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Defining Logistics in Construction project

Case: Watrec. Equipment Delivery from European Countries to Construction Site in Vietnam for Building Biogas Plant Project

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The construction industry is a complex area to deal with due to the nature of the industry itself. The related logistics management includes transportation, warehousing, inventory and packaging all of which are crucial factors in an efficient construction project planning.

This study was conducted on the logistics in a construction project with a special focus on equipment delivery on site. This study attempted to focus on the factors involved in construction logistics, give some approximate answers regarding transportation roles in logistics and help the case company, Watrec's, equipment delivery and import from European countries to Vietnam.

The mixed methods approach of quantitative and qualitative research was applied in this research for obtaining the primary and secondary data. The first step of the study was a literature review consisting of the theoretical background on logistics in construction planning, the roles of transportation and import to Vietnam. Interviews and measurements were conducted in order to collect the primary data which was the second step of the research. This data was to let Watrec know the real figures related to the cost and time of shipping their equipment to the construction site.

The findings could help Watrec in planning the purchasing and delivery of equipment to the site based on the estimated equipment delivery cost and time from European areas to Vietnam. Those aspects related to cost and time in transporting equipment to construction destination were also the influencing factors for choosing suppliers for Watrec. Furthermore, this study is helpful for construction companies as a review on the logistics involved in the building projects.

Keywords/tags (subjects) Logistics, Construction, Equipment Delivery, Transportation, Quotation, Cost, Lead time Delivery.

Miscellaneous (Confidential information)

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1 INTRODUCTION

1.1 Research motivation

Enterprises have assumed several innovative actions to enhance their logistics performance; due to the constant changes in society and the manufacturing structure. Logistics management is no longer regarded and treated simply as managing transportation and storage in the supply chain. Rather, most enterprises consider that their logistics operations play a significant role in optimizing their supply chain and developing their business. (Nyhuis, Peter, HasenfuB, Katja, 2006).

In general, logistics control is the integration of information and production flow from the original point to the consumer point to meet the customers' requirements (Stukalina, 2014, 5). Logistics is divided into inbound logistics and outbound logistics, which include transportation, inventory, warehousing, material handling, packaging, and quality control. Since logistics management is a part of the supply chain, the systematic logistics and transportation could improve business operation more effectively and reduce costs. (ibid., 5-6).

The logistics functions in the supply chain influence directly the financial performance of the company, especially from the on-time delivery aspect. To be specific, when material and information are not available on time in a project or construction site, technically, the contractors and employees are not working in an efficient way. The purchasing department keeps paying for those unproductive hours. The main reason leading to the failure of the delivery project is lacking information integration, inadequate communication, planning, and coordination between involves. Another major issue is the badly organized synchronization logistics activities interconnected to the project requirements. The restrictions create a late update in the project plan and cause inefficiently usage of project resources. (Robert Handfield,2017). Yet, understanding logistics operations in project implementation is important because it could help a company to fully use project resources and optimize costs and time in equipment delivery.

1.2 Case Watrec Ltd.

Watrec company is one of the biggest biogases for a waste solution in Finland who is planning to expand their market globally. Therefore, Vietnam has been chosen as a potential country in southwest Asia for Watrec Ltd. investing and providing their technologies as well as services. The company's goal is building bio plants in big cities of Vietnam to produce renewable energy for industry and transportation. (Watrec LTD.)

Watrec Ltd. is going to offer a technical solution for Vietnamese companies that including transferring technical and economic joint-treatment solution. They plan to transport equipment from their suppliers around Europe into Vietnam which are accounts for 45-50% of their supply chain for implementing this project. Thus, Watrec Ltd. needs to know the estimated lead time delivery and how much the transportation cost would be so that the equipment for constructing the plant would reach its destination in time. Moreover, understanding Vietnamese customs; as well as forwarding, and transportation system in Vietnam are the stepping-stones for achieving their targets.

However, the company size is small as they do not have a logistics department or a specialist in logistics. They use subcontractors or third-party logistics (3PL) to run their supply chain and delivery to the plant. Hence, comprehending logistics in construction planning and transportation could help Watrec make the right decisions in choosing suppliers and logistics partners to minimize both the money and time expenditure. This would bring benefits to Watrec Ltd. themselves as well as their clients in Vietnam and build up their partnership in the long run. (Watrec Ltd.)

"Watrec is always aiming at finding optimum solutions for clients", says Dr. Juhani Suvilampi, the Managing Director of Watrec Ltd.

1.3 Company description:

Watrec Ltd. is a Finnish environmental company whose core business is biogas technology and environmental and energy consulting. The company has been in business since 2003 and currently employs around 25 people around Finland. The main office is located in Forssa and another office in Jyväskylä. Watrec Oy launched its first biogas plant project at Huittinen in 2009.

The plants were built in Kuopio, Honkajoki, and Oulu. Moreover, the company is seeking for not only domestic projects, but also international growth. (Watrec Ltd.)

The building period of the biogas plant is on average 9 months and the plant is delivered to the customer on a turnkey basis. Each biogas plant is designed according to customer needs, but the main principle is the same. Watrec Ltd. describes their services as a figure 1. (Watrec Ltd.)

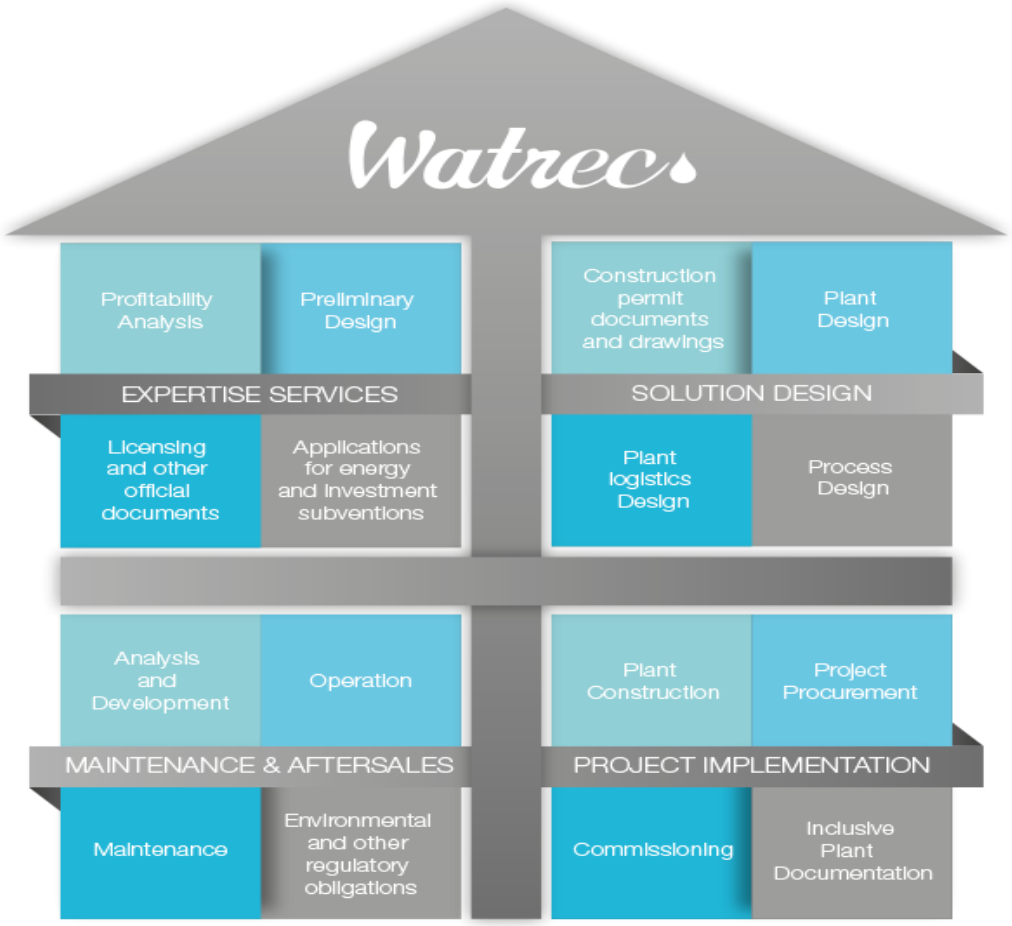

Figure 1. Watrec services. (Watrec Ltd.)

2 RESEARCH IMPLEMENTATION

2.1 Research objectives and research questions

The key research objective was to define the logistics in the construction project which was directly linked to Watrec's core product: building a plant for biogas treatment. To reach the core aim, the thesis identified the logistics characteristics in a construction project and highlighted the transportation impact on the logistics performance. In addition, the aim of the study was to describe the customs procedure, the Vietnamese forwarder, and transportation information in order to help Watrec Ltd. bear in mind how they could import the equipment from European countries to Vietnam. The focal point of the work was also estimating the cost and the lead time of the transportation of the equipment from the supplier countries to Vietnamese ports.

To accomplish these objectives, these research questions were addressed in the study:

i. What is logistics in project construction planning – which elements are involved?
ii. Which aspects do companies need to consider when they import equipment to Vietnam?
iii. How much does it cost and how long is the lead time for delivering the equipment from Europe to Vietnam?

Due to the fact that the thesis focused Watrec's concerns and because some data was provided by Watrec, any investigation, and recommendation only valid to this case. Although the logistics aspect was an interest to the company, the theoretical background of the study could only partly discuss logistics in construction planning; the logistics in Vietnam including core information of aspects related to delivery from Europe to Vietnam and table of prices. Since, the purchasing plan, shipment plan and warehousing plan for Watrec's project are going to be scheduled based on the cost and time of delivery equipment from European countries to Vietnam. The author, especially, focused and analyzed those values in the research implementations.

2.2 Research Methodology

2.2.1 Qualitative, quantitative and mixed methods

Quantitative research is a type of research which is based on a statistical methodology (questionnaires, surveys, rating scales, checklist) for collecting, analyze and integral close-ended information (John Dudovskiy, 2018). The quantitative approach involves mathematical calculations in order to measure variables based on each object and analyze their relations statistically. The final purpose of the methodology is to generalize research results through random distribution and representative sampling. On the other hand, the quantitative method is capable of providing data to describe the featuring distribution of a general research, survey and determine the causal relationships. (ibid.)

However, this method has some disadvantages. It cannot clarify the phenomena related to the human aspect, and the result can be affected by different elements that sometimes decrease the objectivity of the research. Moreover, there are many ways of explanation for an understanding of a standard scale.

“Not everything that can be counted counts and not everything that counts can be counted” (Albert Einstein).

On the other hand, **qualitative research** mostly involves collecting data through words, text; and behaviors (interviews, observations, documents, filming, and recording) with the aim of describing and analyzing features of a group of objects from the personal points of view. This method consists of approaching and illustrating based on experiments, awareness, behaviors, and attitudes. The data in such research is qualitative data. It is used to answer the questions: how? what? and why? In addition, qualitative research still takes advantage of numerical data to support analyses and arguments only. (ibid.)

Qualitative methodology points at some specific purposes in a study reflected by some specific elements of a general research. It is practiced in learning, discovering the essence of a research subject, so that the respondents are not required to follow available answers and it normally uses open questions to stimulate the subject, in

order to reach the heart of the argument. The problem is that it would be hard to approach experts for interviewing.

Practically, the quantitative and qualitative methodologies can be completely combined and applied in the same research process, and this is called **mixed methods**. In a project, we could initiate with either quantitative or qualitative method. While the quantitative approach may generalize the results of a statistical analysis, the qualitative one helps to prove the presented results with the opinions of the expert or evidence from real-life situations related to the mentioned object or subject. The aim of combining methods is to study different aspects of the same topics or to perceive complex phenomena from different perspectives. The two approaches support each other and reduce the restrictions in each method and to cross-validate data which is described by Golicic and Davis (2011, 731) in figure 2.

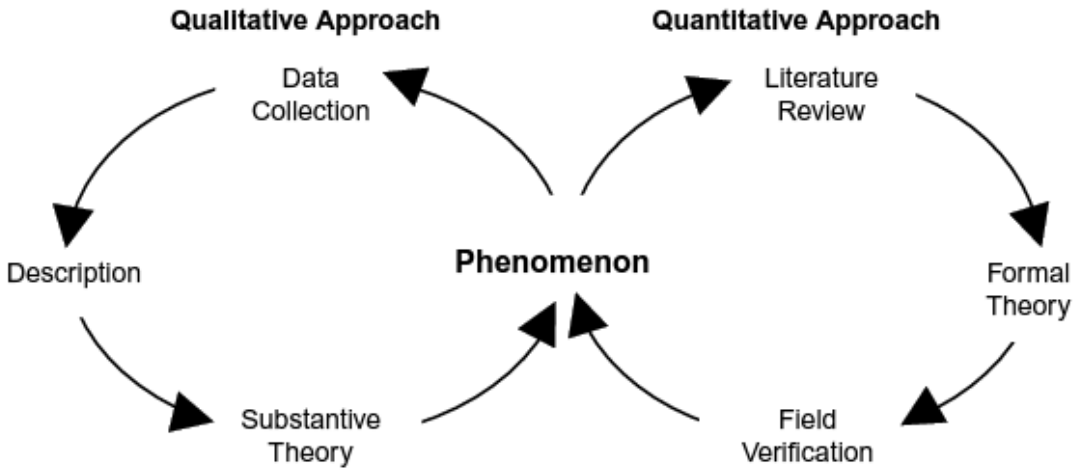

Figure 2. Mixed research design. (Golicic & Davis 2011, 731)

2.2.2 Data collection

Data collection is a significant phase to the research process. It is a process of collecting information from all the relevant sources to find answers to the presented

subject or evidence to clarify or demonstrate the hypothesis. Yet, data collection takes time, effort and costs of money, therefore it is required to make sure the data collection methods in order to select out a suitable method for the phenomena doing a base for data collecting plan to get the highest efficiency for this stage. There are two categories of data collection: secondary data and primary data. (Trần, Trương, Lương & Nguyễn, 2009)

Secondary data collection

Secondary data is a type of data that had been collected by other people using for the purposes which may be different from our research purpose. Secondary data could be not-processed data (raw data) or processed data. In other words, secondary data is not collected directly by the researcher. For that reason, many researchers or students could underestimate available secondary data; hence we need to consider the rationality of secondary data source to our research subject before conducting data collection. (ibid.)

The pros of using secondary data are to save time and money cost. Nevertheless, available data collected for other research could be different from our intention and could not be suitable for our issue. It is also difficult to categorize data, and variables and unit of measurement could not be matched. Normally, secondary data has been processed that makes it hard to validate the accuracy and the confidence level of data sources. Therefore, the responsibility of the researcher is to guarantee the accuracy of the data, it is needed to verify that all the original results were based on secondary or primary data. (ibid.)

Primary data collection

Primary data is whole new data which is collected for the first time by the researcher. In reality, when secondary data is not capable of meeting our need or the available data is not available, it is necessary to collect data by ourselves to make it suitable for the presented research. (ibid.)

Primary data aim to resolve the posed problems urgently and timely. The obvious advantage of this type of data is the high level of accuracy because of directly information collecting. However, primary data should be getting through a process of

practical research, therefore primary data collection takes more time and money cost. As a consequence, the researchers need to consider when to apply primary data collection and select collecting methods efficiently to limit this con. (ibid.)

2.3 Research design

The researcher understood the Vietnamese customs, as well as culture, are an advantage to conducting this study. Essentially, this study has been done to deal with the specific situation of Watrec LTD. The author firstly had a meeting with Mr. Kimmo Tuppurainen – Sale Director at Watrec and discussed which areas and results that Watrec wished the researcher reviewing on and delivering to them. Following the fact that was the first time for Watrec building the plants in Vietnam, it was crucial to be aware of the cost of time and money for importing equipment supplied from Europe suppliers comparing the equipment prices supplied from local manufacturers and some aspects related to them. However, there are approximately 50% of the project budgets that was for the purchasing equipment around Europe, the research subject was then narrowed down and focused on the equipment delivery from Europe to Vietnam of building plant project.

Secondly, the researcher conducted selecting and categorizing secondary data for the literature review which should be involved directly to the research topic. Documents have been one of the main sources for data collection (ibid., 138-139) which are in various types such as written documents, movies, videos, radio program but the author mainly used printed books, articles, and journals from online sources for collecting data in chapter 3,4 and 5 in order to answer the research question i. and ii.

Due to the realistic case characteristic, the author desired to access the data contained a practical value in real time. Thus, she collected the primary data by interview and measurement at the third step of the research for chapter 6 and 7, among that chapter 7 responds for the research question iii.

Finally, thanks to all the collected data, the author could do an analysis and a comparison to send a final result and a conclusion; as well as her own perspectives about the case to the company. The thesis design was detailly processed in figure 2.

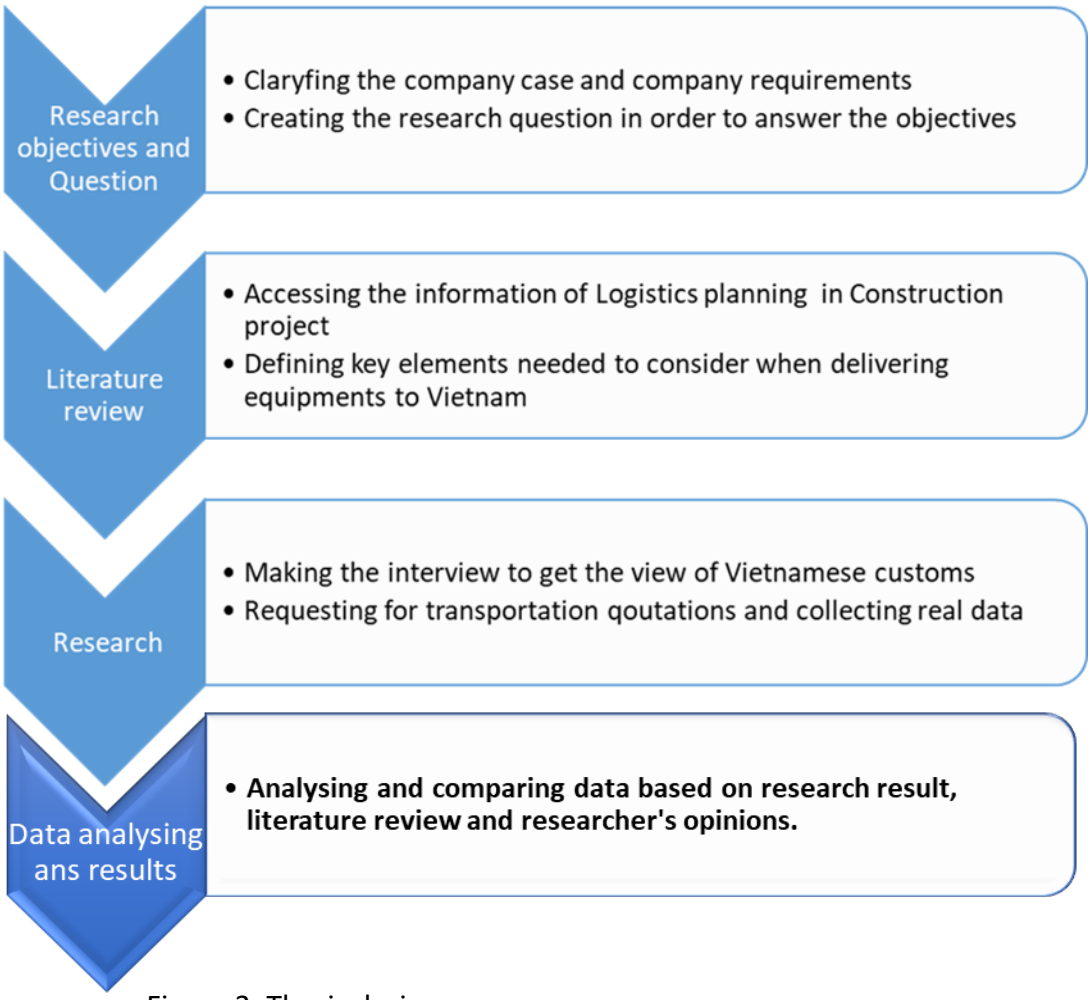

Figure 3. Thesis design

3 LOGISTICS IN CONSTRUCTION PLANNING

3.1 Logistics management

The logistics in construction is one of the most complex phases in the construction industry. How to plan and integrate all the logistics activities in the movement of materials, equipment, and goods from site to site has always been a significant concern of enterprises. However, most of the construction projects are suffer from redundant activities, which creates consequences for the overall productivity and efficiency (Almohsen & Ruwanpura, 2011). The reason for that is often inadequate management of planning logistics and transportation. This leads to increased cost

and time in the projects. This chapter explains which contributing factors are involved in the logistics of a building project.

Logistics management is part of the supply chain management: it is a process shaped to meet the customer requirements and the industry standards from origin to destination, embracing planning, implementing and controlling the effective procession and storage of goods, services, and the related information. (Kenneth W. Green, Gary Dwayne Whitten & R. Anthony Inman, 2008)

Logistics management concerns several components in order to assist the companies to scale down their spending and improve their customer service. It consists of choosing the best logistics actors such as suppliers and other 3PL that could provide their infrastructures, choose the best itinerary, and the most efficient way of transportation, as well as the most functional information system to master the process. (ibid.,318)

3.2 Material logistics planning

Material Logistics Planning (MLP) is characterized as a plan that involves logistics management along with resource and costs management to direct material flows in a construction project, especially in the big ones. MLP gives companies certainty and costs predictability from the project conception to its execution. There are several steps for setting up the MLP. Importantly, a project team has to identify the raw materials and how much the project requires, as well as how to procure them, and store them. All the supply chain actors involved the need to be included in the MLP. If these steps are considered well, the project costs will be more predictable, and it could avoid some wastes and extra costs. The companies must focus on the importance of Material Logistics Planning in construction projects, which is certainly a major tool for being effective.

3.3 Logistics techniques

Construction consolidation center

Construction consolidation centers are used to store materials that will be supplied for multiple sites. The Construction Consolidation Centers (CCCs) are ideally located next to highways or major routes and they allow companies to fluidize materials and goods flow, depending on the customers and construction site demands. Thanks to the location and the organization, it is noted that the CCCs gives a 6% productivity gain as the average time gain is about 30 minutes per day. (Greger Lundesjo, 2011)

This technique enables lower material wastes (from 7% up to 15%) by preventing quantity order mistakes. Furthermore, that kind of infrastructure permits reversing logistics as a vehicle would go back frequently to the CCC cutting the wastes and bringing back the materials that were not used. Same for the excess packaging could be trashed from the CCCs instead of staying waste on the construction site. It also reduces the distance between the center and the construction site. This can mean up to 70% in freight traffic to the site as well as late deliveries with the more efficient utilization of delivery vehicles. It is, hence, environmental-friendly because it reduces CO2 emissions and traffic congestion around the cities (for cities construction projects) and scales down the noise pollution. Figure 4 describes the idea of the CCC. (Lundesjo, 2011)

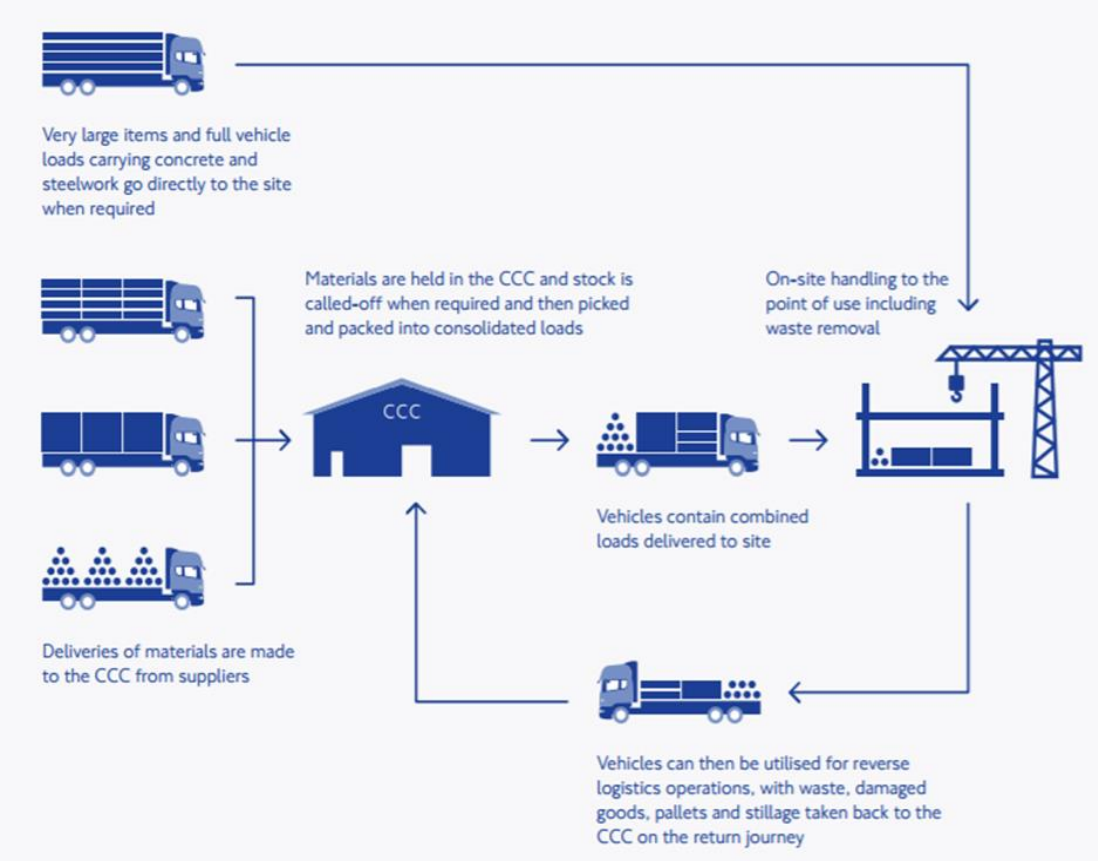

Figure 4. The Construction Consolidation Centers organization (APPPM)(Greger Lundesjo, 2011)

Demand smoothing

The Demand smoothing consists of having a global vision on the construction project and the supply chain to see how and which level could be smoothed to scale down several resources such as transport, goods, and workforce (WRAP, Material Logistics Plan good practices guidance 2007).

On-site marker places

For some construction projects, the site is big enough to provide a temporary warehouse or storage space nearly the site. This solution is called an on-site marketplace which is built to stored tools, materials and goods delivered from each supplier when they are needed. Besides that, that equipment and materials will be distributed to site follow the project plan and refilled at low inventory by a storeman.

This technique increases productivity and affects the cost reduction by mutualizing one storage place for all equipment and materials. (WRAP, 2007).

Pre-assembled and Offsite Fabrication

The materials for the construction should be pre-assembled and offsite-built in advance before they arrive at the site. Delivering packages of pre-assembled parts avoid the wasting time on site for assembling and decline the wastes like the packaging on the construction site. Pre-assembled and offsite fabrication also increases the work quality and it requires less transport (WRAP, 2007).

Just-in-time (JIT) delivery

Just-In-Time (JIT) delivery is a system created to decrease transportation costs as low as possible. The material and equipment are stored off-site and only delivery to the site when they are required (The Role of the JIT Delivery System in Manufacturing Logistics, 2018). This technique helps to avoid extra storage on the construction site, the low inventory and reduces the risk of errors. It requires to know perfectly how long it takes for every step of the supply chain to do JIT without delays. It could be done through Construction Consolidation Centers for example, as they distribute materials in a right time, to the right place and in the required quantity (WRAP, 2007).

3.4 Critical aspects effect to logistics performance

The logistics process contains numerous steps and participants, making it very complex. The logistics performance of a company measures its productivity and efficiency, including all the quantitative and qualitative aspects (Hwang, D.W., Hong, P.C. and Lee, D.Y., 2017). We identify the factors that affect the logistics performance on these aspects. If some research has been done about performance in the global supply chain, we will focus on construction logistics in particular. However, all the aspects need to be examined. Here are the key elements.

Logistics processes

The first factor that affects the logistics performance is the overall management of the logistics process. The manager should identify the improvement areas, and each

area must be measured with the suitable data. Then, she/he takes the most effective decision and put it in action at the right moment. This is mostly done thanks to an efficient information system.

Nowadays, it has become essential for companies detecting their current operations to fix a problem at any steps of the logistics supply chain. The system should be able to track and trace the shipments, collect all the information about the materials, and other data inside or outside suppliers of the company (Yacoub, 2017, 3). Thus, the communication network system has to be technologically advanced as it plays directly on the productivity and logistics performance of the company, as well as on its competitiveness.

Paperwork process

The paperwork could also be a factor that effects on logistics performance. The trade and transport facilitation is initiative from governments and the customs documentation. It has a direct impact on the management of international logistics processes due to different regulation. However, those customs clearance is less uncomplicated nowadays thanks to globalization and modern technology. For example, some customs process could be done faster and easier by filling online in electronic forms allowing companies to minimize the costs and shorten the time.

Logistics suppliers

Finally, choosing logistics suppliers is an important aspect need to be considered in logistics performance. Indeed, there are some companies that could not provide all logistics services themselves especially in small and medium size company. Therefore, buying services from third-party logistics or fourth party logistics would be the most productive way for them to intensify the whole logistics process. The companies enable to further focus on core competencies and delivery the qualified customer services.

3.5 Third-party logistics (3PL) and Fourth-party logistics (4PL)

3.5.1 Introduction to 3 PL and 4 PL

A third-party logistics model involves three factors including a manufacturer, a customer and a shipper or 3PL firm. The Third-Party Logistics (3PL) is known as a company that arranges physical logistics services for a customer such as picking, packing, warehousing, transporting, freight forwarding, customs operations, fulfill orders or cross-docking, dealing directly with the service providers (Understanding the Difference Between 3PL and 4PL, 2017). These services are scaled to the demand of the client to meet its needs. For example, UPS is a 3PL based on transportation while Caterpillar Logistics is a 3PL based on storage & distribution.

According to Susanne Hertz and Monica Alfredsson (Strategic development of third-party logistics providers, 2002), four types of 3PL could be distinguished and listed below

- The standard one who provides picking and packing, storing and distribution.
- The service developer who offers extra services such as cross-docking, tracking of the goods or other more specifics demands.
- The customer adapter who manages almost all the logistics activities in the large domain but does not develop the business of the customer.
- The customer developer who control the whole logistics activities and scales exactly the customer's demand to meet all its needs, respecting strictly all its processes in terms of quality and safety.

In contrast, a Fourth-Party company (4PL) supplies end-to-end solution to the customers as it can arrange all the aspects of the entire supply chain. The added-value includes precise information systems, new technologies, business planning, consultancy, project management, and other services which help 4PL preventing from mistakes and allowing them adapting to a specific situation (Understanding the Difference Between 3PL and 4PL, 2017). Furthermore, the 4PL would buy the service from the 3PL company and hand over them to their clients including their own

services which could serve the most suitable, efficient and comprehensive supply chain solution for their customer's business. For instance, DHL and Deloitte are 4PLs as they can arrange the entire supply chain of a customer's business.

3.5.2 Benefits of 3PL and 4PL

The 3PL and 4PL are more productive in manage logistics or whole supply chain compared single company who is not specialized in logistics. The most benefit what 3PL and 4PL bring to their customer is their various connection with shippers and suppliers. This network advances the 3PL and 4PL picking quickly and correctly a solution that would be the most for the client. (Elizabeth Scolari, 2018).

Thanks to 3PL and 4PL, small and medium size company does not have to invest in equipment, truck or infrastructure, for example, warehouse or distribution center. In addition, companies could save their budget and time in hiring staffs to work on logistics department. Moreover, the assign of logistics operations (3PL) and the management of whole supply chain (4PL) allows the customer to get strategic advice on top of getting operational support and concentrate in their core business. (Elizabeth Scolari, 2018).

4 ROLES OF TRANSPORTATION IN LOGISTICS

4.1 Economical role of transportation

Transport is defined as "The activities involved in moving supplies from point of origin to internal customers or beneficiaries" in the context of humanitarian organizations. The main purpose of transport is physically transferred supplies to their destination on time, effective cost and a reliable and safe manner (Justin White, 2015).

Transportation takes a vital position in the logistics process from inbound to outbound logistics that occupies approximately 30 percent of logistics cost that is a scale for logistics efficiency performance. Thanks to the trend of nationalization and globalization, the transportation modes have been developing in a colossal way. Thus, choosing the right transportation mode is one of the key elements for

determining the moving products. That choice depends on which goods we are going to ship and should be considered on these several main criteria: transport distance, time of delivery, goods value, physical characteristics of goods and special requirements. Figure 4 describes the shipping advantages and disadvantages by modes that could support a logistics firm pick up the right ones.

MODE / CRITERIA	ROAD	RAIL	SEA	AIR
Relative speed	Moderate	Moderate	Slow	Very high
Reliability	Good	Good	Limited	Very good
Cost per ton/km	Medium	Low/medium	Low/very low	Medium
Flexibility	High	Low	Low	Medium
Other Considerations	Extensive network	Limited and fixed infrastructure	Restricted network	Limited network
	Short and medium distances e.g. Europe/Middle East. From a neighboring country to the operation site. Internal transport. Short/medium distance	Large consignments. From the port of discharge to the inland operation site (warehouse). Ecological.	Large quantities; Less urgent; Prepositioning phase; Long distance with no time constraint.	Emergency phase; Expensive goods; Fragile or perishable goods; Cold chain; No alternative option; Small shipments; e.g. diplomatic pouch; Long distance with a time constraint
Advantages	Relatively fast; No transshipment; Direct delivery; Flexible; Cost.	Economical; Large loading capacity; Range and speed (in most countries).	Economical; Large loading capacity; No restriction on loading capacity; Cheap.	Fast; Reliable; Limited losses; Direct; Easy tracking and tracing.
Disadvantages	Roads may be dangerous (landmines) or blocked (rainy season); Sometimes, driver's nationality or vehicle registration not acceptable.	Difficulty finding freight cars; Delays; Transshipment; Inflexible; Tracking.	Slow; Transshipments at ports; Use as a second means of transport for large volumes; Higher theft risk in the port; Not flexible	Expensive; Restricted to journeys between airports; Restricted loading capacity (dangerous goods, size of shipment, weight, fuel, size of packages, etc.).

Figure 5. The comparison matrix for different modes (Justin White, WFP Transportation Manuals, 2015)

Transportation plays a key role in logistics. It is obviously considered as the major link in the chains because of its impact on the final product's price. The transport costs represent between 5 to 10 percent of the delivering finished product value. It varies depending on products: the volume, the weight, the value, and the destination. That is why it is crucial for the supply chain managers and the logistics players like carriers, forwarders or shipping companies searching for the best economical compromise. For some situations, it could be defined as if a company transaction is profitable or if the customer is losing money in purchasing product from the company. (CSCMP, Thomas J. Goldsby, Deepak Iyengar, Shashank Rao,)

According to the Council of Supply Chain Management Professionals (CSCMP), transportation represents about 30% of the total cost of logistics activities. It is even higher in developing countries such as Vietnam if the infrastructures are poorly maintained. Figure 6 is the cost ratio of logistics items in the world (Chang, 2000s). As we can see in the figure that the transportation portions 30% were almost six times larger than the movement portions 7 % and ordering portion 5%. This transportation ratio was approximately equal a total amount of inventory and warehousing ration and accounted for one third the cost ration of logistics items.

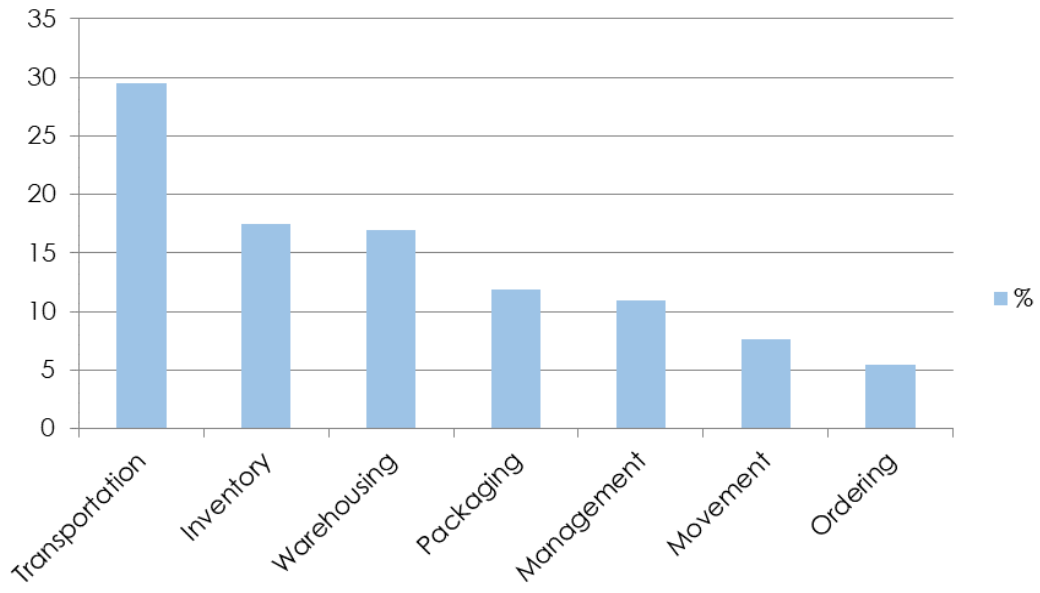

Figure 6. Cost ratio of logistics items in the world (Chang, 2000s)

4.2 Management and quality role of transportation

The complexity of transportation makes the actors of the supply chain maximize their efficiency in order to avoid any mistakes and it is only possible with a nearly unfailing management. They need to guarantee that the processes concerned in the planning and coordination of the transportation are reliable and safe along with building customer relationships and partnerships. Transportation plays a role as a bridge between the producer and the customer. If a company is not able to ship his product the customers properly in time, the company would get bad feedback from them. In other words, transportation reflects the quality and efficiency of the management as well as supply chain management. For instance, if a delivery is late or goods are damaged during the delivery, it will be a source of complaint or be a reason for a customer to change to a different supplier for the next purchase. The reliability of shipping information is also important, as the customer likes to know the tracking of the goods in real time, providing the tracing of product delivery is one of the best ways to gain the customer's reliance. (Thomas J. Goldsby, Deepak Iyengar, and Shashank Rao)

5 IMPORT TO VIETNAM

5.1 Customs procedure

Customs clearance procedure is followed by specific facilitation instruments such as the Single Administrative Document (SAD), the World, Customs Organization (WCO) Harmonized System Code, and the WTO Customs Valuation Agreement. (Ruth BANOMYONG, Vinh V. THAI, Kum Fai YUEN,2014,44- 45).

Nowadays, we could apply for the customs clearance process online based on an automation system implemented to simplifying the clearance process. In order to import goods, the enterprise must provide those documents listed Bill of lading, commercial invoices, packing list, certificate of origin, cargo release order, customs import declaration, inspection report, and SOLAS certificate. Once all the shipment information and original or faxed copies invoices are collected, we use the electronic declaration software Ecuss / Vnaccs and log in to the account of the company, for

example, SAIGON FNB Co., Ltd to declare data transmission to the customs office. After the declaration is completed, we will receive a number from the system, it is considered as a step of submitting the completed electronic declaration, then, we wait for the feedback from customs authority. There are three channels Green, Yellow and Red for the cargo categories. Green channel is used for the cargo clearance without inspection. While yellow channel works for cargo need documents clearance (scanned original documents) at the customs office point. Whereas Red channel is used for cargo clearance with the inspection. In the case that the cargos are put in the red channel, the border compliance for import contents 3 components. Firstly, the import clearance and inspection required by customs authorities take 16 hours. Secondly, Clearance and inspection required by agencies other than customs are handled in 8 hours. Finally, the port or border handling is completed in approximately 32 hrs (A Work Bank Group Flagship Report, 2018).

5.2 Logistics providers

The Logistics industry has been growing fast in Vietnam which is accounted for 20% of GDP in Vietnam and calculated the growth at a stage faster than the GDP's growth. However, the role of Vietnamese authorities involves in logistics segment need to be clarified since it creates a lot of confusion for both the development of national logistics strategies and logistics companies (Ruth BANOMYONG, Vinh V. THAI, Kum Fai YUEN, 2014, 45). According to World Bank (2014) Logistics in Vietnam is cumbersome and uneasily understood government inconsistent, interpretation, implementation, and regulation which interferers in developing logistics competitiveness in Vietnam. Additionally, the undeveloped and poorly maintained of transport infrastructure has a high impact on the logistics cost.

The Current major logistics areas are Hanoi (north) and Ho Chi Minh (south) where the outsourcing trend is categorized into three group as follow

- Primary logistics services are outbound and inbound logistics such as loading, unloading goods into vehicles and vessel, transportation, warehousing, inventory, customs clearance procedure, vendor and order management reverse logistics, and climate-controlled logistics.

- Logistics services specialized only in the transportation domain
- Other services related logistics services like quality control, technical check and inspection and redistribution and delivery of products.

Logistics suppliers are available both in domestic and international areas. Although they are one of the actors to catalyst the national and global trade of Vietnam and present multiple services, there are still considerable limitations in domestic logistics comparing to international sectors in this domain (Ibid., 46-47). Specifically, the main service is a domestic container for inland goods transport offered by local logistics providers. The service quality is rather low and unpredictable times because of unequipped tracking and tracing for cargo. Since freight flow monitoring would be beneficial for both logistics providers and their customers like Vietnamese producers and traders in reducing cost and saving time but not many logistics suppliers could able to provide that service. (ibid.)

According to Vietnam Freight Forwarder Association (VIFFAS), the number of freight forwarders in Vietnam is nearly 1,200 but the available labor forces who are specialized logistics knowledge could only accommodate 30% of the demands (transportation,2013b). The Large of them are small and medium-sized- private companies with lacking resources and limited owner's equity. While State-owned companies have the advantages in experiences, capital, large warehouse, and well-equipped facilities but lacking technology (IT), know-how and efficient business plan. Sum up, those limitations lead to the difficulty in providing added value for logistics and the competitiveness of Vietnamese logistics providers within domestic markets and global markets. (ibid.)

5.3 Transportation in Vietnam

This subchapter provides the existing transportation infrastructure and reflects the current capability in order to support trade and logistics activities. Vietnam's transport infrastructure has been improved and expanded significantly. However, the development of transportation remains limited in terms of capacity and capability for the social growth and economic needs in Vietnam.

Road Transport

Road transport has remained the first option of domestic's consignors in Vietnam due to its flexibility, with the lengths of 258,200 km across Vietnam. From 2006 to 2012, the usage of road mode for goods shipping increased by 10% serving nearly 75% all freight transport and over 90% of passenger transported (General Statistical Office of Vietnam). However, it is only 19% paved and 40% of them in poor condition. Most of the road infrastructures were built a long time ago which have not gotten enough maintenance or improvement works (General Statistical Office of Vietnam). In certain provinces, there are traffic bans to decongest roads around the big cities. Some specific bans also prohibit containers haulage because of the poor road condition and the bridge limitation. In terms of an available transport vehicle, there are vans, trucks and an articulated vehicle like 8-14-wheel combination of tractor and semi-trailers which the large proportion of the commercial trucking fleet is rather old. (Ruth BANOMYONG, Vinh V. THAI, Kum Fai YUEN, 2014, 32-39)

Moreover, Vietnam's economic growth has a negative impact due to the lack of a well-connected road infrastructure between industrial zones, seaports and key population center. Thus, it is very important for the government and provinces push the investment in a quality network, especially, the main highways and roads from hubs in provinces to the main seaports such as Hai Phong port, Da Nang port and Cat Lai and some neighboring country's border like China, Cambodia and Lao PDR to growing both domestic transportation and the international trade. (General Statistical Office of Vietnam)

Inland Waterway transport

According to the General Statistical Office of Vietnam, the inland water has a vital role in transportation in Vietnam with nearly 17% of the global volume of cargo in 2012. There are more than 200 river ports, 8000 landing stages, more than 40 seaports and more than 200 terminals in the country which able to make up for approximately 20% of cargo transport and 5% all passenger transport. The main routes from seaports to hinterland are Saigon - Rach Gia, Ha Tien, Saigon - Can Tho - Ca Mau (south) / Haiphong - Hanoi, Nam Dinh - Viet Tri (north). The big advantage of this mode is the price compared to the capacity of the carriage, which is quite cheap

compared to road transport. Nevertheless, waterways transport could be more exploited to relieve more congestions.

Sea transport

Vietnam is composed of 3260km of coastline (UNCTAD), with several 141 seaports and 841 vessels fleet, whose 65 container ships (UNCTAD (2014), VINAMARINE (2014a), VINAMARINE (2014b)). It represented about 0,7% of the total volume cargo in Vietnam decreased almost 2% compared with the percentage in 2006 (ibid.). Ocean transport also plays the first position in the external trade. The largest and most efficient seaport of the country on this day is the Saigon Vung Tau seaport organization, handling approximately 70% of the foreign trade. Yet, the quality and quantity of the infrastructures are still in a poor condition to meet the growth needs. Most of them have been built before 1939, so they are now outdated and not suitable for nowadays big vessels width and underwater depth. (ibid.)

Nevertheless, it is noted an investment effort from the authorities to seaports infrastructures, with the constructions launches in the ports of Saigon (Saigon New Port), Cai Mep and Haiphong in 2010, helping the country to handle most of the biggest container's vessels, thus, to meet the needs of the increasing trade. Some maritime companies such as K-Line or OOCL also added Vietnam main ports to their international routes. (ibid.)

Figure 7. Map of Vietnam

Rail transport

Rail mode plays a minor role in the global transport system in the country, only 7% of the global volume cargo in 2012. Currently, the railway network is long 3200km (the Netherlands worldwide) and about 260 train station. The two main routes for container carriage are Haiphong - Yen Vien - Viet Tri - Lao Cai, and the North-South route. The rail network includes of various operation lines such as 1,435m wide standard-gauge (5%), 1,00 m wide narrow-gauge line (85%) and mixed gauge (10%) which is summarized in figure 6. The limited weight per freight wagon is 60 tons on standard-gauge and from 25 to 40 tons for 1m gauge. (ibid.)

Gauge specification	**Total distance (km)**
1000 mm-gauge	**2,632.249 km**
1435 mm-gauge	**222.206 km**
Mixed gauge	**292.183 km**
Total	**3,146.638 km**

Figure 8: Railway system in Vietnam. (Vietnam Railway Authority, 2014)

There are only 500 are flatbeds wagons to carry containers among a total of 5000 because of unwell equipped containers handling systems in the train stations across Vietnam. Most logistics companies prefer shipping goods or cargo by road for the flexibility and reasonable price since the rail mode give incompetent combined unpredictable and long transit time. (ibid.)

Air transport

Air mode is not popular for freight delivery in Vietnam, with less than 1% of the global volume of cargo. The system is composed of 7 international airports of total 23 airports supervised by the Civil Aviation Administration of Vietnam (CAAV). The main airports are Noi Bai in Hanoi and Tan Son Nhat in Ho Chi Minh, where most of the logistics services are made. In a limited capacity, these airports are equipped of controlled temperature warehouses for perishable cargos as well as dangerous goods, allowing them to deal with all kinds of goods. The country's planes fleet is that limited that most of the airfreight is transported in belly cargo passenger aircraft (only 10% carried in freighters). (ibid.)

According to BMI, the freight volumes shipped by air has increased by 9,2% in 2017 (257,540 tons) and will increase by 8,3% in 2018. The CAAV recently opened the rights for international freight services to the Association of Southeast Asian Nations countries (ASEAN), which is composed of Indonesia, Thailand, Singapore, Malaysia, Philippines, Myanmar (Burma), Cambodia, Laos, Brunei (and Vietnam). However, only Vietnamese agents of the Airport Corporations (Southern, Northern, and Centre) are allowed to handle freight on the aircraft loading area and to do storage in the airport.

6 CUSTOMS RESEARCH

6.1 Interview Implementation

Exploring the experience and subjective views of interviewees by asking the question is the primary data collection (Whipp, 1997). The interview aim was to elicit questions related to the study objectives. Thanks to that the reader could understand the real situation of customs and forwarders in Vietnam lying on the answer from the logistics provider perspective.

Obviously, the quantitative and qualitative information is collected by asking questions from the public. This is a flexible tool that the interviewer has an advantage of organizing a structured format. Then, the respondents could easily follow and reply. However, this method requires a lot of times to design the

questionnaires as well as skills to able to interview people for getting a true reply (Nicholas Walliman, Research method). The author chose open format questions where the respondents could feel free to answer their opinions and experiences. There were eight main questions divided into two parts: Vietnamese's customs and freight forwarder.

The author had a small discussion with her personal contact who is responsible for the import and export products for international companies and connects to many reputations local forwarders. After all the considerations, the author chose three forwarders. The two private business forwarders (Blue Water Shipping and K- PEX Logistics) were contacted for requesting quotations and the state-owned enterprise VOSA group Saigon was to interview. The reason for that was VOSA group have been experienced in this domain for 30 years and have abundant staffs.

The researcher contacted Mr. Le Hong Thanh VOSA's presentative by phone and was arranged to have a non-physical interview. The interviewee would like to receive the question table listed below, answer them by writing and send them back by email.

Part 1: Vietnamese customs

- Question 1: How are the Vietnamese customs in general?
- Question 2: What are the procedures for a foreign company who wants to import equipment to Vietnam?
- Question 3: What are the advantages and drawbacks for importing product to Vietnam?
- Question 4: How long is the customs clearance process?
- Question 5: What is the advice for foreign business who wants to import and do the customs clearance in Vietnam.

Part 2: Freight forwarder

- Question 1: How is the important of forwarder in helping to import equipment to Vietnam?
- Question 2: Why should foreigner business use the local forwarder?
- Question 3: What kinds of service do the forwarder provide?

6.2 Result and analysis

Import customs in Vietnam

According to Mr. Le Hong Thanh, the customs in Vietnam always strictly control the tax policies and import policies. The customs authorities often change the policy regulations to increase tax revenues. That leads to the limitation in order to help the foreign enterprise import their products or machines. Custom officers try to maximize tax revenue as much as possible. For example, Based on the HS code, the customs office will apply the corresponding import and export taxes to the enterprise, and at the same time can count on domestic trade and import or export. The enterprises apply this HS code for the machinery or equipment import, but the customs officer could apply a different one which has to pay a higher tax. Therefore, the respondent advised that the foreign companies should prepare their budget in advance for paying tax to avoid the delay in custom clearance process which takes normally 2-3 days to complete. Besides that, the companies should provide enough required documents for the customs clearance such as a bill of lading, invoice, packing list and certificate of origin products and the profile of accreditation depending on specific types of machinery or equipment.

Forwarder in Vietnam

The carrier has a policy of importing goods that will advise the importer of the fastest way of transporting and spending less time and money. At the same time, the domestic transportation services with experiences could handle the situations arising unexpectedly. The carrier could help his customers in customs clearance, insurance, international and domestic transportation, door to door delivery, loading and unloading, installation of machinery at the factory. However, if the foreign firms place too much emphasis on declaring the processes and fees import which is taken care by forwarders. It could lead to a delay in the total import process. Since there are many fees and steps that could not able to be clarified due to the bureaucracy and the cumbersome customs process in Vietnam.

Analysis

The interview method was non-standardized by electronic interview because of the limited available source and access. In this case, there was only the VOSA Saigon 's presentative answering the questions. However, it still gained the main valued information which could help the author collating and comparing with the theoretical parts. In this interview, it was noticed that the less formal the interview the more "open" respondent. Thanks to the non-face to face interview, the respondent had his time to prepare the answers and felt comfortable to express them in his writing, supporting respondents to be more candid and give the true reply.

7 TRANSPORTATION RESEARCH

7.1 Transportation research implementation

The main purpose of this research was to estimate the equipment transportation cost and the lead time delivery from European countries to Vietnam in order to help Watrec LTD. in reaching the real value of the transportation cost segment, transit time and a better plan for their project and budget. This also describes in detail the operations involved in the total transport fee. Specifically, Research data was collected by creating a request for quotation for transportation companies and analyzing received offers.

7.1.1 Collecting data for request quotation

In general, the author analyzed the equipment packing list and the process equipment specification information provided by Watrec Ltd. in order to understand and make a right request for the quotations. There were two versions of the packing list. The first list contained 39 items of equipment. After the second meeting with Mr. Kimmo Tuppurainen, he decided to have an updated version of the packing list with 32 items that the author used for the research. The reason was that Watrec Ltd. had found some local suppliers who could offer them the needed materials and equipment with a competitive price compared to those manufactured in Europe. That equipment is going manufactured under a license in Vietnam but designed in Finland.

Watrec Ltd. has partnerships with many suppliers from Finland, Sweden, Denmark, Germany, France, Italy, and the United Kingdom and it has signed the trade contracts followed by two main incoterms. The 2010 FAC and DDP. FAC is a short-term of Free Carrier, which means that the seller delivers a cargo to the carrier who is nominated by the buyer to the named place, for example, a seaport or airport. After this, the risks are taken by the buyer at that place, while DDP (delivery duty paid) is undertaken by the seller. The seller bear costs from the Export-customs declaration to import-customs clearance including import taxes and the whole delivery processes. Figure 9 gives the costs and duty of FCA and DDP terms.

INCOTERM **COST PAID BY**	**FCA**	**DDP**
PACKAGING	Seller	Seller
LOADING FROM WAREHOUSE	Seller	Seller
PRE-CARRIAGE	Seller	Seller
EXPORT CUSTOMS CLEARANCE	Seller	Seller
HANDLING AT DEPARTURE	Buyer	Seller
MAIN TRANSPORTATION	Buyer	Seller
TRANSPORTATION INSURANCE	Buyer	Seller
HANDLING AT ARRIVAL	Buyer	Seller
IMPORT CUSTOMS CLEARANCE	Buyer	Seller
POST-CARRIAGE	Buyer	Seller
UNLOADING INTO WAREHOUSE	Buyer	Seller

Figure 9. FCA and DDP incoterm 2010

In order to optimize the transportation cost and guarantee the availability of equipment on the construction site, the author conducted grouping of the shipment by country. Specifically, she categorized the packing list followed by picking up

countries showed in table 2. This was because Watrec Ltd. did not have a specific delivery schedule for each item of equipment provided when the author conducted the research. The author supposed that all the equipment from different suppliers in one specific country were sent by the sellers to the international pick up port based on the FCA purchase agreement between Watrec and their suppliers. Next, all the deliveries would have to be consolidated into one shipment and shipped to Vietnam. Realistically, Watrec's project team is going to schedule a precise plan for the delivery equipment following the building process. Watrec Ltd. is going to assembling a temporary warehouse nearly the construction site, and then, they are going to ship a certain item to the construction site at a certain time.

Table 1. The equipment packing list summary

Pick up country	Finland	Sweden	Denmark	Germany	France	Italy	UK
Number of suppliers	12	1	1	5	1	1	1
Pick up port	Helsinki	Malmö	Copenhagen	Hamburg	Le Havre	Genoa	Manchester
Number of pallets	81	1	1	4	1	3	9
Total volume, m3	62,31	0,18	0,77	43,54	6,435	1,97	1,26
Total weight, kg	36,556.6	110.00	35.00	4250.00	2,900.0	610.0	4,500

Table 2 illustrates the equipment packing list summary of 7 suppliers from Finland, Sweden, Denmark, Germany, France, Italy and the United Kingdom where the international pick up ports are Helsinki, Malmoe, Copenhagen, Le Havre, Genoa, and Manchester respectively.

As we can see in table 2, Finnish suppliers are the primary suppliers of Watrec accounting for approximately 55% of the total EU equipment purchase partners, followed that number is German suppliers with 22%. The other manufacturers from Sweden, Denmark, France, Italy, and the United Kingdom take 23% of the total suppliers. Turning to the total weight, the Finnish suppliers have the largest weight (over 36000 kgs) taking 75% of the total transportation weights (48960,30 kgs), while the Swedish, Danish, German, French, Italian and British suppliers account for 0.22%, 0.07%, 8.68%, 5.92%, 1.25%, and 9.19% respectively.

In general, determining the weight of a shipment is not only based on the total weight but also the number of pallets, the volume. Understanding the physical equipment could also give us an idea about how many pallets could be placed in a container 20’ and a container 40’. Figure 8 is an example of calculating how many containers, what type and size of containers are needed. This information could help us in bearing the cost of each shipment and being able to compare them with the quotation offered by logistics providers.

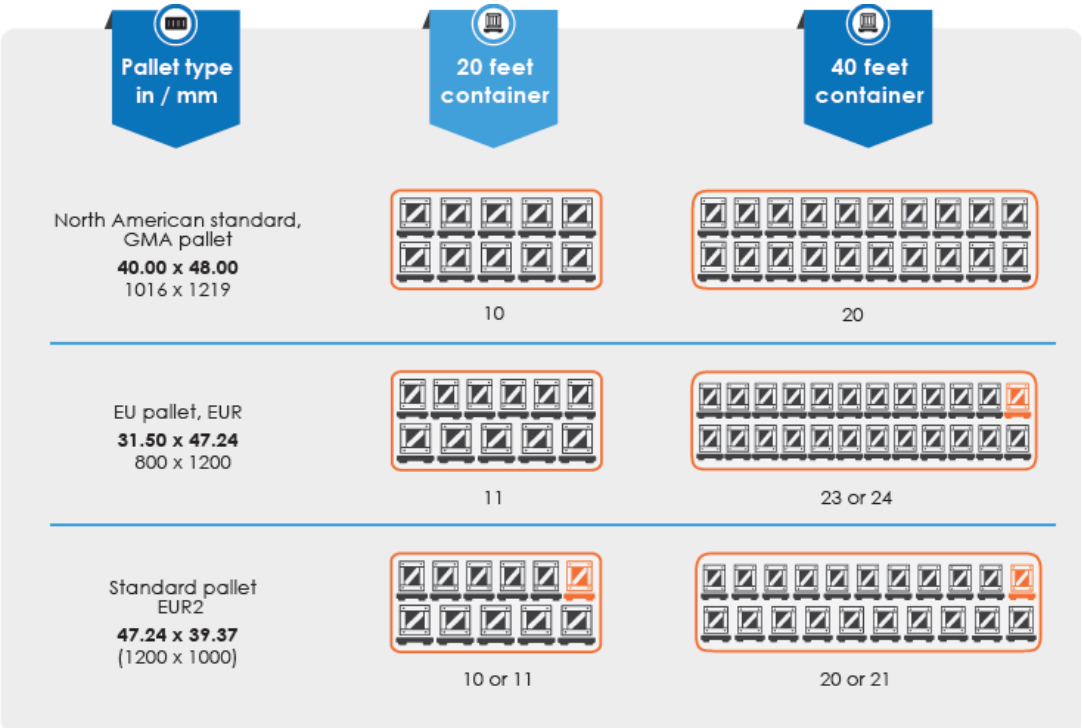

Figure 10. The number of different pallet types fits in 20' container and 40' container (logistics and shipping, Icontainer,2018)

7.1.2 The Quotation

From the very first discussion with the presentative from Watrec Ltd., the author understood the Watrec's project portfolio like which types of Watrec customer and where the building plant location. She is also knowledgeable about economic geography in Vietnam such as the industrial zones, focal economic zones, airports, and seaports. In addition, the author desire to provide for Watrec the estimated costs not only transportation from EU to Vietnam port but also from the port to the construction site. Basing on those advantages, the researcher made an assumption that the project will be conducted in the industrial zone Binh Duong, Ho Chi Minh city where is the most crowded transport activities from the international seaport in Ho Chi Minh city. This district is also a location of many manufacturers who could be the potential customer buying the waste biogas treatments from Watrec.

Firstly, the researcher sent emails with the contents of introducing herself, Watrec's case and the packing list in appendices to private logistics companies Blue Water Shipping and APEXshipping. She had some discussions with them by email about the packing list and the final delivery destination - Binh Duong industrial area as mentioned above before receiving the quotations. Those shipping companies were really professional and informative with quick response. After a few days, they sent the researcher the quotes of delivery from 7 countries Finland, Sweden, Denmark, Germany, France, Italy, and the UK. Table 4 contains a summary of main segments in seven quotations including freight cost and transit time offered from Blue Water Shipping and K-Apex Shipping.

Finland

There is a bunch of equipment shipped from many cities across Finland by multiple suppliers to Vietnam. Valves, mixers, filters, coolers, and other parts will be loaded on a total of 81 pallets, for a total weight of 36,556.60kg. As it is the most complex shipment, the equipment will be consolidated in Helsinki and stuffed into 9 containers estimated 7x40' dry containers and 2 oversized 40' containers 750*350*350cm/4000kgs OOG and 713.5*240*169cm/1800kgs IG. This stuffing will be done in Helsinki seaport. The estimated transit time from Helsinki port to Ho Chi Minh City port is from 39 to 47 days, with vessels going every week.

The quotation also incorporates one hour of free time to unload the truck at the destination. The estimated total price for this shipment would be 41,812.44 USD including ocean freight, handling charges, ISPS, port dues, THC, VGM fee and weighing and bill of lading set. clarified in table 4.

Table 2. The estimated price for shipment from Finland

OPERATION	UNIT	PRICE PER CONTAINER			TOTAL (USD)
		40'DC	40'FR IG	40'FR OOG	
Moving & stuffing into containers	7	690			**4,830**
	1		1,980		**1,980**
Ocean Freight from Helsinki to Ho Chi Minh	7	1,600			**11,200**
	1		3,050		**3,050**
	1			9,650	**9,650**
Terminal Handling Charge	9	174			**1,566**
Gross Mass – Fee	9	30			**270**
Gross Mass – weighing	9	42			**378**
Port dues (USD 5,1/1000kg)	36.5566	5,1			**186.44**
Bill of lading fee (USD 102.00/set)	2	102			**204**
International Ship and Port Facility Security	9	24			**216**
Handling	9	48			**432**
Destination local charges & door delivery cost	1	7,850.00			**7,850.00**
TOTAL					**41,812.44**

Sweden

The heat exchanger will be supplied by the Swedish supplier in Ronneby city. It will be loaded on a 0,82x0,33 pallet for a total weight of 110kg. The equipment will be shipped from FCA Ronneby City via Malmö by air. Due to the small size shipment, it is more economical for transport the cargo by plane. The freight cost 685.00 USD includes FCA from Ronneby City, Sweden to door Binh Duong via Malmoe airport.

The estimated transit time from Malmö airport to Ho Chi Minh City airport is from 4 to 7 days. Quotation from Blue Water Shipping includes one working hour free time for unload-in, that means when the truck arrives at the consignee's location, he has one hour to unload the goods from the truck before leaving. Blue Water Shipping offers a price of USD 685 for this shipment

Denmark

Dosing pumps will be provided by a supplier in Hillerod, Denmark. They will be shipped on a 1,2*0,8m pallet (EUR type), representing 35Kg. The goods will leave from FCA Copenhagen City via Hamburg port (Germany) by Less Container Load (LCL). The freight cost calculated from FCA Copenhagen City, Denmark to door Binh Duong via Hamburg port including ocean freight, handling charges, Bill of lading on. From Copenhagen port to Ho Chi Minh City port, the estimated transit time is 37 days, with vessels going every week. The quotation also incorporates one hour of free time to unload the truck at the destination. Total price for this quotation is USD 770.

Germany

Crushing unit, biogas cooling unit, emergency flare and in-line crusher will be provided from German suppliers in different cities, for a total weight of 4,250kg. These parts will be consolidated in Hamburg into 2 containers: 1x20' dry container + 1x40' FR container. This stuffing will be done in Hamburg port by. The estimated transit time from Hamburg port to Ho Chi Minh City port is about 37 days, with vessels going every week. The quotation also incorporates two hours of free time to unload the truck at the destination.

Blue Water Shipping offers a total price of USD 10,935 for this specific shipment including Container stuffing 1,450 USD, ocean freight 20'DC 1,545 USD ocean freight 40'FR 5,590 USD and destination local charges & door deliver 2350 USD.

Italy

Centrifugal blowers will come from a supplier in Villafranca di Verona, Italy. Goods will be shipped on one 0,87x0,59 pallet, one 0,99x0,77 pallet and one 1,03x1,01 pallet. Total shipment represents 1,97m3, but it has to be noticed that these pallets

are not stackable, that means that there are no possibilities to load well on top of each pallet. Total weight of the shipment is 610kgs. It will leave from FCA Villafranca di Verona via Genoa port by LCL. Blue Water Shipping give a price of USD 695. The estimated transit time from Genoa port to Ho Chi Minh port is about 26 days, vessels going every week. In the quotation from Blue Water Shipping, there is one working hour of free time for unloading at the consignee place.

France

The French supplier will provide the decanter centrifuge from Châteauroux. This equipment will be transported on a special mount as the size is 3,9m length, 1,1m width, and 1,5m height, for 2,9 tons. It will leave from FCA Le Havre Warehouse Port, where K-APEX will pick up the goods and will deal with the origin local charges that are Terminal Handling Charges, bill fee International Ship and Port Facility Security, VGM weighing & customs, then the ocean freight, and destination local charges such as handling charges, import customs and other fees and the delivery to Binh Duong which the price 1134.00 USD declared in figure 9. The estimated transit time from Le Havre port to Ho Chi Minh City port is about 29 days, vessels going every week.

CHARGE FEE	UNIT PRICE		QUALITY		TOTAL	
	EURO	**USD**			**EURO**	**USD**
OCEAN FREIGHT (CBM)		50	6,44	CBM		322
LOCAL CHARGE ORIGIN						
THC (Tons)	45		2,9	Tons	131	
BILL FEE ISPS	65		1	Shipment	65	
VGM FEE	25		1	Shipment	25	
EXPORT CUSTOMS	85		1	Shipment	85	
LOCAL CHARGE DESTINATION						
HANDLING CHARGE		30	1	Shipment		30
D/O FEE		35	1	Shipment		35
CFS FEE (CBM)		17	6,44	CBM		109
THC (CBM)		7	6,44	CBM		45
CIC (CBM)		5	6,44	CBM		32
IMPORT CUSTOMS		65	1	Shipment		65
DELIVERY TO NGOC LAN CO.		140	1	Shipment		140
Total					**306**	**779**

Figure 11. Quotation for shipment from France (KApex, 2018)

The United Kingdom

British supplier has signed the DDP purchase contract with Watrec. In this case, they will take care the delivery to placed destination. Though, the author asked the quotation for this shipment to get the price and time for Watrec has a comparison with the transportation fee from their supplier. Mono Pump Ltd. will provide progressing cavity pumps from Manchester. This equipment will be transported on 9 pallets of 3m length and 0,6m width, for 4,5 tons. It will leave from FCA Manchester Warehouse Port, where K-APEX will pick up the goods and will deal with the origin local charges that are documentation, port security, SOLAS weighing & customs, then the ocean freight, and destination local charges such as handling charges, import customs, and other fees and the delivery to Binh Duong. The estimated transit time from Manchester port to Ho Chi Minh City port is about 35 days, vessels going every week. They offer the freight cost 1349.00 USD clarified in figure 10 below.

CHARGE FEE	UNIT PRICE		QUALITY		TOTAL	
	GBP	**USD**			**GBP**	**USD**
OCEAN FREIGHT (CBM)		54	11,34	CBM		612
LOCAL CHARGE ORIGIN						
DOCUMENTATION	20		1	Shipment	20	
PORT SECURITY	8		1	Shipment	8	
SOLAS VGM	5		1	Shipment	5	
EXPORT CUSTOMS	40		1	Shipment	40	
LOCAL CHARGE DESTINATION						
HANDLING CHARGE		30	1	Shipment		30
D/O FEE		35	1	Shipment		35
CFS FEE (CBM)		17	11,34	CBM		193
THC (CBM)		7	11,34	CBM		79
CIC (CBM)		5	11,34	CBM		57
IMPORT CUSTOMS		65	1	Shipment		65
DELIVERY TO NGOC LAN CO.		180	1	Shipment		180
Total					**73**	**1251**

Figure 12. Quotation for shipment from the United Kingdom (K-Apex, 2018)

For the quotations from Finland, Sweden, Denmark Italy, and Germany, Blue Water Shipping offered the price valid until 30/09/2018 and did not include the FCA local charges costs that will be on shipper's account. The import tax/duty at the destination, any special custom clearance formalities that may request from the consignee. The deliveries free on the trailer (container remains on chassis for consignee's unloading). They handle customs formalities on behalf of the customer only, all valid custom documents must be provided and signed by the real importer. Finally, they can offer to take out the insurance on our behalf on the written order. While The quotes were offered from K- Apex including most of the fees which Ocean freight charged base on CBM, THC (local charge at France) base on tons. CFS, THC, CIC (local charge at Vietnam) base on CBM. In the case of shipment from Manchester, a total of 9 pallets with a volume 1.26*9 = 11.34 m3(Volume, m3/pallet: 1.26m3). Whereas the shipment from France has a total weight 2,900 kgs and total volume CBM 6.44 m3.

Table 3. Quotation summary

Pick up country	**Finland**	**Sweden**	**Denmark**	**Germany**	**France**	**Italy**	**UK**
Pick up port	Helsinki	Malmö	Hamburg	Hamburg	Le Havre	Genoa	Manchester
Transport modes	Intermodal	Inter-modal	Inter-modal	Inter-modal	Inter-modal	Inter-modal	Inter-modal
Transit time (days)	**39-47 (port to port)**	**4-7 (airport to airport)**	**37 (port to port)**	**37 (port to port)**	**29 (port to port)**	**26 (port to port)**	**35 (port to port)**
Frequency	Weekly	Daily	Weekly	Weekly	Weekly	Weekly	Weekly
Price per shipment (USD)	**41812.0**	**685.0**	**770.0**	**10935.0**	**1134.0**	**695.0**	**1349.0**

7.2 Discussion

7.2.1 Cost analysis

As the discussion at the subchapter 7.1.1 as a packing list analysis, we could guess which shipment would cost Watrec the most based on the shipment weight summarized in table 2. However, the freight cost is also affected by the distance transport and transportation modes. As a result, we could see in figure 11 that the freight cost of equipment delivery from Finland accommodates for more 70% of the total transportation cost because of the longest distance delivery and its shipment size. Following that is the shipment from German with the portion approximately 20%. Even the weight of shipments from Manchester (4,5 tons) is bigger than it's from Germany (4,25 tons), the equipment form British supplier could be loaded in the same container with other shipments. Therefore, the freight cost ratio from the United Kingdom is on the third place 2,35%. The other shipments from France, Denmark, Italy, Sweden are counted for a small proportion of 1.97%, 1.34%, 1.21%, and 1.19% respectively.

However, the shipment cost from Finland can be reduced if we could maximize the number of pallets fitting into a container at the stuffing process. In my opinions, the number of 40’ DC containers could be decreased from 7 containers to 6 containers basing on total shipped pallets 79 pallets excluding 2 oversizes pallets showing in the packing list, the physical equipment, and the theoretical information at figure 8.

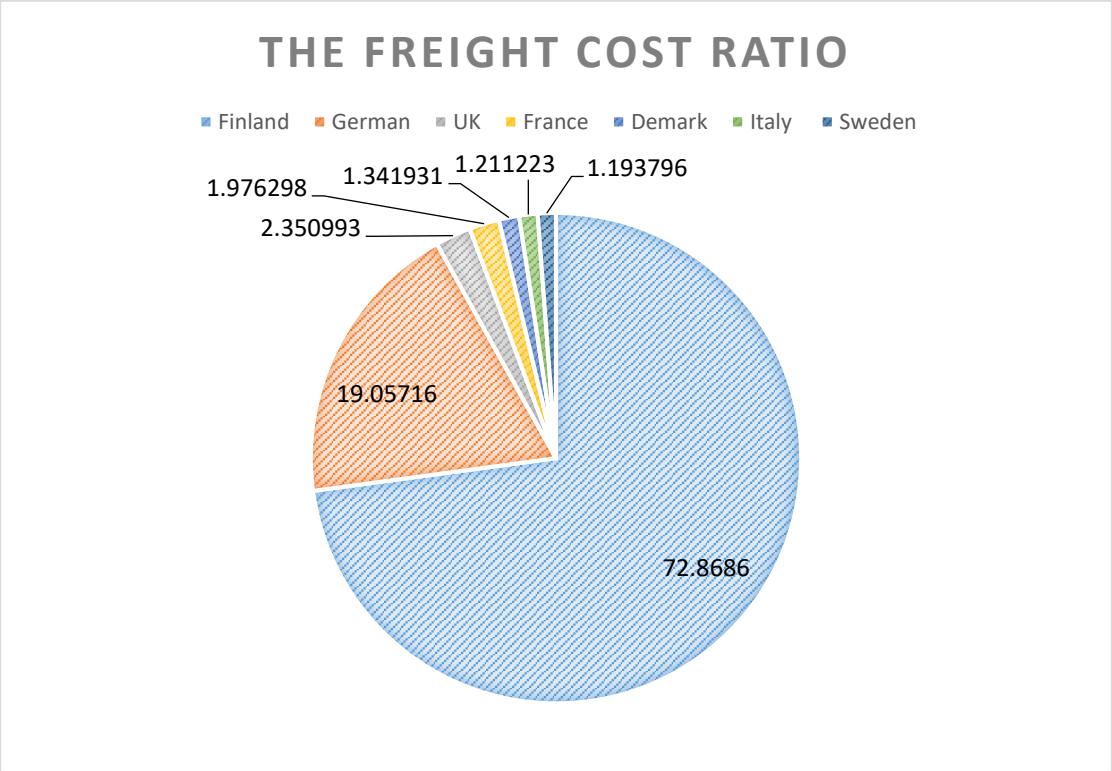

Figure 13. The freight cost ratio of different shipments from Finland, German, UK, France, Italy, and Sweden.

7.2.2 Lead time Delivery

The Lead time of equipment delivery is the vital aspect for Watrec in order to schedule a particularly purchasing plan as well as the construction process precisely. The figure 12 below provides detail the estimated delivery time processes consisting of transit time (port to port), customs clearance and delivery to site Binh Duong.

In general, the time spending for customs procedure would be the same for every shipment with the average 2-3 days according to the interview with Mr. Le Hong Thanh. Nevertheless, the number of pallets or containers and equipment characteristics could influence the customs process. As the theoretical background mentioned in subchapter 5.1 Customs Procedure, there are three channels in the online customs, if the shipment clearance is put into red channel, it will be physically inspected by customs officers leading to an unexpected delay.

Turn to the point of delivery time from the port in Ho Chi Minh city to Binh Duong, the travel distance is approximately 4 hours. Although there is a short time for equipment delivery from the port to Binh Duong, we need to consider of number of shipments, a prohibiting time frame of truck getting to Ho Chi Minh city for instance light truck is banned getting to city streets from 6:00 to 9:00 and between 16:00 to 20:00. Whereas heavy truck is prohibited with the time frame 6:00-22:00 Therefore, it is estimated 1 day for transferring the shipments from Port in Ho Chi Minh city port to Binh Duong.

Furthermore, the transit times are different for each shipment. The machinery is shipped from Finland takes the longest time in the transit seaport to seaport due to its longest distance average 43 days. While Swedish supplier locates also in the Nordic region, the transit time 5 days from port to port is almost 9 times faster than the shipment from Finland thanks to the air transportation modes. The other shipments shipped from Denmark, German, France, Italy, the United Kingdom have the average seaport to seaport transit time 37days, 37days, 29days, 35days, and 26 days respectively.

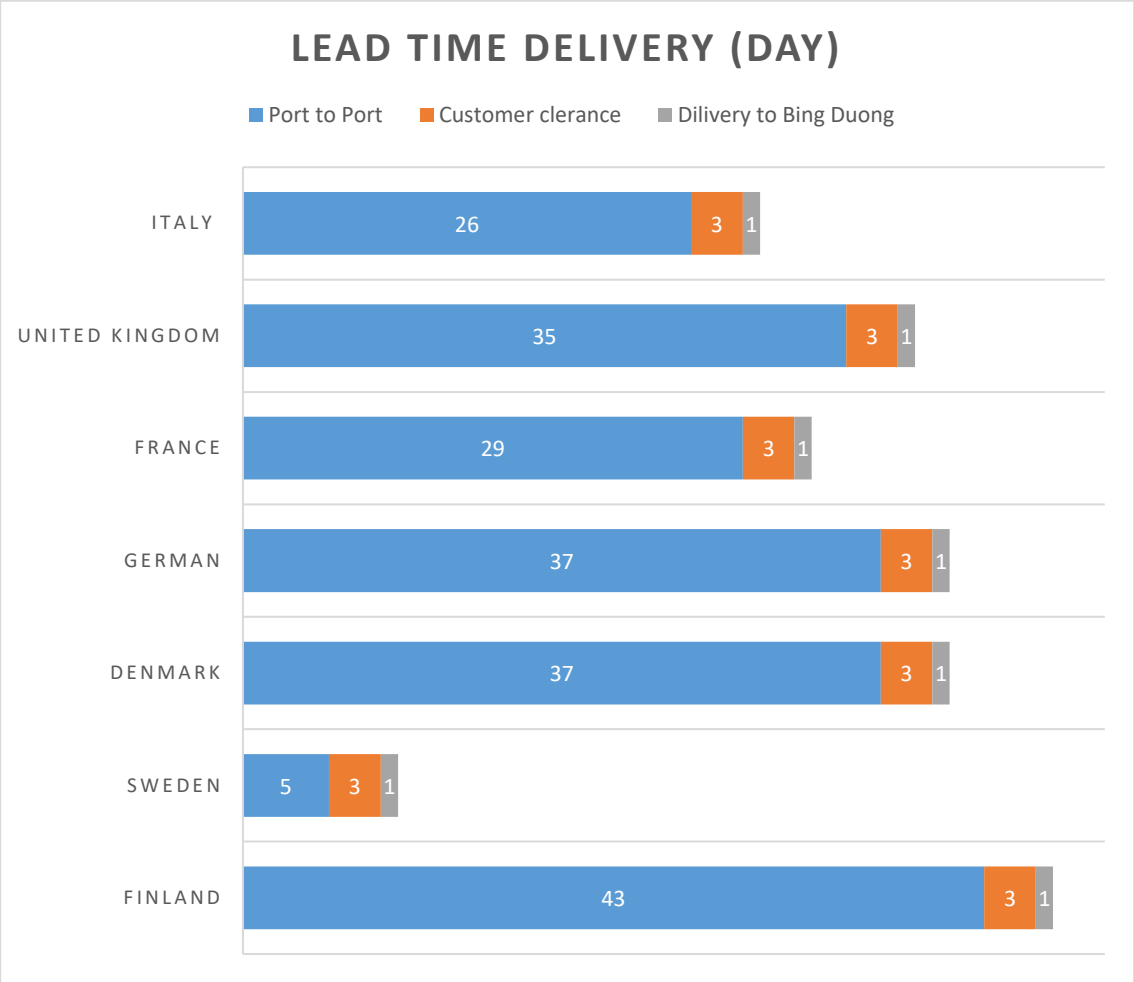

Figure 14. Estimating delivery lead time from 7 European countries

8 CONCLUSION

The main objective of this study was to define the information both in theoretical and practical connected directly to Watrec's case as machinery shipping from European regions to construction site in Vietnam in order to build the plant for biogas treatment. The content was selected for this study going through from theoretical background consisting of three main chapters construction logistics, the roles of transportation in logistics and importing to Vietnam which was supported by the subchapters relating to the main chapters. Turning to the research part, the

author applied the interview method for identifying customs and forwarders in Vietnam and requesting a quotation to answer the research question related to cost and time of equipment delivery.

To be specific, the research objectives and research questions indicated in chapter 2 built a concrete foundation for the finding. The literature revealed, in Watec Ltd. case, there are many aspects related to construction logistics that relevant for an efficient project plan. The effective management, as well as the usage of key tools, were fundamental to be successful in construction projects. Every step was taken into the project needed to be optimized for time and money saving. It could be done with material logistics planning (MLP) that will consider the entire needs in materials to predict costs. The finding also brought various logistics techniques presented in part 3.3 for the construction project such as Construction Consolidation Centers that enabled fluidize materials flows determined by the project's demands, gained the productivity and avoided wastes for the project. It involved in the quality of service as it plays a role as a bridge between producers and customers. Thence, the good choice of the suppliers (3PL, 4PL) as well as forwarders highly considered for a successful supply chain which was detailed it in part 3.6. The transportation impact in logistics planning was also explained in chapter 4. Besides that, the research regarding import to Vietnam was discussed in chapter 5 shows that the overall customs system was quite cumbersome and required an organization who was know-how to deal with it when importing into Vietnam, while its advantage was online custom clearance helping to shorten the time procedure. Furthermore, basing on the solid literature review, the author was able to conduct the interview and measurement. The result delivered to the reader an overview of equipment delivery and import process in terms of cost and lead time for different shipments indicated and analyzed in chapter 8, answered research question ii. and question iii. and summarized in figure 13.

Figure 15. Equipment delivery steps

The finding supplied to Watrec a clear picture of equipment transport including the cost and time of the delivery as well as access the logistics and customs characteristics of the local where the project is assembled. Thanks to the result, Watrec Ltd is able to create a proficiency plan for their project focused on purchasing plan, transportation, warehousing, inventory, and budget plan. This work supporting various time and cost obstacles would optimize a possible failed equipment delivery which has a huge impact on the whole construction project both in budget and efficiency. The research also helps Watrec have a different point of views in choosing suppliers for their equipment in terms of design, quality, quantity, and total cost.

It was a reward for me to work with Watrec Ltd on their project. I had a chance to review and investigate my studies in many perspectives of logistics, transportation an import process. The work created an opportunity for me to sharpen my collecting data and critical analysis skills. Being a person who did an interview and contacted logistics providers enhancing my communication skill. Finally, during the work, I learn how to manage tasks and time which are an important skill for my working life in the future.

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APPENDICES

Toimituseräe	Equipment	Supplier	Incoterms 2010	Pick up City	Pick up Country	Number of pallets	Pallet type	Pallets Size Length /m	Width /m	Height /m	Possible to load goods on top of the pallet	Volume, m3	Needed space on a fleet	Weight per pallet/ kg	Total weight /kg
1	Crushing unit	YTM-Industrial	FCA	Borgen-Weseke	Germany	1	EUR	1,2	0,8	0,8	No	0,77	-	260	260,00
1	Centrifugal pumps 0,5kW + 5*11kW + 3*7,5kW * 3kW	Xylem	FCA	Vantaa	Finland	8	EUR	1,2	0,8	0,8	No	0,77	-	200	200,00
1	Dosing pump 0,25kW + 0,048kw + Dosing pump 1,1kW	Iwaki	FCA	Hilleröd	Denmark	1	EUR	1,2	0,8	0,8	No	0,77	-	35	35,00
1	Centrifugal blower 5,5kW	Ourex	FCA	Villafranca di Verona	Italy	1	Pallet	0,87	0,59	0,96	No	0,49	-	110	110,00
1	Centrifugal blower 11W	Ourex	FCA	Villafranca di Verona	Italy	1	Pallet	0,99	0,77	0,77	No	0,59	-	200	200,00
1	Centrifugal blower 15kW	Ourex	FCA	Villafranca di Verona	Italy	1	Pallet	1,03	1,01	0,86	No	0,89	-	300	300,00
1	Sight classes 8kpl	Malux	FCA	Porvoo	Finland	1	Pallet	0,6	0,4	0,5	No	0,12	-	50	50,00
1	Basket filter & mud separator	Econosto	FCA	Kuopio	Finland	1	Pallet	0,8	0,6	0,5	No	0,24	-	240	240,00
1	Heat exchanger	Alfa Laval	FCA	Ronneby	Sweden	1	Pallet	0,82	0,33	0,66	No	0,18	-	110	110,00
1	Process instruments TI, PI, LI 101kpl	ABB	DDP Ware house	Minden & Shangai	Germany & China	1	EUR	1,2	0,8	1,35	No	1,30	-	140	140,00
1	Process valves 200kpl	Econosto	FCA	Kuopio	Finland	18	EUR	1,2	0,8	0,8	No	0,77	-	260	260,00
1	Biogas cooling unit 15kW	Aprovis	FCA	Mosbach	Germany	1	Pallet	3,4	0,5	1,55	No	2,64	-	430	430,00
1	Cooler 15kW	Kylmäntekijät	FCA	Tampere	Finland	1	Pallet	1,65	0,75	1,5	No	1,86	-	350	350,00
2	Energency flare	C-nox	FCA	Neumünster	German	1	Unpacked	8,2	2,4	2	No	39,36	-	3300	3 300,00
2	Side mixer 4kpl	Japrotek	FCA	Pietarsaari	Finland	2	Box	2,5	1,6	0,8	Yes	3,20	-	1450	1 450,00
2	Top mounted mixer 2kpl	Japrotek	FCA	Pietarsaari	Finland	2	Box	4	1,1	1,5	Yes	6,60	-	2600	2 600,00
2	Top mounted mixer 2kpl	Japrotek	FCA	Pietarsaari	Finland	2	Box	6,3	1,5	1,3	Yes	12,29	-	2900	2 900,00
2	Submerged mixers	Sulzer	FCA	Helsinki	Finland	10	EUR	-			No		-	270	270,00
2	In-line crusher	YTM-Industrial	FCA	Borgen-Weseke	Germany	1	EUR	1,2	0,8	0,8	No	0,77	-	260	260,00

2	Tubular heat exchangers 4kpl	JP-Set	FCA	Silvola	Finland	2		6,5	1,3	2,2	No	7'	-	3550 per one heat exchanger	14 200,00
2	Process Instruments QI, FI 35kpl	ABB	DDP Varasto	Göttingen & Kajaani	Germany & Finland	4	EUR	1,2	0,8	1,35	No	1,296		820	3 280,00
2	Over pressure valves (CV)	Jp-Set	FCA	Silvola	Finland	3	Pallet	1,6	0,85	1,24	No	1,6864	-	180	180,00
2	Pre condensator	Plastvo	FCA	Vääksy	Finland	1	Unpacked	(5)	(5)	(5)	No		4	800	800,00
2	Activated carbon filters 2 pcs	Plastvo	FCA	Vääksy	Finland	1	Unpacked	(5)	(5)	(5)	No		4,5	1200	1 200,00
2	Odour gas scrubber	Plastvo	FCA	Vääksy	Finland	1	Speciali delivery	7,5	Ø3,5	3,5	No		-	4000	4 000,00
2	Activated carbon filters 2 pcs	Plastvo	FCA	Vääksy	Finland	1	Unpacked	(5)	(5)	(5)	No		7,5	1500	1 500,00
2	Submerged knife pumps 2kpl 7kW	Xylem	FCA	Vantaa	Finland	2	EUR	1,2	0,8	0,5	No	0,48	-	150	300,00
2	Progressing cavity pumps 4*18,5kW + 4*15kW + 7,5kW	AxFlow	DDP Varasto	Manchester	UK	9	Pallet	3	0,6	0,7	No	1,26	-	500	4 500,00
2	Cooler 400kW	Alfa Laval	FCA	Vantaa	Finland	1	Pallet	7,135	2,4	1,69	No	28,93956		1800	1 800,00
3	Decanter Centrifuge	Aprotech	FCA	Châtearoux	France	1	Unpacked	3,9	1,1	1,5	No	6,435	-	2900	2 900,00
3	Polymer dosing unit	Aprotech	FCA	Hamina	Finland	2	Pallet & box	lava: 80*60*47 cm & laatikko: 151*67*86 cm			No		-	54+227,5	281,60
3	Scada Automation	HI-Automation	FCA	Vantaa	Finland		ks. Alla								

Scada content :

1	Pallet	0,6	0,3	0,5	Vain max. 10kg	0,09	-	5	5,00
1	Pallet	0,6	0,3	0,5	Vain max. 10kg	0,09	-	5	5,00
1	Pallet	0,6	0,3	0,5	Vain max. 10kg	0,09	-	5	5,00
1	Pallet	1,2	0,2	0,1	Vain max. 10kg	0,024	-	30	30,00
2	Pallet	0,9	0,8	2	Vain max. 10kg	1,44	-	75	150,00
2	Pallet	0,6	0,3	0,5	Vain max. 10kg	0,09	-	5	10,00
2	Pallet	0,6	0,3	0,5	Vain max. 10kg	0,09	-	25	50,00
1	Pallet	1,2	0,3	1,2	Vain max. 10kg	0,432	-	75	75,00
1	Pallet	0,8	0,3	1,2	Vain max. 10kg	0,288	-	75	75,00
6	Pallet	0,6	0,3	0,8	Nämä saavat olla päällekkäin	0,144	-	25	150,00
						Total	**101**	**parcels**	

Appendix 1. Equipment Packing List (Watrec Ltd.)