Special Research project 2007
Project No: A-07/ 003-3

Transportation Research Challenges In Thailand

Sub-Project on

Thailand's Logistics cost

November 2008

ATRANS
Special
Research
Project
2007

902/1 9th Floor, Glas Haus Building, Soi Sukhumvit 25 (Daeng Prasert),
Sukhumvit Road, Klongtoey-Nua, Wattana, Bangkok 10110, Thailand
Tel. (66) 02-661-6248 FAX (66) 02-661-6249
http://www.atransociety.com

November, 2008
Printed in Thailand

ATRANS
Special
Research
Project
2007

Transportation Research Challenges In Thailand

Sub-Project on

Thailand's Logistics cost

List of Members

• Project Leader •

Dr. Viroat Srisurapanon
Department of Civil Engineering,
Faculty of Engineering,
King Mongkut University of Technology Thonburi,
Bangmod, Bangkok, Thailand

Table of Contents

List of Tables

List of Figures

ATRANS
Special
Research
Project
2007

CHAPTER I INTRODUCTION

1. Introduction

The goal of the research conducted under ATRANS special research project, "Transportation Research Challenges in Thailand", was to develop an analytical tool that would help in the estimation and clarification of Thailand's macro logistics cost by using some data from the input-output table. The input-output table consists of integrated set of macroeconomic accounts based on internationally agreed concepts, definition, classification, and accounting rules. In the input-output table, the rows describe the distribution of a producer's output throughout the economy while the columns describe the composition of inputs required by a particular industry to produce its output. For this study, some sectors which are the components of logistics cost (e.g., transportation service, petroleum, vehicle, maintenance, warehousing, etc.) were extracted from the rows of input-output table.

At the first glance, the macro logistics cost can be compared with other countries in term of total logistics cost per gross domestic product. This shows the efficiency and competitiveness of each country. However, to search for the better strategy for developing country, it needs to clarify and compare each component of logistics cost in details. For this study, the macro logistics cost would be analyzed and clarified by two ways: logistics activity base and demand group base. For the analysis based on logistics activity, the logistics cost was classified into four categories: transportation cost, inventory carrying cost, administration cost and infrastructure cost. For the analysis based on demand group, the logistics cost was classified into three groups: business sector, household and government. By these two ways of clarification, it helps to understand that each demand group spent for each logistics activity. After perceiving the macro logistics view, alternatives of strategic logistics policy will be come out.

Once a new policy is implemented, all components of logistics cost are interacted to each other. The decision making process must consider the interrelationship between transportation, warehousing, inventory, and customer service. No one area of logistics operates independently. The decisions made in the transportation area, for example, have an impact on the cost of warehousing and inventory. A specific technique is required for managing the total logistics cost. For this study, mode shift policy, shifting freight from road to rail, was tested as a strategy in transportation development to find the change in logistics cost. In addition, the changes of fuel consumption and emissions were also estimated.

1.1 Research Objectives

The goal of this research is to develop the analytical tool that can be used to estimate macro logistics cost by using the input-output table. The objectives of this study would be as follows:

1.1.1 To determine macro logistics cost in Thailand

1.1.2 To calculate logistics cost per GDP in Thailand

1.1.3 To analyze the impacts of the strategy in transport development

1.2 Outline of Report

The remainder of this report was organized as follows. The next section, section 2, provided a comprehensive literature reviews that described the definition of logistics and the classification of logistics cost. The logistics cost per GDP was also discussed. Section 3 described data sources available and its preparation. An appropriate modeling and technique to analyze the logistics cost were proposed in this section. Section 4, the logistics cost and the impacts of transportation strategic policy were estimated. Finally, conclusions of the research findings were discussed in section 5, together with future research in logistics cost and transportation strategic plan.

CHAPTER 2 LITERATURE REVIEW

2. Literature review

2.1 Logistics Definition

Logistics Management defined by The Council of Logistics Management (CLM) is that part of Supply Chain Management that plans, implements, and controls the efficient, effective forward and reverses 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.

2.2 Classification of Logistics Cost

James R. Stocks and Douglas Lambert (2001) described activity of logistics in 13 groups such as customer service, demand forecasting, inventory management, logistics communications, material handling, order processing, warehousing and storage, packaging, parts and service support, plant and warehouse site selection, procurement, reverse logistics, and traffic and transportation and clustered them into 6 groups related by logistics cost as follows: 1. Transportation costs, 2. Warehousing costs, 3. Order processing and information costs, 4. Lot quantity costs, 5. Inventory carrying costs, and 6. Customer service cost that were shown in Fig. 2.1. Heskettt (1973) classified logistics cost into 4 groups: transportation cost, inventory cost, warehouse cost, and order processing cost as shown in Fig. 2.2. Nevertheless, Delaney (2003) grouped logistics cost classified by Stocks and Lambert into 3 groups such as transportation cost, inventory carrying cost, and administration cost as shown in Fig. 2.3. It is almost the same as logistics cost classified by Japan Institute of Logistics Systems (JILS, 2005) as shown in Fig. 2.4. It should be noted that macro logistics cost estimated by JILS did not include infrastructure cost.

For this study, the logistics cost would be described in two ways: logistics activity base and demand group base. For the former, macro logistics cost was separated into four groups: transportation cost, inventory carrying cost, administration cost and infrastructure cost. For the latter one, the macro logistics cost was classified into three groups: business sector, household and government.

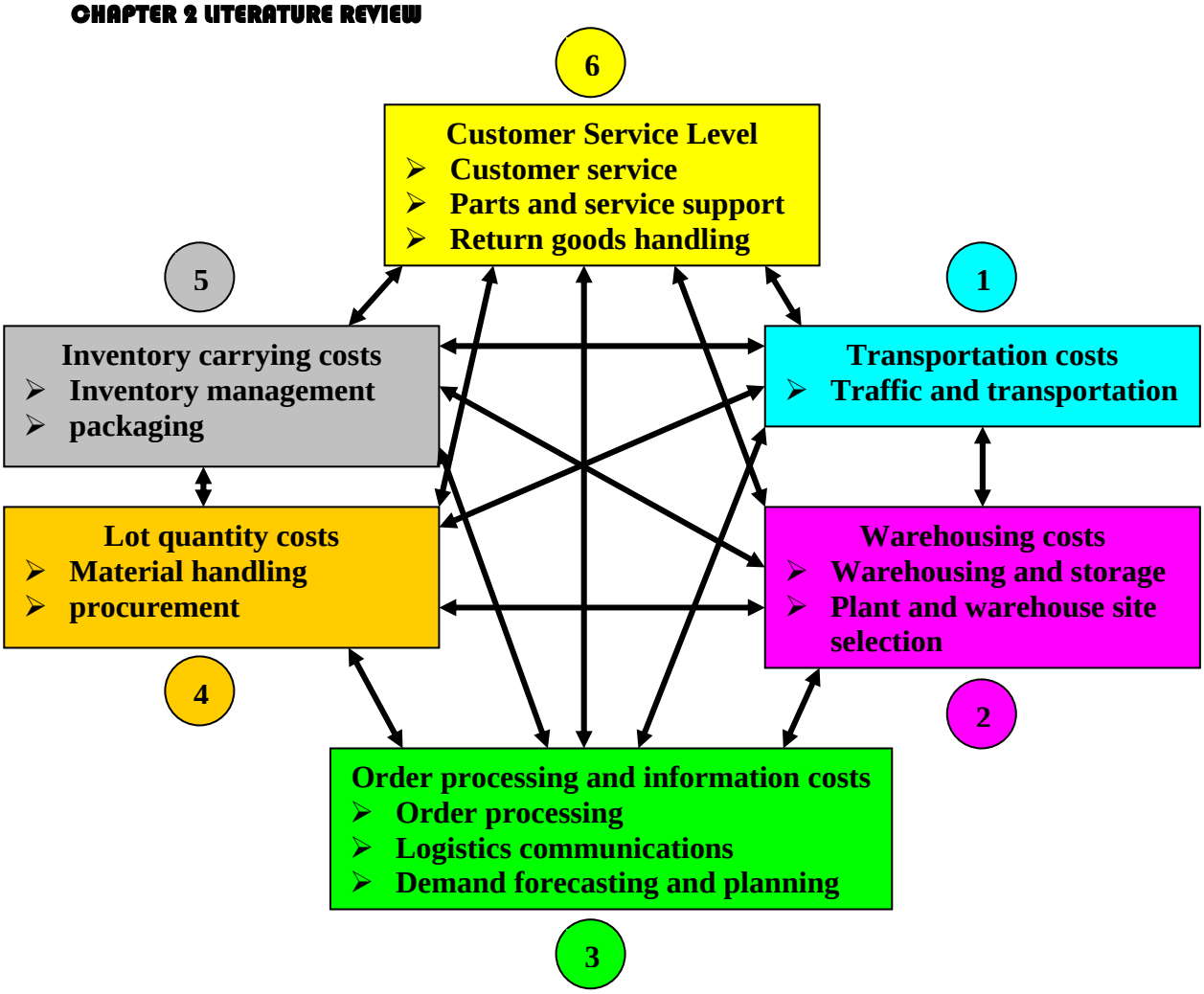

Figure 2.1 Relationship between logistics activity and logistics cost

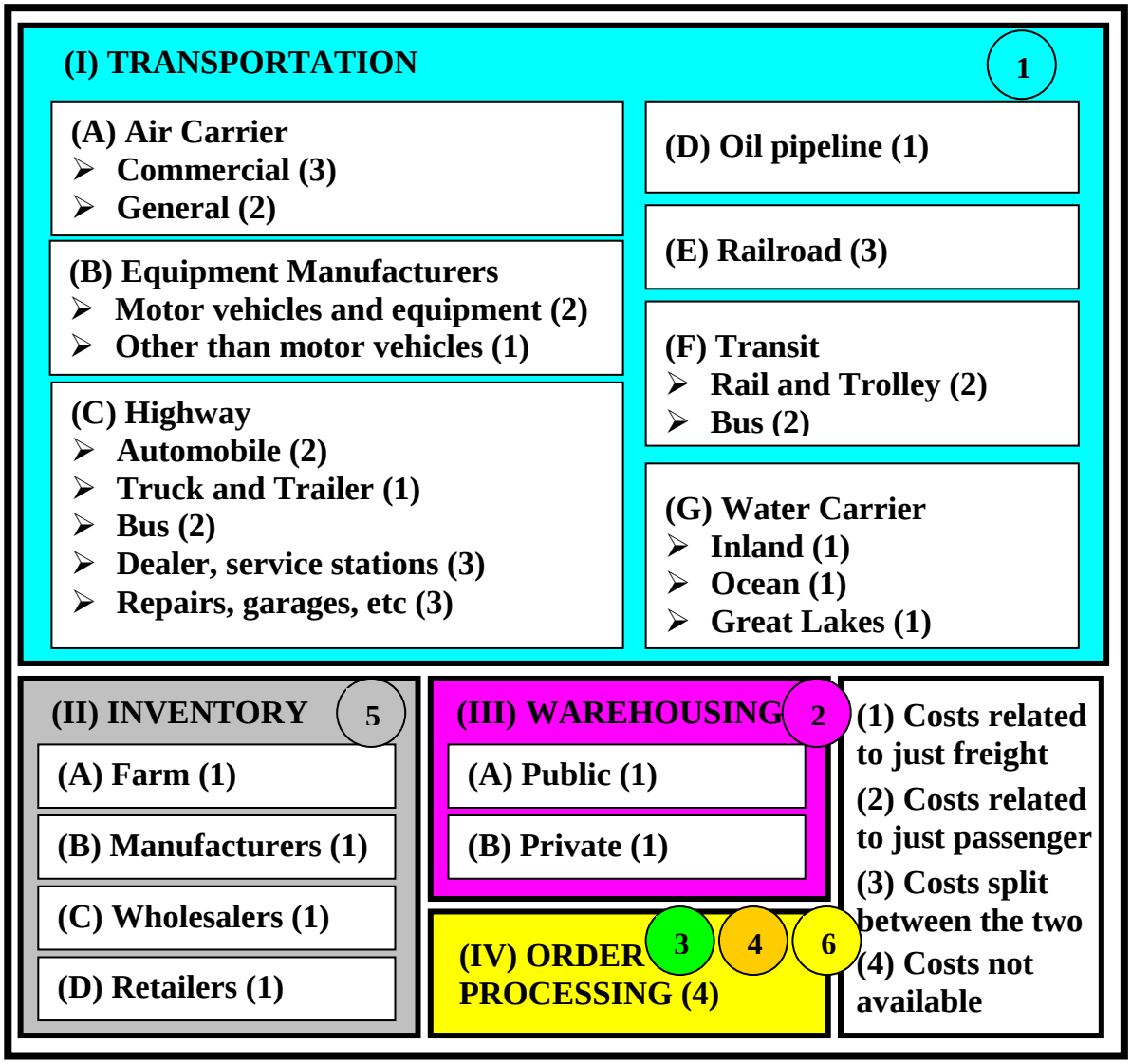

Figure 2.2 Classification of logistics cost proposed by Heskett

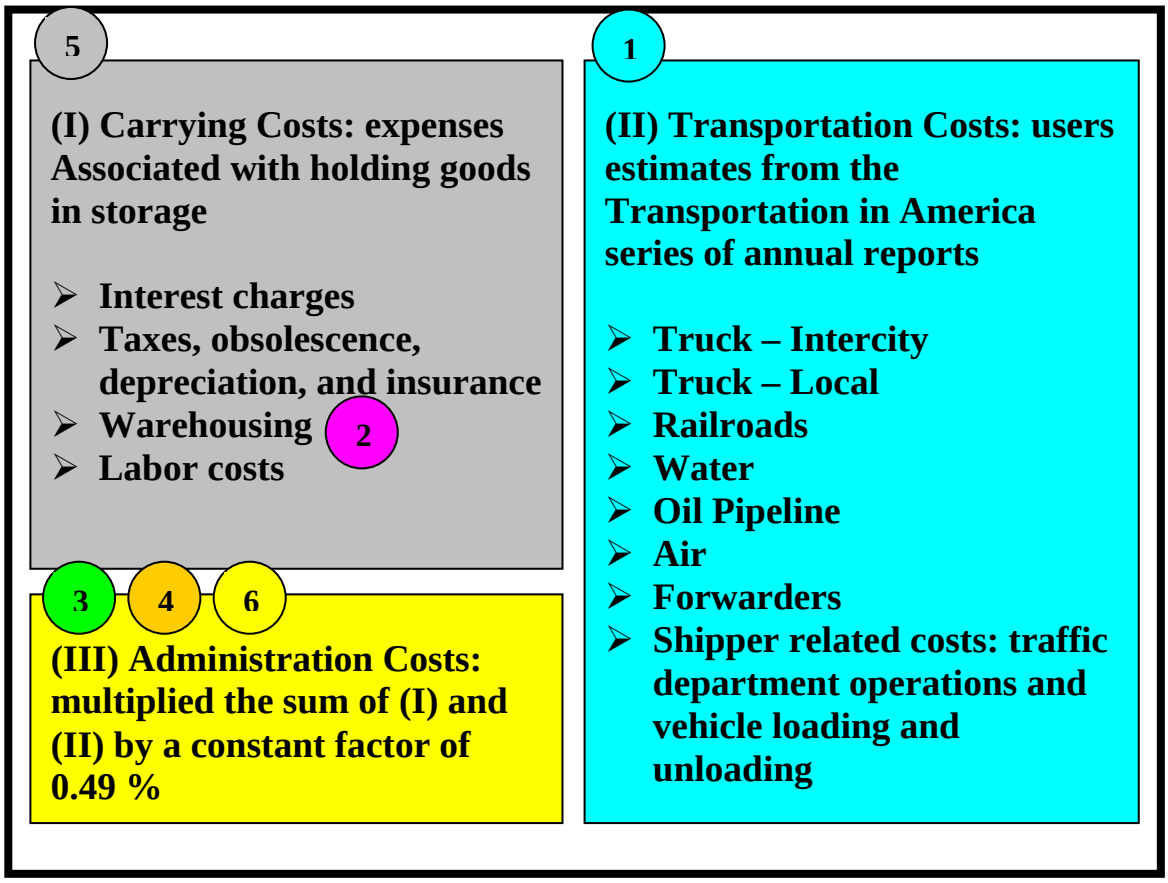

Figure 2.3 Classification of logistics cost proposed by Robert Delaney

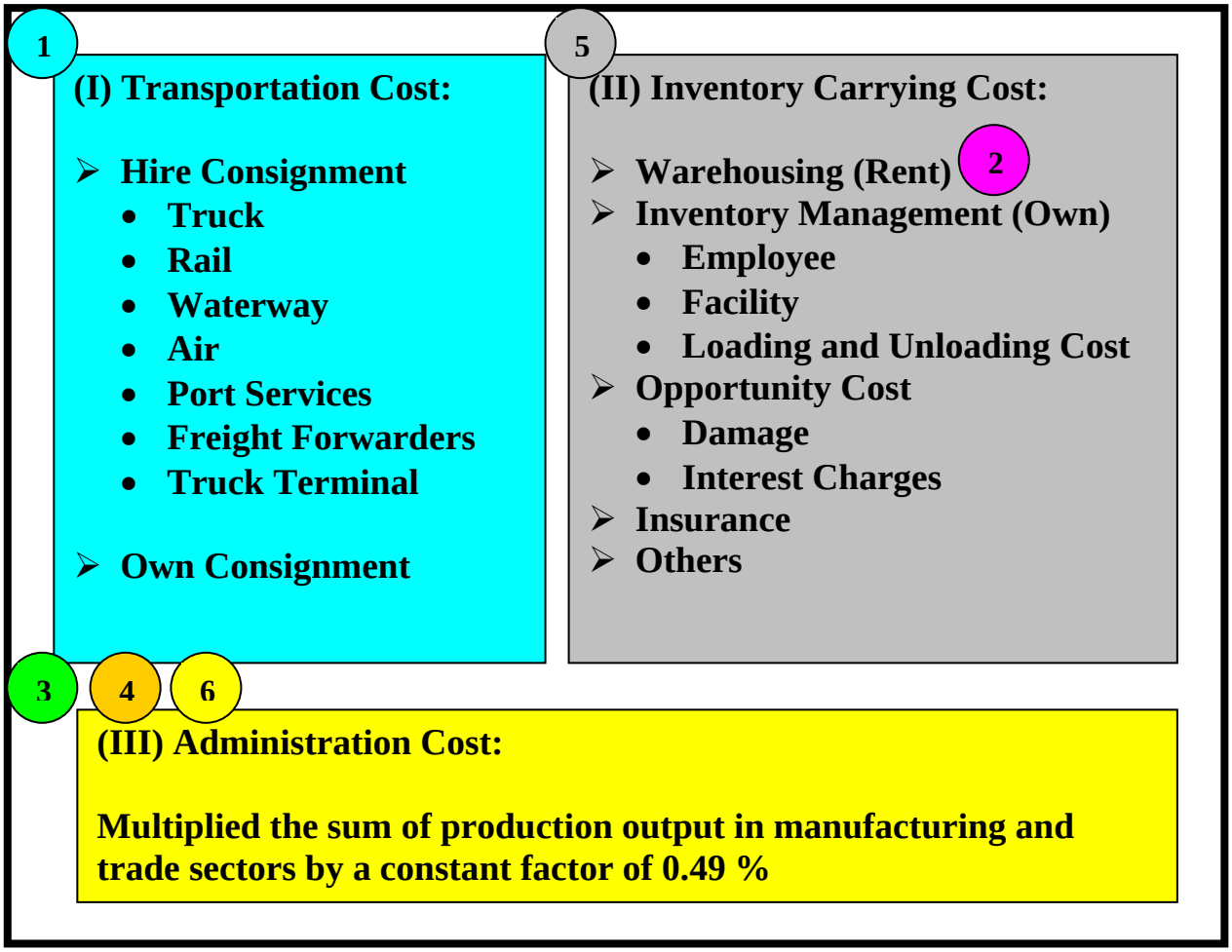

Figure 2.4 Classification of logistics cost proposed by Japan Institute of Logistics Systems

2.3 Comparison of Logistics Cost

Logistics cost per gross domestic product (GDP) for the year 2000 was shown in Table 2.1. Most of developed countries, e.g., US, UK and Japan, had low logistics cost per GDP, about 10-11 % while most of developing countries, e.g., Thailand, China and India, had high logistics per GDP, greater than 16%. High logistics cost reflected low efficiency of the system. It caused the price of commodity higher. Thus countries that had high logistics cost would have low competitiveness.

Table 2.1 Logistics cost per GDP for the year 2000

Region	Country	GDP	Logistics cost	
		(US $ Billion)	(US $ Billion)	% of GDP
North America	Canada	887	108	12.2
	Mexico	892	131	14.7
	United States	9,907	997	10.1
	Region	11,686	1,236	10.6
Europe	Belgium	287	33	11.5
	Denmark	152	20	13.2
	France	1,483	176	11.9
	Germany	2,114	324	15.3
	Greece	185	24	13.0
	Ireland	123	19	15.4
	Italy	1,414	166	11.7
	Netherlands	421	50	11.9
	Portugal	180	24	13.3
	Spain	805	107	13.3
	United Kingdom	1,463	156	10.7
	Region	8,627	1,099	12.7
Asia	Thailand	120	23	16.3*
	China	5,506	975	17.7
	India	2,546	434	17.0
	Hong Kong	171	24	14.0
	Japan	3,445	382	11.1
	Korea, Rep.	865	108	12.5
	Singapore	94	13	13.8
	Taiwan	386	55	14.2
	Region	13,013	1,991	15.3
South America	Brazil	1,339	204	15.2
	Venezuela	147	19	12.9
	Argentina	453	58	12.8
	Region	1,939	281	14.5
Remaining	Other Countries	11,357	1,772	15.6
Total		46,622	6,379	13.7

Source: *Final Report of Logistics Cost and Value Added of Logistics Industry Development Project*, Bangkok, National Economics and Social Development Board (2005)* estimated

.

CHAPTER 3 METHODOLOGY

3. Methodology

The main part of this study is to estimate the macro logistics by using input-output table. The process of logistics cost calculation was explained in Section 3.1. Consequently in Section 3.2, the transportation development strategy was tested to find the change of logistics cost. Moreover, the analysis of change of energy consumption and environment impacts were described in this section.

The secondary data required for this study are as follows.

Input-Output Table

Office of the national economic and social development board (NESDB) constructs the input-output table every 5 years. The last version of the input-output table is for the year 2000. Even though it seems to be out of date, it can be updated by using GDP. The structure of input-output table is shown in Table 3.1.

Table 3.1 the structure of input-output table

<table>
<tr><td></td><td></td><td colspan="6">Production Demand</td><td rowspan="2">Final Demand</td><td rowspan="2">Total Demand</td></tr>
<tr><td></td><td></td><td>Agriculture</td><td>Mining</td><td>…</td><td>Transport</td><td>Services</td><td>Sub Total</td></tr>
<tr><td rowspan="7">Intermediate Input</td><td>Commodity A</td><td colspan="6" rowspan="6">X_{ij}</td><td rowspan="6">F_i</td><td rowspan="6">Q_i</td></tr>
<tr><td>Commodity B</td></tr>
<tr><td>…</td></tr>
<tr><td>Transport service</td></tr>
<tr><td>Other Services</td></tr>
<tr><td>Sub Total</td></tr>
<tr><td colspan="2">Value Added</td><td colspan="6">V_j</td><td rowspan="2"></td></tr>
<tr><td colspan="2">Total Input</td><td colspan="6">Q_j</td></tr>
</table>

From table 3.1, total demand was divided into 2 groups: the production demand of all business sectors and the final demand.

$$Q_i = \sum_{j=1}^{n} X_{ij} + F_i$$

Where;

Q : total demand

X : matrix with purchases of input to produce by business sector

F : Final demand

i : intermediate input sector

j : business sector

- Gross Domestic Product (GDP)

NESDB calculates the annual GDP. The last version of GDP is for the year 2006. Time series of GDP were used to forecast GDP for the year 2010, 2015 and 2020.

- Energy Consumption in Transportation Sector

Department of alternative energy development and efficiency publishes the annual Thailand energy situation report.

- Freight Transport Statistics

Bureau of Information Technology, Ministry of Transport, publishes the annual transportation statistics.

- Business data

From National Statistics Office report, the vehicle cost by industry was also used.

3.1 Logistics Cost Calculation Process

By using the input-output table, gross domestic product and energy consumption in transportation sector, the logistics cost is calculated. The process of this part was shown in Fig. 3.1. The steps of calculation are as follows.

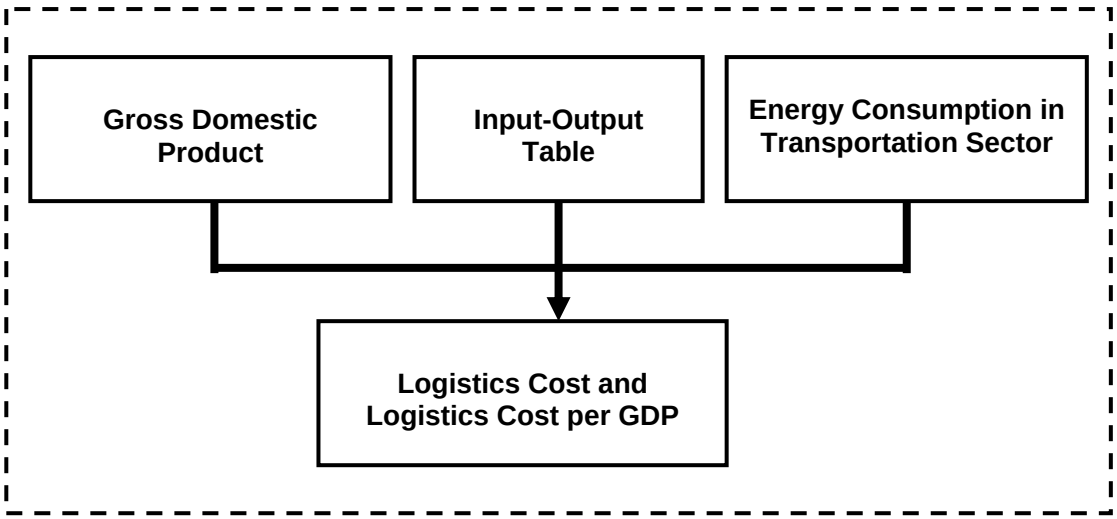

Figure 3.1 Logistics cost calculation process

1. Adjust and reconcile the input-output table for the year of 2000 by GDP.
2. Using time series set of GDP to forecast the input-output table for the years 2005, 2010, 2015 and 2000.

3. Grouping the business sectors of the input-output table. It was grouped from 180 sectors to 9 sectors as follows.
   - Agriculture
   - Mining
   - Manufacturing
   - Public Utility
   - Construction
   - Trade
   - Hotel and Restaurant
   - Transportation
   - Services

4. Extract the rows, k, which are the components of logistics cost from the input-output table as the following equation.

$$LC = \sum_{i=k} Q_i = \sum_{i=k} \sum_{All.j} X_{ij} + \sum_{i=k} F_i$$

5. Then adjust each extracted component by some business data.

The components of logistics cost comprise of 4 main components that grouped from 9 elements as shown in Table 3.2.

Table 3.2 Logistics cost components

Logistics Cost	
Transportation Cost (TC)	Transport Services Cost (TSC)
	Petroleum Cost (PC)
	Vehicle Cost (VC)
	Maintenance Cost (MC)
Inventory Carrying Cost (IC)	Warehousing Cost (WC)
	Financial Cost (FC)
Administration Cost (AC)	Communication Cost (CC)
	Employee Cost(EC)
Infrastructure Cost (IFC)	

Four main components of macro logistics cost are Transportation cost, Inventory carrying cost, Administration cost and Infrastructure cost.

Transportation cost is the highest cost in macro logistics cost that comprised 4 elements such as transportation services cost, petroleum cost, vehicle cost and maintenance cost. Inventory carrying cost comprises warehousing cost and financial costs. Administration cost is the lowest cost in macro logistics cost that includes compensation of employees in business logistics operation and communication cost. Last component is infrastructure cost that expensed by government sector.

3.2 A Case Study of Freight Transportation Development Strategy

Modal split of freight transport during 1999-2006 was shown in Tables 3.3 and 3.4. Road freight transport in ton-kilometer shares 92% of total freight in 2006. The composition of transportation cost for China, US and Thailand during 2002-2004 was shown in Table 3.5. It indicates that highway cost is highest comparing with other modes. Railway costs for China and US shared about 11 percent and 6 percent, respectively. It was not high comparing with the share of highway cost but it was not so low like Thailand's railway cost that was only 0.5 percent. Thus, the scenario of modal shift from road freight transport to rail freight transport was interesting to be tested as a case study of freight transportation development strategy to see the impact of the change of logistics cost.

Table 3.3 Modal split of freight transport in ton during 1999-2006

Unit: Thousand Ton

Year	Modes					Total
	Road	Rail	Water	Coastal	Air	
1999	392,244	9,264	17,910	21,970	56	441,444
2000	397,976	9,171	25,235	23,347	57	455,786
2001	400,241	8,776	17,833	19,657	66	446,573
2002	434,918	8,889	25,043	24,795	56	493,701
2003	440,018	10,521	29,024	22,941	54	502,558
2004	435,147	12,883	29,135	27,767	53	504,985
2005	430,275	11,760	29,569	28,322	54	499,980
2006	427,581	11,579	31,074	29,981	48	500,263

Unit:Percentage

Year	Modes					Total
	Road	Rail	Water	Coastal	Air	
1999	88.85	2.10	4.06	4.98	0.01	100

2000	87.32	2.01	5.54	5.12	0.01	100
2001	89.62	1.97	3.99	4.40	0.01	100
2002	88.09	1.80	5.07	5.02	0.01	100
2003	87.56	2.09	5.78	4.56	0.01	100
2004	86.17	2.55	5.77	5.50	0.01	100
2005	86.06	2.35	5.91	5.66	0.01	100
2006	85.47	2.31	6.21	5.99	0.01	100

Source: Bureau of Information Technology, Ministry of Transport and Communications

Table 3.4 Mode shares in ton-kilometer during 1999-2006

Unit: Million Ton-Kilometer

Year	Modes					Total
	Road	Rail	Water	Coastal	Air	
1999	94,757	2,981	1,781	4,950	33	104,502
2000	91,756	2,904	2,847	3,933	35	101,475
2001	97,228	3,083	2,086	3,356	36	105,789
2002	103,311	3,154	2,086	4,950	35	113,536
2003	105,354	3,325	2,133	3,933	32	114,777
2004	105,962	3,414	2,107	3,396	34	114,912
2005	104,164	3,002	2,103	5,093	34	114,396
2006	100,942	2,904	2,164	4,009	31	110,050

Unit:Percentage

Year	Modes					Total
	Road	Rail	Water	Coastal	Air	
1999	90.67	2.85	1.70	4.74	0.03	100
2000	90.42	2.86	2.81	3.88	0.03	100
2001	91.91	2.91	1.97	3.17	0.03	100
2002	90.99	2.78	1.84	4.36	0.03	100
2003	91.79	2.90	1.86	3.43	0.03	100
2004	92.21	2.97	1.83	2.95	0.03	100
2005	91.06	2.62	1.84	4.45	0.03	100
2006	91.72	2.64	1.97	3.64	0.03	100

Source: Bureau of Information Technology, Ministry of Transport and Communications

Table 3.5 Comparison of transportation cost by mode and by country during 2002-2004

Country	Year	Railway	Highway	Waterway	Airway	Others	Total
China [1] (Billion RMB)	2002	136 (11.36)	538 (44.95)	148 (12.36)	10 (0.84)	364 (30.41)	1,197 (100)
	2003	158 (11.26)	683 (48.68)	169 (12.05)	12 (0.86)	381 (27.16)	1,403 (100)
	2004	175 (10.57)	760 (45.89)	212 (12.80)	14 (0.85)	494 (29.83)	1,656 (100)
U.S.A. [2] ($Billion U.S.)	2002	37 (6.41)	462 (80.07)	27 (4.68)	27 (4.68)	24 (4.16)	577 (100)
	2003	38 (6.33)	482 (80.33)	26 (4.33)	28 (4.67)	26 (4.33)	600 (100)
	2004	42 (6.52)	509 (79.04)	27 (4.19)	31 (4.81)	35 (5.44)	644 (100)
Thailand [3] (Billion Baht)	2002	3 (0.52)	474 (80.60)	92 (15.74)	11 (1.95)	7 (1.20)	587 (100)
	2003	3 (0.50)	516 (80.58)	101 (15.86)	12 (1.91)	7 (1.15)	640 (100)
	2004	3 (0.47)	565 (79.98)	117 (16.51)	13 (1.90)	8 (1.14)	706 (100)

Source:
[1] *Transport Infrastructure and Logistics Development in China* (2007)
[2] *18th Annual State of Logistics Report*, National Press Club, Washington D.C. (2007)
[3] estimated

The measurement of the impact of the transport policy was presented in term of the reduction in macro logistics cost. By using freight volume data and transport service cost by mode in logistics cost data, the freight transport service rate could be calculated. The process was shown in Fig. 3.2. Last step in the process is to estimate of saving in transport service cost, by using freight rate by mode multipled by freight volume that changed in each mode.

By shifting 5 percent of total freight volume from road transport to rail transport, road transport would decrease, for instance, in 2010 from 461,015 thousand tons to 433,557 thousand tons that was 27,457 thousand tons reduction in road freight volume. On the other hand, rail transport would increase from 14,808 thousand tons to 42,265 thousand tons that was 27,457 thousand tons increase in rail freight volume in the same year.

Furthermore, by shifting freight from road transport to rail transport, it caused the saving in total energy consumption. This could be estimated from two data sets: energy consumption in transport sector and freight volume by mode. The calculation process was shown in Fig. 3.3. The last step for estimating the saving of energy consumption was by multiplying the estimated energy consumption rate of each mode with the freight volume that changed in each mode.

Moreover it would be estimated the reduction of air pollutant emissions such as carbon dioxide (CO_2), carbon monoxide (CO) and nitrogen oxide (NO_X), by using the emission factors.

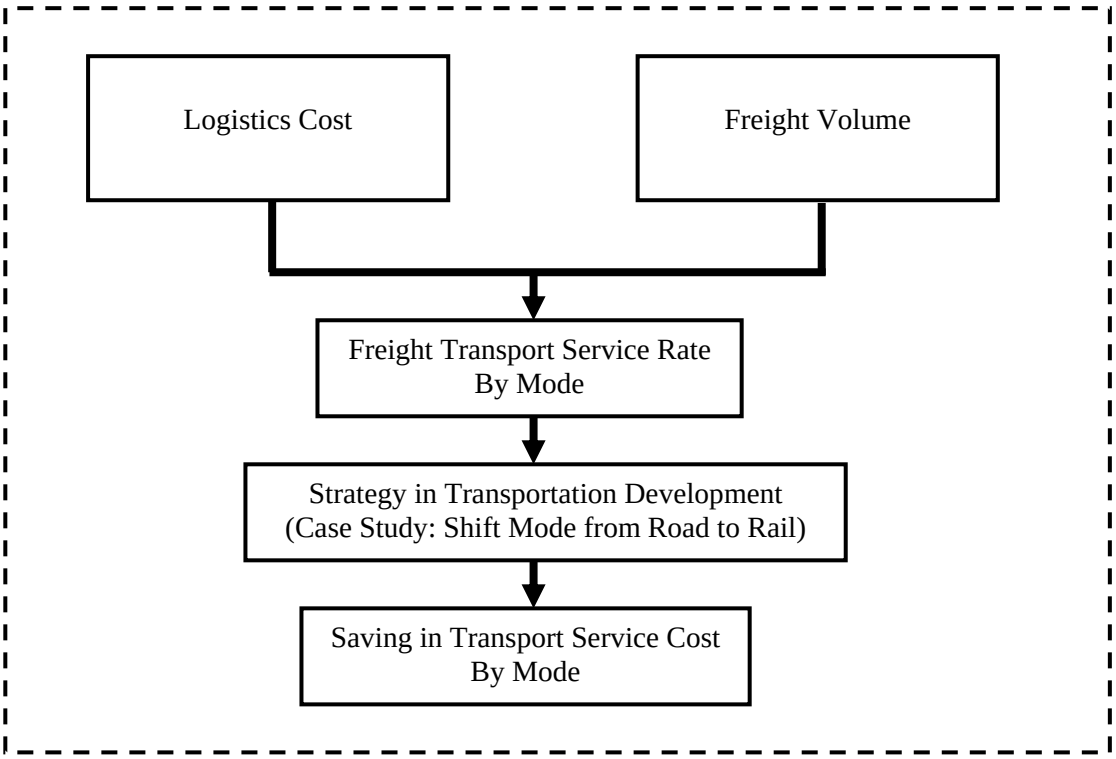

Figure 3.2 Economics impacts analysis process

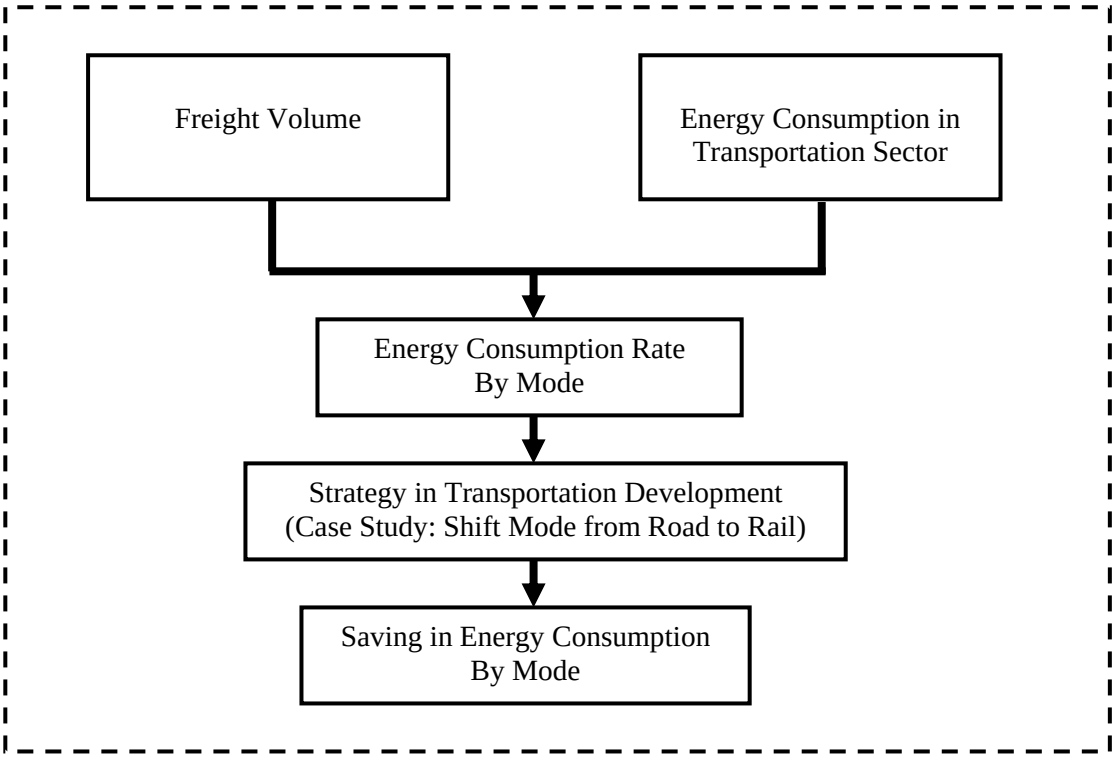

Figure 3.3 Energy and environment impacts analysis process

CHAPTER 4 RESULTS

The results of this study were separated into 3 parts. The first part is the overview of Thailand's macro logistics cost following by the clarification of logistics cost by activity. The second part described and clarified the logistics cost by type of demand. The last part was the impact analysis of a case study of freight transportation development strategy.

4.1 Clarification of Macro Logistics Cost by Activity

From the estimated input-output table, some data from the table were extracted and classified into four groups: transportation cost, inventory carrying cost, administration cost, and infrastructure cost. The total amount of logistics cost constantly rose about 100 billion Baht per year. It increased from 857,917 million Baht in 2000 to 2,754,425 million Baht in 2020 as shown in Table 4.1.

Table 4.1 Logistics cost by activity

Unit: Million Baht

Year	2000	2005	2010	2015	2020
Transportation Cost	518,361 (60.42%)	806,510 (60.82%)	1,075,027 (60.49%)	1,369,563 (60.46%)	1,664,987 (60.45%)
Inventory Carrying Cost	210,437 (24.53%)	299,810 (22.61%)	398,313 (22.41%)	497,544 (21.96%)	596,848 (21.67%)
Administration Cost	72,985 (8.51%)	107,321 (8.09%)	142,878 (8.04%)	179,672 (7.93%)	216,571 (7.86%)
Logistics Cost	801,784 (93.46%)	1,213,641 (91.52%)	1,616,218 (90.94%)	2,046,779 (90.36%)	2,478,406 (89.98%)
Infrastructure Cost	56,134 (6.54%)	112,516 (8.48%)	161,011 (9.06%)	218,416 (9.64%)	276,019 (10.02%)
Macro Logistics Cost	857,917 (100%)	1,326,157 (100%)	1,777,229 (100%)	2,265,195 (100%)	2,754,425 (100%)

Transportation cost was the major component of logistics cost. It constantly cost about 60% of total logistics cost following by the inventory carrying cost. The inventory carrying cost gradually decreased from 25% to 22% during 2000 and 2020. The administration cost and infrastructure cost were minor components of logistics cost. During the same period, the administration cost decreased from 9% to 8% while the infrastructure cost increased from 7% to 10%. Moreover, the logistics activity was divided into 9 sub-categories: transport service cost (TSC), petroleum cost (PC), vehicle cost (VC), maintenance cost (MC), warehousing cost (WC), financial cost (FC), communication cost (CC), employee cost (EC) and

infrastructure cost (IFC) as shown in Fig. 4.1. The TSC was the major portion of transportation cost. It cost about 36% of total logistics cost.

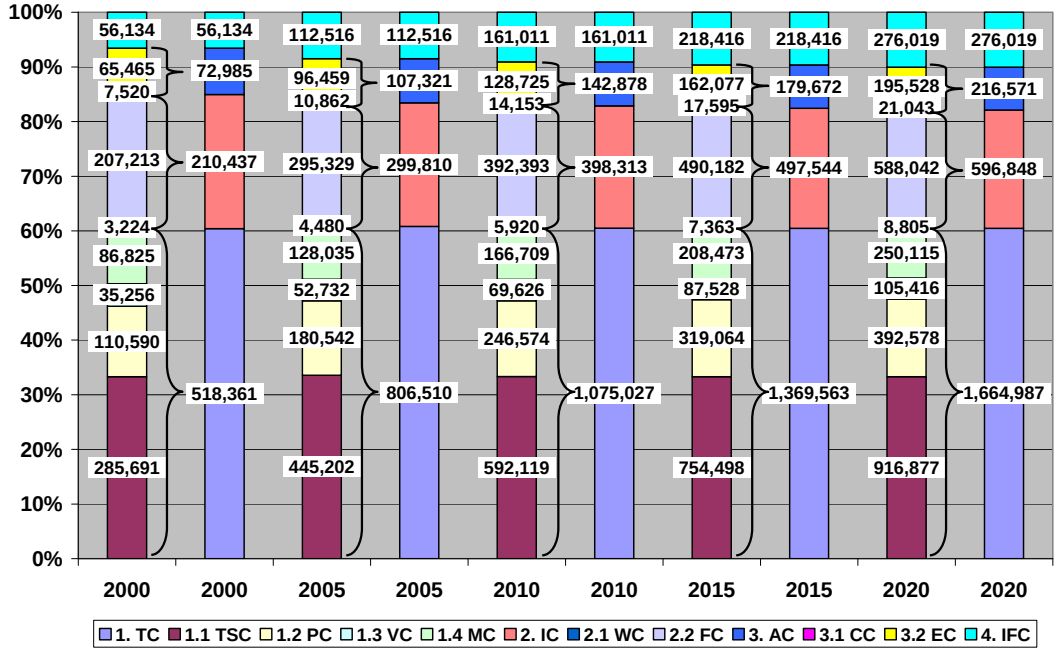

Fig. 4.1 Logistics cost by sub-category

Comparing the logistics cost with GDP, it was observed that it increased rapidly from 17.43% to 18.69% during 2000-2005 and kept constantly until 2010. After the year 2010, it gradually increased to 19.09% in 2020 as shown in Table 4.2. Looking the proportion of logistics cost by activity, it was found that all proportions of all activities, transportation, administration and infrastructure except inventory, rose during 2000-2005. After the year 2005, the proportion of transportation cost, 10.53%, and infrastructure cost, 1.14%, increased to 11.54% and 1.91%, respectively in 2020 while the proportion of administration cost kept constantly 1.50%. For the proportion of inventory carrying cost, it gradually decreased from 4.27% in 2000 to 4.14% in 2020.

Table 4.2 Percentage of logistics cost per GDP

Year	2000	2005	2010	2015	2020
Transportation Cost	10.53	11.37	11.27	11.43	11.54
Inventory Carrying Cost	4.27	4.23	4.17	4.16	4.14
Administration Cost	1.48	1.51	1.50	1.50	1.50
Logistics Cost	16.29	17.10	16.94	17.08	17.18
Infrastructure Cost	1.14	1.59	1.69	1.82	1.91
Macro Logistics Cost	17.43	18.69	18.63	18.90	19.09

CHAPTER 4 RESULTS

The ratio of logistics cost per GDP by type of logistics activity could be separated into 9 groups: transport services cost (TSC), petroleum cost (PC), vehicle cost (VC), maintenance cost (MC), warehousing cost (WC), financial cost (FC), communication cost (CC), employee cost (EC) and infrastructure cost (IFC). For instance, the percentage of the cost of each logistics activity in 2005 were 34%, 14%, 4%, 10%, 0.4%, 22%, 1%, 7% and 8%, respectively as shown in Fig. 4.2.

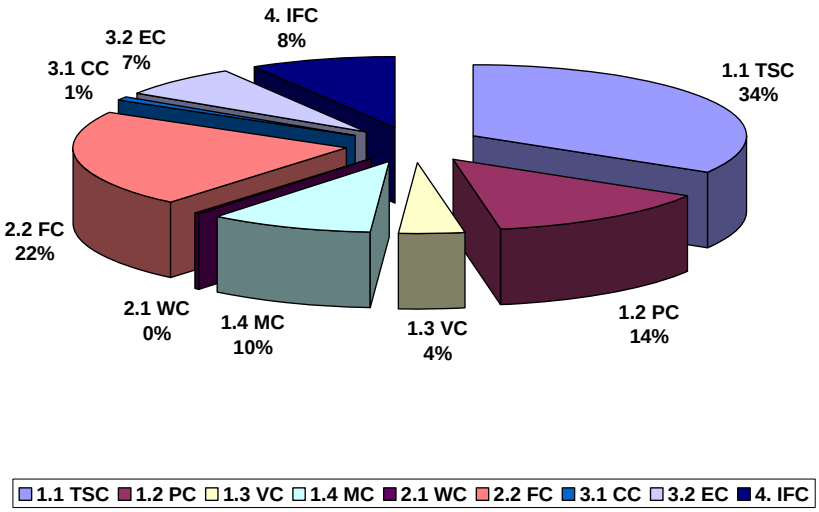

Figure 4.2 Logistics cost per GDP for the year 2005

The clarification of transportation cost by mode was represented in Table 4.3. It was observed that transportation cost increased constantly about 60 billion Baht every years. Comparing transportation cost between modes, for example in 2005 as shown in Fig. 4.3, highway cost was 684 billion Baht, 80% of total amount of transportation cost, while railway cost was only 4 billion Baht, less than 0.5% of total amount of transportation cost. From this relevant information, shifting road to rail transport is the most challenging strategy that is possibly to save the logistics cost.

Table 4.3 Transportation cost by Mode

Unit: Million Baht

Year	2000	2005	2010	2015	2020
Transportation Cost	518,361 (100%)	806,510 (100%)	1,075,027 (100%)	1,369,563 (100%)	1,664,987 (100%)
Railway	2,677 (0.52%)	3,782 (0.47%)	4,932 (0.46%)	5,942 (0.43%)	6,830 (0.41%)
Highway	420,303 (81.08%)	684,197 (80.37%)	852,448 (79.30%)	1,078,402 (78.74%)	1,305,045 (78.38%)
Waterway	79,120 (15.26%)	131,301 (16.28%)	186,835 (17.38%)	246,881 (18.03%)	307,213 (18.45%)

Airway	10,077 (1.94%)	14,630 (1.81%)	19,587 (1.82%)	24,517 (1.79%)	29,484 (1.77%)
Others	6,184 (1.19%)	8,600 (1.07%)	11,226 (1.04%)	13,821 (1.01%)	16,417 (0.99%)

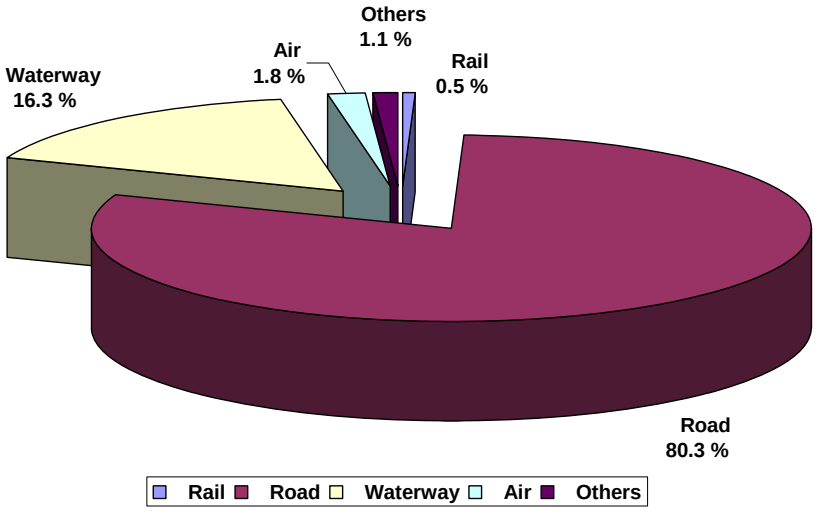

Figure 4.3 Transportation cost by mode in year 2005

4.2 Clarification of Macro Logistics Cost by Demand Group

Considering the logistics cost by demand group, it could be classified into 3 groups that were the production demand in business sector, the final consumption demand by household, and government as shown in Table 4.4. The logistics cost in all business sectors was 680 billion Baht in 2000 and increased to 1,026 billion Baht in 2005. The logistics cost in business sector increased about 70 billion Baht each year. It shared 79% of total logistics cost in 2000. This share gradually decreased to 76% in 2020. For the logistics cost of household sector, it was 117 billion Baht in 2000 and increased to 180 billion Baht in 2005. It shared about 14% and maintained the same portion until 2020. For the logistics cost of government sector, it was 61 billion Baht or 7% in 2000 and continuous rising to 11% in 2020.

Table 4.4 Logistics cost by demand group

Unit: Million Baht

Demand Group	2000	2005	2010	2015	2020
Business	679,759 (79.23%)	1,026,062 (77.37%)	1,365,947 (76.86%)	1,728,910 (76.32%)	2,092,736 (75.98%)
Household	117,478 (13.69%)	180,414 (13.60%)	240,598 (13.54%)	305,379 (13.48%)	370,349 (13.45%)

Government	60,681 (7.07%)	119,681 (9.02%)	170,684 (9.60%)	230,906 (10.19%)	291,339 (10.58%)
Total	857,917 (100%)	1,326,157 (100%)	1,777,229 (100%)	2,265,195 (100%)	2,754,425 (100%)

The logistics cost per GDP of total demand increased from 17.43% in 2000 to 18.69% in 2005. After the year 2005, it gradually increased to 19.09% in 2020. For the proportion of logistics cost of business sectors, it accounted approximately 14% of GDP, while the proportion of logistics cost of household and government sectors were increasing from 2.39% and 1.23% in 2000 to 2.57% and 2.02%, respectively in 2020 as shown in Fig.4.4

.

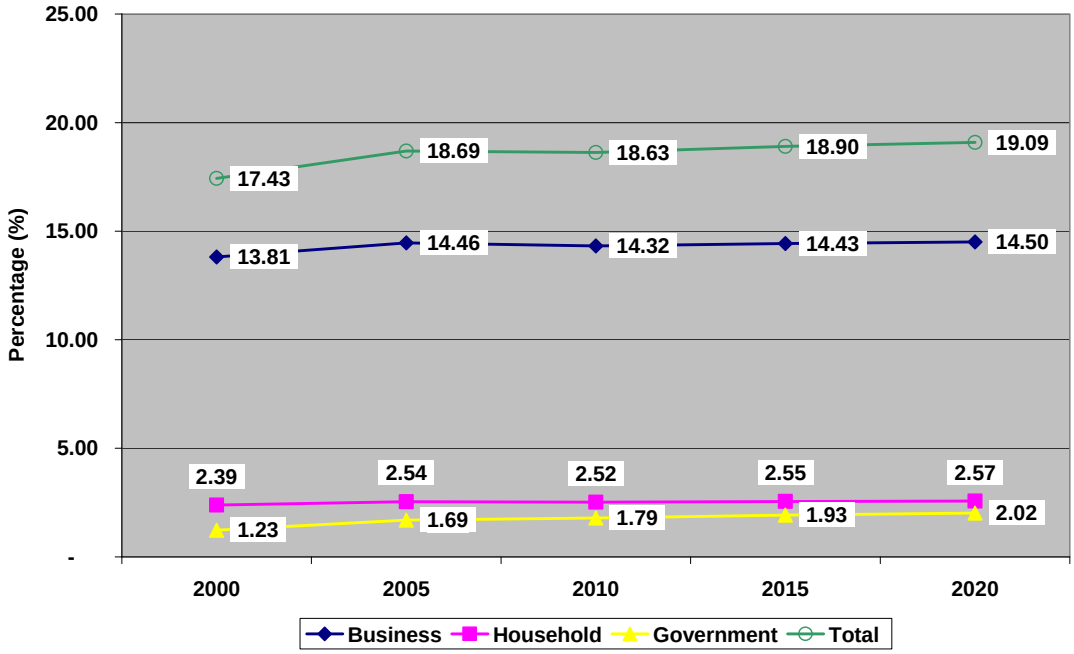

Figure 4.4 Logistics cost per GDP by demand group

For the logistics cost of business sector, it was classified into 9 sectors as shown in Table 4.5. Manufacturing sector was the dominant sector. It shared 35% of logistics cost of all business sectors for the year 2000 and expected to be 40% in 2020. The second order was transportation sector, 28% of logistics cost of all business sectors following by construction and services sectors, 10% and 7%, respectively of logistics cost of all business sectors.

Table 4.5 Logistics cost by business sector

Unit: Million Baht

Year	2000	2005	2010	2015	2020
Total Business Sector	679,759 (100%)	1,026,062 (100%)	1,365,947 (100%)	1,728,910 (100%)	2,092,736 (100%)
B.1 Agriculture	36,014 (5.30%)	61,811 (6.02%)	91,770 (6.72%)	121,750 (7.04%)	151,975 (7.26%)
B.2 Mining	12,561 (1.85%)	25,390 (2.47%)	38,537 (2.82%)	53,024 (3.07%)	67,686 (3.23%)
B.3 Manufacturing	239,430 (35.22%)	387,902 (37.80%)	524,118 (38.37%)	676,153 (39.11%)	828,444 (39.59%)
B.4 Public Utility	19,262 (2.83%)	30,601 (2.98%)	41,818 (3.06%)	53,202 (3.08%)	64,661 (3.09%)
B.5 Construction	66,879 (9.84%)	96,414 (9.40%)	127,445 (9.33%)	159,903 (9.25%)	192,372 (9.19%)
B.6 Trade	48,434 (7.13%)	59,086 (5.76%)	70,725 (5.18%)	83,075 (4.81%)	95,420 (4.56%)
B.7 Hotel and Restaurant	18,302 (2.69%)	23,561 (2.30%)	29,914 (2.19%)	35,919 (2.08%)	41,928 (2.00%)
B.8 Transportation	188,534 (27.74%)	265,007 (25.83%)	338,741 (24.80%)	415,053 (24.01%)	491,420 (23.48%)
B.9 Services	50,343 (7.41%)	76,290 (7.44%)	102,878 (7.53%)	130,831 (7.57%)	158,831 (7.59%)

Considering the percentage of logistics cost per total output for each business sector as shown in Fig.4.5, it was found that the highest percentage was in transportation sector, 19.51 % following by the construction sector, 13.81 % for the year 2000. Although the value of logistics cost in manufacturing sector was highest compared to other business sectors, the percentage of logistics cost per total output for this sector was low, only 3.92 %, for the year 2000.

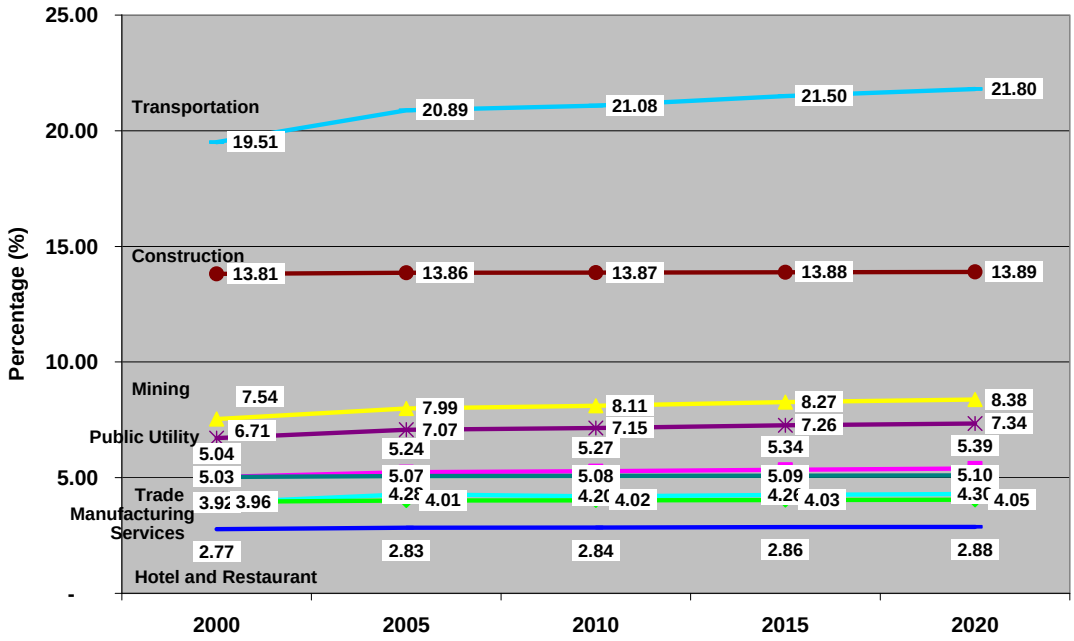

Figure 4.5 Logistics cost per total output by business sector

4.3 Impact Analysis of Transportation Development Strategy

To apply mode-shift strategy, by shifting 5 percent of total freights from road to rail transportation, freight volume by mode would be changed and shown in Fig. 4.6.

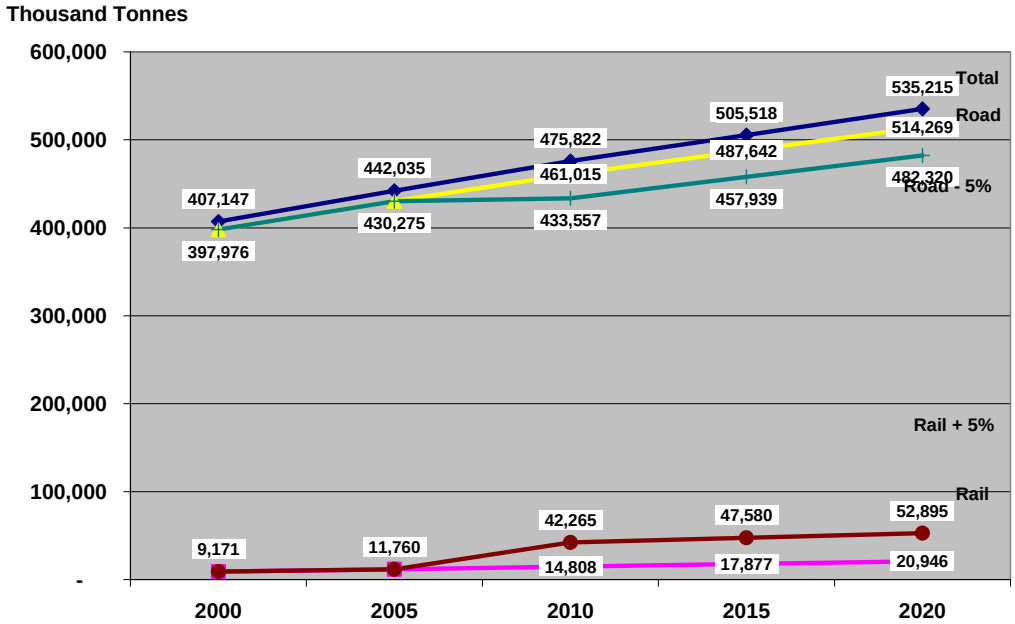

Figure 4.6 Comparison of freight volume between base case and a case study of shifting 5 percent of total freight volume from road to rail

The measurement of the impact of the transport policy was presented in term of the reduction in macro logistics cost. Using freight volume data and transport service cost by mode, transportation rate would be estimated. By shifting 5 percent of total freight volume from road transport to rail transport, logistics cost decreased from 1,777 billion Baht to 1,758 billion Baht in 2010 due to 19 billion Baht saving in transport service cost, that was equivalent to 0.21% of GDP as shown in Figs. 4.7 and 4.8. With the same strategy, the estimated reductions of logistics cost were 27 billion Baht and 34 billion Baht, respectively, in 2015 and 2020.

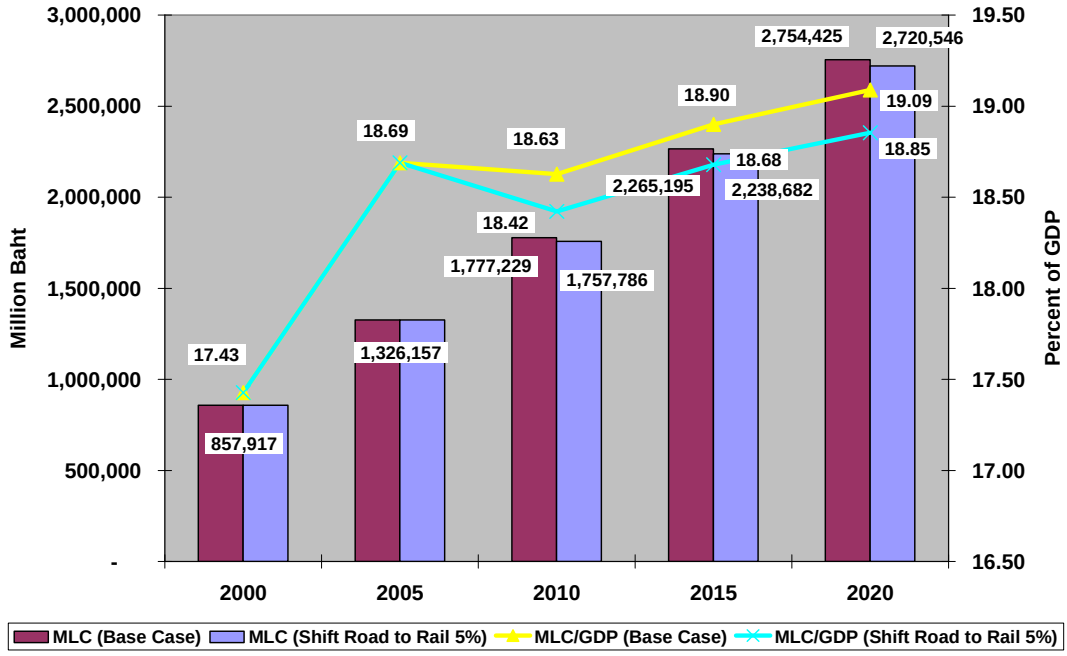

Figure 4.7 Comparison of logistics cost and logistics cost per GDP between base case and a case study of shifting 5 percent of total freight volume from road to rail

In addition, other benefits occurring from shifting mode strategy, 5 percent of total freight volume from road transport to rail transport, were the reduction of energy consumption in transportation and the reduction of air pollutant emissions, e.g., carbon dioxide (CO_2), carbon monoxide (CO) and nitrogen oxide (NO_X). In 2010, energy consumption in transportation was estimated to decrease from 21,199 million litters to 20,127 million litters, or equaled to 1,072 million litters saving in fuel consumption as shown in Fig. 4.9. Using the emission factors, the reduction of air pollutant emissions could be estimated as shown in Figs. 4.10-4.11. For instance, in 2010, the reduction of air pollutant emissions for carbon dioxide (CO_2), carbon monoxide (CO) and nitrogen oxide (NO_X) were estimated to be 2.6 million tons, 27 thousand tons, and 12 thousand tons, respectively.

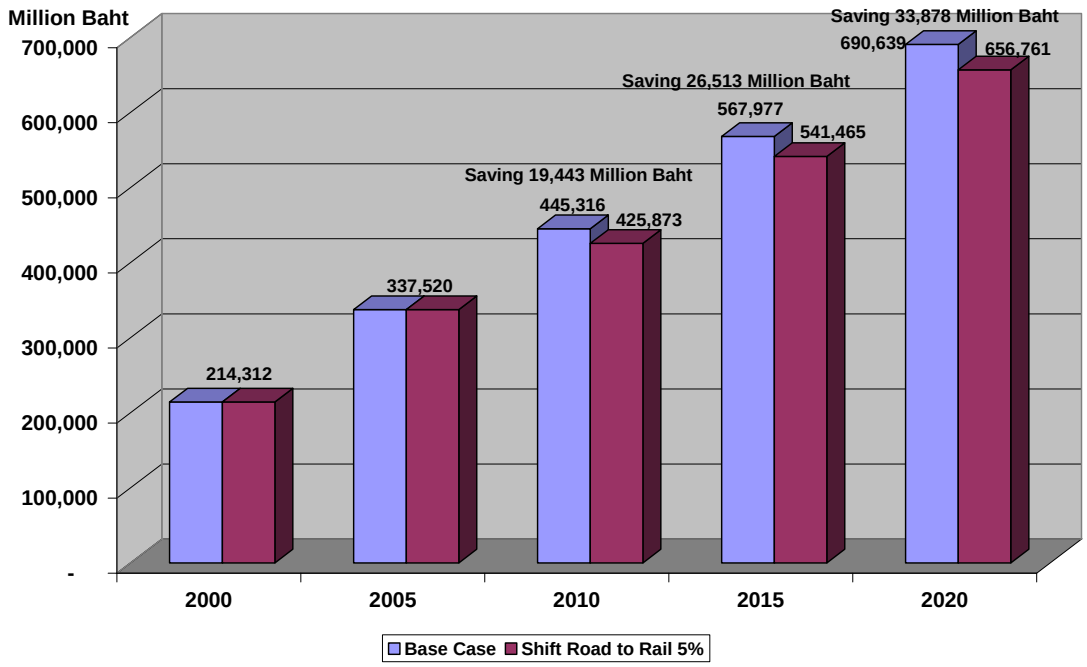

Figure 4.8 Comparison of freight transport services cost between base case and a case study of shifting 5 percent of total freight volume from road to rail

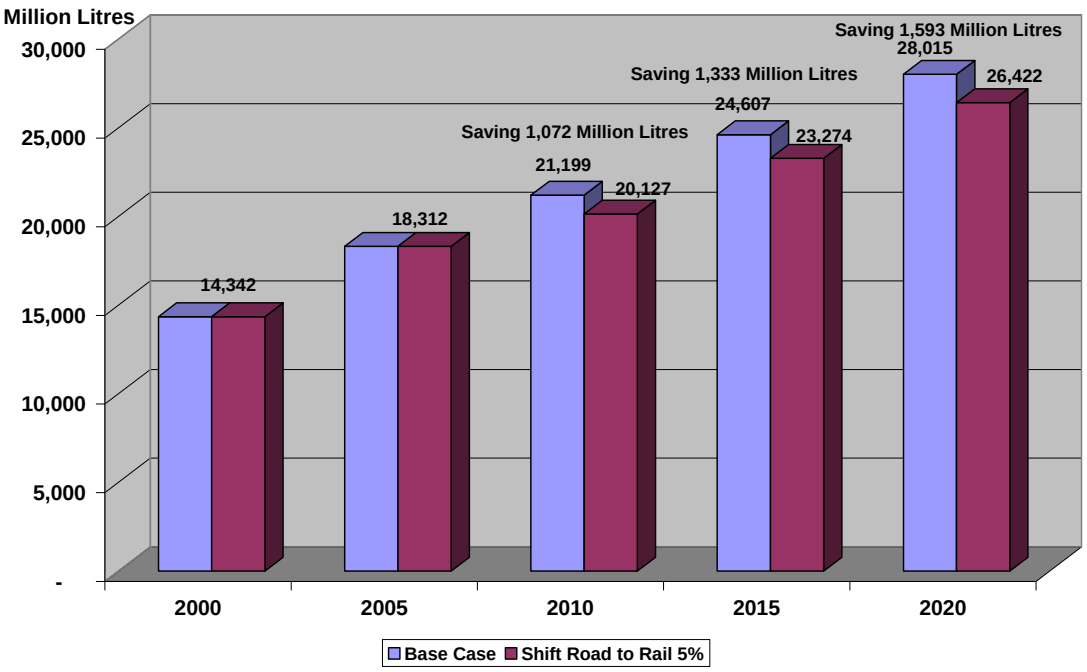

Figure 4.9 Comparison of energy consumption between base case and a case study of shifting 5 percent of total freight volume from road to rail

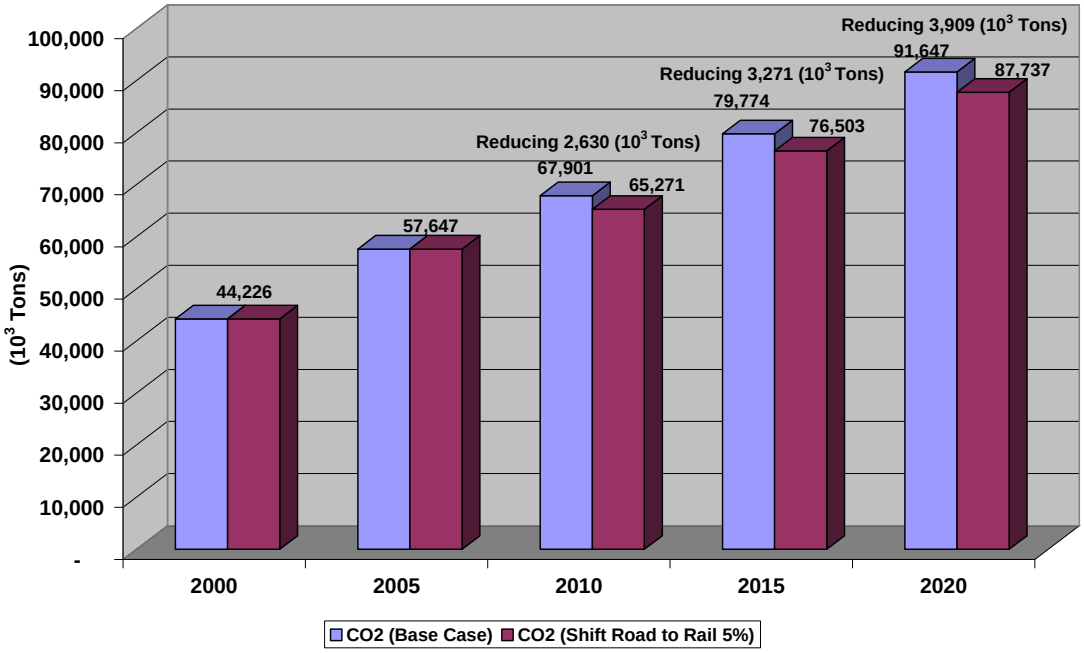

Figure 4.10 Comparison of Carbon dioxide (CO_2) emission between base case and a case study of shifting 5 percent of total freight volume from road to rail

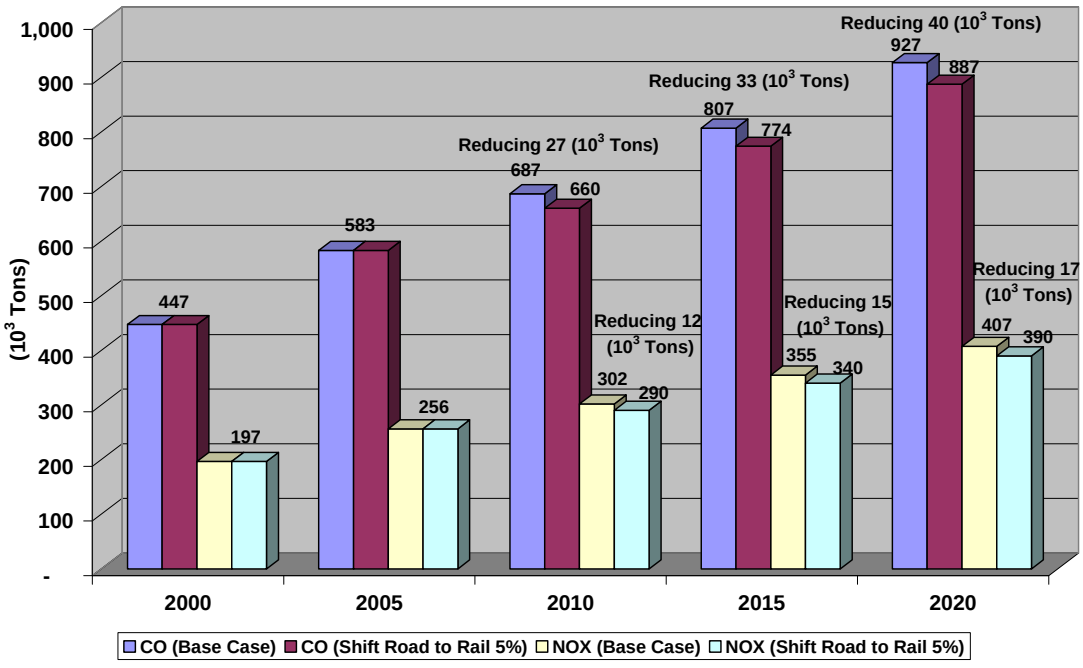

Fig. 4.11 Comparison of carbon monoxide (CO) and nitrogen oxide (NO_X) emissions between base case and a case study of shifting 5 percent of total freight volume from road to rail

CHAPTER 5 CONCLUSIONS

5. Conclusions

Macro logistics cost could be estimated by using data from the input-out table. Thailand's logistics cost was 858 and 1326 billion Baht in 2000 and 2005, respectively. It was estimated to be 1777, 2265, and 2754 billion Baht for the years 2010, 2015 and 2020, respectively. It rose rapidly from 17.43% of GDP in 2000 to 18.69% of GDP in 2005. After the year 2005, it was estimated to increase gradually to 19.09% of GDP in 2020. Thailand's logistics cost was high comparing with the developed countries, e.g., Japan, US, UK, that varied between 10 to 11% of GDP.

The clarification of logistics cost could be done in 2 ways: logistics activity base and demand group base. For the activity base, the logistics cost was classified into 4 groups: transportation cost, inventory carrying cost, administration cost, and infrastructure cost, that were 61%, 23%, 8% and 8% of total logistics cost, respectively, in 2005. For the demand group base, the logistics cost was classified into 3 groups: business sector, household, and government that were 77%, 14% and 9%, respectively, in 2005.

As a case study of transportation development strategy, 5 percent of total freight volume was assumed to shift from highway to railway. This caused 0.21% of GDP in saving of logistics cost in 2010. In addition, it caused 1,072 million litters in saving of energy consumption in the same year.

5.1. Recommendations

Before making comparison of logistics, it should be checked which components were included since the total logistics cost depended on scope and definition.

There is a gap between macro logistics view and micro logistics program. The results of this study showed the macro view of logistics cost. It can be used to tell which logistics component that we should take a look in details but it can not be used to describe how to reduce the cost of that logistics component.

From the analysis of logistics cost, it was found that transportation cost was a major component. The transportation cost interacted on movement between regions. If the efficiency of interregional freight movement was improved, transportation cost could be reduced. For the analysis of the impacts of

transportation development strategic plan, the interregional freight transportation demand modeling was essential.

No one area of logistics operates independently. As a case study of mode-shift strategy, it does not work in transportation area only. All components of logistics activity, i.e., transportation, inventory, warehousing, are interrelated each other. The decisions made in the transportation have an impact on the cost of inventory and warehousing. The total logistics cost must be considered.

References

[1] Lambert, D.M., Stock, J.R. and Ellram, L.M., (1998). *Fundamentasl of Logistics Management*, Boston, McGraw-Hill Companies.

[2] Heskett, J.L., Glaskowsky, N.A. and Ivie, R.M., (1973). *Business Logistics Physical Distribution and Materials Management*, 2nd Ed., New York, Ronald Press Co.

[3] Delaney, R.V. and Wilson, R., (2003). The Case for econfiguration, *14th Annual State of Logistics Report*, National Press Club, Washington D.C.

[4] Japan Institute of Logistics Systems (2005). *Survey of Logistics Cost*, Bangkok, Japan External Trade Organization.

[5] Thammasart Research and Consultant Institute (2005). *Final Report of Logistics Cost and Value Added of Logistics Industry Development Project*, Bangkok, National Economics and Social Development Board

[6] Zhao, S. (2007) *Transport Infrastructure and Logistics Development in China*, in Efficient and Sustainable Intermodal Logistics Network in the Asia-Pacific Region edited by Nemoto, T. and Kawashima, H., Institute of Highway Economics, Japan.

Special Research Project
2007

ATRANS