sweden geographical location, shipping has always been important to commerce and transport to and from Sweden. Approximately 90 percent of all goods measured in tons, and about 60 percent in value of the goods, go over Swedish ports. [11]

As it is possible to observe in figure 3.11, the tendency of international trade of maritime freight transportation has increased during the last 40 years, having a great importance for the economics of Sweden, for the turnover generated and, moreover, for the great amount of employees.
Common practices and future trends

According to the different transport system towards land transport, this section is going to focus on rail and road transportation. Sweden is a long country, it is necessary to save long distance between cities to support goods to the different urban areas. To do this, a good infrastructure network is necessary that can transport the different goods with cost effective way.

The major quantity of goods come through ports, so it is essential to have good connections with those containers traffic ports. In reference to Port of Gothenburg, the most important in container traffic of Sweden, has good connections with rail network to dry ports and road transport.

Firstly, about rail-port network in figure 3.12, will be show the connections of Port of Gothenburg with dry ports.

![Figure 3.12: Railport network, dry ports [12]](image)

Port of Gothenburg has an extensive rail network; connecting the port to dryports with rail shuttles, most of this rail network is a single track with approximately of 8200 km and 1900 km of double track, it makes easily the transportation of big quantities of goods in long distances but could be an inconvenient due to the large quantity of single rail track. To know the importance of this transport system, figure 3.13 shows the volume of freight in tonnes during the last ten years.
Figure 3.13: Volume freight, railway transport. Table 5.7 [9]

Railway transport has not had a relevance evolution in the last 10 years. It has maintenance with same +-500 thousand tonnes values. Now, it is necessary to know the freight volume for road transport in order to know which of this transport system is more important to transport goods in Sweden and, furthermore, to see the evolution and future trends.

Road transport, as Spain the road network is almost 10 times the rail network [26], is the transport system on land that move the highest quantity of goods between these both transport system, as it is possible to observe in figure 3.14.

Figure 3.14: Volume freight, road transport. Table 5.8 [9]

Both transport systems have increased their volume freight through the years, to know what is the future trend that will be used recently, it is necessary to show how has been the increment for each transport system through the last years. It will be showed in figure 3.15.
Road transport has a higher percentage of growth of volume freight transport than rail transport during the last decade. While the road transport has been increasing, these last two years, rail transport has had a decreasing trend, so it means that road transport could be the future trend for Sweden. As a result of an analysis of Trafikverket in collaboration with KTH, it has been predicted the evolution for each transport system through the following years, in figure 3.16.

As it is possible to observe, road transportation will have the highest increment during the following years. On the other hand, rail and maritime transportation will decreased. so the tendency will be the same as actually, having more importance the road than the other ones.

3.1.4 Spain vs Sweden

Once it has been explained the influence of maritime freight transportation for each country, this section will develop differences and common aspects between both countries.

The first subject that will be develop in this section is the importance of the road transport system for both countries. Road transport is the most important transport system for land transportation. In figure 3.6 and figure 3.15, can be derived that this
transport system has experimented an important increment during the last years. Comparing these graphs, which have been mentioned, in Sweden the road transport has grown more than Spain during the last 10 years.

On the other hand, Sweden has a large infrastructure for rail transportation and its connections dry ports-ports. Nevertheless, rail transportation in Sweden has not increased, it has maintenance in the same range approximately + - 1% during the last years. On the contrary, Spain has had an increment of this transport system for the last decades as it is possible to observe in figure 3.6. This increase for Spain is due to the improvement of the rail transport infrastructures and its connections with the ports. It is true that the volume freight in this transport system is so far from the volume freight of road transportation but it is important that different transport system will increase its importance in order to have different alternatives to transport goods.

Maritime transportation for Spain and Sweden is very important for both. It generates a lot of directs and indirect jobs so it is an important source of employees for each country. Thus, Spain has a higher importance than Sweden due to the location and the infrastructure ports this is why the maritime freight volume of transportation is higher in Spain than Sweden.
Chapter 4

Case study: Regulatory Changes

4.1 Verified Gross Mass

As it has been stated, the 1st of July 2016 started this new regulation in the maritime freight transportation. With this new regulation change is mandatory for the Shipper must gives a verification of the gross mass of a full container for exportation if they want that the container to be move onto the vessel, sending the notification with sufficient in advance to the company in charge of the vessel. [27]

This new regulation is a request of the companies which manage the vessels because if the container has a wrong mass it could generate a huge operational challenge: [27]

- Problems in navigation of the vessels.
- Malfunctions on boats.
- Malfunctions on containers and surrounded containers.
- More consumption of combustible.

On the other hand, it could generate other problems in ports such as:

- Breakages on reach stacker

These things could generate huge problems to the vessels and the installations of the ports so these are some of the reasons by this new regulation was created.

This new regulation can be applied to those containers which are regulated by CSC (International Convention for Safe Containers) and both containers in RO-RO cargo and offshore are exempts to apply this regulation and if and only if the maritime transportation has a national character it will not be necessary to apply this regulation.

There are two methods to verify the gross mass of the container:

- Method 1: the container is weighted alone or with the truck and then to get the gross mass will exclude the mass of the truck. [14]
- Method 2: the goods are weighted and after that will be include the different tools of subjection and the tare mass of the container to get the gross mass. [14]
It is very important to know that a estimation of the gross mass is not allowed. On the other hand, there are three ways to weight these containers: [27]

- Shipper’s installations or company.
- External company.
- Port terminal: it is possible to decide if the container will be weighted inside the terminal or if at the last moment the shipper decides to weighted at the terminal it will cost more expensive than if you decide it before.

There is a tolerance in the weight of the container: [27]

- Container less than 15 Tn: ± 500 kg of the gross mass
- Container more than 15 Tn: ± 5% of the gross mass

Once the VGM has been obtained, it must be presented in a shipping document, such as a shipping instruction, a booking request, or a separate document.

This document must include, minimum, the following statements: [27]

- Name and address of the shipper and who has verified the gross mass, if it is a third person.
- The verified gross mass, expressed in kilograms, preceded by the symbol "VGM".
- Method used to obtain the VGM.
- Name and signature (electronic or name in capital letters) of the person who make the document.
- Place and date of signature of the document.
4.1.1 Main implications and challenges

The analysis of this study will proceed with addressing the main problems that arise as a result of the law of Verified Gross Mass has been introduced.

- The first one lies in the navigation of vessels which, because the container has a wrong weight, are placed in an area not according to their weight. It can lead to destabilization during the ship’s navigation, which would lead to accidents during the crossing.

- Secondly, it is also related to the navigation of vessels because, given the new environmental impact laws, having a wrong weight of the cargo transported can lead to high fuel consumption and this may lead to exceeding the new limits Emissions of harmful gases. In addition, if the container has a different weight than established, it can lead to breaks in the container itself and in the adjoining containers.

- Thirdly, the responsibility of the shipper. This occurs mainly when forwarder act on behalf of the shipper. In this case the forwarder obtains the load from the supplier and the initial assessment is based on having to trust the supplier that the container load is in accordance with the law and thus have no problems to the time to move the container into the ship. On the other hand, if the shipper is the supplier itself, it should not exist any problem. When the container does not comply with the regulations, it is immediately immobilized and is prevented from being transported to the ship to be transported.

- Finally, the problem of the time of information exchange to the ship that the container is ready to be transported to it. It is not specified a minimum or maximum time to perform this action and if not done with sufficient time can lead to problems of stowage.

As it is possible to observe, the different problems that occur with this new law involve many companies, each with a different work in freight transport.
4.1.2 Possible solutions

At the time when a new regulatory change is implemented, it requires, since the date when it will be implemented, a long range of actions on the part of the actors involved is required. As it is possible to observe in figure 2.4, in the maritime freight transportation the supply chain is more complex than usual, because of the large number of actors involved. Regulatory changes affect these actors directly, but there are many secondary actors for whom these changes affect indirectly.

In accordance to this new regulatory change has an insignificant affection as possible the company, it implies that from the moment the news of the law comes out, an intense analysis is carried out regarding the different conditions that can affect the company. So as a main measure the implementation of new changes is know well in advance of this new regulatory change and produce strategies on how to treat it.

It is evident that many companies are involved in maritime freight transportation and each of them will, of course, be affected in different ways by the new regulatory change. In this case the communication between actors is essential to avoid misunderstandings during the transactions and thus to achieve greater efficiency to solve the problems that could arise.

This new law requires a relatively quickly exchange of information, the main solution is to establish platforms on the Internet where both shippers and shipping companies can access and verify information in a fast and simple way. This allows better collaboration between stakeholders and an efficient information exchange.

VGM is implemented in order to guarantee safety during navigation, ensuring a better stowage and an assurance that the shipper pays what he transports, avoiding possible traps to avoid high costs during transportation. The combined use of the three solutions proposed to ensure the proper functioning of the law is essential to avoid major problems in maritime transport actors, figure 4.4.

![Figure 4.4: Combination of solutions for VGM](image-url)
4.2 Comparison between Spain and Sweden

The implementation of a new regulatory change means, for the stakeholders involved from each country, a new challenge to face in order to achieve that their commercial activity are not affected. The VGM is a regulatory change that affect many actors in different ways. In order to carry out this analysis, a survey has been sent to different companies to assess this condition by the new regulatory change in both countries. This survey can be seen in Appendix C. Based on the answers obtained and after analyzing numerous FAQs of big companies on this law, it can be observed that:

As it has been said, this new regulatory change involves many actors from both countries, an intensive analysis of how the system is going to be affected is needed because this new change and, after that, it will necessary to observe the best solution to carry out into it. In the same way, it will be analyze the repercussion that can be occurred and the time cost efficiency to be able to implement it properly in an efficient way to the system.

In maritime freight transportation there are certain actors who may have a greater influence over the rest, so differentiating owners and users of the infrastructure will be necessary. Given this distinction, after conducting the questionnaire it has been obtained that the organization or company that owns the port infrastructures contacts with the different companies with the intention of knowing their needs, always adjusting to what is marked by the law. From both countries the most common practice is to obtain a feedback from the orders actors, it will make an easy way to manage this new regulatory change.

As a new regulatory change arises the opportunity and possibilities to create new companies that offer such service, or seek a solution internally when they have the necessary means.

For example, Port of Valencia (ValenciaPort) and also Panalpina have configured a platform that allows the users of the port to access and provide the information quickly and easily. However, an external company INTTRA [28] has been created in order to offer a new service to manage this new regulatory change that can be used to speed up the exchange of information between different companies.

On the other hand, stakeholders from both countries, it is possible to highlight the importance of the information exchange for manage the regulatory change and offer a properly service for them.

Finally, the actors involved have manage this new regulatory change adequately and, moreover, some of them have obtained some benefits from this new law e.g. offer new service of weighting or new actors involved, it created new opportunities.
Chapter 5

Conclusion

To sum up this Master Thesis, it has made an effort to answer the following questions for each of its parts and the different conclusions that have been derived:

- How is the influence of the maritime freight transportation in the country?

In Spain, maritime freight transportation has a greater importance compared globally, given that there are two of the largest ports in Europe in terms of volume of merchandise [29]. This sector has a very important influence for the country due to the large number of companies involved in maritime freight transportation and the high number of jobs and job opportunities that it generates. On the other hand, Sweden has the largest port of the Nordic countries in terms of container volume, the Port of Gothenburg. As in Spain, this sector involves a large number of companies and generates a large number of jobs. So this sector has a very important influence to the economy for both countries.

- Spain vs Sweden: What is the best option for intermodal land transport for maritime flows?

Both countries agree that the most used transport system to connect land and sea is road transport, which is of very high importance compared to the other modes.

On the other hand, road transport for both countries has the largest network comparing the other modes. It makes this transport system more fast and flexible to connect different locations. Exception, Rail shuttle network of Port of Gothenburg which due to his large traffic jump in the city this rail shuttle network connect the port with the different dryports in Sweden.

- If they are different: Would it be possible to change the option with the other country?

In addition, given the data provided by the different authorities in each country, it is possible to verify the trend of each mode of transport and its evolution over the years. It can be concluded, the different modes of transport tend to grow in a way slower than road transport. So road transport will continue to be of greater importance compared to other transport systems in both countries over the following years.

- What actors have been involved with and affected by this measure?
As it can be observed, during this Master Thesis many actors have been involved with this new regulatory change, most of them directly and other ones indirectly as well. In figure 2.4, is showed the connections between these actors and, moreover, in figure 2.6 the supply chain for maritime transportation taking the example of Maersk Group. The main actor affected is the Shipper who is the main figure in this law, nevertheless, the other ones have to apply different measures to reduce the impact of this new regulatory change.

- What are the main challenges for each actor i.e. forwarders, shippers and operators?

The main challenge for each actor is to reduce the impact of this regulatory change in their company and minimize the impact in their commercial activity. There are different challenges for each actor:

- Shipper: ensure that the weight is according to the certification of VGM
- Forwarder: offer to different actors new possibilities to manage this law.
- Operators: offer to shippers and forwarders a properly installations to develop their activity and provide new services.

- Have they applied any solutions?

These actors have applied solutions in order to manage this law efficiently. The main solutions that have been applied are related to offer new services at the terminal and to improve the information exchange between actors, which is the key to manage this regulatory change adequately. The answer of this question is based on the survey, showed in Appendix C, where it has obtained answer from the different actors involved e.g. Panalpina Sweden as a forwarder, Hutchison Ports as a terminal operator and Valencia Port as a infrastructure owner.

**Discussion & future work**

During this Master Thesis, it can be observed the importance of the maritime freight transportation and, furthermore, the importance of the other transport system in order to get a successfully supply chain. The infrastructure network of each country is essential to get it. In figure 2.6 shows the complex supply chain for maritime freight transportation, and the large amount of actors who are involved in it, so it makes more important this transport system. Hence, when a new regulatory change is gonna be implemented the repercussion of it could be several from some of these actors. In this case study where VGM is analyzed as the latest regulatory change, the different stakeholders have managed it with their own experts in their companies. It has already emphasized in the importance of the information exchange between the actors involved or could be involved with this change and it has created a new possibility to offer new services, generating a new income, and improve their own business.

Nowadays, the new technologies are improving constantly the different systems around the world, hence new regulatory changes will be necessary to be implemented in order to maintain the safety in these systems. To get a successful manage of it, the collaboration between the stakeholders will be necessary to achieve it. VGM has been implemented to ensure the safety in the navigation of the vessels and guarantee that the shipper will pay the quantity that will be transport through the maritime transportation.
Bibliography


## Appendix A

### Table 5.1: Total Container Transport Spain (Tonnes) [7]

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Table 5.2: Total Container Transport Spain (TEUs) [7]

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Table 5.3: Total Container Transport Port Authorities (Part 1) [7]

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<td>53,622,184</td>
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Table 5.4: Total Container Transport Port Authorities (Part 2) [7]

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<td>1.142.912</td>
<td>5.534.741</td>
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<td>7.326.436</td>
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Table 5.5: Total Container Transport Spain (TEUs) [7]

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<th>Year</th>
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<th>Maritime-Rail</th>
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</thead>
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<tr>
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<td>2008</td>
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<td>9.718</td>
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<td>11.051</td>
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Appendix B

Table 5.6: Total Container Transport Sweden (TEUs) [9]

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<th>Year</th>
<th>TEUs</th>
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Table 5.7: Volumen freight, railway transport Sweden [9]

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<td>2009</td>
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<td>2010</td>
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<td>2011</td>
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<td>2012</td>
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<td>2013</td>
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Table 5.8: Volumen freight, road transport Sweden [9]

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<td>2013</td>
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<td>2014</td>
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Appendix C
SURVEY
“Impact of Regulatory Changes”

The aim of this survey is to collect information in order to get a better understanding of the different impacts that the actors involved in maritime transportation experience when a new regulatory change is implemented. Moreover, this study will assess the solutions and strategies the actors propose in order to minimize the impact on their work. This survey is a part of a Master Thesis within the Department of Transport Science from Royal Institute of Technology, Stockholm, Sweden.

The supervisor of this Master Thesis is Dr. Behzad Kordnejad and the examiner is Associate Professor Albania Nissan.

The student in charge of this survey is Luis Blanco Munuera.

Name of company/organisation:

Person answering the survey:

REGULATORY CHANGES

The first part of this survey is about the general regulatory changes within international maritime transportation that have been applied during recent decades. These regulatory changes are made for different reasons e.g. limitations of CO2 emissions, safety at sea, operations efficiency etc. These changes have a direct impact on some actors, whereas there are indirect impacts on other actors as well.

Please respond to the following questions from your and your organization’s perspective regarding regulatory changes in general within international maritime transportation:

- Question 1. Please describe the common preparation process when a new regulatory change is to be implemented.

- Question 2. When a new regulatory change is to be implemented, how is the effect on your organisation and its financial performance commonly anticipated?
- **Question 3.a.)** If your organisation is an infrastructure manager/owner, do you have contact with operators affected by a certain regulatory change in order to know their new necessities or demands?

- **Question 3.b.)** If your organisation is an operator affected by a certain regulatory change, do you experience that you have possibility for good dialog with infrastructure manager/owner in order for them to get your organisation’s perspective?

- **Question 4.a.)** How do you usually resolve new problems and issues associated with a regulatory change? Do you manage these tasks internally or do you acquire external expertise?
  
  - Own company  
  - Other company

- **Question 4b.)** Please elaborate on the reasons why you do these tasks internally or externally?

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**Verified Gross Mass**

The second part of this survey deals with the general regulator change called VGM (Verified Gross Mass), which is the latest regulatory change applied by S.O.L.A.S treaty. It was implemented the 1st of July in 2016 and it states that shippers are not be able to load the container onto a vessel unless the gross mass of the container has been verified and this gross mass must comply with the requirements according to the law.

- **Question 5.)** How has the effect of this new regulatory change been on your organisation?

- **Question 6.)** Please account for main problems as a result of this new law.

- **Question 7.)** How has the company managed this new law?

- **Question 8.)** Which solutions and strategies have been applied?

- **Question 9.)** Has this new law benefited your organisation in anyway?