



Norwegian University of  
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# Sustainable logistics in practice

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**Dedicated to**

My dear parents, my beloved husband and daughters



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Baerum, 10.10.2011

Irza Fitria



## **Declaration**

I, the under signed, hereby declare that this thesis has been performed in accordance with the regulations of the Norwegian University of Science and Technology (NTNU), Trondheim, Norway.

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## **ABSTRACT**

Improved logistical performance is one of the tools to mitigate greenhouse gases emissions from freight transport. The production company and transportation company should find the practice to decrease the emissions from their activity in distributions of goods. In this thesis, the sustainable logistics in practice in focal company (Ekornes) is studied. The potential improvement in relation to sustainable transportation principle is explained.

Through qualitative method research, the theory related to the sustainable logistic and the findings on logistic practice in Ekornes is discussed. It is found that Ekornes is lack of environmental factors in the contract with third party logistic (3PL) providers. Ekornes indicates the positive response to the pressure to implement the environmental concept on their operational strategy.

**Key Words:** sustainable freight transport, qualitative method research, environmental concept on operational strategy.



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# 1 INTRODUCTION

The effect of logistics activity to the environment cannot be neglected. Logistics is used to describe the transport, storage, and handling of products from the source of raw material to the point of sales. The environmental implications of logistics activity are diverse and can affect along the supply chain. The implications such as air quality, noise pollutions, causes accidents, and contribution to global warming, are evitable. As the growing importance of sustainability, the logistics activity now is incorporated with the return of waste product and packaging for reuse, recycling and disposal (McKinnon, 2010, p. 13). Presently, the company is not only aware about their forward logistics impact to the environment, but they also have to think about the reverse logistics.

Transport as a part of logistics activity, is an essential component for the whole supply chain if a company wants to contribute into sustainability. It is estimated that freight transport accounts for roughly 8 per cent of energy related CO<sub>2</sub> emissions worldwide (Cullinane and Edwards, 2010, p. 32). Moreover, warehousing and goods handling will add around 2 – 3 per cent to the total emissions of logistics. Growth trend of transportation indicated that transport problem will continue to arise. As we can see from figure 1 below, historically freight transport follows trade activity and grown more than GDP because the transportation volumes have increased more than GDP. European Commissions had formed supportive objective to sustainability in their 2001 - 2010 white papers for transportation in European Union (European Commission, 2006). They aim to decouple the transport growth from GDP by 2010, and to result in reducing the negative impact to the environment. However, the improvement on those condition only seen in passenger transport. The freight transport on the other hand, grew on average by 2.7 per cent per year (European Commission, 2009, p. 11). This was due to the increased in global trade and the economic practice in the production company. Production companies tend to allowed reduction of costs and emissions in other sectors at the expense of higher emissions from transport. All of those conditions represent on how the transport activity gives negative impact to the environment. It is because transportation sector still 97% dependent on fossil fuels which has negative implications also for the security of

energy supply (European Commission, 2009, p. 13). For the next decade, European Commission pointed out that they will increase its involvement in trying to decrease the total emissions from the freight transport in EU (European Commission, 2009).

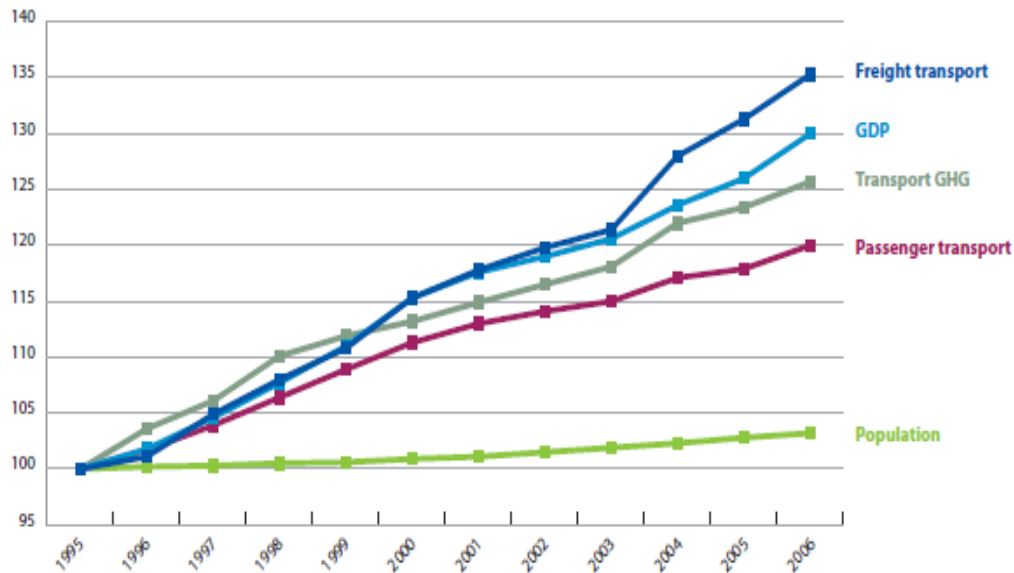


Fig 1 Evolution of GDP, population and GHG emission from transport

Source: European Commission, 2009, p. 14

Taking the greenhouse gas emissions into account in order to achieve sustainable logistics is only one part of the sustainability concept. Sustainability has another element beside the environmental aspect. Sustainability will need to balance the need for economic growth and development with the social equity and less harmful to the environment. Moreover, in practice many of the measures that reduce the environmental impact of logistics also save money, avoiding the need to trade off economic costs against environmental benefits.

## 1.1 Problem Statement

Improved logistical performance is one of the tools to mitigate greenhouse gases emissions from freight transport. The production company and transportation company should find the practice to decrease the emissions from their activity in distributions of goods. Transportation terms consist of examining the transport means and transportation infrastructure. Transportation infrastructures include all sorts of facilities such as ports, airports, roads, warehouses, stations, container depots, etc.

Therefore, examining the impacts of transport activity will also include the infrastructure of transportations.

From figure 2 we can see that the largest share of CO2 emissions which are related to freight transport are the results from road transport. In year 2000 accounted for 43%, in year 2010 accounted for 46%, and in year 2020 it is estimated will account for 45% of EU freight transport. On the other hands, road transport is recognised as the least environmentally friendly mode of transport (Goel, 2009, p. 50; Cullinane and Edwards, 2010, p. 32). It means that the present practice of transportation is far from the concept of sustainable development.

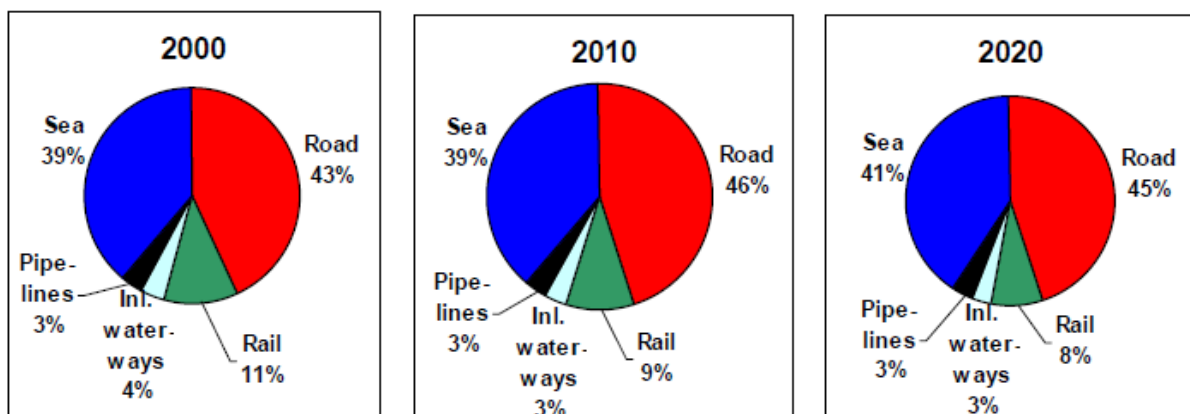


Fig 2 Evolution of modal split in freight transport 2000 - 2020

Source: European Commission, 2006, p. 27

Ekornes as a worldwide furniture company is on the way of strengthening their competitive advantage through their concern on environment. One of Ekornes objectives regarding environment is to ensure a focus on the environment throughout the organisation. The company aims to provide reliable environmental information about its products and be perceived as a responsible supplier. However in their transport activity, they use 60% of transport means by truck and 40% by boat. Recent study indicate that road transport gives high negative impact to the environment. This fact seems to jeopardise Ekornes commitment to sustainable development. Therefore, in this thesis we will take a closer look at this issue. We will see further from the company's strategy in transportation and distribution, and aspects that can affect the company's contribution for better environment.

## 1.2 Objective

The general topic of this thesis is sustainable logistics in practice. In particular, the aim of this study is to investigate how logistics transportation practice is carried out in focal company (Ekornes) and what potential improvement could exist in relation to sustainable transportation principle. This will be done by looking at their strategic perspective of sustainable transportation and their respond the pressure to implement the sustainable freight transport practices. The evaluation of the practice will be based on environmental aspects of sustainable transportation and with further reference to the economic and social aspects according to the literature.

In order to achieve the objective, I have defined research questions that I will attempt to answer in my thesis:

1. To what extent Ekornes has reached its implementation of sustainable freight transport practices in their transport logistics strategy?
2. How is Ekornes responded to pressures from external and internal regarding the sustainable freight transport practices?
3. How to improve the company's practices in sustainable transportation without any consequences to their business profitability?

## 1.3 Scope

Considering and analyzing all the elements in sustainable logistics system is so vast and beyond this project. Thus this thesis will only talk about one elements of logistics activity, which is freight transport. The main analysis is on company's practices on reducing the environmental effect of freight transport, but frequent reference is also made to their economic and social implications. Furthermore, the analysis will focus on company's strategy in transport logistics and the factors that influence the company in implementing the sustainable practices in international distributions activity.

## 1.4 Outline of The Thesis

First the theoretical basis for this paper will be introduced in **chapter two**. Various concepts like sustainability, transport logistics, sustainable transportation, environmental impacts of transportation logistics, freight transport modes and factors influencing the company for implementing the sustainable transportations are discussed here. **Chapter three** describes the research methods that were used when conducting this research and how it was carried out. The **fourth chapter** presents the findings from data collection, consisting of interviews and documents. **Chapter five** contains an analysis and discussion of the findings and other results of the data collection. The **sixth chapter** contains the conclusion based on the data analysis and discussion.

## 1.5 Summary

The objective of this chapter is to give an overview to the reader about the whole content of the master thesis. Therefore in the introduction, it explained generally about sustainable transportation, the case company, the objective or what we will achieve at the end of the report and the scope of the report. Finally at the outline of the thesis, we could see how the structure of the thesis is arranged.



## 2 THEORETICAL FRAMEWORKS

This chapter will presents views from different literatures relevant to the research topics. The goal is to give a clearer picture of the situation, how they are addressed, and give solutions to the different issues. At first, we will explain about the concept of logistics and supply chain management, transport logistics, sustainability, followed by sustainable transportations. Thereafter, the focus of literature review will be on the factors that influence the decision in finding a practice on supporting sustainable transportation practice.

### 2.1 The Supply Chain and Competitive Performance

Logistics is the process of strategically managing the procurement, movement and storage of materials, parts and finished inventory (and the related information flows) through the organization and its marketing channels in such a way that current and future profits ability are maximized through the cost effective fulfilment of orders (Christopher, 2005, p. 4). This basic definition gives us an understanding that logistics is related to the flow and storage of goods, and the information across the organization. Supply chain management, on the other hands, is a wider concept than logistics. It is not only related to move and position inventory, but also deal with the relationship between actors in supply chain, i.e. supplier, customers, and the organization itself. The goal is providing all parties in the chain with a more profitable outcome (Christopher, 2005, p. 5).

Michael Porter has brought the concept of value chain in his book. He said that to understand the firm's competitive advantage, the activities perform inside must be seen as a discrete event because each of the activities can contribute to firm's relative cost position and create a basis for differentiation (Christopher, 2005, p. 13). Porter categorized his value chain activities categorized as primary activities and support activities (figure 3). Primary activities consist of inbound logistics, operations, outbound logistics, marketing and sales, and service, and support activities consist of

infrastructure, human resource management, technology development and procurement.

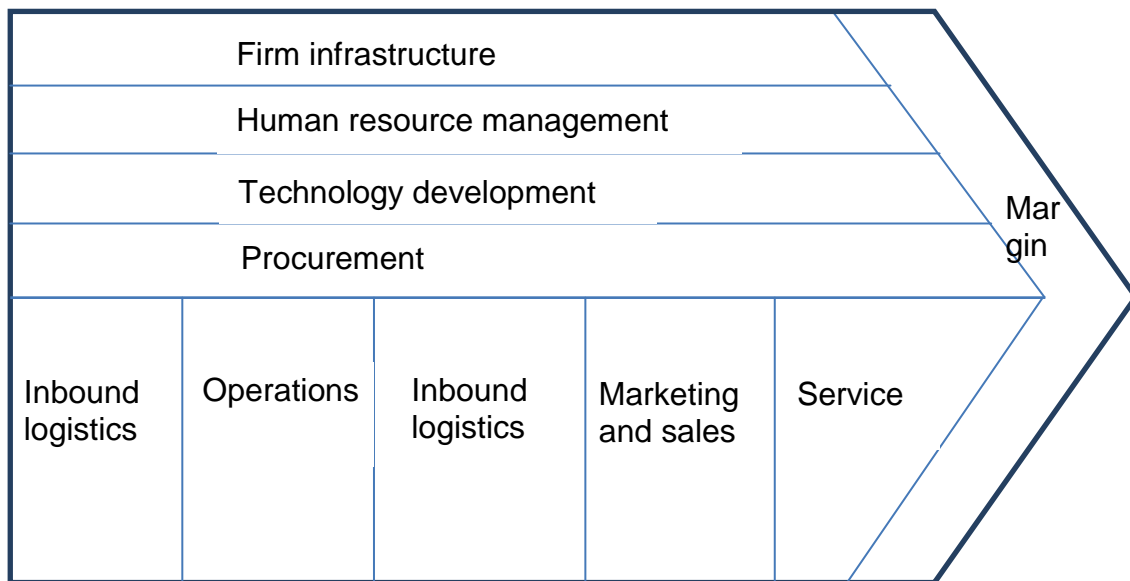


Fig 3 The value chain

Source: Porter (1985) In : Christopher, 2005, p. 14

From Porter's point of view, firm has to find their real competitive advantage from each of activities by means create cost or value advantage. If they do not, **outsourcing** is one option to create value from that activity. There is an increasing focus on company's nowadays to focus on their core competencies and outsource everything else in order to seek the cost and value advantage from their business partners. Outsourcing firm's activity could expand the supply chain. Thus value or cost advantage is created by all the entities that connect to each other in extended supply chain (Christopher, 2005, p. 14).

**Cost advantage** is related to having the lowest cost in production and has the greatest sales volume. Basic argument for cost leadership strategy is to gain sales volume as big as they can. Thus the increasing market share will compensate the cost. When the market become mature, it is difficult to compete based on this strategy because usually the technology as the source of cost reduction become available for all the participants in those market. However, the source of cost reduction is not only based on lowering the cost and increasing the volume. We discuss more on logistics management role in cost reduction later. Another concept



in gaining competitive advantage is through creating **value advantage**. Value advantage means that the products will provide the customer with differentiation or competitive offering than the other competitors. The value could create by increase the responsiveness on the market, reduced lead times, just in time delivery, etc. In other words, value advantage related with giving the best service to the customers.

The competition on the market now is not only about having the best products. In order to get success in the market, the producers have to focus on their logistics and supply chain management to find their strategic advantage. The question now is on finding how can logistics and supply chain management contribute to strategic advantage. It is apparent from the Porter value chain that logistics is related to activities in inbound logistics, operation, and outbound logistics. Therefore, the focus now is to find the value and cost advantage from those activities in the company.

When the choice of focusing on core competencies become apparent on the organization, which means they extended their supply chain, the networks in the supply chain become more complicated. Christopher (2005, p. 17) mentioned that traditionally the relationship between the focal company and their upstream (such as suppliers) and downstream customers (such as distributors or retailers) were adversarial rather than cooperative. Those companies seek to find their cost advantage at the expense of their supply chain partners. But transferring their cost to their partner will not make them have the competitive advantage. The cost definitely will be reflected on the final price. Nowadays, the strategy is by adding the value that could reduce the cost overall. The reason is because the competition now is supply chain against supply chain, not only company against company.

## **2.2 Transport Logistics**

Transport is concerned with changing the geographic position of goods or people. In logistics terms, transportation is one of the most important activities. It involves the movement of raw materials, parts, finished goods from point of origin to point of consumption. Moreover, in the context of supply chain management, logistics exist to move and position inventory to achieve desired time, place, and possession benefits

at the lowest total cost (Bowersox et. al, 2007, p. 26). The positioning of inventory, which uses transport, will be valuable if they could achieve the goal of desired time and place. The transportation activity will involve managing the movement of products and includes selecting the method of shipment (air, rail, water, pipeline, truck, intermodal); choosing the specific path (routing); complying with various local, state, and federal transportation regulations; and being aware of both domestic and international shipping requirements (Stock & Lambert, 2001).

Bowersox et al.(2007, p. 28) mentioned in his book that there are three factors fundamental to transportation performance, namely cost, speed, and consistency. **Cost** in transport is visible. The movement of goods between two geographical location and maintaining goods during its shipment will derive some expense. From logistical point of view, this movement or the use of transportation will be on the minimum total system cost. Using the least expensive method of transportation may not result in the lowest total cost of logistics (Bowersox, et.al, 2007, p. 25). This condition could arise because the inefficient transport will lead to increasing expenses on transport.

**Speed** of transportation is the time required to complete a specific movement (Bowersox et. al, 2007, p. 25). There is a relationship between speed and cost. The company need to balance between the speed and cost of service in order to minimize total system cost. The transport firm capable in offering faster service usually charge higher rate. The faster the transportation service is, the shorter the time interval during which inventory is in transit and unavailable. Therefore it is important for company to know which transportation service suitable for their company.

**Consistency** of transportation refers to variations in time required to perform a specific movement over a number of shipments (Bowersox et. al, 2007, p. 26). Consistency in shipment is important because variance in time will danger the inventory.

In order to have effective transportation in supply chain, there are four groups that need to consider, which are the shippers, the carrier, the owners and operators of

transportation infrastructure, and **the regulators** that set transportation policy worldwide (Chopra & Meindle, 2007, p. 386). **The shipper** is groups that require the movement of the product between two points in the supply chain. In this case we could mention it as the focal company. **The carrier** is the groups that moves or transport the product. In this case we refer to the freight forwarders uses by the focal company. **The owner and operator** of transportation infrastructure is the one that related to roads, ports, canals, and airport.

Logistics responsibility is to find and manage the desired transportation mix across the supply chain. Recently wide ranges of transportation alternatives are available to support the transport logistics. The value of transportation has become greater than simply moving product from one location to another. Many freight forwarders are available with greater services such as product sortation, sequencing, and customized freight delivery (Bowersox et.al, 2007, p. 166). Supplier's company could have particular demand to the freight forwarders on what they willing to have on their transportation activity, if they wish to give transport responsibility to specialised company.

### ***2.2.1 Transportation in Global Pipeline***

Global company recognized by its global source of production and distribution. The global business will source its materials and components worldwide, having multiple manufacturing or assembly located geographically dispersed, and markets its products worldwide. The search for cost reduction and value advantage is done through scale of economies in purchasing and production, and through focused manufacturing and/or assembly operations (Christopher, 2005, p. 207).

The growth of global transportation infrastructure has made the possibility for factories to produce in larger quantities to serve the global demand. Business also adjusts their logistics strategy to adapt with the environment. Christopher (2005, p. 212) presented three ways of which global company could implement their global logistics strategy.

First strategy is by having focused factories. Company try to limit the range and mix of products manufactured in single location in order to achieve economies of scales. They are having fewer factories in order to meet worldwide demand. This strategy could give the production cost saving. While having many factories to produce, the crucial issue need an attention from the logistics management on this strategy is regarding warehousing for distribution. Cross-docking is one of logistics strategy to reduce overall transport cost. Products flow from diverse localities and origins are merged for onward delivery to the customer. Product is received and unloaded at the warehouse, then sorted by destination. The transport company could also combine the delivery with another company to reduce cost. The precise on time delivery for each manufacturer and labelling are crucial for cross-docking. Therefore, cross docking is highly dependent on information technology.

Second strategy is by having centralization inventories. Consolidating inventory into fewer locations can reduce total inventory requirement, resulting in the availability of regional distribution centres. Recently the idea of centralization moved toward managing and controlling inventory centrally, but not physically holding the inventory on the distribution centres. The idea is not physically centralizing the inventory, but rather by locating it strategically near the customer or the point of production but managing and controlling it centrally (Christopher, 2005, p. 215). This strategy could minimize the transport cost. The crucial point for this strategy is by having the information system that could give visibility on the real time demand.

Third strategy is postponement and localization. In serving local markets, there exist different requirement from the consumers. In order to cope with those requirements, the strategy is to delay the final configuration of products in the final market destination. This strategy has resulted in increasing demand on outsourcing the distribution to the third party logistics service provider (Christopher, 2005, p. 217).

## **Observations**

Based on the theories regarding logistics, supply chain, and global pipeline, there are some issues that we could highlights. Firstly is regarding gaining the competitive advantage from the competitors. By using Porter's value chain, we conclude that in

order to compete in the market firms must have the cost or value advantage, or both. Secondly, firms need strategy to pursue the competitive advantage that has chosen. Regarding the logistics and transportation, there are some actors need considerations for having the effective and efficient transport. In case of outsourcing the logistics activity, firms must be carefully in determine what they expect from the logistics company. The requirement based on logistics point of view also presented.

### **2.3 The Concept of Sustainability**

Although there is no universally accepted definition of sustainability, it is important to understand sustainability terms and connections between terms in the society in order to move towards sustainable development. Recent research shown that sustainability embraces terms such as cleaner production, pollution prevention, pollution control, minimization of resource usage, eco-design and others (Glavic & Lukman, 2007, p.1875). Moreover, Glavic and Lukman (2007, p.1884) noted that sustainable system introduce interconnections between environmental protection, economic performance and societal welfare, guided by a political will, and ethical and ecological imperative. The use of this terms also different based on their designation and usage. Yet, the terms of sustainability spread and numerous terms are emerge.

The word sustainability itself became widely used after it appeared in a United Nations report written by World Commission on Environmental and Development (WCED), namely Our Common Future (1987). Former Norwegian Prime Minister Gro Harlem Brundtland was the chairman of this commission in establishing Our Common Future, therefore this report is well known as Brundtland report. Our Common Future defined the concept of sustainable development as the development that meet the needs of the present without compromising the ability of future generations to meet their own need (1987, p.54). Moreover, this report also noted that “the goals of economic and social development must be defined in terms of sustainability” (WCED, 1987, p. 54). These concepts consider that growth on economic or development using resources will give effect to the environment. Therefore, we should take accounts the impact of three principals of sustainability, or also known as triple bottom line, namely environmental, economic, and societal dimensions for

development. Sustainable development would be seen as the process or evolution of the three dimensions on the human society.

Based on definition from Bruntland report and influences from strategy and management literature, a variety of subsequent definitions emerged from sustainability in relation to organizations, referred as corporate sustainability (Linneluecke and Griffiths, 2010, p. 358). Corporate sustainability is a challenge to business. Business or industry is important as the centre of economy and development. But industry is also commonly seen as the source of environmental degradation and social concern. Incorporating sustainability concept into corporate strategic decision is business contributions to a better quality life today without compromising the quality of life of future generation. Hence sustainable future will be preserve.

Business will also gain competitive advantage if they integrating the triple bottom line (figure 4) into their practice. Some of the advantages such as cost savings due to cleaner production methods and innovation, lower health and safety cost, lower labour cost and innovative solutions, company reputation, market advantage, ethical investors, etc. (Azpagic, 2003, p. 304). Another driving force of corporate sustainability is legislation which is being tailored toward sustainable development (Azapagic, 2003, p. 3030). We can see the policy and legislation from EU and Norwegian government as well such as polluter pays or producers responsibility policy. Therefore we can see that sustainability lies between the interest of society and the interest of business.

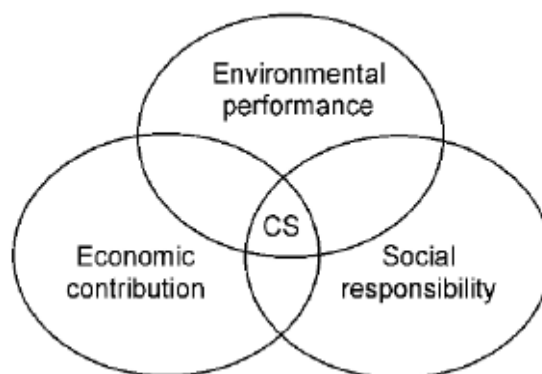


Fig 4 Corporate Sustainability and the triple bottom line

Source: Azapagic, 2003, p. 304

Businesses also argue whether sustainability will give them economic advantage or it will create new challenges for profitability. Companies aiming to decrease the environmental impact of their logistics networks should look for good trade-offs between environmental impact and cost (Neto et.al, 2008, p. 207). Corporate sustainability is not a concept that can be added instantly into the company. Azapagic (2003, p. 304) noted that it is not always possible to quantify direct financial benefit of corporate sustainability and often they may have longer than usual payback time. This is what the company have to face if they are interested in long term sustainable development. They have to be embedded sustainability concept into the business vision and strategy, and systematically integrated the corporate sustainability into all business activity. Moreover, an integrated approach to sustainability can unlock numerous opportunities to improve competitiveness and enhance reputation (Azapagic, 2003, p. 304), to gain or retain environment-conscious consumers, to comply with the sometimes cumbersome and blurry current legislation, and to anticipate necessary changes to cope with future legal environmental standards (Neto et.al, 2008, p. 195).

## **2.4 Sustainable Freight Transport**

Freight transport system played an important role in the company. Transportation is usually the largest single cost expenditure in most logistics operations (Bowersox, et.al, 2007, p.191). Moreover, most recent surveys have revealed the widening diffusion of green logistics/supply chain strategies across the business world and suggested that transport and distribution activities have a prominent role in these strategies (McKinnon, 2010, p. 14). Therefore, it is important to manage transportation effectively. Despite of the importance of transport in the production company, transportation often seen jeopardise sustainable development. The use of transport means such as cars, trucks, trains, ships, aircraft, to move goods from the factory to the customers will have significant impact into the energy use and environment. They will produce air pollution, noise, and land use in local and global level. As economic growth and transportation growth, concern into the environment growth largely as well. Company's concern on auditing the three aspects of

sustainable transportation will be reflected on the way they manage the transportation and distribution of products.

In search for a sustainable transportation definition, there is no universally acceptable definition on it as well. OECD (2001, p. 18) defined sustainable transportation as that, which does not endanger public health or ecosystems and that meets needs for access consistent with (a) use of renewable resources that are below their rates of regeneration, and (b) use of non-renewable resources below their rates of development of renewable substitutes. Richardson (1999) defined a sustainable transport system as one in which fuel consumption, vehicle emissions, safety, congestion, and social and economic access are of such levels that they can be sustained into the indefinite future without causing great or irreparable harm to future generations of people throughout the world.

From these two definitions we could summarize that sustainable transportation means that environmental, economic, and social considerations are accounted into decisions in transportation activity. It derives from the sustainability concept with triple bottom line as consideration. The effort made for increasing the economic and social welfare should not deplete natural resources, destroy the environment and harm human health (Janic, 2006, p. 84).

#### ***2.4.1 Environmental Impact of Transportation***

As we have mentioned above, transportation not only has the largest part on logistics but also gives significant impact into the environment compared to another activity in logistics. The impact of transportation to the environment could be directly or indirectly. For example, the impact of increasing air freight and congestion from global sourcing is the direct impact, and the increasing of transport infrastructure is the indirect impact of transportation to the environment. The transportation of goods mainly will affect the environment directly (Cullinane & Edwards, 2010, p. 31). There are so many environmental impact categories defined by scholars or organisations regarding transportation such as by OECD, ISO, UN, etc. We will summarize and present it on a simplification.



*Air pollution*

Air pollutions results from emission of gasses occur from the transport means. The internal combustion engine and other machines and processes cause severe pollution from the combustion of fossil fuels (Benson, et. al, 1994). The pollutant emitted by transport can be divided into local, regional, and global effects (table 1) (Cullinane & Edwards, 2010, p. 33)

Table 1 Geographical extent of pollutant effects (Cullinane & Edwards, 2010, p. 33)

Effect	PM	HM	NH3	SO2	NOx	NMVOC	CO	CH4	CO2	N2O
<b>Global</b>										
Greenhouse – indirect					X	X	X	X		
Greenhouse – direct								X	X	X
<b>Regional</b>										
Acidification			X	X	X					
Photochemical					X	X	X			
<b>Local</b>										
Health and air quality	X	X	X	X	X	X	X			

PM – particulates, HM – heavy metals, NH3 – Ammonia, SO2 – Sulphur dioxide, NOx – Oxides of nitrogen, NMVOC – non-metallic volatile organic compounds, CO – carbon monoxide, CH4 – methane, CO2 – carbon dioxide, N2O – Nitrous Oxide.

The global effect is caused by the greenhouse gas emission. Greenhouse gas emission is defined as the total mass of a GHG released to the atmosphere over a specified period of time (Cullinane & Edwards, 2010, p. 34). GHG will cause climate change from the trap heat reflected from the surface of the planet in the lower atmosphere causing the greenhouse effect. Carbon dioxide accounts for the largest proportion (approximately 85%) of GHGs in the atmosphere (Cullinane & Edwards, 2010, p. 35), and now this gas has gain so much attention to reduce it. By tightening a control into the source of global effect, it could help in eased pollution problems at local and regional.

Knowing the emissions and source of emissions could lead us to selecting strategies for sustainable transportation practice. We have mentioned before that the source of

emissions is from the use of fossil fuels, including petrol, diesel, and coal. The consumption of fossil fuel definitely will harm the environment. This condition is worsening by the dominant use of trucks as inland freight transport. The main fuel used for trucks nowadays is diesel. Some goods also travelled by petrol engine truck, electric truck, or another alternative fuels, but it is still on small numbers. On average, trucks have higher costs, fuel consumption, and emissions per ton-km of freight transported than marine and rail modes (Ranaiefar & Regan, 2011).

Table 2 present the emissions from transport means within Europe. From this table we could see some potentials switch to environmentally friendly transport modes, such as from aircraft to rail. From the energy consumption point of view, we could see that energy consumption of aircraft is far much more than railway. But we also have to consider other aspect in logistics terms before making changes. Such as distance travelled and time consumption. If the goods need to travel fast and long distance, so the aircraft probably still the best choice. We will discuss about this matters more on freight transport modes section.

Table 2 Average emissions factors for freight transport modes within Europe (Cullinane & Edwards, 2010, p. 44)

		EC (kj/tkm)	CO2 (g/tkm)	NOx (mg/tkm)	SO2 (mg/tkm)	NMHC (mg/tkm)	PMdir (mg/tkm)
<b>Aircraft</b>		9,876	656	3,253	864	389	46
<b>Truck &gt;34-40-t</b>	Euro 1	1,086	72	683		75	21
	Euro 2	1,044	69	755		55	10
	Euro 3	1,082	72	553	90	54	12
	Euro 4	1,050	70	353		59	2
	Euro 5	996	66	205		58	2
<b>Train</b>	Diesel	530	35	549	44	62	17
	Electric	456	18	32	64	4	4.6
<b>Waterway</b>	Upstream	727	49	839	82	84	26
	Down-stream	438	29	506	49	51	16

EC = energy consumption, NMHC = non methane hydrocarbon.

### *Noise pollution*

Noise pollution is a result from local traffic. If people live alongside busy roads or near airport, they will notice a high noise pollution. The effect of noise pollution include annoyance, communication difficulties, loss of sleep and impaired cognitive functioning resulting in loss of work productivity. From truck, the noise could come from tyre and engine. Air transport produces a high level of noise as well. Some research had been conducted to reduce the noise level of road and air transport (Cullinane & Edwards, 2010, p. 38), such as research in engine design, tyres, and the aerodynamic profiling of vehicles.

### *Water pollution*

Water pollution could cause by oil spills in the sea because of ships accidents or leakage from the platform. Another possible cause is the loss overboard of containers of deck cargoes of chemicals, fertilisers and similar product (Benson et. al, 1994). These water pollutions will danger the marine biology.

## **2.4.2 Social Impact of Transportation**

### *Accidents and fatalities*

Accident could cause injury and death. Truck accidents and fatalities are a significant and continual public concern (Ranaiefar & Regan, 2011). The accident rate in the EU varies enormously and caused by a variety of factors, such as driver behaviour, age of vehicles, vehicle maintenance, road standards, the nature and enforcement of safety regulations (Cullinane & Edwards, 2010, p. 39), weather conditions, safety features in trucks, etc. (Richardson, 2005).

### *Human health impact*

Human health impact is cause by pollution emitted by the transport means. Air, water, noise pollution could be harmful to human if they are expose frequently to the pollution. Respiratory diseases, asthmatics conditions, and irritation to the eyes, nose, and throat are some example of human diseases cause by emission to the air.

### **2.4.3 Economic Impact of Transportation**

#### *Crash damages*

Every accident and fatalities will incur cost to the transport system. The cost is a result of the damage vehicles, infrastructure, broken goods or human effect. The fatalities could also cause disabilities to transport goods for several days and it will cause quite big loss to the company. Therefore having low crash damages will be a better option.

#### *Congestion*

Congestion in traffic will incurred cost to the transportation. In congested road, a small decrease in traffic volume results in a relatively large decrease in delays (Ranaiefar & Regan, 2011). The size of vehicles will also contribute to congestion. The largest the vehicle is, the greater its contribution to congestion. The delays of moving goods will add cost to logistics transportation. Richardson (2005, p. 32) adding land use patterns as the factors of congestion as well. If the land use for transport infrastructure is high, the congestion density could decrease.

## **2.5 Factors Influencing the Use of Sustainable Transport Practice**

We have presented the environmental, social, and economic impact of transportation. We also have explained why it is important to have the sustainable practice. Knowing the negative impact of transportation could encourage the stakeholders to find the practice with least negative environmental impact. However, different author have given insight into the factors that influence sustainable transportation practice (Hall, 2000; Richardson, 2005; Bjorklund, 2010). These factors as describe in the works of the different authors have some commonality but different in the way they have been expressed.

Hall (2000) investigates the circumstances under which environmental supply chain dynamics (ESCD) emerged. The term ESCD uses to present the phenomenon where environmental innovations diffuse from a customer firm to a supplier firm. Environmental innovations defined as being a product, process, technology or

technique developed to reduce environmental impact. Further it will lead to company decision to have innovative logistics changes to cope with pressures. Hall (2000, p. 462) summarize the theoretical issue and proposes a framework for addressing the pressure for environmental improvement in the supply chain.

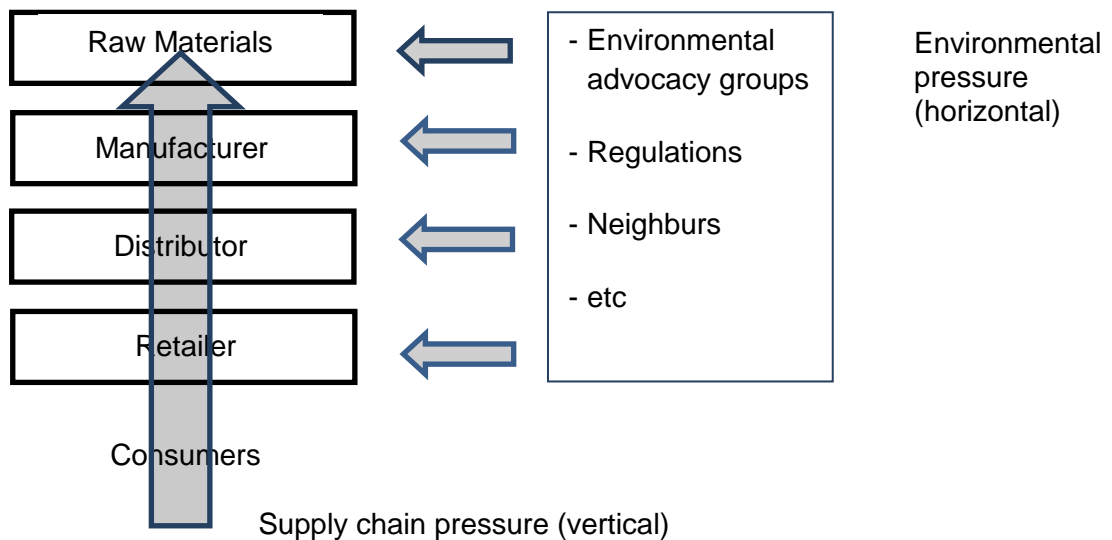


Fig 5 Pressure for environmental improvement

Source: adapted from Hall (2000, p.462)

Environmental pressure refers to the selection of environment where firm chooses to develop. Hill argue that firm change their environmental performance in response from such sources as environmental advocacy groups, consumers, regulators, neighbours, etc. The response to the pressure is as a result of the supply chain pressure and the environmental pressure. Findings show that there is a clear relationship between the pressures to which firms were exposed and the actions that were ultimately initiated (p. 468). Although sometimes this was limited to meeting the regulations, firms that closed to their end customers and recognized publicly will experienced more pressure. The findings also suggest that firm should understand their internal capabilities and the pressures to which they are exposed (p. 469). From the theoretical review, Hall (2000, p. 457) found out that **regulations and consumers** as the main pressure for company to change their logistics system.

Related to the transportation and distribution activity, pressure from regulations and consumers could also influence company to acquire the green solutions. As the

increasing attention to the environmental impact of transportation, the regulations for the emissions also become stricter. Hill (2000, p. 458) argued that consumer attitude towards green procurement influence by the campaign and environmental advocacy group. However, Hill (2000, p. 458) also mentioned that while some firms take the environmental concerns of their consumers seriously, it does not fully describe why these consumers have become environmentally concerned.

Richardson (2005) analysed the passenger and freight transport and presented frameworks illustrating the interaction of factors that influence indicators of transport sustainability, identifies opportunities for policy intervention, and illustrates the possibility of unintended consequences of such intervention and the trade-offs among the indicators. The findings of the study indicate that **government policies** and **market forces** as the factors with the greatest influence for sustainable freight transport practice.

A comprehensive study about finding the influencing factors in using the green solutions in transportation was done by Bjorklund (2008). Bjorklund conducted a comprehensive study in literature review in order to determine **factors influencing the environmental purchasing of transportation services**. Several contingency factors were identified from literature review. Survey from two case studies concludes that factors with great influence to purchasing of green transportations are categorized into five groups which are management, company image, customers, carriers and the means of control applied by government and other authorities. **The management of the firm**, expressed in *top/middle management awareness and priorities, environmental management, and characteristic of management* are the factors with great influence on the environmental purchasing of transportation services. *The communication within the company* is also considered as influencing factors, but it doesn't give as much impact as others management factors. It is indicated from the mean factor that results lower than others. **The company image** expressed with *the reputation of the firm and image of the firm and its products* are two great driving forces for green transport solutions. Third category influence the use of green transport solution is **customers**. *The customers with non-environmental demands* identified as the hindrance of purchasing green transport solutions. While *the customer with environmental demands* identified as driver. The fourth category is

**carrier.** *The knowledge, ambitions, and equipment of carriers, and the relationship with the carrier* are factors with a great positive influence on green practice. The main factors need to consider are the carrier's knowledge and equipment. While some of respondents also state that the equipment used by the transport service suppliers could have a role as a hinder to performance. **Influence from government and authority** are identified as the fifth category. *Juridical means of control, taxes, and subventions* are described as driving the performance by the respondents. However taxes are also describe as hindrance by 20% of respondents.

Research by Bjorklund (2010) found out that external factors have greater influences to green transport purchasing than the internal factors. It is indicated from the five categories explained above. However, the internal factor still have important role as a driver of purchasing green transport. The author stated that it is important for company to make sure that the top/middle management have the required level of environmental awareness and that the environmental aspect is given the required priority, thus ensuring that a proper environmental management team is in place.

Eidhammer and Andersen (2010, p. 1) stated that **one of the important groups for designing successful transport policy is the freight forwarders**, and it is important to understand their priorities and perspectives on green freight, what technology they use, and how requirements for green logistics and freight transport have been included in their services. However, demand to the freight forwarders will come from their customers. If the supplier company as their customer's doesn't have any demand regarding green transportation, there is no need from freight forwarders to have high standards on green transportation. Therefore, Eidhammer and Anderson (2010) analysed the environmental status of the Norwegian freight forwarding industry.

Eidhammer and Andersen (2010) highlighted some aspects from their findings. Firstly, the freight forwarder with high turnover will offer more green transport solutions than freight forwarders with low turnover. However, the requirement from their customer also higher than the requirement from the low turn over's freight forwarders. The practices that most frequently offered by the freight forwarders and the most frequently requested by their customers are use of rail or sea transport on

long distance, ISO 14001 certification, use of environmental calculator, and supply of environmentally differentiated transport. The practice that more often offered than requested is courses in fuel efficient, which could give direct financial benefit from the supplier of transport services. Findings from the offered practices and the requested practice indicate that the Norwegian freight forwarders are ready to meet more extensive requests for green transport solutions than what they are facing from their customers recently (Eidhammer and Anderson, 2010, p. 7). Other offered practices found from the survey are environmental accounting, recycling of packing materials and waste, use of natural gas as fuel, and transport of semi-trailers on rails, and practices that requested include recycling of waste, use of co-loading, and ISO 14001 (p. 8). Regarding the ISO 14001, finding indicate that this certificate is not interesting for the customers on hiring the freight forwarders. Although the freight forwarders have offered the environmental transport solutions, but it seems the customer didn't find that it is on their priority. 41% of the respondents indicate that less than 3% of the transport orders have associated requirements for green transport, compare to 45% who didn't answer to the question (p. 9). Only a few customers have strict requirement to green solutions, but in general they are not ready to pay extra for it. There would be potential price increase by 1 to 10 % for green transport solutions.

Reducing the environmental impact of freight transport could come in several ways, such as advances in vehicles technology (McKinnon et. al, 2010), optimizing transport route, etc. We have mentioned before that the emission to the air mostly because of the fuel type. Transportation of goods mostly uses the diesel engine vehicle. This type of fuel will emit pollution. However, nowadays various alternative of fuel existing is a result of increasing concern about environment. By using more environmentally friendly fuels, the emission to the air could be lowered. The alternative fuels in use today are biodiesel, bioethanol, hydrogen, gas-fuelled vehicles, and electric vehicles. But every alternative fuels are also have advantage and disadvantage into the environment. Even natural gas vehicles still fossil fuel dependent. Biodiesel also have disadvantage in land use for making crops. Therefore, making more environmentally sustainable fuels is complex and still need more technology and development. From the survey conducted by Eidhammer and Anderson (2010), they found out that there is a significant share of freight forwarders



who plan to extend the use of alternative fuels in the future such as biofuels and hybrid technology (p. 13).

## 2.6 Government Intervention on Reducing Transport Externalities

We have seen that the transportation sectors have significant impact to the environment. We also have mentioned that there is increasing focus from the society about sustainability, particularly environment. Therefore, much research, policy, and legislation now is aiming to decrease the negative effect of transportation into the environment. Government policies intervention is one of the most important factors in sustainable transportation (Hill, 2000; Richardson, 2005, p. 37; Bjorklund, 2010).

On the global level, some institution such European Union had established policy and target to reduce environmental impact of transportation. They have published the EU transport policy 2001 – 2010, followed by EU transport policy 2011 – 2020. In their policy, they have set their target regarding the decreasing emission that they must achieve on the following years. Below we present the EU targets for reduction of some environmental impact of transportation (table 3).

Table 3 Absolute targets for the reduction of some environmental impacts in the European Union (Janic, 2006, p. 85)

Type of Pollutant	Long term targets in terms of quantity until 2020
Carbon dioxide (CO <sub>2</sub> )	Should not exceed 20% of total Co <sub>2</sub> emissions in 1990
Volatile organic compound (VOCs)	Should not exceed 10% of total VOCs emissions in 1990
Nitrous oxides (NO <sub>x</sub> )	Should not exceed 10% of total transport related NO <sub>x</sub> emissions in 1990
Particulates	Reduction of fine particulate (PM <sub>10</sub> ) emissions from transport for 55-99%
Noise	Should not exceed a maximum of 55-70 db during the day and 45 db at night and indoors
Land use / Land take	Compared with 1990, a smaller proportion of urban land is devoted to transport infrastructure

The targets on environmental aspects results on regulation by government. European Union has established the mandatory standards for heavy duty vehicles. The mandatory standard is a technical standard regarding emissions from the vehicle. We could see from table 4 the emission standards for heavy duty vehicle. Recently, the standard use is the euro v standards.

Table 4 Emission standards for heavy duty diesel engines (g/kWh). (Cullinane & Edwards, 2010, p. 41)

Tier	Date of implementation	CO	HC	NOx	PM
Euro I	1992 (>85kw)	4.5	1.1	8.0	0.36
Euro II	1998	4.0	1.1	7.0	0.15
Euro III	2000	2.1	0.66	5.0	0.10
Euro IV	2005	1.5	0.46	3.5	0.02
Euro V	2008	1.5	0.46	2.0	0.02
Euro VI	2013	1.5	0.13	0.4	0.01

Besides the standards for emissions, European Commissions also provide directive for the noise generated by the tyre (Directive 2001/43/EC).

Ship is known as having the NOx, SOx, and particulates emission. European Commission through directive 2005/33/EC limit the maximum sulphur content of fuels marine fuel to 1.5% for ship operating in the Baltic Sea as from 2006 and in the North Sea and the English Channel as from 2007. Additional rules also implemented through the European Union such as:

- The obligation for ships at berth or anchorage in EU ports to use fuels containing max. 0.1% sulphur.
- The obligation for passenger ships on regular service to EU ports to use fuels containing a maximum sulphur content of 1.5%.

## Observations

On the three parts of theory above, we have presented the concept of sustainability, sustainable freight transport, the environmental impact of transport activity, and some

support from authority for better environment. The concept of sustainability gave an overview about the importance of environment and why firms must address their activity towards sustainable development. Further, it explained the sustainable freight transport issue and how this could harm the environment. From this theory, we want to explain that transport logistics activity have certain impact to the environment. Therefore it is important to align the logistics strategy with sustainable concept.

## **2.7 Increasing Sustainability in Transport Logistics**

Each transportation system is complex, and the complexity derives from the pluralism of its hardware (infrastructures and vehicles) and of the people and organizations involved (Richardson, 2005, p. 29). Glavic and Lukman (2007, p. 1883) also mentioned sustainability policy as the fourth aspects of sustainability besides environmental, economic, and social. They explained that sustainability policy is important on institutional, corporate, as well as on regional, state, and alliance level because this are a plan of what to do and had been agreed officially by group of people, a business organization, a government or a political party about environmental, economic, and social issue. Through having similar concept on transportation, In order to have sustainable transport practice, having appropriate policy is important. The policy can be locally, nationally or internationally oriented.

### ***2.7.1 Incorporating Environmental Consideration into logistics Decision***

Relating environmental impact into company decision, need discussion in terms of strategic, tactical, and operational decisions. Aronsson and Brodin (2006) have done research on how firms may contribute to environmental improvement through structural changes of their logistics system. Moreover, Aronsson and Brodin (2006, p. 400) have proposed a framework on how decisions at different levels both create opportunities and sets limitations for decisions made on another level.

Framework proposed by Aronsson and Brodin (2006, p. 400) based on earlier discussion regarding strategic, tactical and operational decisions (figure 5).

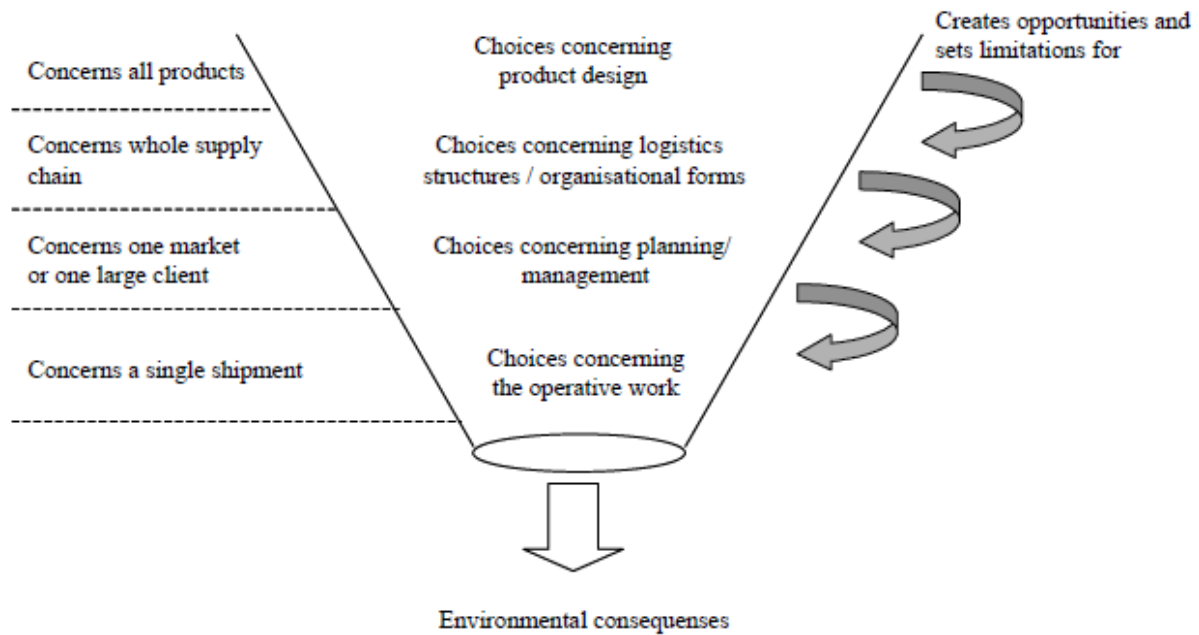


Fig 6 Different logistics decision levels and their funnel-like relationships

Source: Aronsson and Brodin (2006, p. 400)

Logistics decision started to exist when the product's weight and volume is known. The next hierarchy will follow as strategic/structural, tactical and operational decisions. The model points out two aspects of decision making as important (p. 401). Firstly, the degree of freedom of choice is decreased the further down the funnel, because higher levels will have opportunities and set limitations for subsequent levels. Secondly, it suggest that environmental issues should be considered in the same manner as time and cost at all levels, in order to reach the full potential in reducing negative environmental impact (p. 401)

Aronsson and Brodin (2006, p. 395) claimed that improving the sustainability of the transport sector requires a more comprehensive and integrated transport and environment policy approach, combining legislation and economic instruments in a transparent way. The actors involve in addressing the conflicting dilemma between logistics and environment lies between two different actors, macro domain and micro domain. Macro domain constitutes actions taken by the government and legislative authorities. Whilst micro domain is constitutes by actions taken by companies. Based on the macro and micro perspectives, Aronsson and Brodin (2006, p. 397) presented the important area relating directly or indirectly to emissions (figure 6).

	Technology	Structure
Macro perspective	<ul style="list-style-type: none"> <li>- More energy technology efficient</li> <li>- Reduce usage of fuels with high emission e.g fossil fuel</li> </ul>	<ul style="list-style-type: none"> <li>- Infrastructure, e.g road network, railways, airports</li> <li>- Education</li> <li>- Modal shift</li> <li>- Reducing the demand for transport</li> </ul>
Micro perspective	<ul style="list-style-type: none"> <li>- Fuel efficient technology if it saves money</li> <li>- Saving energy for heating or cooling if it saves money</li> </ul>	<ul style="list-style-type: none"> <li>- Economies of scale &amp; scope</li> <li>- Fleet/structure utilisation</li> <li>- Reduce transport cost</li> <li>- Reduce overall logistics cost</li> </ul>

Fig 7 Important areas relating directly or indirectly to emissions

Source: Aronsson and Brodin (2006, p. 397)

The matrix shows that changes are possible within technology and structural. Technological solutions to the emission problem exist on micro and micro level. Further Aronsson and Brodin explained the government and authorities can encourage the use of alternative fuels, and through taxation punish the use of less environmentally friendly technology. Firms, on the other hands, will seek the new technology in order to cope with government regulations. On the structures changes, infrastructure development and support for modal shift towards increased use of modes with less environmental impact will be represent the macro perspective. For micro perspective on structural changes, Aronsson and Brodin (2006, p. 397) explained that there is still lack of research in terms of empirical investigations and calculation, and the environmental impact as well. Therefore, the discussion regarding how to reach the total goal of sustainable development through both reducing environmental impact and improved business profitability still not exists. There are only some factors that are believed to also reduce the environmental impact (Aronsson and Brodin, 2006, p. 397).

We choose to analyse reducing environmental impact through imposition of environmental standards on company's freight transport policy and the use of intermodals/multimodal transport modes because it represent the holistic perception

of the company's environmental consideration and the operational strategy respectively.

### **2.7.2 Environmental Management System**

Many companies adopt environmental management system (EMS) to integrate corporate environmental policies, program and practice. Lozano & Valles (2007) defined EMS as the part of the overall management system that includes organizational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing, and maintaining the environmental policy. The EMS will examine the environmental effects of activities, product, and services in the organization. However, the question always lies upon the advantage of having the EMS on company, whether it could improve company performance or not.

Besides having regulations on environmental aspects, government also encourage companies to have their environmental management system being certified. By using EMS, company could assess their activities which are not environmentally friendly and set a strategy to move toward sustainable development. Companies that want certification of their EMS, there are a series of international standards such as ISO 14001 and Eco-management and Audit Scheme (EMAS).

#### **(i) ISO 14001**

ISO 14001 standards specifies requirements for an EMS to enable an organization to develop and implement a policy and objective which take into account legal requirements and information about significant environmental aspects. The process in ISO 14001 will not only cover the organizational evaluation through environmental performance evaluation and environmental auditing, but also the product and process evaluation through environmental labelling and environmental aspect in product standard as well (Melnik et al., 2003, p.331).

The ISO 14001 standard is based on the methodology known as Plan-Do-Check-Act (PDCA) (ISO14001, 2004). The ISO 14001 with PDCA methodology for continual improvement presented in figure 7.

**Plan:** establish the objectives and processes necessary to deliver results in accordance with the organization’s environmental policy.

**Do:** Implement the process.

**Check:** monitor and measures processes against environmental policy, objectives, targets, legal and other requirements, and report the result.

**Act:** take actions to continually improve performance of the environmental management system.

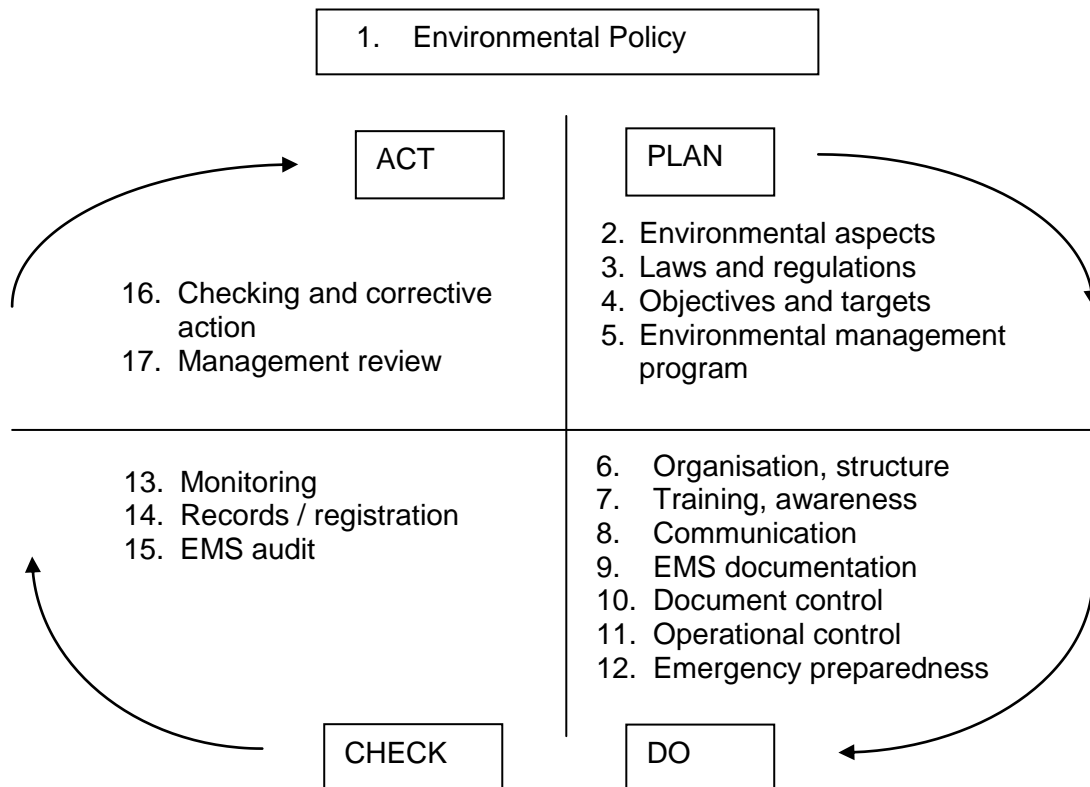


Fig 8 ISO 14001 – Environmental Management System for Continual Improvement

Transportation and distribution of goods and products are included in ISO 14001 standards. Company aiming on certified their EMS with ISO 14001 should documented their activities and their associated environmental aspects, objectives, targets, programmes, indicators, operational control, and monitoring and measurement regarding transportation activities (ISO 14001, 2004). The evaluation will be based on company’s continual improvement on minimizing the environmental aspects of transportation activities.

## **(ii) Eco Management and Audit Scheme (EMAS)**

Eco-Management and Audit Scheme (EMAS) basically has the same component and requirements with ISO 14001. The Aim of EMAS is to recognize and rewards those organizations that go beyond minimum legal compliance and continuously improve their environmental performance.

EMAS regulation stated that the top management of the company must commit to the principles and goals of environmental policy and to the targets of the environmental program. The regulation also requires environmental impacts must be limited to the level that can be reached by the application of the best available technology. This is due to the development of environmental protection is strongly connected to the development of technology.

### ***2.7.3 Moving into Greener Freight Transport Modes***

A mode identifies a basic transportation method or form, and the five basic transportation modes are rail, highway (road), water, pipeline, and air (Bowersox et.al, 2007, p. 177). An important part of the transport manager's or transport and distribution manager's job is to decide which mode (or modes) of transport is best suited for moving the company's traffic (Benson et. al, 1994). They are all having knowledge about advantage and disadvantage of each mode, and also they have known every factor than can affect the distribution process regarding the logistics point of view. When a company have a policy to integrate the sustainable transportation concept into their operational, the transport manager's or transport and distribution managers also have to incorporate those policy into their decision in choosing freight transport mode. The advantage and disadvantage of each mode will also include their effect into the environment, economic, and social as well. We have mentioned the environmental, social and economic impact of transportation. From the impact we could see that the freight transport choice is an important consideration in adopting sustainable transportation practice. Technology development into the green solution is the key figures for the transport modes. When the technical improvement into the transportation modes becomes available, there is a wide range solution for the transportation manager to choose between the



transport modes. Therefore, we will give description of each transport mode and some of characteristics need to consider in inland and international transport.

### **Highway (Road) Transport**

Road transport always mentioned as the least environmentally friendly modes. Many scholars and research suggest moving from road transport to other modes such as rail or ship to decrease the negative impact of transportation. On the other hands, many logistical decisions turn to road transport because it sees as the most flexible ways of transport. Road networks have made unlimited road choices for trucks. Road transport mostly use for small shipment and in relative short distance.

Comparing to rail, road transport have relatively small fixed investment in terminal facilities. Publicly financed and maintained roads also made road transport cheaper than rail transport. However, road transport will generate more expenses. Labour requirement, licence fee, user fees, and tolls are some of cost needed when using road transport. Another increasing cost possible to incurred such as cost to replace equipment, maintenance, safety, driver shortages, driver hours of service regulations, and dock wages (Bowersox, et. al. 2007, p. 179). Therefore, road transport characterize by low fixed cost and high variable cost.

Piecyk (2010) study about the carbon footprint process and calculate the carbon emission for road freight transport. She recommends calculation based on fuel based approach means that calculate using the fuel consumption record. From the calculation, she summed up that the Co<sub>2</sub> emissions from road freight transport are the function of two factors: the nature of vehicle and how it is used (figure 8).

From this study, we could see that when company's wants to reduce CO<sub>2</sub> emissions, they have to manipulate the two factors. If we look at vehicle factors, it is important to monitor the type and age of the vehicle, tyres, type of fuel, body type, and maintenance of the vehicle. Old vehicle could consume more fuel, thus will produce more emissions. How the vehicle being used also could affect the emission. Such as using vehicles on congestion road will need more fuel and time consuming, thus it will produce more emission as well. Therefore, reduction in in fuel consumption will yield in reduction of CO<sub>2</sub> emissions level.

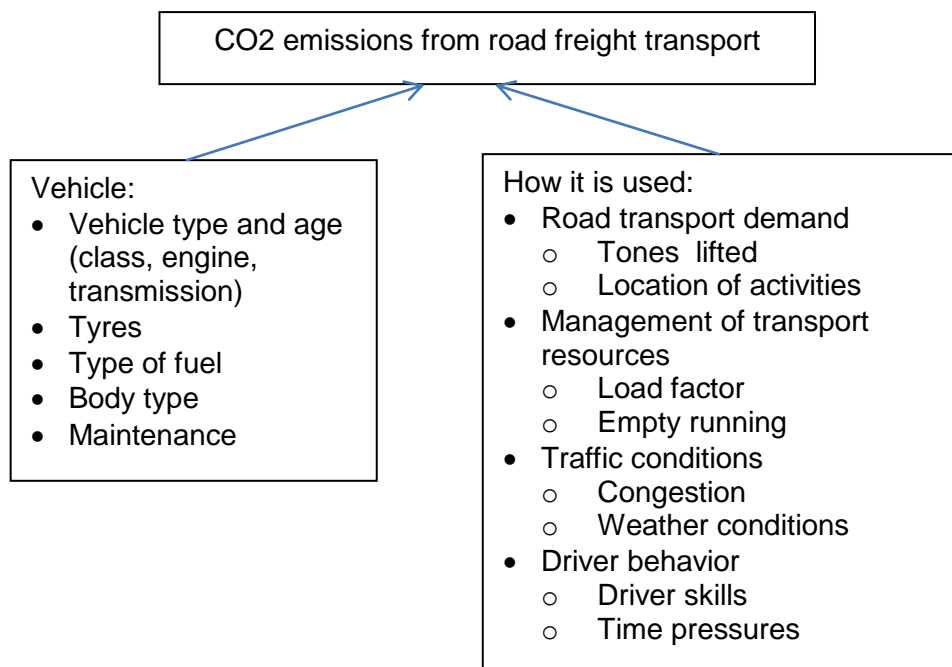


Fig 9 Factors affecting CO2 emissions from road freight transport

Source: Piecyk, 2010, p. 65

Another approach to control the emission from road freight transport is by increasing the fuel efficiency of trucking. Fuel efficiency of trucking could be gain through the vehicle’s improvement and operation’s improvement (McKinnon, 2010, p. 230). Vehicle’s improvement through aerodynamics design and lightweight design could give significant impact on fuel efficiency. Delegates at a workshop organized by the International Energy Agency indicated that improved aerodynamics could represent 10 – 20 per cent of all potential fuel efficiency improvements to the HGV fleet, with most of the benefits accruing to larger articulated vehicles making high speed, long distance trips (McKinnon, et al, 2010, p. 142).

**Water transport**

Water transport could offer cheaper price than any other transport based on the capacity of shipment. Water transport could carry very high capacity with continuous operation in 24 hours basis. The way is also free when they get into the 12 mile limit or coastal limit. However, water transport consider have a relatively slow speeds. Sometimes problem in sea could arise from bad weather.

Water transport could be on high demand when the shipper need large tonnage with low freight rates and speed is a secondary consideration. Water carriers must develop and operate their own terminals, but it compensate with the right-of-way is develop and maintained by the government. Compared to rail, it has moderate fixed cost (Bowersox, et.al., 2007, p. 181). Supplemental haul by truck or rail is also needed if the origin and destination of shipment far from the port.

The water transport is suffered from the SO<sub>x</sub> emission result from the fuel burned in ships. The International Maritime Organisation (IMO) limits the sulphur content in bunker fuel to 4.5 per cent and this maximum will drop to 1.5 per cent by 2020 (McKinnon et al, 2010, p. 160). Decreasing SO<sub>x</sub> could result to putting the NO<sub>x</sub> into low level. Traditionally, shipping counted as the most environmentally friendly modes of transport based on the fuel consumption compare to the carrying capacity (McKinnon, 2010, p. 157). However, the technology improvement of ship in green area has been slow for some reasons. This could be challenging for the ship designers and regulators body to keep the shipping line as the environmentally friendly transport. Tightening emission controls, tougher environmental specifications from clients and the future inclusion of shipping in emission trading schemes will incentive the adoption of cleaner technologies and practices across the shipping industry (McKinnon, 2010, p. 158).

### ***Rail transport***

Rail transport could offer quick delivery over long distances between cities. Large capacity also made rail transport more favourite than truck. However, rail still struggle with low speed delivery and transshipment needed. Transshipment could cause damage and increasing time deliveries.

The capability to efficiently transport large tonnage over long distances is the main reason railroads continue to handle significant intercity tonnage (Bowersox, et.al., 2007, p. 178). However, rail transport gives high fixed cost due to expensive equipment, tracks, and terminals.

Improvement in greener rail freight transport could be in term of energy use. Train usually operate in diesel engine and improvement in diesel engine design could result in energy efficiency (McKinnon, 2010, p. 152). In term of electric train, zero emission could achieve if the source of electric power is not from fossil fuel. Moreover, McKinnon (2010, p. 153) mentioned that quieter engine technology, track lubrication, new braking systems and other improvement could reduce the noise and vibration problems of trains.

### ***Air transport***

Air transport mostly used for high priority products such as emergency drugs, vital parts during breakdowns, etc. The important characteristic of air transport is the fast speed of shipment. However, this speed advantage also comes with high cost.

Aircraft release high emission to the air and consume more fuel than any other transport modes. Therefore, air transport consider more damaging to the environment. Increasing in fuel efficiency and technology improvement in aircraft could contribute into decreasing the environmental impact of aircraft.

### ***Pipeline transport***

Pipeline usually use for transporting natural gas and oil. Nowadays, transporting solid products in the form of slurry of hydraulic suspension such as coal slurry pipelines also become a good choice. We are not going to elaborate more on pipeline because it is definitely not suitable for the topic of this thesis.

### ***Intermodal Freight Transport***

Intermodal freight transport is the movement of goods in one and the same loading unit or road vehicle, which uses successively two or more modes of transport without handling the goods themselves in changing modes (Goel, 2009, p. 49). This choice becomes common if the final destination of products is far from the harbour or from the rail terminal if the combination is between rail and road.

European Commission through their white paper aim at having competitive and resource efficient transport system promote this intermodal transport by suggesting changing mode from road to rail. These changes could overcome the congestion

problem in the road and the subsequence impact such as accident and noise in the public road. However, these advantages could be obtain if the infrastructure for intermodal such as loading/unloading unit is capable for handling the transfer between road, rail, and other transport unit.

## 2.8 Lesson Learned From Theories

This chapter have presented the theory that gives valuable insight to analyse the answer of the research questions. The first research question is:

*“To what extent Ekornes has reached its implementation of sustainable freight transport practices in their transport logistics strategy?”*

The theories have presented the strategy on how to gain competitive advantage through logistics and supply chain management. The strategies are by having cost advantage or value advantage, or both. This decision will effect on how company pursue their distributions of products and their relationship with four actors in transport logistics. There are four actors need to consider on order to have effective transportation in supply chain, which are the regulators, the shipper, the carrier, and the owner and operator of transport infrastructure. Firm could choose between using their own transport or outsource the transportation and distributions activity into the third party logistics company. These two choices off course have their own advantage and disadvantage, and strategies need to pursue in order to have effective and efficient transport. This decision could also give impact on firm’s contribution to environmental protection and social responsibility.

The second research question is:

*“How is Ekornes responded to pressures from external and internal regarding the sustainable freight transport practices?”*

There are some factors that influence the implementation of sustainable freight transport practices. From the theory, there are six factors need consideration namely the management, company’s image, customers, carriers, government and

authorities, and market pressures. These factors could determine sustainable freight transport practices need to implement by the company's.

The third research question is:

*“How to improve company’s practices in sustainable transportation, without any consequences to their business profitability?”.*

This could be approach by discussing how the company incorporating the environmental consideration into logistics decision. The external pressure and the motivation from internal firm will determine the effort made to improve the practice on sustainable freight transport. Therefore, it is important to analyse the macro and micro perspective, as well as the involvement on voluntary environmental management system.

From this three reserach questions, it is possible to draw the theoretical foundation in answering the research questions (figure 10).

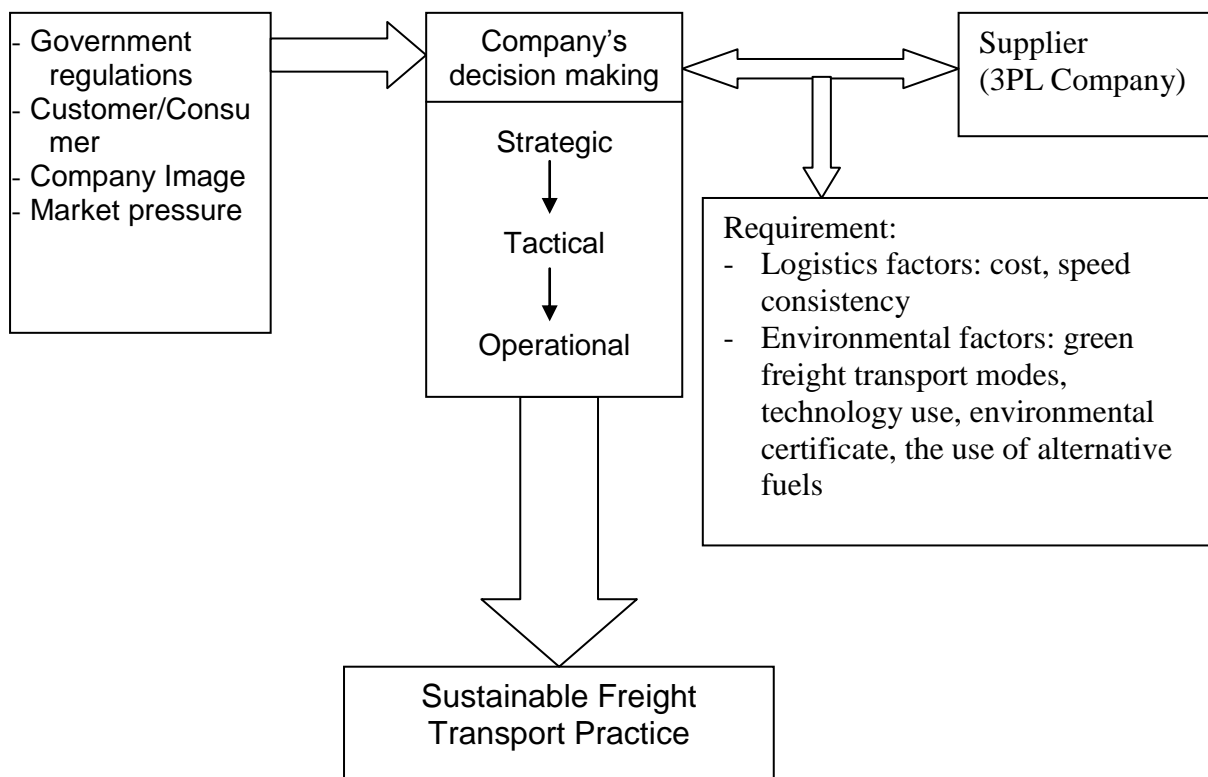


Fig 10 Theoretical Model

## **3 RESEARCH METHOD**

This chapter will discuss the methodology used and considerations made for this research work. In this section, the qualitative research design, data collection processes which comprise data collection processes for the theoretical framework, interviews, and document will be discussed. Further, the limitation of the study is presented.

### **3.1 Qualitative Research Methods**

There are some choices need to be decided in designing a research project. Firstly, we have to decide the approaches or the methods which are used in carrying out the research. The choices will be determined by the research problem, and none of the approaches or methods will fit for all problems. It will be unique for each problem. The two basic approaches to the research are quantitative and qualitative research. Quantitative research is used when the researcher wants to test the theory or hypothesis. While the qualitative research is used when observing and interpreting reality with the aim of developing a theory to explain what was experienced (Glenn, 2010, p. 37).

Applying the quantitative research methods will not be suitable for this research work. There is no hypothesis or theory need to test. We are not going to test the practice done in the company regarding the sustainable transportation. This research is a descriptive research work, aims at investigating the existing situation and analyse the facts. The qualitative research methods are considered as appropriate with the research problem and suitable with the aim of this research. With this methods, it is possible to gain in depth understanding of the subject, not only answering the what, where, when questions but also the how and why questions. Through this thesis we want to investigate how Ekornes integrate the environmentally concept into their strategies. The sample is purposive rather than gather data through big sample of company's employee. Therefore, the interview was conducted to gain insightful information from the Manager of Customer Services and Manager of Environment and Quality. The data from Customer Services regarding outbound logistics is

gathered with intention to understand the strategy on transportation and distribution activity. Moreover it also aims to understand how such strategy and practices implemented on transportation and logistics. The similar practices are also used to gain insightful information from the environment and quality department.

In this qualitative research, a case study method has been chosen as the methodological approach to explore the research area. According to Dubois and Gadde (2002, p.555) that case studies provide unique means of developing theory by utilizing in-depth insights of empirical phenomena and their contexts and the researcher will have insight into the feelings such as motivations and attitudes of the interviewee (Polonsky and Waller, 2011, p. 134). The case study needs an integrated approach, and researcher should see the interrelatedness of the various elements in the research work. A case study on this research will explore the established theories concerning the research area. Hence it will give explanations on the recent practice in the research focus. The case study will also explore the interrelatedness between the important stakeholders, namely the carrier, policy maker, and the infrastructure owner.

### **3.2 Data Collection**

This research focused on the transportation and distribution strategy, and finds out practices in align with sustainable transportation principle. The complex relationship between the transportation and logistics principle with the triple bottom line concept will create the challenges to the company on implementing the sustainable transportation principle. Therefore this thesis will explore the determinant factor for transportation in logistics and sustainable transportation. The qualitative research methods with case study analysis considered appropriate for this research because of the exploration and explanation characteristics of the qualitative research.

In this research, the qualitative method was implemented through semi structured interviews to the department manager. It was important that data had been collected with such ways to reflect what actually exist in their transportation logistics practices. Hence, through literature review we studied at what had already been discussed on



this research area. The interview and environmental documents from the company were provided insight perspective to sustainable freight transport practices in the company. This would give the research an opportunity to contribute to the company's decision regarding implementing of the sustainable transportation concepts into practices.

### **3.2.1 Data Collection Process for Literature Review**

There are number of different types of sources for literature used for this research, namely books, e-books, electronic databases and the internet. The text books were found in the campus library. The electronic databases were the pool for sourcing articles, journals and other related publications. The internet is the media for gather the e-books and electronic databases viz. the information about the case company on their website.

The library provided the books about green logistics, transportation in supply chain and supply chain logistics management. These books were important in giving the background description about the green logistics, logistics strategy, transportation infrastructure, and transport modes with their negative environmental impact to the environment. The electronic databases were important in finding the theories about the company practices on sustainable transportation, their strategy and strategic consideration in incorporating the environmentally friendly concept. The key search parameters in electronic databases included phrases like "sustainable freight transport", "green logistics", "transport logistics", "sustainable transportation practices", "green logistics strategy", "environmental aspects of freight transport", "environmental impact of road transport", etc. These search phrases returned a fairly sizeable amount of relevant literature on sustainable freight transport practices. Websites such as science direct, Springer Links, Sage publications as well as the Yahoo and Google search engines are also used as a source of journals, e-books and other related publications. Further, the information gathered was used to develop an interview questions.

### **3.2.2 Data Collection Process for Case Study**

Ekornes was chosen as a case company for this research. In order to gather the empirical data for the research, two semi structured interview with manager and access to various documents was conducted.

#### ***The interview processes***

The interview was done with the Manager of Customer Services and the Manager of Environment and Quality. This research used the semi structure interview. The outline of the interview and some guiding questions were prepared before the interview and sent to the interviewee at least one week before the interview. In this type of interview, the researcher as the interviewer will assure that all topics are covered, but at the same time let the conversation be guided by the interviewee when appropriate. When the new topics of interest were discovered during the interview process, the interviewer has the opportunity to ask follow up questions and also introduce new issues based on the responses.

The aim of the first interview with the manager of customer services was to have an overview about the company's activities on transportation and logistics, since the customer service department is responsible for the outbound logistics. Thus the questions were focused on transportation and distribution process of the products, transport modes used in delivering the product to the distributor in destination countries, challenges in managing the transportation and distribution of the products, actor involved, and the relationship with the third party logistic (3PL) companies. The interviewee was also asked about the environmental aspects involve in transportation activities and his perspective on those aspects within the company.

The second interview with the manager of environment and quality was aimed at having insight about the environmental policy in the company. The questions were specifically designed to have more specific aspects on environmental consideration in the company and their motivation to pursue the environmental initiative in the company.

### **Documents**

Organizations produce large number of formal documents and reports about their operations. This research also uses some of the document released by the company with regards to the environmental concern. The document consist of the report to UN Global Compact 2010, the carbon disclosure project 2011, annual report 2010, company's objective and value, and the presentation on transportation and distribution activities in Ekornes. Some of the documents could be accessed through their website. But not all of this document relevant with this research topics. Some of these documents only talk about environmental aspect on the general level. For example the objective and value and annual report 2010. The UN Global Compact also only provided the general achievement on environment. The other documents were examined carefully in order to get clearly understanding on sustainable transportation practices stated in those documents.

### **3.3 Limitation of the Research**

In this research, the limitation lies on the data collection methods for qualitative research. The researcher was only able to use the phone interview and access documents to collect the data necessary for this research. Interview is recognized as the appropriate methods to gain depth information from the interviewee. However, the phone interview method had made the interviewer could not see the interviewee face. Therefore it is impossible to learn the interviewee gestures and facial expressions. Hence the findings may be subjective and would be interpreted differently.

The data was collected from the two interviews with the Manager of Customer Service and the Manager of Environment and Quality. Interview with Manager of Customer Service was done to get the important information about the outbound logistics. Whilst the interview with Manager of Environment and quality was done to get information regarding the objective and implementation of environmental policy in Ekornes. Although the chosen interviewees were suitable to gain the information about transportation and environmental aspects in Ekornes, these two interviews could not represent the general perspective of the company. This because

These interviews only represent the perspective from the top/middle management in the company. The interviews have not represented the operational level management as the subject who has direct interaction with transport activity. Having an interview with one of the 3PL company could also enrich the research findings.

### **3.4 Summary**

This chapter has described the process of organizing and retrieving data that will be used for the analysis of the research questions. The interview with the manager of customer service/outbound logistics was useful in answering the first research question. While the second interview and the documents will be the basis on answering the second and third research questions. Finally, the fourth research question will be retrieved from comparing and analyse the first, second, and third research questions.

## 4 FINDINGS

This chapter will present the results of two interviews done with Manager of Customer Service and Manager of Environmental and Quality. The customer service department is responsible for managing the outbound logistics. Findings from studying the documents regarding social and environmental aspects are also presented. The documents are Communication on Progress 2011 (CoP 2011), Ekornes objective and value, and annual reports 2010. These findings will be presented on two main sections. First, there is a case description which aims to give an understanding of the international distribution activity on Ekornes. It includes an overview of the transport means which are used to deliver the products worldwide, which is important to have in mind when analysing the case. The second part presents the environmental concerns in Ekornes related to transportation and distribution of products.

### 4.1 Transportation and Distribution of Products in Ekornes

Ekornes is a global company with market share around the world. Ekornes's products are manufactured in Norway and marketed all over the world by a network of national and regional sales companies. They presents almost in all country in the world, except in Africa. The biggest market is central and south Europe, followed by USA and UK. The main distribution centre is in Ikorndes. All of the finished products from production facilities are sent to Ikorndes and being scanned, labels, and sorted. Then the products are ready for distribution to the international market channel and in Norway. Distribution products from Ikorndes will be around the clock. Because of time difference, the international distribution in Ekornes has a greater requirement for flexibility.

The customer service department will be responsible for the outgoing products from Ikorndes. However, the transportation and distribution of products is outsourced to the third party logistics (3PL) company. One of the 3PL companies will have responsibility to load and sort the products based on the label in Ikorndes port to the ships. Then the 3PL companies responsible for each destination will have

responsibility to carry the products in the ships to a warehouse in country of destinations. This description shows that the responsibility of 3PL companies includes transport consolidation and warehousing of products.

One of the requirements for choosing the 3PL is having enough trailers to provide services for Ekornes. Ekornes will choose the 3PL having enough resources to cover the distribution for one country or one area of distributions. There will be one 3PL company for delivering to Sweden, one 3PL company for Finland, one 3PL company for delivering to the north of Norway, one 3PL company for delivering to the south of Norway, one 3PL company for central (Austria, Germany, Luxembourg, Netherland, and Switzerland) and south (Belgium, France, Italy, Portugal, and Spain) Europe, one 3PL company for USA, one 3PL company for UK, one 3PL company for Japan, one 3PL company for Asia outside Japan, one 3PL company for Australia, and one 3PL company for Brazil (South America).

Other requirements for the 3PL are they have warehouse that could operate in a good way, and they also could help Ekornes with inventory and scanning for track and trace of the deliveries. Ekornes is only responsible in hiring the 3PL company for delivering to the countries of destinations. The 3PL hired by Ekornes for transportation services to countries of destination, will have another contract with transportation services within the country of destination.

In delivering all the products, 40% of the products for international market channel are carried by ships directly from Ekornes's own port in Ikorndes. Trucks will be used as transport means to deliver product in Norway and to central and south Europe. Whilst ships will be used as transport means for long transport distance. Ships come to Ikorndes every Thursday for delivering to UK. From Ikorndes, ship will travel to Immingham (UK) via Maloy. While for delivering to other countries than UK, ships come every Sunday. From Ikorndes, the ships will travel to Rotterdam or Bremerhaven and continue the journey to different ports in accordance with their country of destinations such as to Port Elizabeth (USA) or Santos (Brazil). After arrive in country of destinations or the warehouse for one market area, the finished product will continue their journey to the local distributors. For distribution in USA, the

transportation of products to the local distributors is carried out by the freight forwarders hired by the first tier of 3PL companies hired by Ekornes.

The transportation routes to the country of destinations are determined by the transporters, checked and conformed by Ekornes. Whilst cost of transportation is one of the reasons in choosing the transporters and the routes, the main consideration is to get the furniture as soon as possible to the retailers. Therefore the routes have been designed with the possible shortest delivery time from factory to the retailers. During transported, all goods from Ekornes is reloaded many times before it reaches the different retailers. Therefore, packing of the furniture becomes the most important things in delivery. The interviewee point out that Ekornes has an absolute minimum of transport damaged during delivery worldwide for this matter.

Freight transport in Ekornes shall not use air transport mode to deliver finished products. However, it does sometimes. When the problem comes out with one of the freighter in transit, then it will be too late if the replacement being sent by ships. Therefore, they will use UPS (air freight transport company) to send the freight. If the freight is too big, the delivery will use airfreight cargo. However, these are very seldom to happen and only on very small number.

According to one of the interviewee, Ekornes have something that has run very good for many years in transportation and distribution of products. The challenge on daily basis is on how to cope with all the rules along the transport chain, such as EU rules and harbour rules. For example the rules in Rotterdam harbour stated that the information regarding the goods needs to be sent 24 hours before it comes to Rotterdam. Another challenge is regarding having enough containers in Ekornes, and put all of them on the same ship. If there is no enough space in one ship, they have to provide another ship. Then the two ships will leave Ekornes at the same time and arrive at the destination at the same time as well.

## 4.2 Environmental Concern on Transportation in Ekornes

Ekornes is supportive to the environmental concern. This is reflected from the statement made by Chief Executive Officer (CEO) to support corporate social responsibility and engagement of Ekornes with UN Global Compact. The objective on environmental aspect is to accept environmental responsibility related to manufacturing, distribution and use of the company's products. Long term objective of Ekornes is to develop environmental issues to a competitive advantage through being ahead of the competitors in this field.

However, including the environmental aspect on operational decision strategy is not considered as the important factor recently. Sometimes, it exist conflicting interest between the environmental aspect and business profitability. One of the interviewee mentioned that the objective now is to have growing profit in company's strategy and the long term strength both brand and the product because company's position now is in mature phase. Therefore the goal for environmental concern now is to build the environmental consciousness throughout the value chain within the company. The strategy is by having the environmental ambassador in each department and in sales office. The environmental ambassador will focus on environmental issue in each department, and try to motivate and implement the environmental initiative in internal department. Ekornes established an Environmental Steering Group (ESG) in 2008. This group is reporting to the CEO and works to bridge the gaps between the different markets and departments. Input from the whole organization will be collected on daily basis, and the employees are welcome to ask questions and suggest improvement. All of the information will be collected to keep up to date on potential upcoming changes. This group also function as a central hub for environmental issues and expertise. The Involvement in UN Global Compact is also one strategy to build the environmental awareness internally. Even though having the UN Global Compact is not crucial to the market, but it could improve the company's awareness within the tenth principles of UN Global Compact. Building the environmental awareness throughout the value chain definitely needs times. It is important to take it step by step and in the future hopefully there will be common



understanding in the company to considered environmental factors as important as other business aspects.

The conditions concerning the role of environmental aspects on company's decision are also seen in customer service/outbound logistics department. Transportation and distribution of products to destination countries are done by the 3PL companies. Therefore company's initiative to reduce the carbon footprint from transportation and distribution activities also depends on the 3PL companies. With their concern in environment, Ekornes will hire the 3PL who offer services with less pollution. However in recent times, there is no specific environmental requirement set up by Ekornes in choosing the 3PL companies. The requirements only consider the logistics aspects such as cost, time of delivery, enough vehicles, enough warehouse, etc.

The 3PL will offer everything they have on green solutions such as environmental certificate and the use of environmentally friendly vehicles. But these services usually also come with extra cost. The 3PL with green vehicle or with environmental certificate usually demand for higher prices compare to the 3PL without the environmental certificates or green vehicle. But as mentioned by the interviewees that if there is a choice in green solutions and there is no huge different in cost and all of the requirements regarding the logistics factors are met, then the choices for green solutions is possible. Recently none of the 3PL hired by Ekornes are ISO 14001 certified. But some of the 3PL hired by Ekornes uses trucks with biodiesel.

Ekornes is involved in carbon disclosure project (CDP) on 2011. Through CDP, Ekornes reported their strategies, achievement, and reduction targets in climate change and emission reductions. Since Ekornes outsources their transportation and distribution of products, they consider that these activities only have indirect influence to the company. However, they estimated that 80% to 90% of the emissions from the value chain are related to extraction and transportation of raw materials for production of components and transportation of chairs to customers (CoP 2011 pg. 4). Therefore, main focus areas in the future would be on increased efficiency in use of raw materials and minimizing of transport volume resulted in reduction in emissions and costs. The strategy to minimizing transport volume is by sending

components or part assembled for assembly locally. Ekornes ship components to own stock for assembly locally in main overseas markets, and for other markets, products are ship mainly part assembled. By sending components and part assembled, it is possible to arrange for efficient transport volume. However, this arrangement is not possible for a product called as Stressless sofas. Stressless sofas are bulky and cannot be shipped parts assembled. Hence it will give non efficient transport volume. Therefore, the strategy for Stressless Sofa is by establishing production unit for Stressless sofas in US during 2011. It is estimated that annual monetary savings by sending components and parts assembled for assembly locally by \$355.000 (CDP, 2011, pg. 5).

Ekornes aims to verify their Environmental Product Declarations (EPD) for the entire Stressless collection according to ISO 14025 during year 2011/201. By developing EPD, company will be able to assess the products environmental impact from cradle to grave or from extraction of raw materials to final disposal. The EPD also could make the customers able to compare the products with competing products regarding the greenhouse gasses. From the market point of view, EPD is important for contract market. Contract market is related to company's market in the area such as for hotels, public spaces, maritime/offshore market (ships). Ekornes is not ISO 14001 certified yet. However, according to one of the interviewee the ambition is to certify their environmental management system and other products collections in the future.

## 5 DISCUSSIONS AND ANALYSIS

In this chapter, the findings will be analysed and discusses in relation to the three research questions posed in chapter one. The research questions are:

1. To what extent Ekornes has reached its implementation of sustainable freight transport practices in their transport logistics strategy?
2. How is Ekornes responded to pressures from external and internal regarding the sustainable freight transport practices?
3. How to improve the company's practices in sustainable transportation without any consequences to their business profitability?

Each of the three questions will be discussed in the three upcoming sections in turn. The previously presented theories about transport logistics and sustainable freight transport will used to analyse and discuss the case study.

### 5.1 Transport Logistics Strategy at Ekornes

Ekornes is a global company, with the distribution channel around the world. In today's market, Ekornes is represented in all of the country except Africa. We will see the significant role of transportation in global supply chain. The products from the factory will distribute around the world to the customers. Until the products received by the customers, it will take probably several times of changing transport means and loading/unloading activity. Every transport means (truck, rail, ship, air flight) will derives externalities to the environment. From the findings we could see some strategies carried out in customer service department for handling the outbound logistics with intention to serve better market and gaining more profit with less cost.

**Transportation and distribution of Ekornes's products is outsourced into the third party logistics (3PL) company.** The 3PL companies have responsibility to distribute the product from Ikornnes to country of destination. The services will include warehouses, transport means, handling inventory, and scanning the products. The finished products from seven production facilities are sent to Ikornnes, then distribute around the world by the 3PL company. **Ekornes has built own port**

**in Ikoriness as the main distribution centre.** We could assumed that the port at Ikoriness has a role as the cross-docking facilities, where all of the products are collected in the port, then sorting and labelled, ready to transfer to different destination in the world. By having the private consolidation warehouses, Ekornes could have greater flexibility in terms of operating policies, times, and procedures because the facilities have built based on their requirements. Another advantage from having their own facility is in term of cost and control. Ekornes could have greater control on their products in the consolidation warehouse and could have least cost since the port and consolidation warehouse will not operate for profit.

Ekornes's strategy by outsourcing the distribution activity could assume as **the strategy to strengthen their core competency.** Ekornes eliminates their problem on finding the best way to transport with managing their relationship with the 3PL companies. Outsourcing will also mean that they extend their value chain beyond the boundaries of their firm. Thus it will change the supply chain become the value chain. This strategy also makes **Ekornes have more complex supply chain.** The value or cost advantage needed for competitive advantage will not only create by Ekornes itself, but as Christopher (2005, p. 14) explained it included all the entities that connect to each other in supply chain.

The factors influencing the outsourcing strategy for transportation in logistics are analysed. **Ekornes has to set the requirement, aim at achieving the cost and value advantage from their downstream suppliers.** The requirements consist of factors based on the logistics point of view, which are seeking the service with lower cost but could deliver on time and with consistency. This requirements will chose the 3PL company with the enough transportation infrastructures such as trailers, containers, ships, and warehouses with good conditions.

Ekornes still lack of environment factors on their strategy in transportation and distribution. As mentioned by one of the interviewee, incorporating the environmental aspects on their operational decision is not on the high priority for now. Moreover, the interviewee also mentioned that even when the green solutions exist, they will not use it if the price is much higher. The 3PL companies hired by Ekornes have not ISO 14001 certified yet, assuming that it is because they don't see this certification is not

important for hiring the 3PL companies. These finding is correspond with study by Eidhammer and Andersen (2010). Eidhammer and Andersen (2010) in their study found out that the shippers are not ready to pay extra for the green solutions and do not think that the ISO 14001 certification is important for them.

One of the environmental aspects recognized in transport service hired by Ekornes is the use of biodiesel trucks. However, this practice seems to be offered by the 3PL companies.

## **5.2 Factors affecting the Implementation of Sustainable Freight Transport Practice**

In the previous section, we have discussed about the sustainable freight transport practices in Ekornes. The findings indicate that Ekornes is still lack of environmental policy on sustainable freight transport. Thus in this section we will discussed what factors will influence the use of environmental aspects in company's practices.

Ekornes stated in the report to Carbon Disclosure Program (CDP) 2011 that Ekornes only has indirect influence on the environmental impact of transport logistics because they outsourced this activity into the 3PL companies. However, Ekornes has ambition to verify their Environmental Product Declaration (EPD) according to ISO 14025 during 2011. **EPD verified is a respond to the contract market.** Customers in contract market are concern with the environmental performance of the products. Therefore to have a position on that market, Ekornes must have verified EPD.

The EPD will contain the information about the environmental performance of the products. The EPD is specified based on the Life Cycle Assessment (LCA) of environmental data from raw material production, manufacture, distribution, use, and disposal. Christopher (2005, p. 14) mentioned that having an outsourced activities will make the supply chain extended and the cost/value advantage will depend on all entities in supply chain. Therefore to some extent, it is important for Ekornes to maintain the environmental impact from transportation activities.

The **pressure from market** is become prominent from the EPD verification. It is also indicate the pressure from the **customers with environmental demand**, whilst the **customer with non-environmental demand** become the great hindrance.

Findings indicate that the management of Ekornes is concern with the environmental, but the **pressure in using environmental aspect on decision making is not so high**. Even though the support is available on some areas, there also lack of support on the other area such as transportation. This was expressed from the statement from the interviewee and the practice on transportation. The top/middle management in Ekornes does not put the environmental aspects as their priority on operational decision, such as in determined the requirement for the 3PL company. It is probable to happen when they are lack of awareness of the importance of having the sustainable freight transport. Ekornes for now is on the step where they try to build the environmental awareness throughout their value chain. They communicate internally by using the environmental ambassador in each department. Bjorklund (2010) found out that communication within the company is not as important as top/middle management awareness and priorities in having the green transport solutions. However, this factor is still act as the driver factor in purchasing the green transport solution. Although internal management support for sustainable transport is not as much as expected, Bjorklund (2010) found out that the external factor will influence the company more than the internal management. However, she also pointed out that it is important that companies make sure to make the top/middle management have the required level of environmental awareness and that the environmental aspect is given the required priority (p. 11). Thus it will result on having the appropriate environmental management team on the right place.

The 3PL companies play an important role in greening the transportation services. Knowledge and equipment of the 3PL companies regarding the green transport solutions are major influence on implementing the green transport solutions. Eidhammer and Andersen (2010) found out that the freight forwarders in Norway are having enough knowledge and resources to cope with the requested services on green transport. Moreover, the the condition now is the supply of green transport solutions exceeded the demand. These findings are reflected from Ekornes practices

with the 3PL companies. Ekornes are lack of environmental aspects on the requirement for hiring the 3PL companies.

**There is no sign of practices that government regulations will influence Ekornes in having the green transport solutions.** This condition could be as a result of outsourcing the transportation and distribution activities to the 3PL companies. It also means that Ekornes transfer their responsibility to cope with the government regulations to the 3PL companies. However, Ekornes as a customer to the 3PL companies should concern about this. It is because some of the government regulations will more costly if the freight forwarders could not meet the regulation, such as polluter pays regulation. If Ekornes hired the 3PL company who pollute, then the extra cost paid by the 3PL companies will become apparent in cost for hiring them. Another example is fuel tax. Using non efficient transport means will increase the fuel, thus resulted in having higher fuel tax.

Ekornes considered company image on environmental and socially responsible company is important. It is indicated on Ekornes's involvement in UN Global Compact and environmental labelling. Even though this involvement doesn't related directly with transport logistics, **this involvement could give Ekornes strong image on environmental for an increasingly environmentally aware market.** It is also could be the influence to take the environmental measures and give them competitive advantage to the environmentally aware customer and market.

### **5.3 Improving the Sustainable Freight Transport Practice**

The previous section has discussed the factors that influence the implementation of sustainable practice in the company. The next question will be on how to translate the pressure to the practice. Therefore in this section we will discuss about incorporating the environmental aspect into the company's practices.

Ekornes had established an Environmental Steering Group (ESG) in 2008. This group has responsibility to bridge the gap between the different market and departments, and function as a central hub for environmental issues and expertise.

The group will work on finding the information regarding implementation of environmental policies, reduce environmental risks and respond to environmental incidents, from each department. ISG also appointed a green ambassador at each sales office. The green ambassador will report environmental issue directly to the group. The ESG will present the annual report to the top management team. The information is valuable for the company wide risk management process.

The description above shows how the environmental improvement process in Ekornes. The issue about environment will come from the operational level, and then the top management will consider the issue before taking it into the strategic, tactical, and operational level. However in taking the decisions, the environmental issues still not considered in the same manner as time and cost. The environmental issue is still less important than time and cost in all departments. This finding is not in agreement with suggestion by Aronsson and Brodin (2006). They suggest that environmental issue should be considered in the same manner as time and cost at all levels.

The external pressure and the motivation from internal firm will determine the effort made to improve the practice on sustainable freight transport. If we look at macro and micro perspective, the important stakeholder to improve sustainable freight transport is government and company itself. Ekornes consider to outsource the transportation services to the 3PL companies, therefore in practice they still lack of environmental policy on freight transport services. However, from the Porter value chain perspective extended supply chain will become the value chain. Ekornes should also maintain their relationship with downstream suppliers and create value from the activity by incorporating the sustainable freight transport practice.

Governments are encourage the companies to certify their management system in order to support the sustainable development. Therefore, it is important to analyse the macro and micro perspective, as well as the involvement on voluntary environmental management system. Ekornes actually have give their attention to environmental aspect and start to assess their environmental management system. One of the interviewee mentioned that their ambition is to certify their environmental management system and other products collections in the future. EMS will give the perspective on the activities need an improvement in term of environmental aspects.



It will show whether the regulation regarding certain activities has met the minimum standard or not. Therefore, it is easier for government too in assessing the companies practice in endangering the environment.

Although finding the environmentally friendly transport modes is not on Ekornes's priority, but choosing the right freight transport modes could improve the efficiency in using the transport means to transfer the goods. Findings show that Ekornes uses trucks in 60 % of delivery, whilst the theory stated that trucks are the least environmentally friendly transport means. One of the interviewee mentioned that the use of trucks give them more flexibility in moving the goods and it seems that there exist no problem in using trucks to deliver products. However with technology development, it is actually possible to have the trucks with low environmental impacts.



## 6 CONCLUSION

This thesis has investigate how the sustainable freight transport practices is done at Ekornes, particularly practices in transportation and distribution of products in Ekornes. The transportation services for distribution of products to the national and international market is outsource to the 3PL companies. However we found out that Ekornes is lack of environmental factors in the contract with 3PL providers. Cost, time of delivery, consistency, good wirehouse still become the most important factors in choosing the 3PL companies. None of the 3PL companies hired by Ekornes are ISO 14001 certified.

This thesis also investigate how Ekornes responded to the pressure to implement the environmental concept on their operational strategy. The findings indicate the positive response to some extent. Eventhough the response is not particularly for the transportation services, it is indicate the positive concern on the environment and chances for improvement in other area is possible. Market pressure become the most influencing factor in having the sustainable practice. Ekornes also have to stated the top/middle management support in order to respond to the pressure. The top/middle management will support for sustainable freight transport if they are aware on the importance of sustainable freight transport. Therefore, Ekornes goal in creating awareness or environmental counciousness internally should also targeted on top/middle management.

Finally in finding improvement for the sustainable freight practices, this thesis investigate how the environmental information incorporated in Ekornes decision and the concern in having environmental management system certified and choosing freight transport modes. The environmental consideration is based on the issue collected from the operational level of the company. The issue is reported to the top management and with consideration by the top management the issue could become the company's strategy in the future.

## **6.1 Suggestion for Further Research**

This thesis has a limitation on the data collection process. The interview was done only with two managers of Ekornes related to the research topics. Therefore we only could see the perspective from the focal company and management level of the company. It would be interesting to see from the perspective of the 3PL companies hired by Ekornes. The research will be more enriched if it includes observation on distribution centres on collecting the data.

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