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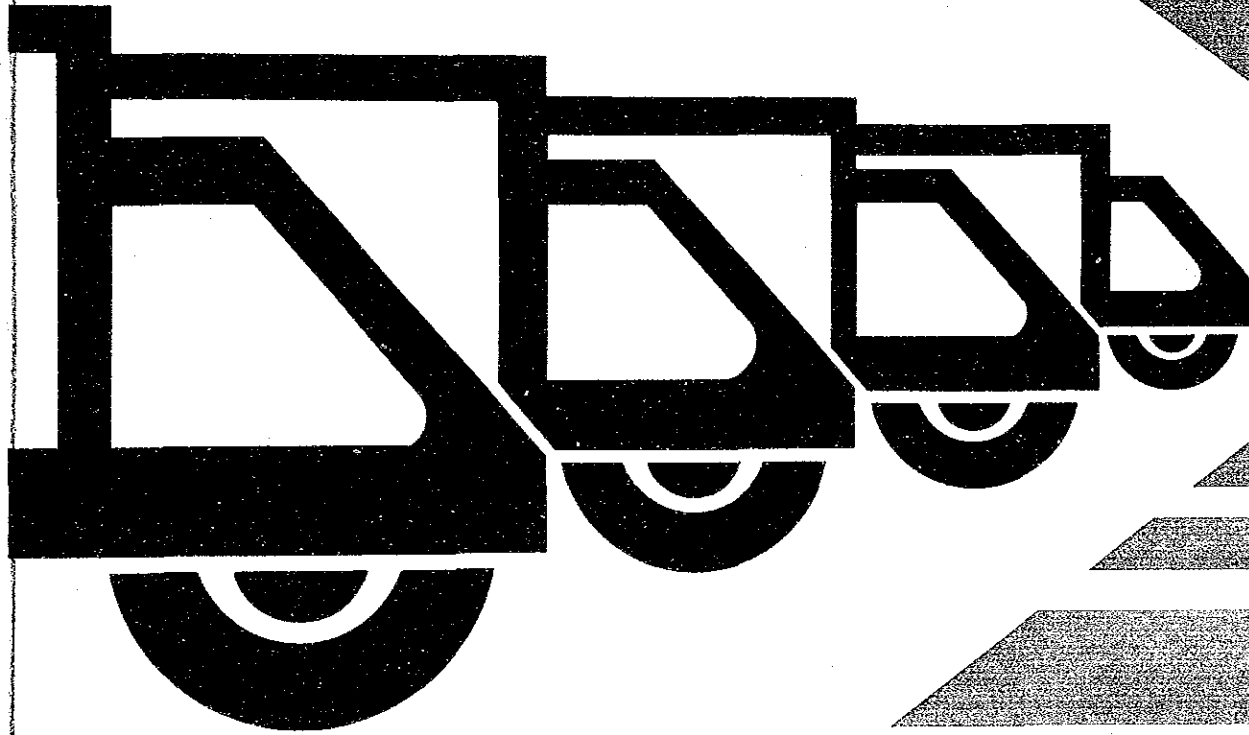
GOVERNMENT OF THE KINGDOM OF THAILAND

No. 8

MINISTRY OF COMMUNICATIONS

DEPARTMENT OF LAND TRANSPORT

FEASIBILITY STUDY
ON
THE PROJECT
OF
THE REGIONAL TRUCK TERMINALS



FINAL REPORT
TEXT

JUNE 1988

JAPAN INTERNATIONAL COOPERATION AGENCY

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MINISTRY OF COMMUNICATIONS
DEPARTMENT OF LAND TRANSPORT**

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国際協力事業団

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PREFACE

In response to the request of the Government of the Kingdom of Thailand, the Government of Japan has decided to conduct a Study on the Feasibility Study on the Project of the Regional Truck Terminals and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Thailand a study team headed by Mr. Kengo UEDA, Pacific Consultants International, four times in 1987 and 1988.

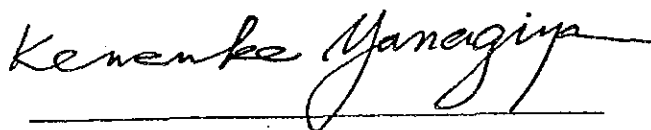
The team had a series of discussions on the Project with the officials concerned of the Government of Thailand and conducted field surveys.

After the team returned to Japan, further studies were made and the present report has been prepared.

I hope that this report will serve for the development of the Project and contribute to promote friendly relations between our two countries.

I wish to express my deep appreciation to all the officials concerned of the Government of Kingdom of Thailand for their close cooperation extended to the team.

June, 1988

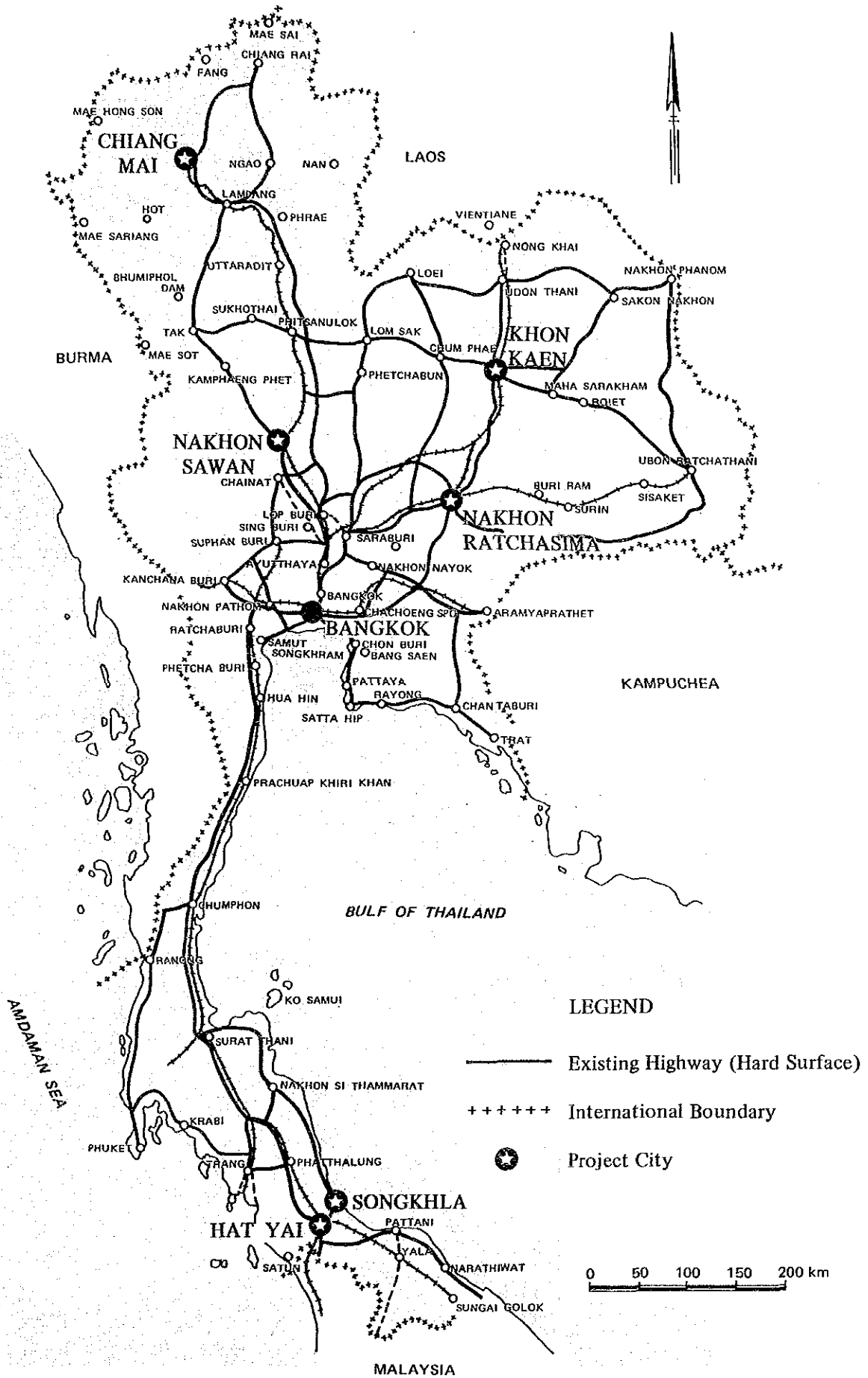


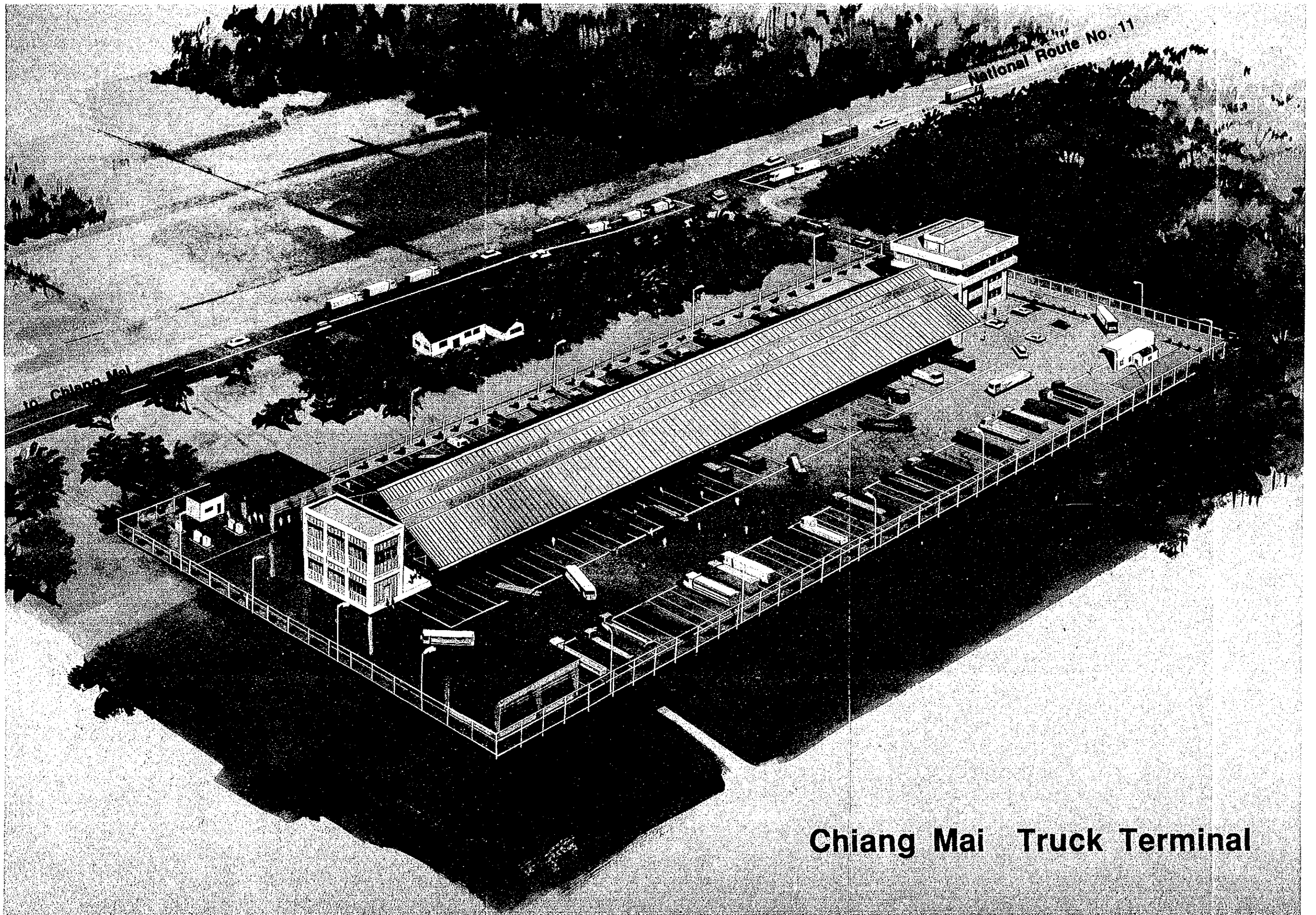
Kensuke Yanagiya

President

Japan International Cooperation Agency

PROJECT LOCATION MAP





Chiang Mai Truck Terminal

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**SUMMARY
AND
RECOMMENDATIONS**

SUMMARY AND RECOMMENDATIONS

1. BACKGROUND OF THE PROJECT

With the development of the economy and social strata in Thailand, urban concentration of the population has resulted in excessive overcrowding in the existing city areas, particularly in Bangkok. This, in turn, has led to a disorderly expansion of surrounding areas. Furthermore, the rapid growth of trucking activities has brought traffic congestion in and around the city. The result of these conditions has been to deter the potential for industrial expansion of the city, and a deterioration of the social and living environments of its populace.

Countermeasures for the above mentioned situations and rationalization of cargo transport throughout Thailand became an urgent necessity.

As one of the solutions for these problems, the planning of a regional truck terminal system was drawn up under a plan by the Government of Thailand as a continuation of the development of Bangkok Truck Terminals.

In assessing the background and merits of the project the following effects have been taken into consideration:

(1) Promotion of Rational Land Use in Urban Areas

It is considered that induction of the transporter's collection and distribution bases and/or storage facilities, presently scattered in and around the city, to suburban areas will undoubtedly be useful in terms of effective land use, functional enhancement of the city, environmental improvement, etc.

(2) Importance of Smoothness of Road Traffic

In large cities with dense traffic volumes, the majority of traffic jams are traffic jams in many cases are caused by the parking of vehicles for the purpose of loading and/or unloading goods on the street. Should a truck terminal be provided at an appropriate location away from the city center, it will surely contribute toward the efficient delivery and distribution of goods, and eliminate unnecessary large truck flows into the city.

(3) Rationalization of Transportation

The establishment of truck terminals will attract both regional and city cargoes to the terminals by the improved efficiency in goods handling. Secondly, both the Line-haul and Pick-up/Delivery services can be scheduled to give a rationalized delivery network.

(4) Scale Merit

Since the public truck terminal is to be used by numerous enterprises it can reduce costs through cooperative use, and procurement of facilities and equipment. Thus enabling greatest use of mechanical equipment to handle freight in large quantities.

(5) Promotion and Development of Regional Economy

Construction of the truck terminals will contribute to the promotion and development of various regional programs for commercial facilities, industrial complexes and such infrastructures as roads, water supply, drainage and so forth. It is also expected to increase employment opportunities in the regions.

(6) Protection of Environment

By establishing an efficient transportation system, the overall number and lengths of truck trips can be reduced, resulting in energy savings and at the same time, reduce air pollution, noise pollution, and traffic accidents.

2. NECESSITY AND GENERAL FUNCTIONS OF TRUCK TERMINAL

Truck terminals are nodes between long-distance line-haul trucks and city pick-up and delivery trucks for the efficient transport of general cargo (non-bulk mixed cargo). The majority of which are consumer goods used both domestically and by businesses. Since the Project Cities and Bangkok are population-concentrated cities, traffic measures have a great impact on urban welfare, as well as on national growth.

In the case of Thailand, the national costs of not having trunk terminals are large since the present system of cargo terminals is ineffective for cargo transport and handling services. The present private terminals in regional cities mainly consist of two types of facilities (see Fig. 2.1):

- shophouses where storage and administrative functions are performed, and
- roadside areas in the CBD where cargo handling and vehicle maintenance are performed.

The truck terminals which can improve these inefficiencies are a facility to allow truck operators a place where they can link and rationalize trunk road transport with collection and delivery operations (loading, unloading, sorting of goods according to destinations and temporary storing) as described below:

(1) Operation of Line-haul Service Out of the Project Cities

Line-haul trucks on designated routes will be operated on time-schedules. The operation will be done exactly and promptly according to user requirements. Efficient loading, unloading and improvement of the load factor will be promoted by truck terminals.

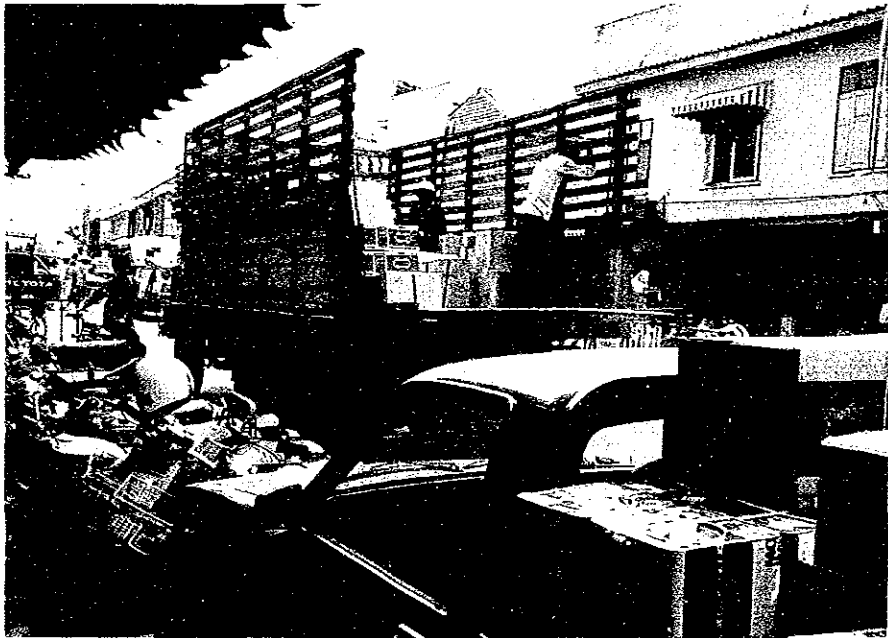
(2) Pick-up and Delivery Service in the Project Cities

Pick-up and delivery services within the Project City area will be served by small trucks (4-wheel) according to time-schedule. Unloaded cargoes from line-haul trucks will therefore be delivered within the Project Cities and surrounding areas. Access for large line-haul vehicles will not be required, in the Project Cities (6- and 10-wheel).

Fig 2.1 Present Situations of Cargo Handling



At Shophouse
(Chiang Mai)



At Roadside in CBD
(Khon Kaen)

(3) Materials Handling on Platforms at the Terminals

Unloading from pick-up trucks and sorting by shipping destination will be performed so that cargo is transferred onto a specific shipping block on the platform for loading to line-haul trucks. Unloaded cargoes from line-haul trucks will be sorted for transshipment to other line-haul trucks or for delivery by zone in delivery trucks.

3. DEMAND FOR REGIONAL TRUCK TERMINALS

Based on the general recognition described in the preceding Sections, the following analyses were conducted in order to forecast the demand for regional truck terminals.

(1) National and Regional Economy

Thailand achieved a remarkable economic growth of 8.4% p.a. during the 1960's and 7.2% p.a. during the 1970's. In terms of the average growth rate of per capita income, 4.7% p.a. had been realized between 1960 and 1980. This record was exceeded only by Korea in this region.

The period of very high economic growth ended with the arrival of the second oil shock of 1979. GDP growth rates of subsequent years are 5.8% in 1980, 6.3% in 1981, 4.1% in 1982, 5.8% in 1983, 6.2% in 1984, 4.0% in 1985 and 4.3% in 1986.

The National Economic and Social Development Board (NESDB) made macro-economic projections for the Sixth Plan. The following table summarizes their forecasts. The Thai economy is expected to grow at a rate of 4.6% per annum till 1991 and at 4.3% thereafter as shown below:

Table 3.1 GDP Forecasts of Thailand 1986 - 2001

Industrial Sector	Billion Baht 1972 prices			% growth per annum	
	1986	1991	2001	1986-91	1991-2001
Agriculture	88.4	100.9	129.8	2.7	2.6
Manufacture	82.1	109.4	188.8	5.9	5.6
Services	45.3	59.4	97.3	5.6	5.1
Other sectors	179.1	224.8	337.5	4.7	4.1
Total GDP	394.9	494.5	753.4	4.6	4.3

Source: NESDB

Thailand's GDP is expected to grow by 2.5 times by the year 2006. The manufacturing sector will grow the fastest at an average rate of 5.8%, while the agricultural sector will be the slowest at 2.5% p.a. The share of the manufacturing sector will increase from 21% in 1985 to 25% in 2006.

Among the Project Changwats, Khon Kaen will grow fastest at 5.3% p.a. and the size of its economy will also be 2.9 times larger than 1985 by the year 2006. The manufacturing sector will also grow fastest in Khon Kaen at a rate of 6.4% p.a. In terms of the total size of the provincial economy, the order among the five Changwats in 2006 will be Nakhon Ratchasima, Chiang Mai, Khon Kaen, Songkhla and Nakhon Sawan.

(2) Modes of Freight Transport

The road transport sector share at present is 83.4% in tonnage and 70.0% in ton-km. The rail transport sector share, in contrast, is only 12.5% in tonnage and 22.4% in ton-km. Figures for the road transport include only freight to and from Bangkok. Therefore, the actual share of the road sector could well be higher.

Table 3.2 Freight Transport Modal Split

	Road	Rail	Inland Waterway	Coastal Shipping	Domestic Air	Total
Tons (000)	38,375	5,726	166	1,475	4	45,746
(%)	(83.4)	(12.5)	(0.4)	(3.2)	(.0)	(100.0)
Ton-km (million)	8,982	2,869	17	960	2	12,830
(%)	(70.0)	(22.4)	(0.1)	(7.5)	(.0)	(100.0)
Average Haul (km)	234	501	105	650		

Source: Annual Transport Statistics, 1985, Transport and Communications Economics Division, Ministry of Communications

There are various plans to strengthen each mode of transport in Thailand. However, considering the inherent advantage of road transport in Thailand with its generally flat terrain, it is likely that the present and forthcoming efforts in promoting other modes would only stem the tide of the growing road transport share at best and cause the existing modal split to remain at the present level.

The dominance of road transport is clear in the Study Team's estimates on modal split. Except for Chiang Mai and Songkhla/Hat Yai, the share of road transport is over 94%. Railways take a significant share only in Songkhla and in the in-flow to Chiang Mai. Songkhla also accounts for a significant share of 15% of coastal shipping in transport from Bangkok.

Commodity flow patterns in Thailand show extreme concentration of flows to and from the Bangkok Area relative to other areas.

(3) Characteristics of Commodity Flow

Existing, as well as future conditions of commodity flows were analyzed based on the survey of qualitative flows.

It can be said that all Project Cities have strong ties with the Bangkok Metropolitan Area. The Project Cities, in closer proximity with the Central region surrounding Bangkok, such as Nakhon Sawan and Nakhon Ratchasima, had strong connections with the Central region.

Chiang Mai and Hat Yai/Songkhla are Project Cities that have a larger amount of inbound cargo than outbound goods.

Hat Yai/Songkhla area has some connection with the North and Northeast with respect to cargo flow because of different characters of primary industry in the peninsula as compared to other regions.

River or coastal located cities such as Nakhon Sawan and Hat Yai/Songkhla tend to depend more on waterways for bulk cargo transport.

On the basis of the collected data, the followings are given as prospective cargo flow characteristics in the future.

- a) There will be few fundamental changes in cargo flow patterns: industrial products and consumer goods from Bangkok to provinces and agricultural products from provinces to Bangkok.
- b) When the Bangkok-bound cargo volume is compared with the upcountry bound cargo volume, the Bangkok-bound flows would grow slower than the upcountry bound flows.

The major commodity group in cargo flow from Bangkok at present, as well as in the future, are other manufactured goods, among which household containers are predominant. The second group is fertilizer and animal feeds which are distributed to rural areas surrounding the Project Cities. The third is beverages followed by household appliances, which are supplied to people in the provinces.

Among the Bangkok bound cargo of today, as well as in the future, few commodities are common across the regions. Bangkok-bound cargo sent from respective regions reflect characteristics of agriculture and manufacturing industries locally prevalent. Characteristics of cargo flow for the Project Cities are described as follows:

i) Chiang Mai

Among cargoes from Bangkok, other construction materials account for a high portion of shipments due to the expected expansion of the construction industry, followed by household appliances. On the contrary, fertilizer and animal feeds show a decline in weight. Among Bangkok-bound cargoes, vegetables and fruits account for a high volume as a result of highland crop expansion in Chiang Mai, followed closely by processed foods and beverages.

ii) Nakhon Sawan

Cargo from Bangkok is characterized by a relatively high ratio of processed foods in comparison with other cities. Among other manufactured products besides household goods containers, there are considerable volumes of ready-made products indicating increasing demand for small-lot-consolidated transport.

Among the Bangkok bound cargo, other construction materials fertilizer and animal feeds occupy a high portion.

iii) Khon Kaen

Among cargo from Bangkok, fertilizer and animal feeds, followed by beverages destined for the surrounding rural areas show a high weight when compared with other cities.

Among the Bangkok-bound cargo, a high proportion are household appliances headed by furniture, followed by vegetables, fruits and animals.

iv) Nakhon Ratchasima

Among the cargo from Bangkok a high proportion are presently fertilizers and animal feeds from surrounding rural areas followed by beverages, vegetables, fruits, and processed foods. This trend is expected to continue.

Among Bangkok-bound cargo, a high proportion are presently processed foods, which may increase even more in the future.

v) Hat Yai/Songkhla

Cargo from Bangkok is characterized by the dominance of other manufactured products at present as well as in the future, which can be broken down into sizable amounts of household containers, and equivalent amount of mixed ready-made products. Agricultural and marine products specific to the southern region dominate the cargo from the region and the characteristics will be carried over into the future.

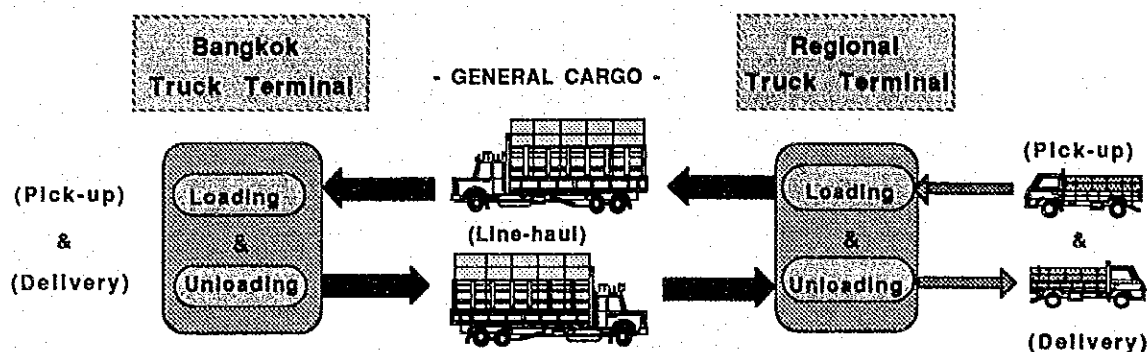
(4) Roles and Functions of Regional Truck Terminals

The general conditions and characteristics of commodity flow in Thailand were studied. The necessity, roles and functions of truck terminals are analyzed based on the surveys and studies in this Project.

Generally the primary roles and functions of the regional truck terminals are to receive, sort and deliver transported cargoes, originating in Bangkok, to local customers according to their consignments.

To maintain regularity and frequency of trunk lines, it is necessary that separate facilities be maintained to handle line-haul transportation and pickup/delivery services.

Fig. 3.1 Primary Roles and Functions of Regional Truck Terminals



The roles and functions to be assigned or absorbed by the regional truck terminals may be summed up as follows:

- To serve as regional centers for receiving, sorting, and delivering to consignees general cargoes brought in/out of Bangkok.
- To take charge of picking up, sorting and loading local manufactured products destined for Bangkok for shipment on line-haul heavy trucks as their other basic role and function.

To effectively carry out such roles and functions, each of the regional truck terminals needs to be installed or equipped with fundamental facilities such as:

- adequate number of berths for loading and unloading general cargoes;
- adequate handling space/platform for sorting general cargoes according to their destinations or consignees;
- adequate reserved space necessary for temporary storage in case delivery of unloaded cargoes cannot be completed in the same day.

(5) Demand for Regional Truck Terminals

Ten commodity groups were selected as having some possibility of being handled at regional truck terminals. They are, other construction materials; vegetables and fruits; beverages; processed foods; household appliances; other manufactured products; and all others.

Tonnage forecasts for each commodity group and for each project area were calculated from sectoral gross product forecasts by means of the relationship between the tonnage of each cargo group and relevant sectoral gross products.

The future volumes of the selected commodities that are candidates for the use of truck terminals were forecast. Their growth rates were found to be 4.8% p.a. for Chiang Mai, the lowest among the five and 7.0% p.a. for Hat Yai/Songkhla, the highest among the five as shown below:

Table 3.3 Growth of Candidate Commodity Flows
(10 Commodity Groups)

(Million tons)

	Chiang Mai	Khon Kaen	Nakhon Sawan	Nakhon Ratchasima	Hat Yai Songkhla
1987 Volume	0.64	3.25	1.05	2.85	1.21
2006 Volume	1.57	10.04	2.75	9.57	4.41
Growth Rate (% p.a.)	4.8	6.1	5.2	6.6	7.0

Commodities which are most likely to use the truck terminal are scrutinized by item of the selected major commodity groups. Levels of terminal utilization per commodity item were only defined to be high, medium and low, in the absence of actual examples in Thailand. Considering the result of field surveys in Thailand and experiences in Japan, utilization levels of 60%, 30% and 10% were employed for the "high", "medium" and "low" levels respectively.

Based on the estimated future commodity flows to and from the Project Cities and the previously determined rates of terminal utilization by commodity, the future commodity throughput of the project terminals were estimated as summarized below:

Table 3.4 Estimated Commodity Throughput at Truck Terminals

(Tons/year)

Terminals	To Terminal		From Terminal	
	1996	2006	1996	2006
1) Chiang Mai	288,020	456,719	148,055	210,547
2) Nakhon Sawan	416,246	657,726	375,630	597,328
3) Nakhon Ratchasima	1,116,420	1,919,874	923,768	1,738,586
4) Khon Kaen	414,468	676,799	246,522	430,512
5) Hat Yai/Songkhla	577,391	1,092,969	262,374	505,197

4. PRELIMINARY DESIGN OF REGIONAL TRUCK TERMINALS

Based on the study results of the truck terminal's functions demands for regional truck terminals and selection of three truck terminals for feasibility study, the preliminary facilities planning for the three truck terminals was conducted according to basic considerations as follows:

- Establishment of Basic Layout Plan
- Preliminary Design (Estimation of the Size of Each Facility)
- Drawing up of a Layout Plan for Each Terminal
- Cost Estimate

(1) Establishment of Basic Layout Plan

The plans were compared by taking each plan and comparing various points such as traffic movement within the terminals (line-haul trucks and pick-up/delivery trucks), construction costs (including on-site expenses) and future construction expansion plans (warehouse, truck center, wholesaler's stock point and bonded area, etc.). Based on these studies, a general evaluation was carried out and the optimal plan decided upon.

(2) Preliminary Design

The basic design conditions, (car specification, road width, rainfall strength and others) were established based on site survey and materials collected at the site, and were used to estimate the construction dimensions of truck terminals. For calculating the scale, the number of berths, platform size and dimensions of parking area was decided based on the amount of cargo to be handled in the future for each Project City as was determined in Chapter 6. The Study Team calculated the manpower necessary for handling cargo at each terminal based on the volume of cargo, and estimated the size of the administrative office, water processing facilities, weighbridge, electric power demand and others.

However, the assessment scope only covers inside the truck terminal and an assessment of related facilities such as warehouses, truck centers, wholesaler's stock points was not carried out.

(3) Drawing Up of a Layout Plan for Each Truck Terminal

The Study Team designed the layout play of each truck terminal based on the facility size as a result of the estimation.

- a) Considerable care has been taken to reduce the crossing of the line-haul truck and pick-up/delivery truck traffic lines as much as possible.
- b) A temporary storage area was provided to be maintained in the planning platform.
- c) The arrangement of the facility has been undertaken with due consideration given to future expansion plans.
- d) The administration office is located near the main gate in consideration of function of the terminals function and cargo security.

e) From the environmental side, the area surrounding the terminal site was provided as a green area.

(4) Cost Estimate

Based on interviews and materials collected at the site, and also based on the unit values determined the cost of each terminal was calculated. The cost breakdown is given below.

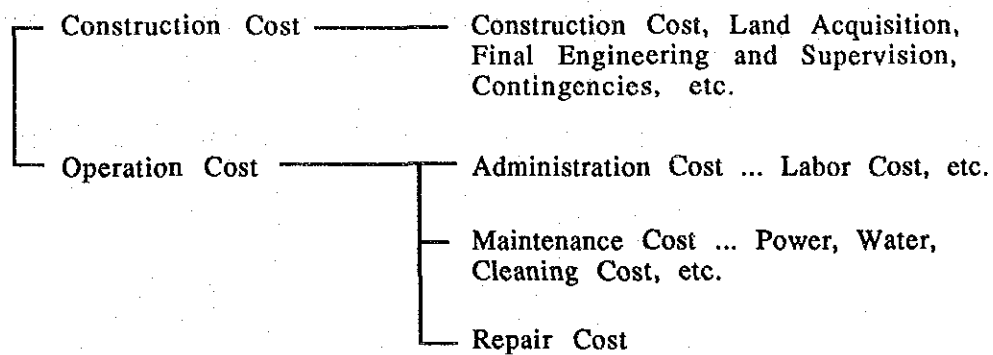


Table 4.1 Summary of Construction Cost

(Unit: B 1,000)

Item	Terminal		
	Chiang Mai	Khon Kaen	Hat Yai/Songkhla
Construction Cost	40,733.1	47,473.8	81,608.9
Land Acquisition and Compensation	4,190.0	10,941.1	806.9
Final Engineering and Supervision	4,073.3	4,747.4	8,160.9
Contingencies	4,899.6	6,316.2	9,057.7
TOTAL	53,896.1	69,478.5	99,634.4
Local Cost	29,043.0	40,209.8	50,220.6
Foreign Cost	24,853.0	29,268.7	49,413.7

Note: Land Acquisition and Compensation Cost consist of only Local currency portion and the remaining costs consist of 50% for local currency and 50% for foreign currency respectively.

5. ECONOMIC EVALUATION AND FEASIBILITY ANALYSIS

(1) Pre-feasibility Study

A preliminary feasibility study was conducted in order to select 3 priority terminals out of the 5 candidate terminals.

The terminal location study was made following such criteria as accessibility to CBD, strategic point in cargo transportation, conditions of access roads, land acquisition and compensation costs and other effects on construction costs.

Based on the future demand for truck terminals a facility planning was made and the preliminary construction costs were estimated as follows:

Table 5.1 Estimated Construction Costs for Pre-feasibility Study

Truck Terminal	No. of berths	Construction Cost (1,000 Baht)
Chiang Mai	35	48,385
Nakhon Sawan	40	50,513
Nakhon Ratchasima	75	89,100
Khon Kaen	40	57,986
Hat Yai/Songkhla	75	88,740

Effects of truck terminals are also analyzed and quantified for the benefit derived from the effective use of line-haul trucks and the effective cargo throughput at loading/unloading and sorting general cargoes by direction.

Consequently, the economic costs and benefits of the project were compared to produce such parameters as shown below:

Table 5.2 Comparison of Economic Cost and Benefit Flows of Candidate Truck Terminals

Candidate Terminals	Discounted at 12% p.a.		IRR (%)
	NPV (฿1000)	B/C	
1) Chiang Mai	108,700	3.53	43.12
2) Nakhon Sawan	18,490	1.40	18.42
3) Nakhon Ratchasima	5,873	1.08	13.24
4) Khon Kaen	40,558	1.79	23.10
5) Hat Yai/Songkhla	184,808	3.45	42.24

Besides the above comparison, viewpoints on urban and regional development of the Project Changwats were taken into consideration.

As a result, Chiang Mai, Khon Kaen and Hat Yai/Songkhla were selected as the priority area for the truck terminal development and further study of their project feasibility.

(2) Feasibility Study on Selected Three Truck Terminals

Further studies are made for the feasibility analysis of the priority three truck terminals. A temporary storage space is additionally planned to be provided in the platform. A weighbridge is also installed at each terminal. Construction costs are analysed more detail to be compatible with the magnitude required for the feasibility study.

The construction cost and the number of berths required are estimated for the selected three terminals as shown below:

Table 5.3 Estimated Construction Costs for Feasibility Study on Selected Three Truck Terminals

Truck Terminal	No. of berths	Construction Cost (1,000 Baht)
Chiang Mai	45	53,896
Khon Kaen	50	69,479
Hat Yai/Songkhla	95	99,634

The economic investment costs of the three truck terminals are distributed according to the implementation schedule. The estimated operation and administration costs are incurred after the start of terminal operation in 1993.

The economic benefits in this feasibility study are defined to quantify the following effects:

- a) Effective use of line-haul trucks
 - i) The reduction of turn-around times of line-haul trucks will produce an extensive operation of line-haul trucks per year and reduce the fixed cost of the truck operations per kilometer.
 - ii) The increase in the demand for such return-haul cargoes as agricultural products from the project cities to Bangkok will eventually reduce to a minimum the overall running cost of transporting agricultural products in the country.
- b) Effective cargo throughput at loading/unloading and sorting general cargoes by direction.

The economic cost and benefit flows are compared for the respective terminals and the results are as follows:

Table 5.4 Comparison of Economic Cost and Benefit Flows for Three Truck Terminals

Terminal Locations	Discounted at 12% p.a.		IRR (%)
	NPV (฿1000)	B/C	
1) Chiang Mai	95,470	2.77	40.36
2) Khon Kaen	17,853	1.26	16.89
3) Hat Yai/Songkhla	157,059	2.66	39.63

The sensitivity test was also undertaken to secure the above results and project feasibility.

As a conclusion, it can be stated that the truck terminal projects in Chiang Mai, Khon Kaen and Hat Yai/Songkhla are economically feasible for their immediate implementation.

6. OPERATION, ADMINISTRATION AND PROMOTION OF REGIONAL TRUCK TERMINALS

(1) Operation and Administration of Regional Truck Terminals

For smooth operation and administration of truck terminals, the Sub-Policy Committee on Truck Terminals (SPCT) and Sub-Control Board on Truck Terminals (SCBT) should be organized in accordance with the Land Transport Act/B.E. 2722. The main role of SPCT is to draw a nationwide unified and standardized master plan for modernization of the trucking industry, and that of SCBT is to draw an implementation plan, to establish truck terminals in cooperation with LTD, and to guide and assist with their administration.

In deciding upon the managing body, Government and Private Corporate Organization management is desirable. The capital should be financed by both. Thus each terminal should be managed independently as a Limited Company without issuing stock to the public. The investors should seek active participation from the government as well as from private sectors, and at the same time capital participation from international organizations may be considered.

Management and operation of terminals is drawn on the premises that the terminal concerned is utilized on a berth lease basis. Trucking companies pay lease by the number of berths and make an effort to increase receipts and profits by increasing transport efficiency. Accompanying service facilities are entrusted and run by outsiders under the leasing system according to each facility. Therefore, running costs are to be borne by the beneficiaries, because of different degrees of utilizing the facilities.

In terms of management and organization of the truck terminals, personnel and expenses should be kept as low as possible to be able to contribute to the

return of the loan capital. Operating organization will be carried out under four departments.

Estimate of the increase of transport efficiency and of profits for the users of truck terminals was made by case study.

(2) Promotion and Governmental Contribution to Users of Truck Terminals

In order to achieve understanding and acceptance of truck terminals, promotion is required to all the parties concerned, such as businesses and the haulage/distribution industry. Also, concrete action will be needed to promote the truck terminals among users including trucking companies. The former will be done by the Central Government and Local Governments; the latter will be done by each regional truck terminal company, the Central Government and Local Governments.

In order to encourage trucking companies to use regional truck terminals, the Government should consider executing the following schemes as Governmental contribution to users:

- a) Priority issue of business licenses for trucking companies and forwarders
- b) Reduction of license fees and taxes
- c) Assistance of cooperation and joint operation of users
- d) Establishment of subsidiary system
- e) Offering of education and training
- f) Others

In order to promote the use of regional truck terminals, it will be necessary to regulate the expansion of existing private truck terminals and new construction of private terminals. Therefore, necessary means are described as follows:

- a) Strengthening of traffic control in cities
- b) Regulation in order to prevent disorderly construction of private terminals
- c) Structure and Facility order of private terminals

7. FINANCIAL EVALUATION AND FEASIBILITY

(1) Berth Rent and ROI/ROE

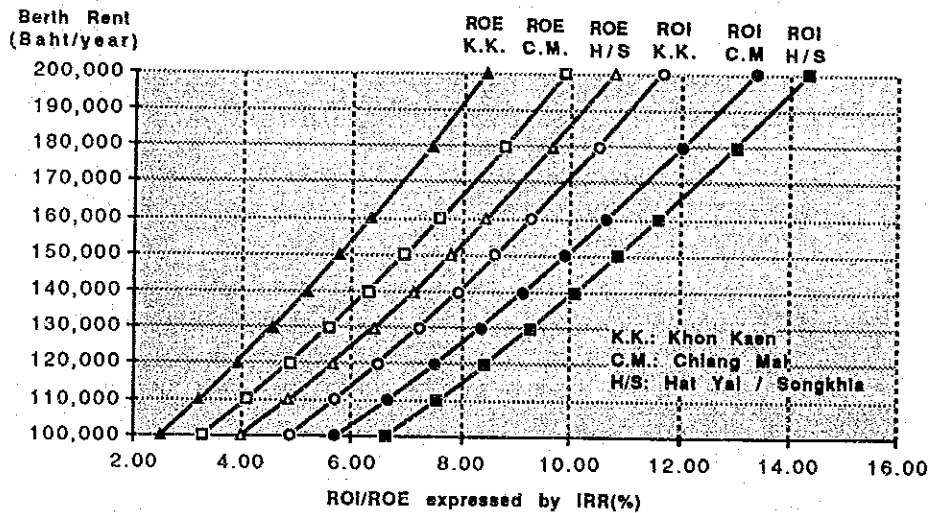
Berth rent is the most critical factor influencing terminal management. From the financial analysis of the existing trucking company the tolerance of berth rent is estimated at B130,000/year.

The financial return on investment (ROI) results in low IRRs at a berth rent of even B150,000/year. The return on equity (ROE) shows much less IRRs in terms of 100% own equity as shown in Table 7.1 and Fig. 7.1.

Table 7.1 ROI and ROE by Alternative Berth Rent

Terminal	Berth Rent (B/year)	ROI (%)	ROE (%)
Chiang Mai	130,000	8.4	5.6
	150,000	9.9	6.9
Khon Kaen	130,000	7.2	4.6
	150,000	8.6	5.8
Hat Yai/Songkhla	130,000	9.3	6.4
	150,000	10.9	7.8

Fig. 7.1 ROI and ROE for Different Berth Rents



(2) Financing Plan and Government's Contribution

The introduction of a long-term low-interest rate loan induces a good effect on financial returns. The greater the proportion of the long-term loan in the initial investment capital the higher the rate of return on equity (share capital other than long-term loan).

In order to attain the ROE of 15% a long-term loan is required for 90% or more of the total initial investment. As long as the Government requires the private sector to further participate in the project investment additional countermeasures are to be proposed.

Two alternative countermeasures are analysed. One is "Tax Exemption" and the other is "Government's participation in share holding without dividend".

The effect of "Tax Exemption" measure is found to be small for improving ROE. Therefore, the Government's participation in holding share capital is

required. Since no dividend is allocated to the Government the terminal operator is urged to pay taxes regularly. In addition, it enables the Government to directly participate in the terminal operation and administration.

In order to attract private investors for the project investment, the ROE for them is assumed to retain more than 15%. Besides this, the Government has to determine the following factors:

- i) Gearing ratio - a proportion of the long-term debt and share capital required for the total initial investment
- ii) Government share capital - a proportion of the share capital that the Government agrees to hold
- iii) IRR of tax revenue - an expected rate of tax revenue on the Government's share capital

If the Government determines two factors out of the three mentioned above a remaining factor is determined by itself.

From the administrative viewpoint it is recommended that the Government should hold 50% of the total share capital. Based on this assumption appropriate gearing ratios; the resulting ROEs; accumulated cash surplus for private investors; and tax revenue for the Government are obtained within the tolerable berth rent of B130,000/year as shown in Table 7.2.

Table 7.2 Appropriate Gearing Ratio and IRR of Tax Revenue

Berth Rent: B130,000/year
Government's share capital: 50%

Terminal Name	Gearing Ratio	ROE for Private Investor (%)	Accumulated Cash Surplus* (1000B)	ROG: IRR of Tax Revenue** (%)	Accumulated Tax Revenue* (1000B)
Chiang Mai	10:90	21.85	4,250	19.65	2,999
	30:70	16.36	5,517	11.81	3,130
	50:50	14.15	6,719	8.48	3,247
Khon Kaen	10:90	18.77	3,902	18.18	3,334
	30:70	13.96	5,574	10.49	3,560
	50:50	12.21	7,196	7.33	3,726
Hat Yai/ Songkhla	10:90	22.65	8,000	21.82	6,144
	30:70	16.84	9,955	13.48	6,447
	50:50	14.66	11,845	10.09	6,710

Notes: * Present values discounted at 15% p.a.

** IRR derived from Government's share capital and tax revenue (ROG)

The gearing ratio of 50:50 will be preferred to 10:90 and 30:70. Although it reduces the ROE for private investors by about 2 ~ 8% and ROG by about 3 ~ 11% it increases the cash surplus by about 30 ~ 60% and the tax revenue by about 5 ~ 10% in terms of the present value discounted at 15% p.a.

(3) Profit and Loss Statement and Cash Flow Analyses

In order to prepare several evaluation indicators a Profit and Loss Statement and a Cash Flow Table are made and compared for alternative gearing ratios. The comparison of financial indicators is figured out by alternative gearing ratios as presented in Figs. 7.2 through 7.4. As the result, it can be stated that:

- i) The first single year surplus emerges in the 7th year of operation in all the terminals.
- ii) The accumulated deficit diminishes in the 11th to 14th year of operation. Khon Kaen Terminal is relatively slow in recovery.
- iii) Average profit-revenue ratios denotes the profitability of the respective terminal operations. Hat Yai/Songkhla terminal is the highest of 23.57% and Khon Kaen is the lowest of 18.98%.
- iv) Comparing the alternative gearing ratios, the more a portion of share capital the more it is profitable and stable in financial management.
- v) From the viewpoint of cash flows, a higher proportion of share capital, needless to say, contributes to the improvement of DSCRs*, because a burden of short-term debt is reduced.
- vi) Before the second stage construction the requirement of maximum short-term debt takes place in the 3rd year of operation and the DSCR at that time is quite low less than 1.0. This means, the managing body at that time faces difficulty to procure short-term debt.
- vii) A higher proportion of long-term debt contributes to the improvement of ROE and ROG as well, because of a very low rate of interest, which is 1/4 of the short-term loan interest, and a long time of grace period.
- viii) Accumulated cash surplus increases as the proportion of share capital increases. This is also the same to the accumulated tax revenue.
- ix) The gearing ratio of 10:90 shows high rates of ROE exceeding more than 15%. However, the acquired cash surplus is about 75% of the 30:70 case and 60% of the 50:50 case.

Note *: $DSCR = \frac{\text{Net profit after tax} + \text{Depreciation} + \text{Interest payable}}{\text{Principal repayable} + \text{Interest payable}}$

Consequently, the gearing ratio of 10:90 is considered not preferable because of a low rate of DSCR and low amount of cash surplus compared with other gearing ratios. A higher proportion of share capital (50:50) assures a sound financial condition and profitability in the amount of cash surplus.

If the ROE for private funds is deemed essential to reach more than 15% a tax exemption will be additionally required for attracting private investors.

Khon Kaen terminal is less profitable compared to Chiang Mai and Hat Yai/Songkhla terminals. Therefore, such a countermeasure as the tax exemption during the early period of operation will be necessary for the improvement of ROE and cash flow conditions.

The terminal operation will become financially feasible under some conditions in the financing plan and revenue program as shown in Table 7.3.

Conditions

- Gearing ratio: 50:50 (share capital vs. long-term loan)
- Government's share capital: 50% (with no dividend)
- Berth rent: B130,000/year

Table 7.3 Financial Situation of Terminal Operation

Terminal Name	* Single Year Surplus	* 1st Year of Acc. Surplus	Profit-Revenue Ratio (%)	Max. Short-Term Debt (B Million)	Average DSCR	** 1st Year of Cash Surplus	ROE for Private Investor (%)
Chiang Mai	7th year	11th year	21.8	0	4.8	1st year	14.2
Khon Kaen	7th year	12th year	20.9	0	4.3	1st year	12.2
Hat Yai/Songkhla	7th year	12th year	23.6	5.5 (8th year)	4.5	4th year	14.7

Notes: * Derived from a profit and loss statement

** Derived from a cash flow (sources and application of funds) table

Fig. 7.2 Result of Profit/Loss Statement and Cash Flow Analyses
- CHIANG MAI -

- (1) Berth Rent : 130,000 Baht/year
 (2) Initial Capital Investment (1,000 Baht) : 44,306.2
 (3) Financing Plan (Share Capital vs. Long-term loan, 1,000 Baht) :

Gearing Ratio 10: 90



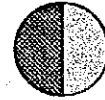
Share Capital : 4,430.6
 Long-term Loan : 39,875.6

Gearing Ratio 30: 70



Share Capital : 13,291.9
 Long-term Loan : 31,014.3

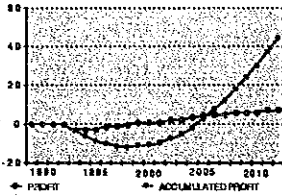
Gearing Ratio 50: 50



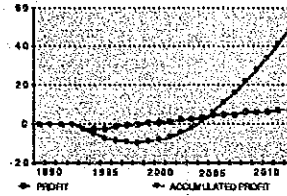
Share Capital : 22,153.1
 Long-term Loan : 22,153.1

(4) Profit after Tax/Cumulative Profit

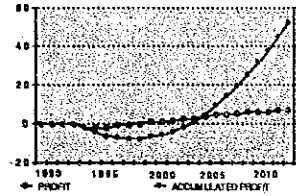
million Baht



million Baht



million Baht



(5) Average Profit-Revenue Ratio (%) :

18.41

20.25

21.83

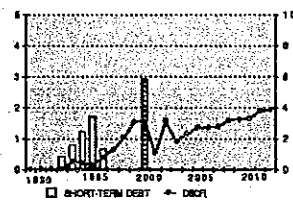
(6) Short-term Debt

(7) DSCR :

(Net profit after tax +
 Depreciation +
 Interest payable)
 (Principal repayable +
 Interest payable)

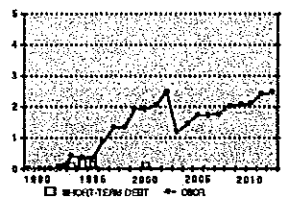
Short-term Debt
 (million Baht)

DSCR



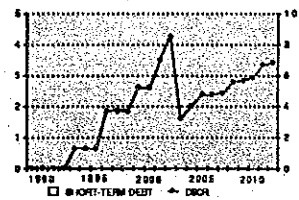
Short-term Debt
 (million Baht)

DSCR



Short-term Debt
 (million Baht)

DSCR



(8) Max. Short-term Debt (1,000 Baht) :

2,909
 (corresponding DSCR)
 (2nd Stage Construction : year 1999/2000)
 (YEAR 2000)

412
 (0.68)
 (YEAR 1995)

0
 (0)

(9) Average DSCR :

2.21

3.31

4.84

(10) Accumulated Cash Surplus
 (1,000 Baht discounted at 15%)



1.30



1.22



(11) Total Share Capital
 (1,000 Baht discounted at 15%)
 [50%-- Government
 [50%-- Private Sector



2.73



1.59



(12) ROE for Total Share Capital (%) :

16.57

0.68

10.93

0.78

8.56

ROE for Private Sector (%) :

21.85

0.75

16.36

0.86

14.15

(13) Tax Revenue
 (1,000 Baht discounted at 15%)



1.04



1.04



ROG (%)

19.65

0.60

11.81

0.72

8.48

Fig. 7.3 Result of Profit/Loss Statement and Cash Flow Analyses

- KHON KAEN -

- (1) Berth Rent : 130,000 Baht/year
- (2) Initial Capital Investment (1,000 Baht) : 58,397.0
- (3) Financing Plan (Share Capital vs. Long-term loan, 1,000 Baht) :

Gearing Ratio 10: 90



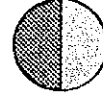
Share Capital : 5,839.7
Long-term Loan : 52,557.3

Gearing Ratio 30: 70



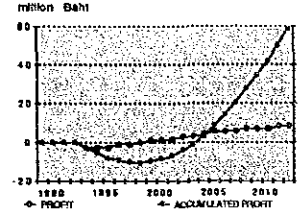
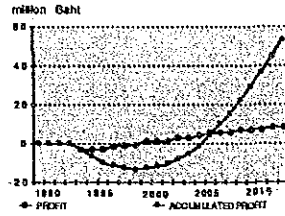
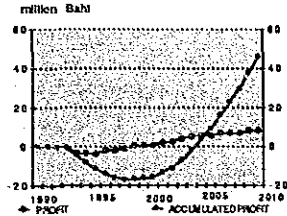
Share Capital : 17,519.1
Long-term Loan : 40,877.9

Gearing Ratio 50: 50



Share Capital : 29,198.5
Long-term Loan : 29,198.5

(4) Profit after Tax/Cumulative Profit



(5) Average Profit-Revenue Ratio (%) :

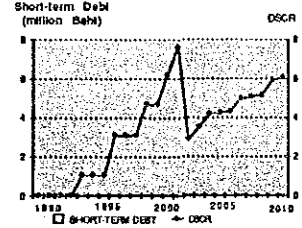
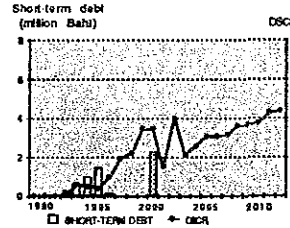
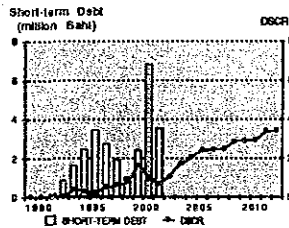
16.44

18.98

20.94

(6) Short-term Debt

(7) DSCR :
(Net profit after tax +
Depreciation +
Interest payable)
(Principal repayable +
Interest payable)



(8) Max. Short-term Debt (1,000 Baht) :
(corresponding DSCR)
(2nd Stage Construction : year 1999/2000)

6,824
(1.03)
(year 2000)

2,287
(3.45)
(year 2000)

0
(0)

(9) Average DSCR :

1.52

2.64

4.28

(10) Accumulated Cash Surplus
(1,000 Baht discounted at 15%)



1.49



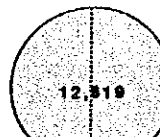
1.29



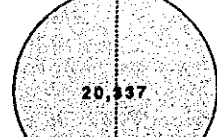
(11) Total Share Capital
(1,000 Baht discounted at 15%)
50%-- Government
50%-- Private Sector



2.85



1.59



(12) ROE for Total Share Capital (%) :
ROE for Private Sector (%) :

14.08

0.65

9.07

0.78

7.09

18.77

0.74

13.96

0.87

12.21

(12) Tax Revenue
(1,000 Baht discounted at 15%)



1.07



1.05



ROG (%)

18.18

0.58

10.49

0.70

7.33

8. TRUCK TERMINALS IMPLEMENTATION

The implementation schedule was prepared on the condition that the entire construction of the three truck terminals would be completed by the end of 1992 (Stage 1) and the end of 2000 (Stage 2) in consideration of effective investment.

The project implementation schedule of truck terminal construction has been prepared according to the above mentioned requirements as shown in Fig. 8.1. The economic and financial studies were carried out based on this schedule. The requirement of each major activity is as described below.

(1) Detailed Engineering Design

The detailed design of the three truck terminals will be completed in 12 months for not only Stage 1 construction but also Stage 2. If there are changes in the socio-economic conditions, policies of urban planning and transportation, etc., a review of the feasibility study should be commenced at the early stage of the detailed engineering design.

(2) Tender Process

After completion of the detailed engineering design and financial arrangement, 6 months will be required for the tender process. The prequalification of contractors will also be required for the solicitation of contractors.

(3) Land Acquisition and Compensation

Since the construction will take place near the urban areas, it is foreseen that serious problems of land acquisition and compensation for terminal complex will occur. Therefore, the period for land acquisition and compensation are estimated at 12 months for any one truck terminal site.

(4) Construction

Almost all of the construction sites are far away from the developed area (Bangkok). Therefore, the construction methods will be limited because of lack of skilled labor and the construction will take a longer period compared with that in the Bangkok area. For this reason the construction period was estimated as at least 18 months for Stage 1.

Fig. 8.1 Implementation Schedule for Three Regional Truck Terminals

Work Items	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Preparation of Construction																				
- Review of Feasibility Study & Detailed Design		—																		
- Land Acquisition			—																	
- Loan Negotiation			—																	
- Preparation of Construction				—																
Truck Terminal Construction																				
- Earth Work													—							
- Drainage Facilities														—						
- Cargo Platform																				
- Building & Others																				
- Pavement																				

Note: — Implementation & Preparation of Truck Terminal

9. RECOMMENDATIONS

In view of the aforesaid situations, the Study Team proposes to make the following recommendations in consideration of future improvement and development of the physical distribution system in Thailand based on the results of this Study up to the present time.

The precise planning and execution of the truck terminal and its related facilities will be determined from the conclusion of the following studies and investigations.

(1) Overall Implementation Program for Truck Terminal Network

Based on the overall implementation program for the truck terminal network, the planning and development of truck terminals in Bangkok should be implemented as soon as possible because of their important functions as discussed in Chapter 6, and in order to reduce the traffic congestion in Bangkok.

The Study Team recommends the program of planning and development for primary truck terminals in consideration of present and future situations of physical distribution throughout Thailand as shown in the following Figure.

Fig. 9.1 General Idea of Implementation Program of Truck Terminal Network

Components of Truck Terminal Network	Step 1	Step 2	Step 3
Bangkok Truck Terminal	██████████		
Bangkok Cargo Related Facilities		██████████	
Regional Truck Terminals at: Chiang Mai, Khon Kaen, Hat Yai / Songkhla Nakhon Sawan, Nakhon Ratchasima	██████████	██████████	
Cargo Related Facilities		██████████	██████████

(2) Further Studies to be Implemented in the Future

a) Investigation of Shipper's Cargo Distribution Throughout Thailand

There are no systematic investigation data for shipper's cargo distribution system such as commodity distribution O/D data, distribution pattern, etc., up to the present time in Thailand. However, these data are essential to analyse the detailed utilization of truck terminal facilities and related facilities, and especially data in Bangkok is most important. Therefore, the Study Team recommends that the following surveys and analyses be carried out as soon as possible.

The most suitable method to investigate the actual movement of commodities is to survey cargo flows directly at their points of origin, such as shippers, as companies and firms, by type of industrial activities. The items of surveys and analyses are summarized as follows.

- Preparation of Shippers' Directory by Industrial Sector
- Selection and Sampling of Subject Shippers for Surveys
- Interview Surveys
- Analyses of Survey Results
- Characteristics of Shipper's Distribution and Commodity Flows
- Cargo Flow Forecast
- Expected Facilities of Physical Distribution in Future
- Master Plan Regarding Development of Physical Distribution Including Truck Terminal Network

Analytical results of the shippers' survey can greatly contribute to the truck terminal planning by using such information obtained as the commodity distribution pattern, flow volumes and cargo size per consignment and other data for each commodity item.

In order to estimate the future demand for a truck terminal, characteristics of cargo flows have to be analysed and commodities suitable for the truck terminal transport system selected.

The result of the survey can be widely used for preparing transport systems and facility planning for cargo distribution in the city. The delivery system of the truck terminal greatly influences the city traffic. Based on the survey results, an optimal delivery system can be recommended as part of the truck terminal transport system.

Thus, the survey contributes to the establishment of a cargo distribution system and ultimately urban landuse planning.

b) Review of Bangkok Urban Truck Terminals Construction Project

A cargo is an entity to be transported like a person, though the cargo can not move by itself. The development of the transport sector, which is deeply related to that of urban and economic activities of a region, depends upon how and where improvements in the movements of cargoes and people are made.

The distribution of cargo flows, therefore, is one of the major issues to be tackled for the development of the Bangkok Metropolis. In this sense, the commodity survey recommended in the previous section will provide the basis to analyse and prepare a haulage distribution system in the future.

Since the feasibility study of Bangkok Urban Truck Terminals was completed in 1980, eight years have already passed. During these years, social and economic conditions in Bangkok have changed. Under these circumstances the Minister expressed his intention last year for early implementation of the Bangkok Truck Terminals. Therefore, the feasibility study of Bangkok Truck Terminals should be reviewed against new studies for the implementation of terminal construction.

In addition to the above, the recent situation surrounding the construction of Bangkok Truck Terminals should be fully recognized in carrying out the review of the 1980 Study.

In order to carry out the study of the haulage distribution center in Bangkok, a review of the future landuse plan should be made and well coordinated with each other to achieve the urban development plan in the Bangkok Metropolis.

To be more concrete and practical for expediting (constructing) the Bangkok Truck Terminals, further studies other than the previous Feasibility Study should be carried out in the following scope:

- Review of Previous Study
- Administration and Organization of Terminals
- Selection of Suitable Area for Terminals Construction
- Basic Requirements and Design Standards for Terminal Construction
- Sample Design for Typical Truck Terminal
- Economic and Financial Analyses
- Implementation Plan

The Study Team recommends that the two types of studies (items a) and b)) be carried out under the technical assistance program from an experienced country.

c) Feasibility Study of Terminals for Nakhon Sawan and Nakhon Ratchasima

According to the study of the Project, all of the candidate truck terminals show economic internal rates of return exceeding 12%. Therefore, it can be concluded that the candidate terminals are all economically feasible.

To assign priority among the candidate terminals, and to select three out of five, the terminals proposed in Chiang Mai, Hat Yai/Songkhla and Khon Kaen were selected from the result of comparative analysis of this Study.

The Study Team recommends that the feasibility study for other two truck terminals such as Nakhon Sawan and Nakhon Ratchasima should be implemented continuously because of the feasibility of these two terminals.

d) Advisor for Implementation of Plan and Development of Facilities

An appropriate experienced advisor should be assigned to LTD for implementation of the plan and development of terminal and related facilities in order to realize modernization and rationalization of truck transportation.

(3) Execution of Periodic Surveys

Surveys of commodities and cargo transport modes are essential not only to project the future traffic demand for facility planning but also to provide vital information for making a decision on the transport development policy in a region.

The movements of commodities are intimately connected with economic and urban activities. Therefore, the relationship between the two will have to be periodically analyzed and cross referenced to ensure a future transport policy based on the expected future changes in economic and urban structures.

Periodic surveys related to commodity movements and cargo transport will be recommended with the following categories:

- a) Shippers Interview Survey (Commodity Flow Survey) - Every 5 years
- b) Truck Owner Interview Survey - Every 5 years

The above two surveys provide the most fundamental and overall information about the existing total cargo movements, and truck transport in particular. Although the survey is of a large scale and costs, periodic execution of the survey should be performed preferably every 5 years.

- c) Roadside Truck Interview Surveys throughout the Country - Every year

In parallel with the traffic count survey being executed every year on the trunk national highways, the O/D interview survey with trucks will provide the regional cargo flows and distribution pattern in the national overview of the cargo transport.

In addition, the collection of the following statistical data will be necessary every year.

- d) The number of trucks registered (private and commercial trucks with owner addresses).
- e) Forwarder and trucking company survey (the number and addresses of forwarders and trucking companies, the volume and value of cargoes transported, number of trucks owned/used and number of employees, floor areas, etc.)
- f) Warehouse survey (the number and addresses of warehouses by business category, the volume and value of cargoes stored, storage duration, floor areas, etc.)
- g) Statistical data of terminal facilities (volume and value of cargo by commodity handled at airport, harbor, railway station, truck terminal, container depot, etc.)

(4) Early Acquisition of Land for Truck Terminals

Considering the rapid urbanization in the project area, it is very important that the declaration of land acquisition for the future terminal area should be made as soon as possible. The land for the terminal area should be acquired immediately after the approval of construction and it should be issued as a result of the public hearing.

The work is very difficult, but if it is delayed, more difficulties and problems will arise.

(5) Early Funding

If a management structure and the investment requirements for the terminals can be settled, the loan negotiation with bilateral funding agencies or multi-national agencies should commence at the earliest appropriate date.

