Chapter 9 Master Planning of Coastal Channels and Ports Development

9. Master Planning of Coastal Channels and Ports Development

9.1 Demand Forecast

In this chapter, firstly, the demand model is formulated to forecast the future demand for coastal shipping up to the year 2020. Secondly, based on the forecast of cargo movement by land transport, possibilities of the modal shift to Ro/Ro shipping are considered. Finally, based on both coastal shipping forecast and Ro/Ro shipping possibilities, the necessary berth capacities in the target year are estimated.

9.1.1. Future Demand for Coastal Shipping

(1) Demand Model

The future traffic is estimated by the gravity model that describes the traffic generation and attraction at each coastal port and identifies the traffic in each route that is likely to occur in the form of Origin and Destination Matrix (O-D). The volume of future traffic is estimated based on growth factor and existing traffic. Two models are used: (a) trip ends formulation, and (b) trip distribution.

(2) Trip Ends Formulation

In the trip ends formation, traffic volumes in the O-D matrix are combined to find trip ends at the place of generation and the place of attraction in each province. Next, the value of trip ends is correlated with socioeconomic variables by using the following equation:

NT_e = T_e (growth factor)

Both generation and attraction has growth factors equal to G_{gpp} E_{gpp}

NT_e = new Trip Ends (for generation and attraction of each province)

G_{gpp} = growth rate of gross provincial product (GPP)

E_{gpp} = elasticity of GPP in relation to Trip Ends

The elasticity is a result of the analysis of various regression equation of each province. The details of elasticity are reported in Table 9.1.1-1.

Table 9.1.1-1 Elasticity Coefficient

Province	Elasticity of Coastal Traffic Volume to GPP	
	GENERATION	ATTRACTION
Bangkok	2.67	1.17
Samutprakarn	8.60	2.80
Samutsakorn	14.09	2.73
Chachongsao	1.25	9.00
Chonburi	1.18	0.73
Rayong	0.13	1.91
Trat	6.45	2.36
Prachubkirikhan	3.11	5.56
Petchaburi	8.75	12.50
Samutsongkram	15.88	0.50
Chumporn	1.67	0.08
Nakhon Si Thammarat	0.69	0.62
Phuket	0.25	2.50
Ranong	1.13	-
Songkhla	3.50	1.20
Surat Thani	1.23	0.77

Remark:

1. Origin data of traffic generation and destination can be obtained from"Transport Statistics" produced by Ministry of Transport and Communications (MOTC) and data of gross provincial product can be obtained from Office of National Economic and Social Development Board (NESDB).
2. Elasticity of coastal traffic generation can be calculated as follows:

$$\frac{\text{Average percentage of change in traffic generated at coastal ports in each province in 1994-1999}}{\text{Average percentage of change in gross provincial product (GPP) of each province in 1994-1999}}$$

(3) Trip Distribution

Trip distribution model is used to produce the distribution of trip in various routes and areas. The trip distribution can be calculated by using Turners Procedure and the output of trip ends which can be described as follows:

T^*_{ij} = $G_iA_jT_{ij}R_iC_j$

T^*_{ij} = future traffic volume between area I and J

G_iA_j = future Trip Ends that generated in area I and attracted in area J.

T_{ij} = existing traffic between area I and J

R_iC_j = balancing factors and calculated from trial and error.

Trip distribution is a simple extension of trip ends that are transformed to be trip interchanges between areas or provinces based on the existing traffic. The result of trip distribution is the future traffic volume between provinces.

(4) Forecast Results

The forecast results are based on three scenarios: Base Case, Optimistic Case and Pessimistic Case.

Base Case:	Coastal traffic volumes will grow at medium rate.
Optimistic Case:	Coastal traffic volumes will grow rapidly (resulting from the rapidness of Thai economy in recovering from downturn)
Pessimistic Case:	Coastal traffic volumes will grow sluggishly (resulting from the long recession of Thai economy)

In this study, the growth rate of traffic volume partly relies on economic growth rate, particularly regional growth, which is outlined in Table 9.1.1-2.

Table 9.1.1-2 Economic Growth Rate at the Years Ending National Economic and Social Development Plans (Constant Price at 1988) (%)

Region	Base Case	Optimistic	Pessimistic
	1996 – 2001 (Plan 8)		
Central, West, and East	2.8	5.0	0.2
South	0.1	0.2	0.0
Bangkok and Vicinity	0.1	0.2	0.0
	2001 – 2006 (Plan 9)		
Central, West, and East	6.0	7.8	4.6
South	4.5	5.8	3.4
Bangkok and Vicinity	4.2	5.5	3.2
	2006 – 2011 (Plan 10)		
Central, West, and East	6.0	7.4	4.9
South	4.6	5.7	3.7
Bangkok and Vicinity	4.2	5.2	3.4
	2011 – 2016 (Plan 11)		
Central, West, and East	5.4	6.6	4.3
South	3.7	4.5	3.0
Bangkok and Vicinity	4.4	5.4	3.5

Source: Thailand Development Research Institute (TDRI)

In estimating the demand, the existing traffic volume and trend of economic growth in different scenarios are incorporated. It is discovered that most of traffic would continue to concentrate in ports located in Bangkok, Rayong, Chonburi, Samutsakorn, Songkhla, and Suratthani. In this estimation, the rate of 2016 is adopted for the growth rates between 2017 and 2020. The estimation of traffic volumes originated and destined at each particular port based on various scenarios is provided in Tables 9.1.1-3 to 9.1.1-8.

Table 9.1.1-3 Future Coastal Traffic Volumes (at Ports of Origin) - (Base Case)

Base Case	2001			2006			2011			2016		
Origin	Petroleum	Other Freight	Total	Petroleum	Other Freight	Total	Petroleum	Other Freight	Total	Petroleum	Other Freight	Total
Bangkok	963,901	166,276	1,130,177	1,350,184	233,016	1,583,200	1,582,397	326,545	1,908,942	2,036,104	462,022	2,498,126
Samutsongkram	108,573	2,137	110,710	138,349	5,955	144,304	157,776	16,594	174,370	197,517	44,946	242,463
Chonburi	10,744,106	136,346	10,880,452	13,366,229	193,675	13,559,904	15,639,739	275,110	15,914,849	19,278,225	379,850	19,658,075
Petchaburi		67,681	67,681		94,254	94,254		131,259	131,259		177,679	177,679
Chumporn	8,565	2,303	10,868	11,621	3,169	14,790	13,536	4,381	17,917	16,713	6,291	23,004
Suratthani	200,432	90,330	290,762	257,822	119,486	377,308	292,452	158,810	451,262	352,579	202,150	554,729
Nakhon Si Thammarat	291,273	47	291,320	386,232	61	386,293	444,976	79	445,055	542,181	98	542,279
Songkhla	59,681	1,200	60,881	73,051	1,776	74,827	82,199	2,641	84,840	98,702	3,761	102,463
Samutprakarn	157,599	13,893	171,492	208,566	25,780	234,346	239,829	47,838	287,667	311,218	89,624	400,842
Samutsakorn	10,696	1,645	12,341	15,430	3,891	19,321	18,503	9,202	27,705	24,166	21,974	46,140
Prachub		447,609	447,609		697,785	697,785		1,087,788	1,087,788		1,648,316	1,648,316
Chachongsao	539	260	799	676	369	1,045	757	525	1,282	925	724	1,649
Rayong	10,587,803	222,944	10,810,747	12,548,859	299,844	12,848,703	14,832,067	403,269	15,235,336	18,165,475	527,192	18,692,667
Trat		5,125	5,125		9,178	9,178		16,437	16,437		28,612	28,612
Phuket	421,472	0	421,472	569,078	0	569,078	661,596	0	661,596	772,102	0	772,102

Table 9.1.1-4 Future Coastal Traffic Volumes (at Ports of Destination) - (Base Case)

Base Case	2001			2006			2011			2016		
Origin	Petroleum	Other Freight	Total	Petroleum	Other Freight	Total	Petroleum	Other Freight	Total	Petroleum	Other Freight	Total
Bangkok	11,168,398	356,857	11,525,255	13,081,355	465,302	13,546,657	15,225,572	606,704	15,832,276	17,755,271	798,696	18,553,967
Samutsongkram	836,645	1,889	838,534	921,557	2,592	924,149	1,006,340	3,556	1,009,896	1,113,716	4,742	1,118,458
Chonburi	1,145,295	97,810	1,243,105	1,375,582	135,538	1,511,120	1,560,185	187,818	1,748,003	1,759,545	252,980	2,012,525
Petchaburi		5,680	5,680		7,910	7,910		11,016	11,016		14,911	14,911
Chumporn	85,186	73	85,259	99,952	95	100,047	112,267	123	112,390	125,734	154	125,888
Suratthani	1,400,440	80,363	1,480,803	1,701,322	104,217	1,805,539	1,967,100	135,800	2,102,900	2,315,521	169,472	2,484,993
Nakhon Si Thammarat	324,503	714	325,217	382,662	921	383,583	445,533	1,195	446,728	533,117	1,483	534,600
Songkhla	1,217,630	282,337	1,499,967	1,542,279	373,466	1,915,745	1,796,446	496,378	2,292,824	2,140,712	631,842	2,772,554
Samutprakarn	2,863,319	180,403	3,043,722	3,758,359	256,903	4,015,262	4,690,432	365,842	5,056,274	5,876,173	525,995	6,402,168
Samutsakorn	2,104,304	2,940	2,107,244	3,100,171	4,187	3,104,358	3,869,014	5,962	3,874,976	4,932,733	8,572	4,941,305
Prachub	11,429	9,266	20,695	13,892	15,163	29,055	16,066	24,933	40,999	21,336	39,263	60,599
Chachongsao	1,623,246	80,083	1,703,329	1,863,860	112,079	1,975,939	2,112,871	156,859	2,269,730	2,446,666	213,388	2,660,054
Rayong	596,678	86,815	683,493	887,411	128,270	1,015,681	1,116,783	189,520	1,306,303	1,440,190	272,182	1,712,372
Trat		1,384	1,384		2,045	2,045		3,021	3,021		4,339	4,339
Phuket	177,568	241	177,809	197,695	340	198,035	224,108	481	224,589	253,315	653	253,968

Table 9.1.1-5 Future Coastal Traffic Volumes (at Ports of Origin) - (Optimistic Case)

Optimistic	2001			2006			2011			2016		
Origin	Petroleum	Other Freight	Total	Petroleum	Other Freight	Total	Petroleum	Other Freight	Total	Petroleum	Other Freight	Total
Bangkok	963,901	166,276	1,130,177	1,367,857	247,919	1,615,776	1,661,067	364,423	2,025,490	2,092,458	540,788	2,633,246
Samutsongkram	108,573	2,137	110,710	143,769	6,478	150,247	175,098	19,275	194,373	215,842	55,250	271,092
Chonburi	10,744,106	136,346	10,880,452	13,531,054	210,687	13,741,741	17,649,915	319,568	17,969,483	21,291,025	466,930	21,757,955
Petchaburi		67,681	67,681		102,533	102,533		152,471	152,471		218,412	218,412
Chumporn	8,565	2,303	10,868	11,858	3,371	15,229	14,077	4,910	18,987	18,006	6,756	24,762
Suratthani	200,432	90,330	290,762	263,637	127,105	390,742	304,555	178,008	482,563	357,690	235,464	593,154
Nakhon Si Thammarat	291,273	47	291,320	390,955	65	391,020	460,310	88	460,398	579,381	114	579,495
Songkhla	59,681	1,202	60,883	75,955	1,893	77,848	95,328	2,967	98,295	121,820	4,391	126,211
Samutprakarn	157,599	13,893	171,492	215,131	27,429	242,560	259,464	53,387	312,851	311,669	104,903	416,572
Samutsakorn	10,696	1,645	12,341	15,615	4,140	19,755	19,628	10,270	29,898	25,014	25,721	50,735
Prachub		447,609	447,609		759,077	759,077		1,263,574	1,263,574		2,026,189	2,026,189
Chachongsao	539	260	799	703	402	1,105	803	609	1,412	932	890	1,822
Rayong	10,587,803	222,944	10,810,747	12,662,157	326,182	12,988,339	16,324,736	468,438	16,793,174	19,850,078	648,050	20,498,128
Trat		5,125	5,125		9,984	9,984		19,093	19,093		35,171	35,171
Phuket	421,472	0	421,472	579,985	0	579,985	791,981	0	791,981	945,647	0	945,647

Table 9.1.1-6 Future Coastal Traffic Volumes (at Ports of Destination) - (Optimistic Case)

Optimistic	2001			2006			2011			2016		
Destination	Petroleum	Other Freight	Total	Petroleum	Other Freight	Total	Petroleum	Other Freight	Total	Petroleum	Other Freight	Total
Bangkok	11,168,398	356,857	11,525,255	13,261,149	495,061	13,756,210	18,241,733	677,081	18,918,814	21,802,336	934,859	22,737,195
Samutsongkram	836,645	1,889	838,534	932,263	2,819	935,082	1,133,171	4,131	1,137,302	1,248,459	5,829	1,254,288
Chonburi	1,145,295	97,810	1,243,105	1,396,116	147,443	1,543,559	1,598,414	218,169	1,816,583	1,830,024	310,976	2,141,000
Petchaburi		5,680	5,680		8,605	8,605		12,796	12,796		18,330	18,330
Chumporn	85,186	73	85,259	102,740	101	102,841	117,617	138	117,755	135,918	179	136,097
Suratthani	1,400,440	80,363	1,480,803	1,760,061	110,863	1,870,924	2,009,321	152,218	2,161,539	2,420,652	197,401	2,618,053
Nakhon Si Thammarat	324,503	714	325,217	395,442	980	396,422	501,121	1,339	502,460	647,082	1,728	648,810
Songkhla	1,217,630	282,901	1,500,531	1,579,705	398,075	1,977,780	1,875,426	557,497	2,432,923	2,226,506	737,440	2,963,946
Samutprakarn	2,863,319	180,403	3,043,722	3,762,113	273,333	4,035,446	4,740,263	408,279	5,148,542	6,086,498	615,667	6,702,165
Samutsakorn	2,104,304	2,940	2,107,244	3,103,268	4,454	3,107,722	3,984,596	6,654	3,991,250	5,116,222	10,033	5,126,255
Prachub	11,429	9,266	20,695	13,906	16,130	30,036	16,903	27,947	44,850	24,530	45,734	70,264
Chachongsao	1,623,246	80,083	1,703,329	1,865,722	121,924	1,987,646	2,175,991	182,208	2,358,199	2,537,858	262,307	2,800,165
Rayong	596,678	86,815	683,493	888,297	139,537	1,027,834	1,131,069	220,146	1,351,215	1,688,619	334,579	2,023,198
Trat		1,384	1,384		2,224	2,224		3,510	3,510		5,334	5,334
Phuket	177,568	241	177,809	197,893	361	198,254	231,336	540	231,876	270,430	761	271,191

Table 9.1.1-7 Future Coastal Traffic Volumes (at Ports of Origin) - (Pessimistic Case)

Pessimistic	2001			2006			2011			2016		
Origin	Petroleum	Other Freight	Total	Petroleum	Other Freight	Total	Petroleum	Other Freight	Total	Petroleum	Other Freight	Total
Bangkok	963,901	166,276	1,130,177	1,152,010	225,294	1,377,304	1,565,924	303,787	1,869,711	2,005,736	411,613	2,417,349
Samutsongkram	108,573	2,137	110,710	125,994	5,572	131,566	156,201	14,738	170,939	176,463	37,878	214,341
Chonburi	10,744,106	136,346	10,880,452	11,583,773	181,219	11,764,992	14,284,970	244,334	14,529,304	17,830,765	320,116	18,150,881
Petchaburi		67,681	67,681		88,192	88,192		116,576	116,576		166,992	166,992
Chumporn	8,565	2,303	10,868	10,167	3,005	13,172	13,531	3,979	17,510	15,722	5,093	20,815
Suratthani	200,432	90,330	290,762	231,986	113,328	345,314	288,001	144,256	432,257	330,009	177,510	507,519
Nakhon Si Thammarat	291,273	47	291,320	341,563	58	341,621	444,447	71	444,518	511,848	86	511,934
Songkhla	59,681	1,198	60,879	68,461	1,681	70,142	80,818	2,395	83,213	89,195	3,297	92,492
Samutprakarn	157,599	13,893	171,492	184,645	24,567	209,212	239,495	43,863	283,358	278,541	78,695	357,236
Samutsakorn	10,696	1,645	12,341	12,621	3,708	16,329	17,661	8,438	26,099	22,272	19,295	41,567
Prachub		447,609	447,609		652,906	652,906		966,098	966,098		1,429,526	1,429,526
Chachongsao	539	260	799	615	346	961	757	466	1,223	848	610	1,458
Rayong	10,587,803	222,944	10,810,747	10,783,420	280,559	11,063,979	12,669,889	358,156	13,028,045	14,939,829	444,288	15,384,117
Trat		5,125	5,125		8,588	8,588		14,598	14,598		24,112	24,112
Phuket	421,472	0	421,472	498,152	0	498,152	657,465	0	657,465	766,629	0	766,629

Table 9.1.1-8 Future Coastal Traffic Volumes (at Ports of Destination) - (Pessimistic Case)

Pessimistic	2001			2006			2011			2016		
Destination	Petroleum	Other Freight	Total	Petroleum	Other Freight	Total	Petroleum	Other Freight	Total	Petroleum	Other Freight	Total
Bangkok	11,168,398	356,857	11,525,255	11,558,767	443,400	12,002,167	13,386,910	556,289	13,943,199	15,561,166	701,302	16,262,468
Samutsongkram	836,645	1,889	838,534	867,512	2,425	869,937	945,966	3,158	949,124	1,032,129	3,997	1,036,126
Chonburi	1,145,295	97,810	1,243,105	1,264,612	126,820	1,391,432	1,480,284	166,807	1,647,091	1,759,357	213,198	1,972,555
Petchaburi		5,680	5,680		7,401	7,401		9,783	9,783		12,566	12,566
Chumporn	85,186	73	85,259	91,224	90	91,314	105,895	112	106,007	123,265	135	123,400
Suratthani	1,400,440	80,363	1,480,803	1,598,530	98,847	1,697,377	1,905,617	123,355	2,028,972	2,234,215	148,815	2,383,030
Nakhon Si Thammarat	324,503	714	325,217	372,371	874	373,245	422,643	1,085	423,728	465,454	1,303	466,757
Songkhla	1,217,630	282,970	1,500,600	1,354,988	355,193	1,710,181	1,698,964	452,382	2,151,346	2,046,465	557,016	2,603,481
Samutprakarn	2,863,319	180,403	3,043,722	2,866,771	244,810	3,111,581	3,703,189	335,442	4,038,631	4,821,358	461,854	5,283,212
Samutsakorn	2,104,304	2,940	2,107,244	2,360,227	3,990	2,364,217	3,397,404	5,467	3,402,871	4,847,100	7,527	4,854,627
Prachub	11,429	9,266	20,695	13,217	14,382	27,599	15,170	22,648	37,818	19,528	34,477	54,005
Chachongsao	1,623,246	80,083	1,703,329	1,708,255	104,871	1,813,126	1,962,366	139,312	2,101,678	2,233,256	179,831	2,413,087
Rayong	596,678	86,815	683,493	744,978	120,020	864,998	1,005,969	168,319	1,174,288	1,407,008	229,380	1,636,388
Trat		1,384	1,384		1,913	1,913		2,683	2,683		3,657	3,657
Phuket	177,568	241	177,809	191,957	322	192,279	211,875	437	212,312	233,859	574	234,433

9.1.2 The Modal Shift from Land Transport to Ro/Ro Shipping

(1) Review of Cargo Movement by Land Transport

The purpose of this section is to review the present situation regarding freight movement by land transport from and to the Study area. The comprehensive understanding of cargo movement by land transport provides insights into the extent to which coastal shipping activities would be enhanced by attracting freight traffic from other competing modes of transport.

Figures 9.1.2-1 and 9.1.2-2 depict the rail network and road network respectively connecting the study area with the rest of the country. Trains serving the study area are operating on a single-track line from the Bangkok main station at Hua Lum Phong with an average freight service frequency of 38 trains per week. Within the Study area, trains normally stop to allow cargo loading and unloading at stations located in the following provinces: Chumphon, Surat Thani, Nakhon Si Thammarat, Songkhla, Pattani, and Narathiwat. The Highway Routes Numbered 4, 41, 42 and 43 are currently the primary inter-city highway link serving truck traffic between the study area and other regions. These highways have been improved to become in most parts four-lane facilities with high design standards. Table 9.1.2-2 shows Average Annual Daily Traffic (AADT) and truck percentages observed at various locations in the Study area in 1999.

Tables 9.1.2-3 and 9.1.2-4 provide information about freight traffic between the Southern region and other parts of the country that were carried by truck and rail respectively during the years 1997-1999. The data shown in these two tables was directly drawn from readily available statistics reported annually by the Ministry of Transport and Communications (MOTC). The classification of provinces into regions is based on the system adopted by the National Economic and Social Development Board (NESDB) as listed below:

Table 9.1.2-1 NESDB Regional Classification

Region	Provinces
Bangkok and Vicinity	Bangkok, Nonthaburi, Nakhon Pathom, Pathum Thani, Samut Prakan, Samut Sakhon
Northern	Chiang Mai, Chiang Rai, Kamphaeng Phet, Lampang, Lamphun, Mae Hong Son, Nakhon Sawan, Nan, Phayao, Phetchabun, Phichit, Phitsanulok, Phrae, Sukhothai, Tak, Uthai Thani, Uttaradit
Northeastern	Buri Ram, Chaiyaphum, Kalasin, Khon Kaen, Loei, Maha Sarakham, Mukdaharn, Nakhon Phanom, Nakhon Ratchasima, Nong Khai, Roi Et, Sakon Nakhon, Si Sa Ket, Surin, Ubon Ratchathani, Udon Thani, Yasothon
Central	Ang Thong, Chai Nat, Lop Buri, Phra Nakhon Si Ayuthhaya, Saraburi, Sing Buri
Eastern	Chachoengsao, Chantahburi, Chon Buri, Nakhon Nayok, Prachin Buri, Rayong, Trat
Western	Kanchanaburi, Prachuap Khiri Khan, Phetchaburi, Ratchaburi, Samut Songkhram, Suphan Buri
Southern	Chumphon*, Krabi, Nakhon Srithammarat*, Narathiwat*, Pang Nga, Pattani*, Phatthalung*, Phuket, Ranong, Satun, Songkhla*, Surat Thani*, Trang, Yala

Note: Asterisks (*) indicate provinces of interest in this study

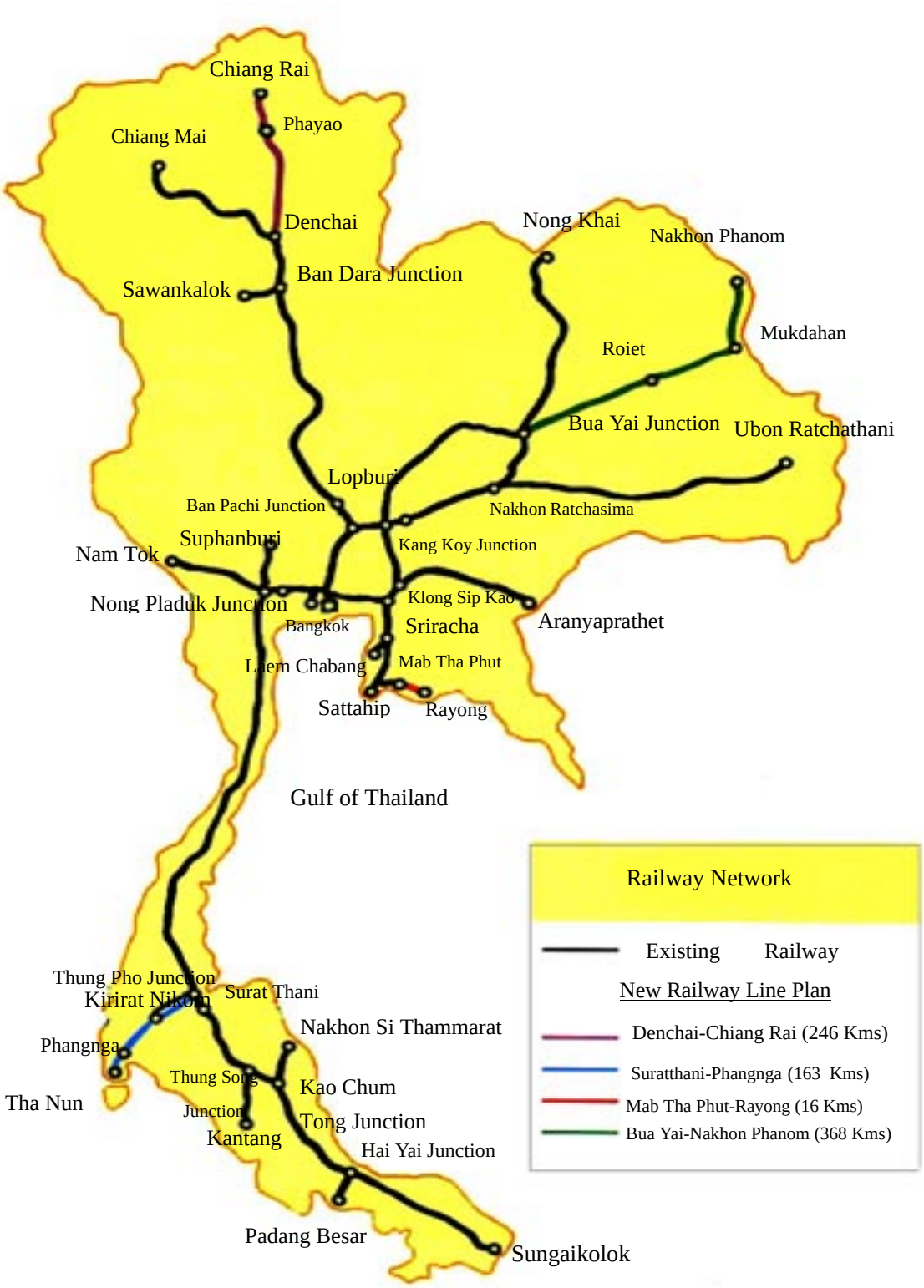


Figure 9.1.2-1 Railway Network of Thailand

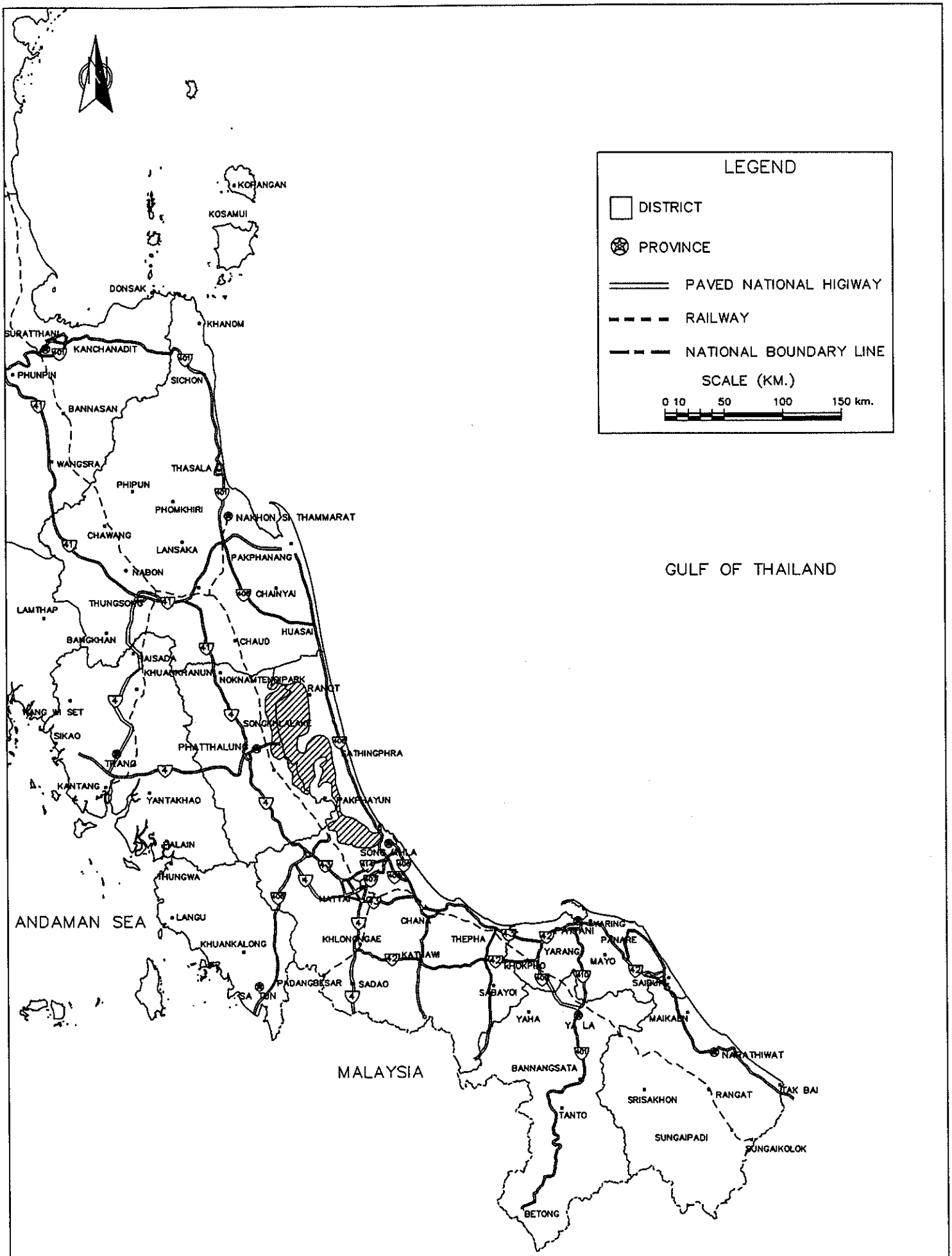


Figure 9.1.2-2 Road Network in the Study Area

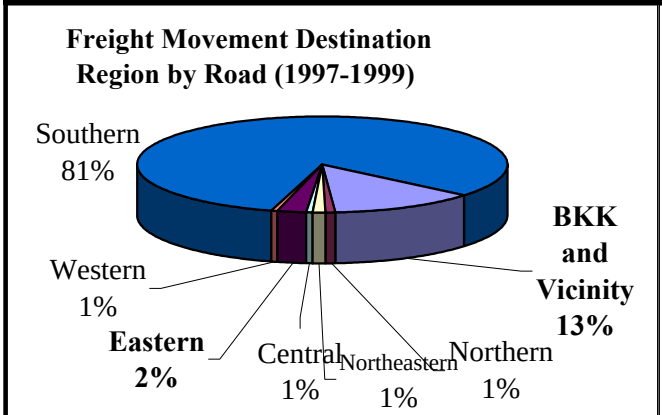
Table 9.1.2-2 Average Annual Daily Traffic (vehicles/day), Volumes by Truck Type (vehicles/day), and Total Truck Percentages (1999)

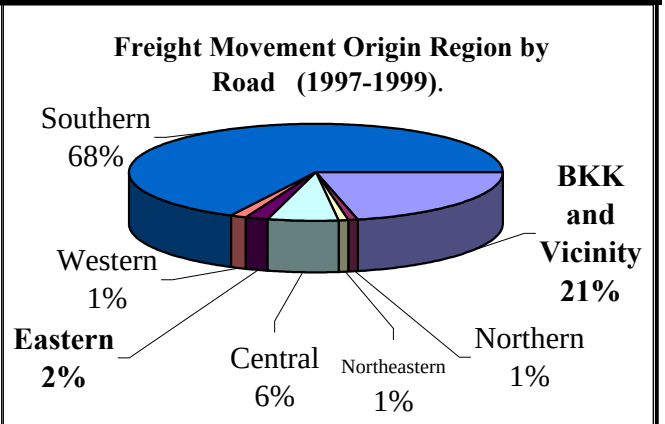
ROAD NO.	SECTION NAME	TOTAL VEH.	LIGHT TRUCK	MEDIUM TRUCK	HEAVY TRUCK	TOTAL TRUCK	% TRUCK
41	CHAIYA - R. NO. 401 (PHUN PHIN)	13,202	3,557	1,152	2,749	7,458	56.49
41	JCT.R.NO.401 - NAKHONSITHAMMARAT DIST. 2	11,441	3,811	2,130	1,977	7,918	69.21
41	SURATTHANI DIST. - WIANG SA	8,716	2,553	1,089	2,324	5,966	68.45
41	WIANG SA - CHAWANG	11,181	4,454	917	2,698	8,069	72.17
41	CHAWANG - MUNI.OF PAK PHRAEK	13,216	1,671	1,076	3,290	6,037	45.68
41	THUNG SONG - RON PHIBUN	15,150	2,901	1,973	1,853	6,727	44.40
41	RON PHIBUN - PHATTHALUNG DIST.	9,880	1,923	1,205	2,178	5,306	53.70
41	KM.36+061(THONG SONG) - THA PRACHA	8,194	3,454	980	1,421	5,855	71.45
41	THA PRACHA - R.NO.4	10,473	6,354	733	1,650	8,737	83.42
4	MUNI.OF PHATTHALUNG - JCT. TO PAK PHAYUN	19,717	3,193	2,256	3,251	8,700	44.12
4	JCT.KHU HA - JCT.TO PAK PHAYUN	11,478	4,220	1,041	1,658	6,919	60.28
4	JCT.KHU HA - JCT.THA CHAMUANG	7,603	472	285	77	834	10.97
4	JCT.THA CHAMUANG - HATYAI (STA. 3+600)	12,482	3,581	457	402	4,440	35.57
4	JCT.THA CHAMUANG - HATYAI (STA. 10+300)	5,774	731	424	271	1,426	24.70
4	JCT.KHO HONG - JCT. KHLONG NGAE (STA. 31+000)	28,167	8,599	1,801	1,098	11,498	40.82
4	JCT.KHO HONG - JCT. KHLONG NGAE (STA. 34+500)	23,598	9,261	1,168	1,862	12,291	52.08
42	JCT.KHLONG NGAE - KM.15+000(PATTANI DIST.)	2,739	1,361	200	227	1,788	65.28
42	KM.15+000(SONG KLA DIST.) - JCT.NATAWEE	4,134	2,456	232	148	2,836	68.60
42	JCT.NATAWEE - JCT. TO THEHA	2,570	995	201	198	1,394	54.24
42	JCT. TO THEHA - JCT. NAKET	3,379	1,208	246	164	1,618	47.88
42	JCT. NAKET - MUNI.OF PATTHANI	11,394	2,070	522	1,221	3,813	33.46
42	PATHANI (DONRAK) - JCT. TO PA NA RAE	10,873	1,926	577	1,143	3,646	33.53
42	JCT. TO PATTHANI	5,622	476	207	126	809	14.39
42	JCT. TO YA RANG	2,308	146	56	27	229	9.92
42	JCT. TO PA NA RAE - KM.49+500	5,585	1,026	425	393	1,844	33.02
42	KM.49+500 - JCT. TO SAI BURI	5,072	552	372	382	1,306	25.75
42	JCT. TO SAI BURI	3,222	926	227	112	1,265	39.26
42	JCT. TO SAI BURI - JCT. NARATHIWAT	4,732	366	490	686	1,542	32.59
43	JCT. KHU HA - HAT YAI (STA. 2+100)	19,411	2,209	2,570	1,240	6,019	31.01
43	JCT. KHU HA - HAT YAI (STA. 20+000)	26,227	3,129	3,321	4,409	10,859	41.40
43	HAT YAI - CHA NA	10,955	4,815	867	1,224	6,906	63.04
43	CHA NA - PAKNAM THEPHA	9,703	4,056	404	1,231	5,691	58.65
43	PAKNAM THEPHA - NONG CHIK	10,684	2,169	509	1,655	4,333	40.56

Source: MOTC

Table 9.1.2-3 Freight Movement by Road in Southern Region

Origin Region (Southern)	Destination Region							Unit: Thousand Ton
	BKK and Vicinity	Northern	Northeastern	Central	**Eastern**	Western	Southern	Total
Year 1999	4,388	386	320	117	625	193	17,530	23,559
1998	3,209	302	259	207	693	210	15,901	20,781
1997	3,055	31	146	216	707	198	34,035	38,388
Average 3 years	3,551	240	242	180	675	200	22,489	27,576
Share	13%	1%	1%	1%	2%	1%	82%	100%
Destination Region	Origin Region							Unit: Thousand Ton
	BKK and Vicinity	Northern	Northeastern	Central	**Eastern**	Western	Southern	Total
Year 1999	8,620	355	333	1,545	417	411	15,901	27,582
1998	3,209	302	259	207	693	210	15,901	20,781
1997	8,870	290	193	4,219	744	668	34,035	49,019
Average 3 years	6,900	316	262	1,990	618	430	21,946	32,461
Share	21%	1%	1%	6%	2%	1%	68%	100%

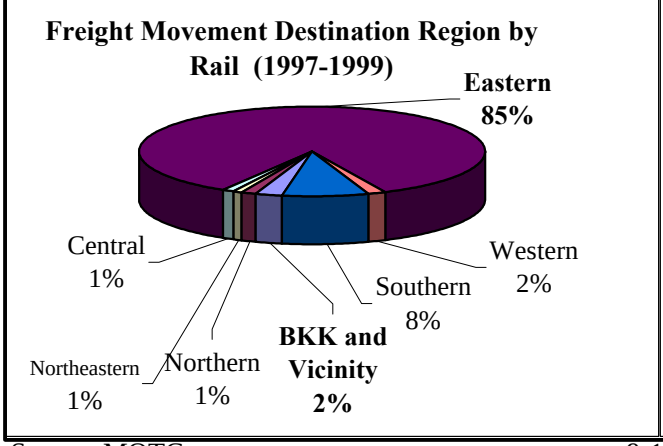


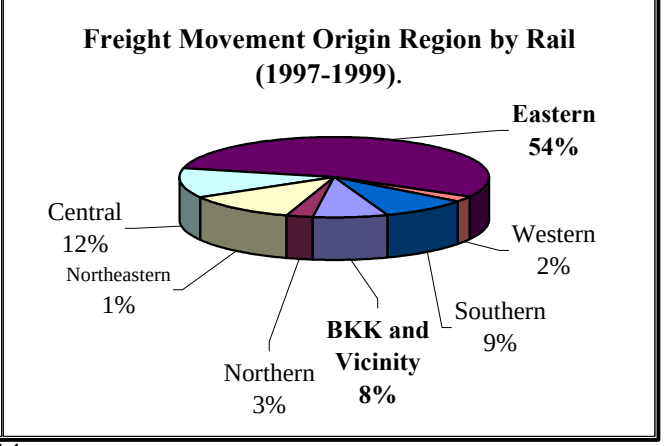


Source: MOTC

Table 9.1.2-4 Freight Movement by Rail

Origin Region (Southern)	Destination Region							Unit: Thousand Ton
	BKK and Vicinity	Northern	Northeastern	Central	**Eastern**	Western	Southern	Total
Year 1999	33	13	5	10	625	18	197	901
1998	23	21	9	14	1,737	25	76	1,905
1997	49	27	19	25	1,291	31	71	1,513
Average 3 years	35	20	11	16	1,218	25	115	1,440
Share	2%	1%	1%	1%	85%	2%	8%	100%
Destination Region	Origin Region							Unit: Thousand Ton
	BKK and Vicinity	Northern	Northeastern	Central	**Eastern**	Western	Southern	Total
Year 1999	77	31	130	98	0	38	197	571
1998	49	32	138	135	1,071	21	76	1,522
1997	165	43	163	215	963	28	71	1,648
Average 3 years	97	35	144	149	678	29	115	1,247
Share	8%	3%	12%	12%	54%	2%	9%	100%





Source: MOTC

It is noted that the Southern region as included in the Tables 9.1.2-3 and 4 consists of more provinces than those directly considered in this study. However, in view of the macro analysis of general trends and geographical distribution of traffic, the freight traffic into and out of the Southern region can be assumed to represent the existing situation in the Study area.

The data clearly suggests that the truck transport has played a dominant role in the freight service in comparison with the rail transport. As far as the Southern region is concerned, freight movements by truck measured in tonnage amounted to over 96% of total surface freight volumes during 1997-1999. It is concluded, therefore, that modal shift to coastal shipping may be irrelevant for rail transport. The data also shows a significant drop in cargo movement associated with the Southern Thailand following the severe economic downturn in 1997. The total road freight traffic originated from or destined to the area fell approximately 50% between 1997 and 1998, but slightly increased from 1998 to 1999. It is noteworthy that more than 70% of freight traffic associated with the Southern region was intra-regional (i.e., movements within the region). Less than 30% of total traffic moved between regions and to other parts of the country.

Tables 9.1.2-5 and 9.1.2-6 show 1999 freight traffic by commodity type transported to and from each province in the Study area. The data concerning freight movements by truck shown in these two tables was summarized from the database maintained internally within the MOTC but not publicly reported. The database represents one of the most comprehensive data on domestic freight transport as it contains information about the distribution of road freight between provinces by commodity type. Unfortunately, no data of similar detail has been collected for other freight modes. The data concerning rail transport as presented in Tables 9.1.2-5 and 6 comes from the annual report of transport statistics prepared by MOTC.

Bulk commodities represent over 62% of total tonnage of surface freight traffic originated in the Study area, agricultural products making up 30%, and manufactured products accounted for about 6%. Concerning commodities destined to the study area, bulk commodities, agricultural products, and manufactured products represent about 60%, 22%, and 17% of total tonnage respectively. The three provinces with highest surface freight movements were Songkhla, Surat Thani, and Nakhon Si Thammarat. Furthermore, the dominant commodities transported to and from the Study area were ores and metal wastes, accounting for roughly 30% of the inflows and 37% of the outflows. However, careful analysis reveals that the movements of this particular commodity type are made mostly within the same province, for example, 4.567 million tons of ores and metal wastes are transported within the province of Surat Thani. Since coastal shipping would be normally suitable for medium-to-long distance movements, these internal freight movements within the study area would not be a target for being diverted to coastal shipping and therefore may be dropped from the analysis. Tables 9.1.2-7 and 8 present road freight volumes when internal movements are removed.