A

CASE STUDY

OF

ENVIRONMENTAL MANAGEMENT PRACTICES

OF

A TRANSPORTATION COMPANY IN THAILAND

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Research report in partial fulfilment of the requirements for the degree of

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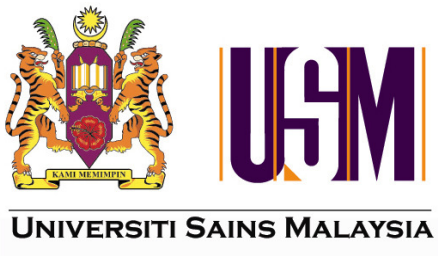

DECLARATION

I hereby declare that the project is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at USM or any other institutions.

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This dissertation was so far the most challenging work that has came across in my entire academic life. In order to complete this task I had to go through some excruciating phases, which at several occasions became so demoralizing that I had to start all over again. Despite the relentless failures I continued to strive for success and it was this very motivation that kept me determined towards achieving the goal.

The conclusion of this dissertation would not have been possible without the support and guidance from my supervisor, Dr. Siti Nabiha for her dedication guidance, advice and valuable time spent throughout the course of doing this case study.

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ABSTRAK

Pencemaran udara merupakan ancaman yang serius terhadap persekitaran dan juga kesihatan manusia. Malangnya, industri logistik merupakan penyumbang kedua terbesar pencemaran udara di dunia dan Negara Thailand. Dengan itu, amalan persekitaran perlu diamalkan di industri logistik termasuk Southern Hauliers, sysrikat logistic yang berasaskan di Thailand yang berlokasi di Hatyai. Tujuan kes ini adalah untuk mengesahkan keputusan amalan pemuliharaan tenaga di syarikat, termasuk bahan bakar dan elektrik, pemuliharaan air dan pengurusan sisa. Selain itu, kes ini juga mengkaji latihan dan promosi yang diamalkan di syarikat Southern Hauliers untuk meningkatkan kesedaran persekitaran serta menegetahui pengetahuan persekitaran pengurusan yang diperolehi oleh pemandu. Dorongan utama untuk amalan persekitaran di dalam organisasi ini juga dipertimbangkan. Tujuan utama bagi Southern Hauliesr mengamalkan persekitaran pengurusan adalah unuk mengurangkan penggunaan tenaga bahan bakar. Walaubagaimanapun, amalan persekitaran lain juga diambil perhatian. Akan tetapi, tujuan utama sebaliknya bagi amalan persekitaran adalah untuk mendapatkan manfaat ekonomi dan bukan untuk alasan persekitaran.

ABSTRACT

Air pollution poses a serious threat to the environment and also to human being. Unfortunately, logistic industry is the second largest contributor of air pollution in the world as well as in Thailand. As such, logistic company needs to be aware of the environmental impact of their operations and take the effort to be eco-friendly. Thus, in this case, the environmental practices of Southern Hauliers, Thailand-based logistics company located in Hatyai is discussed. The focus of this case is on the energy conservation practices in the company including both of fuel and electricity, water conservation and waste management. In addition, the case also examines the training and the promotion of environmental awareness and also environmental knowledge of the management and drivers. The main drive for environmental practices in the organization is also investigated. Southern Hauliers main focus is on minimization of energy and fuel consumption. Other environment practices in their organization are emphasized. The main drive for these practices in Southern Hauliers is to gain economic benefits and not for environmental reasons.

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CHAPTER 1

INTRODUCTION

The issue of climate change and the global warming is a commonly widespread topic. According to Global Issues (2009), they agree that it is happening and has caused an imbalance in the global patterns of all species living on earth. Habitat is decreasing and the chances for ecosystems to adapt naturally are diminishing. Many agree that climate change is one of the greatest threats facing the planet (Global Issues, 2009).

Research has shown that the root causes leading to increases global temperatures are human activities and natural events. As mentioned by the Intergovernmental Panel on Climate Change (2001), global warming which resulted from human activity can have negative impacts on the earth, such as warming temperatures, rising sea levels, more intense storms, and a host of other environmental maladies. Nevertheless, the proliferations of greenhouse gases are also driven by increases in temperatures. Greenhouse gases consist mainly of six gases, namely, carbon dioxide, methane (which is 20 times as potent a greenhouse gas as carbon dioxide), nitrous oxide, and three fluorinated industrial gases: hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride (Global Issues, 2009).

Among these gases trapped in the atmosphere, carbon dioxide is the most significant and harmful (Global Issues, 2009). Carbon dioxide (CO_2) is released with every breath exhaled by nearly every living species (Healtharticles-lk.com, 2008). However, human activity is considered the most significant contributor to the undesired imbalance in the natural cycle (Global Issues, 2009). For instance, the

burning coal to provide heat and power is a leading cause of global warming, as is the burning of other fossil fuels, and deforestation, which also imposes a substantial environmental burden. Apart from heating, fossil fuels seem to be a necessity for transportation, cooking and electricity. However, the burning of fossil fuels adds extra carbon dioxide into the earth atmosphere.

Besides that, the burning of fossil fuel is also one of the greatest threats of logistics companies nowadays. It causes more carbon dioxide emissions to be pumped into the atmosphere. Due to this, the concentration of carbon dioxide is higher today than it has ever been. Scientists also believe that this high concentration of carbon dioxide is not something that happened overnight but occurred slowly over a long time.

These facts raised the awareness of the importance of the environment impact from human behavior, which can threaten every single life on earth. Hence, with increases in environmental awareness, there is the pushed for standards more eco-friendly practices such as adopting vehicle sharing, minimizing waste and etc. Cooperation between private sectors and governments can help to protect the environment by imposing regulations on companies to follow the good environmental practices.

Therefore, many companies started to adopt various green practices. For instance, many logistics companies have started reducing waste in terms of water and energy consumption, as well as reducing paper consumption in the workplace. To

help manage this, some companies have even implemented technology tools such as E- logistic or reverse logistic to eliminate extra waste during operations.

Hence, the purpose of this case study is mainly to investigate a logistics company to understand how well and to what extent has the company implemented good environmental practices. The company chosen for the study is Southern Hauliers, one of the leading third-party logistics companies, which provides comprehensive supply chain management solutions throughout Thailand, Malaysia, Singapore and recently into Laos and China (Kunming).

1.1 PROBLEM STATEMENT

Concern for the environment is no longer a fringe philosophy in a time when global warming is regularly talked about on the radio, television, and the internet. The fundamental root cause of green house gas emissions is transportation of goods and people. As a result, there is a pressing need for action, particularly by the logistics and transportation companies, as they play a large role in the production of greenhouse gases that influence global warming.

According to Min and Galle (1997), pollution and waste generated by the supply chain can contribute to global problems like climate change, global warming, ozone layer depletion, and acid rain. Therefore, to address environmental problems in the logistics sector, it makes sense to focus on energy conservation by directly adopting new technologies for transportation and organization, and on training about and promotion of environmental awareness to engage staff to adopt environmental

practices. The adoption of best practice methods offers the most promising opportunities for logistics operations to become both more efficient and more environmentally sustainable.

The company for this case study, Southern Hauliers, is a Thailand-based logistics company located in Hatyai. It distributes goods within Thailand and across the Malaysian border to the city of Bukit Kayu Hitam. This study aims to investigate the good environmental practices and strategies adopted by the company by focusing on technologies implemented in transportation and organization, as well as training and the promotion of environmental awareness. This is crucial for achieving higher efficiency and also part of the eco-friendly way of reducing expenses and overhead. Apart from this, the study seeks to gain some insights into the environmental knowledge and understanding of the company's management and drivers in order to gauge whether they are aware of the strategies adopted by the company as well as the main drivers for the company in adopting environmental friendly practices.

1.2 RESEARCH OBJECTIVES

The research mainly examined the company's new technology improvements and developments in terms of tires, tractors and trailers and other equipments in office in order to evaluate the overall energy and water consumption. Furthermore, this study will focus on the strategies adopted by Southern Hauliers through the development of technology tools to enhance workflow in the company in order to reduce waste consumption. This study also looks into the challenges and biggest threats the company faced in implementing green practices. These challenges as

mentioned above, refer to the investment financially pressure for Southern Hauliers to adopt theses environment practices in their company as it is a small scale company. Thus, the research objective is to provide insight into how well and to what extent environmental practices have been implemented by Southern Hauliers.

1.3 RESEARCH QUESTION

From the scenario discussed above, the research questions for this case study are:

- What are the environmental management practices (e.g. those related the energy, water conservation and waste management) used in Southern Hauliers?
- What are the main drivers behind Southern Hauliers adoption the best environment-friendly practices?

1.4 SIGNIFICANCE OF THE STUDY

Full benefits are unlikely to be achieved, however, when such proposals are put into practice in isolation, and it may be more sensible to consider them as a wider package of measures. This topic has therefore been explored in the light of the need for integrated solutions; which pull the above- mentioned the use of technologies (such as the aerodynamic styling used in tractors and trailer) together with the personnel training and education that help to eliminate the obstacle (such as excessive energy and water consumption as well as proper waste management) to achieving more effective and sustainable transport and logistics practices. Roles and

responsibilities of various actors and stakeholders have also been considered as an additional element of analysis.

1.5 ORGANIZATION OF REMAINING CHAPTERS

Organization of this case study as per below:

- In the Introduction, the research problem, research objectives, the research question and significance of the study have been reviewed.
- In the Country Profile, an overview of Thailand in term of geographic, demographic, political and economic have been studied. The environmental education and Thai energy policies is further discussed in the end of this chapter.
- In the Transportation Industry, the background of the transportation industry has been reviewed.
- In the Literature Review, the tools used for analysis and the technologies used for transportation and organization with their ability to reduce waste and pollution has been discussed. Personnel education and training, mainly for the staffs and drivers has been reviewed in the end of this chapter in order to know- how the action can be taken to increase their environmental awareness.
- In Methodology, an overview on the method used and steps taken to construct this case.
- In Company Profile, the company background has been reviewed.
- In Case Write Up – Environmental Practices at Southern Hauliers, the depth and breadth of case is reviewed and the problem and issue is highlighted in this chapter.

- In Case Analysis, the company's environmental practices have been benchmarked with the perspectives of toolkits (The Sustainability toolkits-offices and Freight Best Practice). The SWOT analysis is used to formulate the strategies of the finding in order to improve the environmental management system and to formulate the recommendation for Southern Hauliers as so to enhance their environmental awareness.
- In Recommendation and Conclusion, the practical contribution and usefulness of findings are reviewed.

CHAPTER 2

COUNTRY PROFILE

This section will provide the detail description of Thailand in terms of geography, demographic, political, economy, environmental education, and energy policy.

2.1 GEOGRAPHY AND CLIMATE

The kingdom of Thailand, formerly known as Siam is located on the Indochina Peninsula in the continental Southeast Asia. The corresponding with the border countries were Burma 1,800 km, Cambodia 803 km, Laos 1,754 km and Malaysia 506 km. (Asian Center for the Progress of Peoples, 2006) Thailand has five divisions, namely, central, east, north, northeast and south. The total provinces of Thailand are about 75 and Bangkok is the capital of Thailand, with the largest population (11,971,000) of the country (Wikipedia, 2010). Thailand has three major different types' climates ranging from tropical rain climate, tropical monsoon climate and seasonal tropical grassland or savannah climate. Different location and can have different climate, for instance heavy rainfall and tropical rain forest in the coastal areas throughout the year, southwestern and southeastern coast with monsoon and a very high average annual rainfall, dryness in the cold season during savannah climate (Thailand Health Profile, 2004).

2.2 DEMOGRAPHIC TREND

Thailand's population is the 20th largest in the world, which come with a large population of 66 millions. The population growth rate is about 0.626%. About 70.5% of population is in the middle age range group (15-64 years). About 75% of its population are Thai, 14% are Chinese and 11% for other races. Buddhist is the main religion in Thailand. Their main language is Thai and English as the second language. The national literacy rate is around 92.6%, and the school life expectancy (primary to tertiary education) is 14 years (CIA-The World Fact Book, 2010).

2.3 POLITICAL

Over the past decades, Thai kingdoms previously were under the absolute power of the king, however, after the democratic revolution led by the westernized bureaucrats and military in year 1932, Thailand was therefore changed to constitutional democratic monarchy. The prime minister is the head of government and the king is still maintaining little direct power whom symbolize as national identity and unity (Wikimedia 2010).

2.4 ECONOMY

Before 1997, Thailand economy is export- driven and heavily dependent on the agricultural product; particularly rice (Asian Info, 2000). Other agricultural commodities products including fish and fishery products, rubber, tapioca, corn, and sugar are the contributor for country economy growth (Travel Document System,

2009). The main exports partners for Thailand are US, Japan, China, Singapore, Hong Kong, Malaysia and Australia. Therefore, Thailand economic growth strengthens sharply with average growth of 9.4% (Oxford Business Group, 2008). However, Thailand economy is severely hit by speculative currency attack in 1997. The 1997 Asian financial crisis weakened Thailand's economic growth in which Thai currency, the Baht, started to diminish and the stock market dropped by a significant amount of 75%. Such situation resulted in many foreign investors started to lose their confident (Oxford Business Group, 2008).

From year 2000 to 2004, the economy slowly recovered from the 1997 Asian financial crisis with the average growth of more than 4% per year. This fundamental recovery is mainly from the financial aid of IMF 'rescue package' of almost $20bn (IMF, 1997). During the period of recovery, Thai government started to reform their financial system, emphasis more on education agriculture, value- added industry and technology and moving away from the raw industry of old. Unfortunately, the golden years did not last long. Thailand's economic growth becomes slower due to political uncertainty and rising violence in 2005. As a result the political protests hindered investment consequently, many investors started to lose their confident level and the economy growth dropped by 3% from year 2005 to 2008 (CIA-The World Fact book, Thailand 2009).

The contraction continued in 2009, especially the first quarter of 2009, GDP dropped by 7.1% (Travel Document System, 2009). To offset weak external demand and to shore up confidence, the government introduced two stimulus programs with

Thailand's traditional promotion of open market and foreign investment that worth $43.4 billion (Oxford Business Group, 2008).

2.5 ENVIRONMENTAL EDUCATION

Environmental education in Thailand started since 1977 and has been integrated into formal and non- formal educational program. The program has started earlier, but it has been neglected until the year 1990. The significant development on environmental education was then started in early 1990s by the Ministry of Education. Apart from the government implementation, other external factor increased the environmental awareness of the Thai public such as global warming issues, Agenda 21 recommendations from the Rio Conference and the awareness of the use of natural resources as an example, excessive exploited abundant natural resources used for the country development process and economic gain has also reflected to the formulation of the environmental education in Thailand (Japan Environmental Education Forum, 2004- 2007).

The main point of students being involved in environmental education at a grassroots levels to give the Thai youth a better understanding of environmental problems and establish a more solid foundation for sustainable development. This is done through knowledge, morality and learning process approach by applying efficiency learning method in formal and non- formal education program (Asian Productivity Organization, 2003).

Nevertheless, the advancement of environmental education program is slowed due to some constrains. For instance the environmental education subject is not implemented at the basic education level (Academic and Business Research Institute, 2010). It was introduced at graduate level and compulsory course to the first year undergraduates (UNESCAP, 2001). Furthermore, this subject is only been taught in science subject. Thus, usually the science teachers are involved in the activities. Besides that, the content of environmental education generally focused on conservation without linking them to the natural science aspects and also with the social and socio- economic dimensions. Moreover, some of the learning materials and tools for teachers are scare and not easily obtained (Japan Environmental Education Forum, 2004- 2007).

However, according to the Ministry of Education, five guidelines were established as learning activities in school, namely, environment and school context, personnel relationship, campaigns about environmental conservation, environmental management in school and environmental collaboration between school and community (Sri-ootta, 1998; Krapeedang, 2000; Sook-kasem, 2001).

2.6 ENERGY POLICIES

Thailand is facing critical negative environmental impact due to its air pollution from vehicle emissions, water pollution from organic and factory wastes, deforestation, soil erosion, wildlife populations threatened by illegal hunting. According to Thailand is the twenty- second largest emitter in the World, and was rank as second highest emitter in ASEAN, after Indonesia (Asia Pacific Energy

Research Centre, 2009). Thus, the Royal Thai Government implemented policies in various areas to address Thailand's urgent problems and to achieve sustainable development. In the area of energy policy, the government seeks to build an energy sufficient society, achieve food and energy security build a knowledge-based and creative society,, alleviate poverty and income disparity and develop good governance. Furthermore, the initiative from Thai government is to promote their country in the international arena as well as enhance economic linkages with other economies in the region to cooperate in energy and other sectors. Actions are based on five basic guiding principles:

2.6.1 DEVELOP ENERGY SOURCE IN THE COUNTRY FOR GREATER SELF- RELIANCE

Thailand is heavily dependent on the imported energy for the past few years. As a result, started to increase energy stability and to meet sufficient demand by expediting the exploration and development of energy sources at both domestic and international levels through negotiation with neighboring countries at the government level for joint development; develop energy mix to reduce sourcing risk, price volatility, and reduce production cost; encourage electricity production from renewable energy, particularly from small or very small scale electricity generating projects, as well as study the appropriateness of alternative energy for electricity generation (Energy Policy & Planning Office, 2008).

2.6.2 EXPEDITE AND PROMOTE ALTERNATIVE ENERGY

Through its current 15-year Renewable Energy Development Plan (REDP) 2008–2022, the Thai government encourages the production and use of alternative energy, particularly bio- fuel and bio- mass—for example, gasohol (E10, E20 and E85) and biodiesel (B5)—biogas, and municipal solid waste to enhance energy security while reducing environmental impacts. Thailand strongly promotes community-scale alternative energy and continuously promotes research and development of all forms of renewable energy. Besides that, Thai government provides incentive to farmers and community as a way to encourage them on their production and usage of renewable energy. In addition, Thai government encouraged the usage of natural gas in the transportation sector by expanding natural gas distribution system nationwide and rigorously and continuously promotes research and development in all forms of renewable energy (Energy Policy & Planning Office, 2008; Asia Pacific Energy Research Centre, 2009).

2.6.3 MONITOR ENERGY PRICES AND ENSURE APPROPRIATE LEVELS, IN LINE WITH THE WIDER ECONOMIC AND INVESTMENT SITUATION

The government supervises and maintains energy prices at appropriate, stable and affordable levels by setting an appropriate fuel price structure which supports the development of energy crops that reflect true production cost. other action has included to manage the market mechanism and oil funds in order to promote effective use of energy and encourage investment competition in energy business as so to

improve service and safety quality (Energy Policy & Planning Office, 2008; Asia Pacific Energy Research Centre, 2009).

2.6.4 EFFECTIVELY SAVE ENERGY AND PROMOTE ENERGY EFFICIENCY

Thailand has made energy saving discipline part of its culture and encouraged energy conservation in the household, industrial, services, commerce and transportation sectors through energy conscience building campaign. The government provides incentives to encourage the private sector to opt for energy-saving appliances. There are four main energy saving initiatives: a revolving fund for energy efficiency and renewable energy, Energy Service Company (ESCO) venture capital funds, tax incentives for energy saving, and demand-side management (DSM) bidding. Other actions have included the establishment of standards for electrical appliances and energy conservation in buildings, and the encouragement of the development of mass public transportation and the railway system in order to promote effective energy usage while reducing the country's investment (Energy Policy & Planning Office, 2008; Asia Pacific Energy Research Centre, 2009).

2.6.5 SUPPORT FOR ENERGY DEVELOPMENT WHILST PROTECTING THE ENVIRONMENT

Thailand has a strong policy of protecting and encouraging energy consumption and production which attach importance to the environmental impact, especially impacts from oil refineries and power plants, and from the transportation

sector, particularly through Clean Development Mechanism (CDM) projects. The government's intention is to reduce Thailand's CO_2 emissions by least 1 million tons per year (Energy Policy & Planning Office, 2008; Asia Pacific Energy Research Centre, 2009).

The five energy policies define the main mission of the Ministry of Energy, which is to devote its efforts to creating energy security, supporting alternative energy development and maintaining the fairness and stability of energy prices. With the ultimate aim of ensuring the wellbeing of the Thai people, the Ministry has defined its primary objectives to help alleviate the current economic crisis and raise Thailand's energy self-reliance.

In conclusion, Thailand is a well-known country, geographically positioned in a desirable location and it enjoys good relations with other countries. Due to these factors, Thailand has attracted many foreign investments and has good trade with other countries. Thus, Thailand is sometimes looked at as a logistics centre. However, the logistics industry has enduring difficulties freeing itself from its dependence on energy consumption. Logistics firm is one of the bigger sources of carbon dioxide emissions, the very gasses that threaten the environment.

2.7 ENERGY EFFICIENCY STANDARD PROGRAM IN THAILAND

According to the Thai Green Label Scheme, some of the equipment type must follow the mandatory label and minimum standards. These equipments as mentioned

consist of ballasts, CFL, chillers, clothes washers, computers, fans, fluorescent lamps, irons, kettles, air- conditioners, refrigerators and rice cookers (CLASP, 2005).

In general, all the products must be manufactured or assembled by ISO 9002 certified plants or quality control plant according to the test method number 5.6.1 or certified by other standardized tests of product quality that may be set in the future (CLASP, 2005).

In addition, these products must be manufactured, transported and disposed in a manner meeting requirements of all applicable governmental acts and regulations such as Factory Act or Industrial Estate Law, in case the factory locate in the Industrial Estate (CLASP, 2005).

CHAPTER 3

TRANSPORTATION INDUSTRY PROFILE

3.1 TRANSPORTATION INDUSTRY

Transportation plays a connective role among the several steps that result in the conversion of resources into useful goods in the name of the ultimate consumer. Transportation involves in logistics system is more complex than carrying goods for the proprietors. Its complexity can take effect only through highly quality management. By means of well-handled transport system, goods could be sent to the right place at right time in order to satisfy customers' demands. It brings efficacy, and also it builds a bridge between producers and consumers (BestLogisticGuide, 20110). Therefore, transportation is the base of efficiency and economy in business logistics and expands other functions of logistics system. In addition, a good transport system performing in logistics activities brings benefits not only to service quality but also to company competitiveness (Tuzkaya, 2009).

Full benefits of transportation systems are unlikely to be achieved; in fact, it is the stimulator of environmental pollution and affected to human health. However, transportation system can increase the productivity and quality of life if they are planned and managed properly at the same time (Tuzkaya, 2009). The transportation systems should ensure its efficiency movements; such a system should not deplete the natural resources and badly affects the environment (Tuzkaya, 2009).

3.1.1 LOGISTIC HISTORY

Logistic was begun since the ancient war times of Greek and Roman empires. It started when military officers titled as 'Logistikas' was assigned a duty to provide services related to supply and distribution of resources (Wikipedia, 2010). By providing such services, the soldiers were able to move forward from their base position to a new forward position, which was the crucial factor in determining the outcome of wars. This also involved cutting off the enemy's supply locations and safeguarding one's own supply location (BestLogisticGuide, 20110).

3.1.2 LOGISTIC MANAGEMENT

From the war of Greek and Roman empires, had lead to the development and evolution of the present day system of logistics management. Logistic, refers as the technology for controlling physical movement of goods, information and other resources, including energy and people, between the point of origin and to the end point of consumption in order to meet the requirements of consumers (Colin and Fabbe- Costes, 1993).

The Council of Supply Chain Management Professionals (CSCMP), defined logistics management as *"that part of supply chain management that plans, implements and controls the efficient, effective forward and reverse flow and storage of goods, services, and related information between the point of origin and the point of consumption in order to meet customers' requirements"*

In essence, the main functions of logistic covering inventory management, purchasing, transportation, warehousing, consultation and the organizing and planning of these activities (Wikipedia, 2010). For this case study, the focus is on the environmental practices aspects of a logistic company rather than examine the whole function of logistic (inventory management, purchasing, warehousing, consultation and the organizing and planning of these activities). The lesson learned could provide some ideas of the transportation modes provided with the environmental impacts.

3.1.3 MODE OF TRANSPORTATION

Despite of the remarkable expansion of the logistic industry all around the world, many logistic companies provide different mode of transportation services in conjunction with the different geographical positioning, infrastructures and so on. These service providers cover all modes of transportation: marine, air, rail and road (Wikipedia, 2010). Different transportation mode provided different services to the end customers. For example, rail delivery transportation mode is design to handle large bulk shipments and not frequent deliveries. Despite of its outcome of mode of transportation is to provide efficiency service by delivering right products/ services at the right price, place and at the right condition to the end customers, the advantages and disadvantages of transportation modes are still exist. The advantages and disadvantages of each different transportation modes are summarized below:

3.1.3.1 RAIL

The advantages of rail transport is providing constancy, low- cost guarantee, greater reliability and is not affected by traffic and weather changes. Nevertheless, some of the disadvantages are its inflexibility since the train does not stop at intermediate point. (Rondinelli and Berry, 2000; Tuzkaya and Önüt, 2008).

3.1.3.2 ROAD

Road transportation is used to provide door- to- door delivery services of goods. It is flexibility and has ease of freight loading and unloading. Besides that, road transportation does not require rigid timetables. However, the disadvantages of road transportation are they required regular and high maintenance, more fuel consumption, as well as weight limitation (Rondinelli and Berry, 2000; Tuzkaya and Önüt, 2008).

3.1.3.3 MARINE

The advantages of marine transportation are the ability to deliver large amount of bulk freights, liquid and containerized. It is also the cheapest transportation mode. Conversely, marine transportation has its disadvantages too. The disadvantages of marine transportation are inflexibility with regard of finding appropriate port and the long time of shipment (Rondinelli and Berry, 2000; Tuzkaya and Önüt, 2008).

3.1.3.4 AIR

Air transportation can provide flexibility in terms of loading and unloading. In fact, air transportation can cause a negative impacts to the environment, such as creating noise, engine emission and waste disposal carbon usage (Rondinelli and Berry, 2000; Tuzkaya and Önüt, 2008).

3.2 ISSUES FACING IN GLOBAL LOGISTIC INDUSTRY

Logistics and transportation are an indispensable part of the global society and economy. However, they contribute significant negative impact to the environment. Transportation is a major consumption of energy, and thus it creates air pollution through emission of gas CO_2 that could lead to global warming as well as significant contributor that affect human health (Wikipedia, 2010).

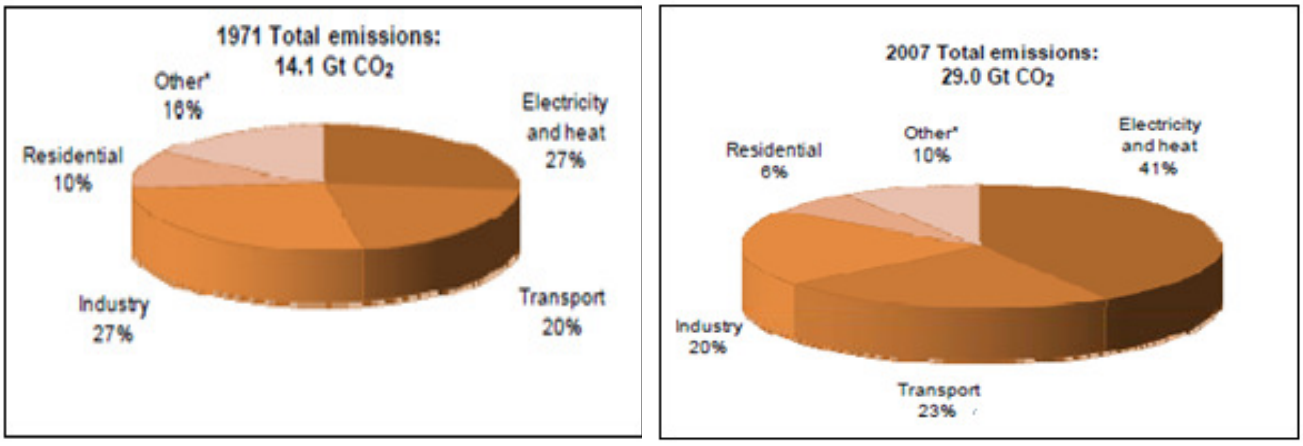

Figure 1: CO2 emission by sector (in 1971 and 2007)

Source: International Energy Agency (2010)

According to Figure 1, transport is the number two emitting sector with 23% of CO_2 emitted in 2007. It ranks second to energy, which encompasses electricity and heat generation. This result highlighted the consequences of global logistic industry which has contributed to CO_2 emissions.

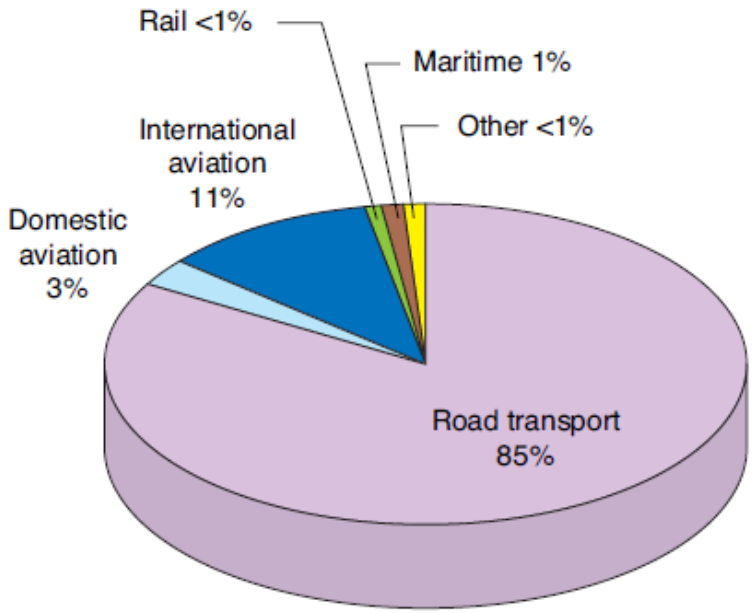

Figure 2: World CO_2 emission by transportation modes

Source: Sustainable Mobility Project Spreadsheet Calculation

Apart from the different sectors resulted in significant amount of gas CO_2 emission, mode of transportation on the other hand contributes of different amount of CO_2 gas emission, is illustrated in Figure 2. Based on the Figure 2, road transport (apart from air, water, freight and passenger rail) emits the most CO_2, follow by air transportation.

Another importance environmental effects shows difference including noise, effects on open land and wild life, safety, scare of natural resources (e.g. fossil oil)

(Goldman and Gorham, 2006; Qureshi and Huapu, 2007; Shiftan et al., 2003) Given the scenario above, many logistic companies facing environmental pressure and looking for method to reduce the emission at the same time does not reduce their profitability.

3.3 THAILAND LOGISTIC INDUSTRY

After taking part in the nation's bilateral trade agreement with China, India, New Zealand and Australia, Thailand received an economic growth of 340% for overall international trade and 370% for manufacturing trade over the past fourteen years. Given such scenario, tt has led Thailand to upgrade its logistics infrastructure and expertise. Currently, Thailand logistics industry is control by foreign companies; its top ten freight forward companies are Maersk Logistics, K&N, DHL, UPS, Schenker, Panalpina, Phoenix International, BAX Global, Agility, and UTI (Thailand Board of Investment, 2008).

Compare among Asia countries, Thailand is a well-known country, geographically positioned in a desirable location and it enjoys good relations with other countries. Due to these factors, Thailand has attracted many foreign investments and has good trade with other countries. Thus, Thailand is sometimes looked at as a logistics centre. However, the logistics industry has enduring difficulties freeing itself from its dependence on energy consumption. Logistics firm is one of the bigger sources of carbon dioxide emissions, the very gasses that threaten the environment.