社会開発調査部報告書

No. 2

THE FEASIBILITY STUDY ON THANH TRI BRIDGE AND THE SOUTHERN SECTION OF RING ROAD NO.3 IN HANOI IN THE SOCIALIST REPUBLIC OF VIETNAM

FINAL REPORT

VOLUME I : SUMMARY

September 1998

PACIFIC CONSULTANTS INTERNATIONAL

JICA
THE FEASIBILITY STUDY ON THANH TRI BRIDGE AND THE SOUTHERN
FINAL REPORT
September 1998

JAPAN INTERNATIONAL COOPERATION AGENCY(JICA)
MINISTRY OF TRANSPORT
THE SOCIALIST REPUBLIC OF VIETNAM

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The following foreign exchange rate is applied in the study:

US$ 1.00 = 12,950 Dong (as of January 1998)

PREFACE

In response to a request from the Government of the Socialist Republic of Vietnam, the Government of Japan decided to conduct the feasibility study on Thanh Tri Bridge and the Southern Section of Ring Road No. 3 in Hanoi in the Socialist Republic of Vietnam and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Vietnam a study team headed by Mr. Minoru Shibuya, Pacific Consultants International, several times between August 1997 and July 1998.

The team held discussions with the officials concerned of the Government of Vietnam, and conducted field surveys in the study area. After the team returned to Japan, further studies were made and the present report was prepared.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of Socialist Republic of Vietnam for their close cooperation extended to the team.

September 1998

Kimio Fujita
President
Japan International Cooperation Agency

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Japan International Cooperation Agency

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Mr. Kimio Fujita
President
Japan International Cooperation Agency

Letter of Transmittal

Dear Sir,

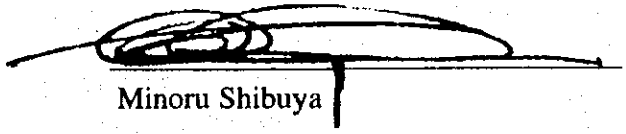
We are pleased to submit herewith the Final Report of "The Feasibility Study on Thanh Tri Bridge and the Southern Section of Ring Road No. 3 in Hanoi (the Project)" in the Socialist Republic of Vietnam.

The report contains the results of study which was carried out by Pacific Consultants International between August 1997 and September 1998. The report consists of four volumes of Summary, Main Report, Appendix and Drawings.

The Summary briefly illustrates the findings of the entire study. The Main Report consists of 19 chapters and presents current road transport profile and the feasibility study on the Project. It recommends that the Project should be implemented at the earliest opportunity and arrangement of land acquisition of the right-of-way should commence as soon as possible. The Appendix contains the supporting data including detailed results of several field surveys carried out by us in Vietnam. The Drawings compiles plans and details associated with the preliminary design of highway, bridges and other structures.

We wish to express grateful acknowledgment to the personnel of your Agency, Ministry of Foreign Affairs, Advisory Committee, Ministry of Construction and Embassy of Japan in Vietnam, and also to officials of the Ministry of Transport, Government of Vietnam for their assistance extended to the Study Team. The Study Team sincerely hopes that the results of this study will contribute to the development of road network in Vietnam.

Yours faithfully,



Minoru Shibuya
Team Leader
The Feasibility Study on Thanh Tri Bridge and
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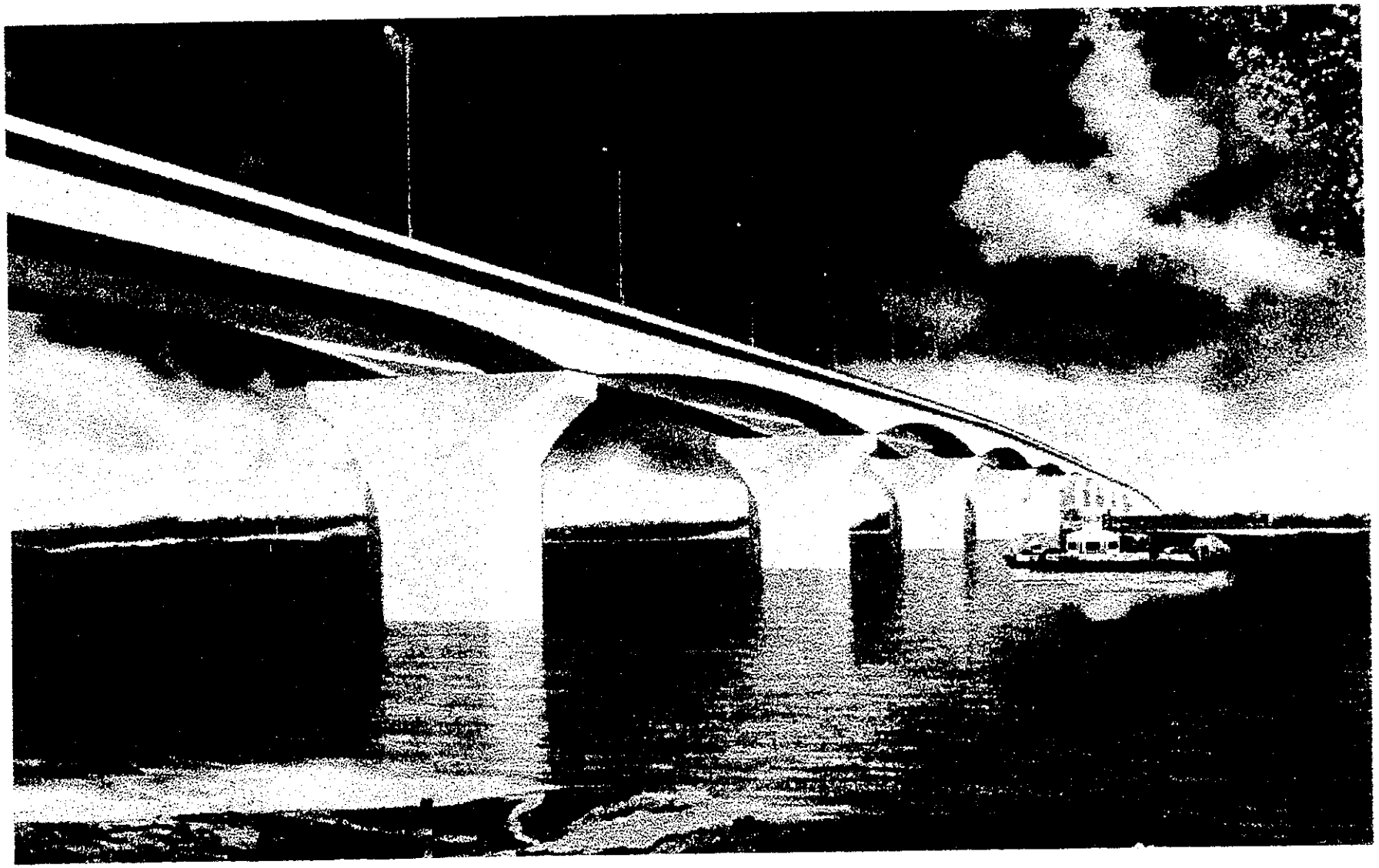
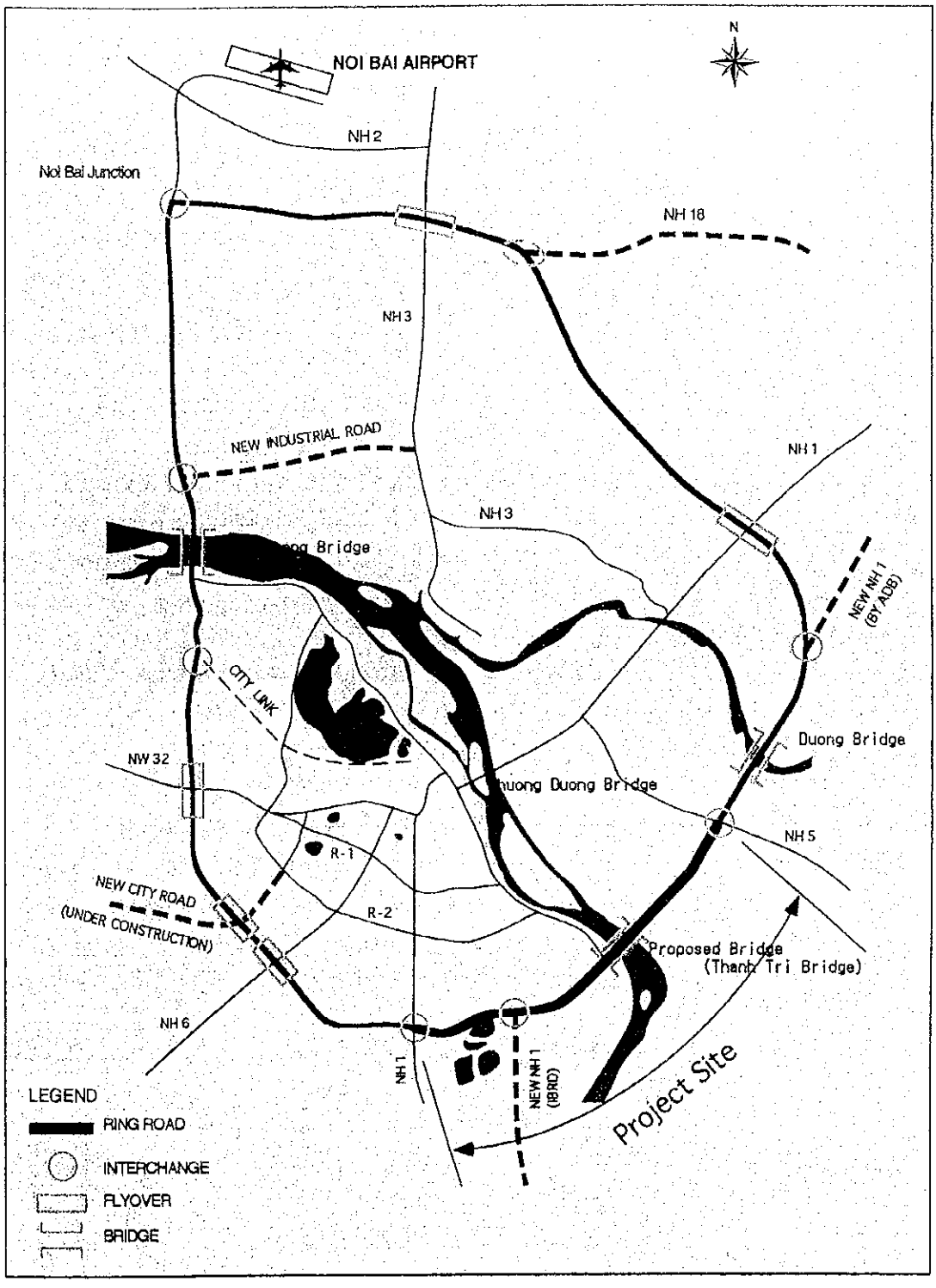
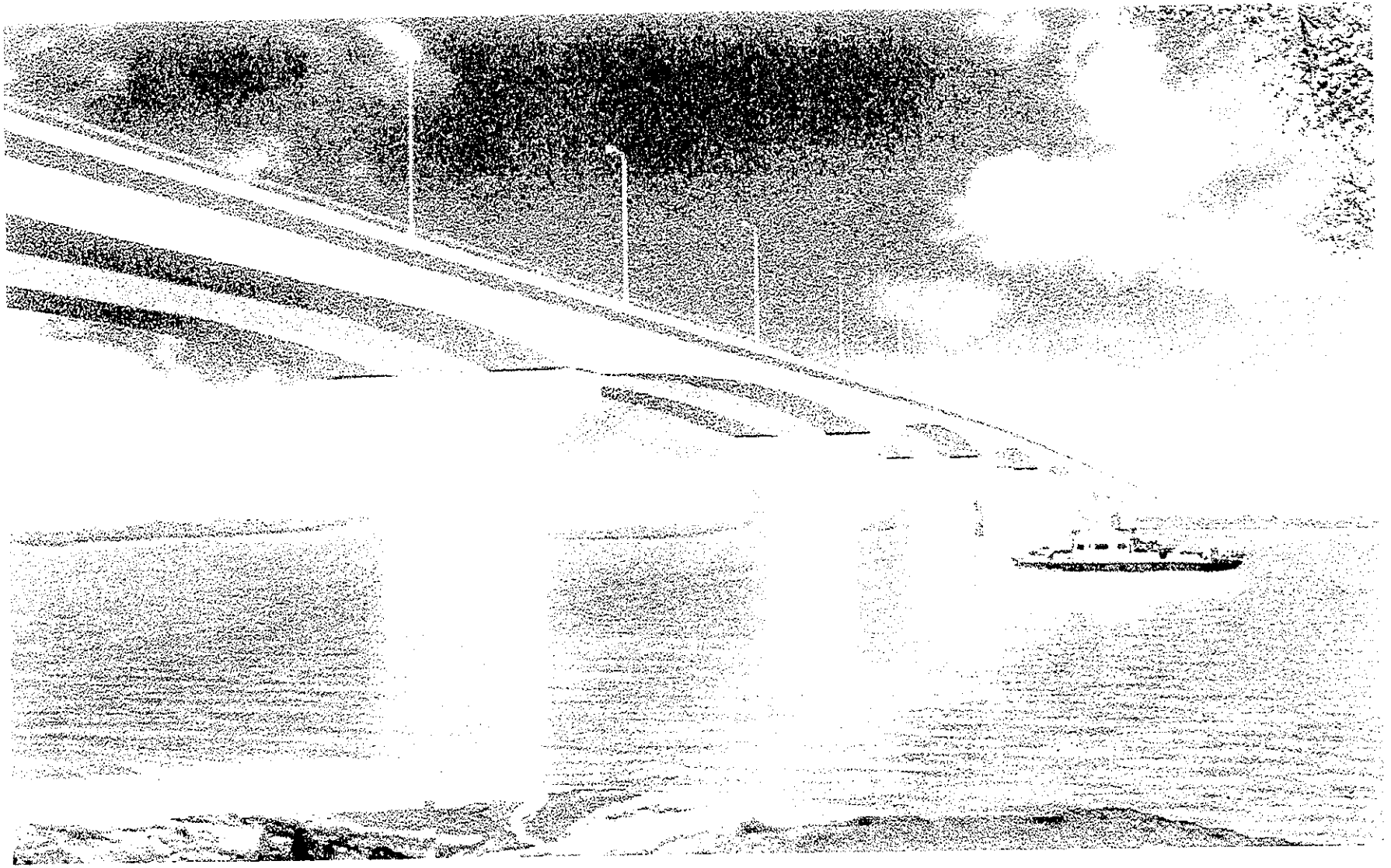


THANH TRI BRIDGE
PRESTRESSED CONCRETE BOX GIRDER DESIGN



PROJECT LOCATION MAP



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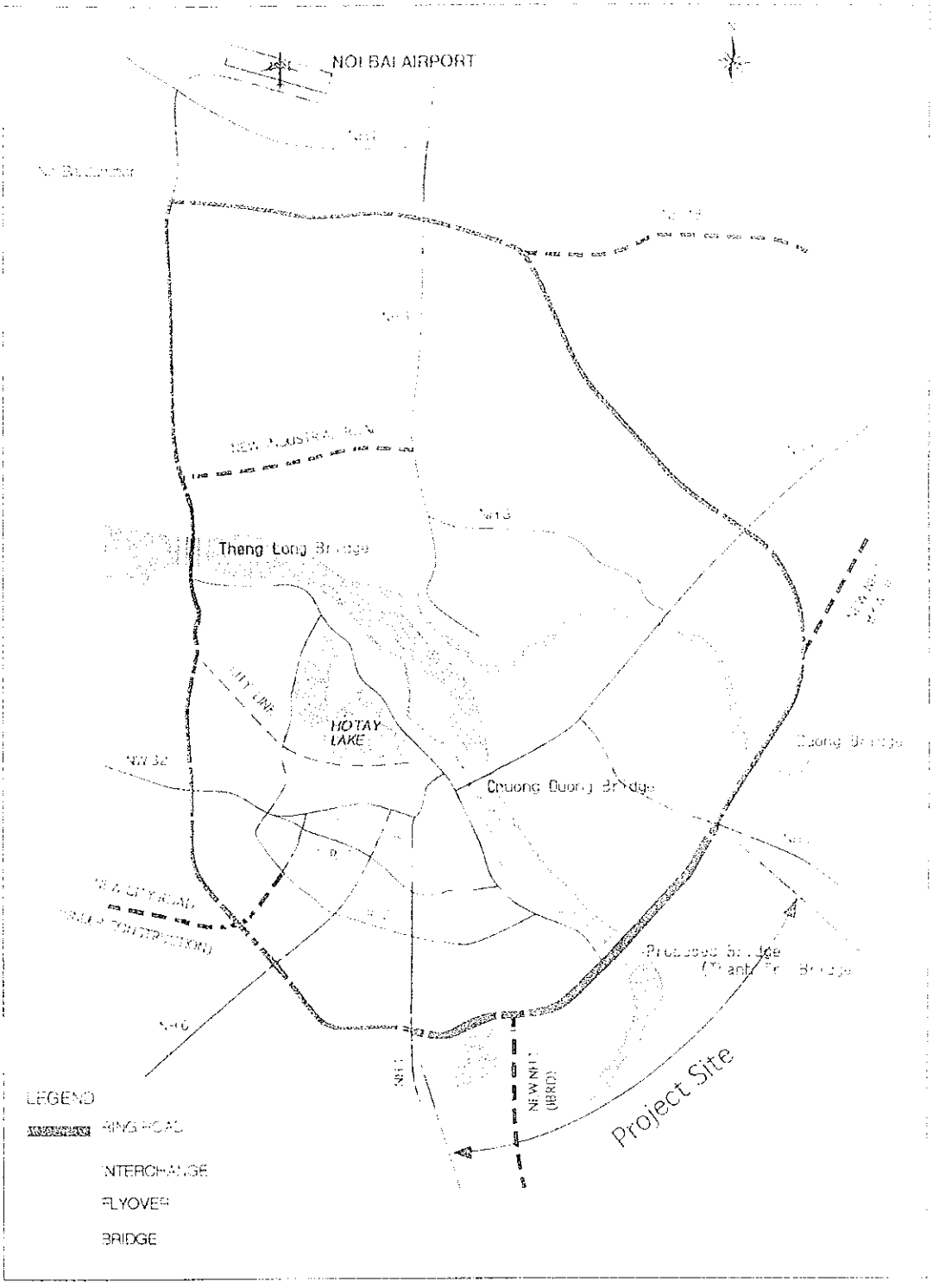

PROJECT LOCATION MAP

DEFINITIONS AND ABBREVIATIONS

(1) Agencies

AASHTO	American Association of State Highway and Transportation
ADB	Asian Development Bank
DOSTE	Hanoi Department of Science Technology and Environment
HPC	Hanoi People's Committee
IBRD/WB	International Bank for Reconstruction and Development/World Bank
JICA	Japan International Cooperation Agency
MOSTE	Ministry of Science and Technology and Environment
MOT	Ministry of Transport
OECF	Overseas Economic Cooperation Fund, Japan
PMU Thang Long	Project Management Unit Thang Long
TEDI	Transport Engineering Design Incorporation
TUPWS	Transport and Urban Public Works Services, HPC
UNDP	United Nations Development Program
VRA	Vietnam Road Association, Ministry of Transport

(2) Technical, Traffic and Economic Terms

AADT	Average Annual Daily Traffic
AC	Asphaltic Concrete
ADT	Average Daily Traffic
BOD	Biological Oxygen Demand
BP	By-pass
CBD	Central Business District
CBR	California Bearing Ratio
EIA	Environmental Impact Analysis
EIRR	Economic Internal Rate of Return
FIRR	Financial Internal Rate of Return
F/S	Feasibility Study
GDP	Gross Domestic Product
GRDP	Gross Regional Domestic Product
HTRR	Hanoi Third Ring Road
HUTMP	Hanoi Urban Transport Masterplan Study (The Master Plan of Urban Transport for Hanoi City in Vietnam, JICA)
HWL	High Water Level
IC	Interchange
IFRR	Internal Financial Rate of Return
LWL	Low Water Level
NH	National Highway
NPV	Net Present Value

O-D	Origin-Destination
O/M	Operation and Maintenance
Pass. or Pas.	Passenger
PC	Prestressed Concrete
PCU	Passenger Car Unit
RC	Reinforced Concrete
ROW	Right-Of-Way
SHTRR	Southern Section of Hanoi Third Ring Road
SPT	Standard Penetration Test
Sta.	Station
STRADA	System for Traffic Demand Analysis
TCVN	Standard of Vietnam
US$/USD	US Dollar
VND	Vietnam Dong
VOC	Vehicle Operation Cost
VRA	Vietnam Road Association, Ministry of transport

PROJECT SUMMARY

1. COUNTRY	The Socialist Republic of Vietnam
2. NAME OF STUDY	Feasibility Study on Thanh Tri Bridge and the Southern Section of Ring Road No. 3 in Hanoi
3. COUNTERPART AGENCY	Project Management Unit Thang Long, Ministry of Transport
4. OBJECTIVE OF STUDY	To carry out the feasibility study on the construction of Thanh Tri Bridge and the SHTRR

NOTE: SHTRR denotes Southern Section of Hanoi Third Ring Road.

1. STUDY AREA: Hanoi and Surrounding 6 Provinces (Ha Tay, Vinh Phuc, Thai Nguyen, Bac Giang, Bac Ninh and Hung Yen)

2. FUTURE TRAFFIC VOLUME

Package No.		1	2	3
Section		Thanh Tri Bridge	Thanh Tri Section of SHTRR	Gia Lam Section of SHTRR
Road/Bridge Length		5.1 km	6.1 km	3.2 km
Traffic Volume (PCU/day)	Year 2010	73,100	57,600 / 73,100	73,100
	Year 2020	111,700	86,400 / 111,700	111,700

3. NUMBER OF LANES AND TYPICAL CROSS SECTIONS

Package No.	Section	Design Speed	Number of Lane	Typical Cross Section *
1	Thanh Tri Bridge	100 km/hr	6	Type A
2	Thanh Tri Section of SHTRR	100 km/hr	4	Type C or D
3	Gia Lam Section of SHTRR	100 km/hr	4	Type B or C

* See the Figure 3

4. PROJECT COST

Unit: Million Dong (Foreign Exchange: Mil. US$) (Value as of May 2003)

Package No.	Section	Road/Bridge Length	Project Cost		
			Foreign Exchange	Local Currency	Total
1	Thanh Tri Bridge	5.1 km	1,783,803	1,146,152	2,928,955
2	Thanh Tri Section of SHTRR	6.1 km	581,200	485,903	1,067,111
3	Gia Lam Section of SHTRR	3.2 km	350,568	239,855	590,423
	Total	37.4 km	3,714,579	1,871,910	4,586,489

5. IMPLEMENTATION SCHEDULE

Package No.	Description	1999	2000	2001	2002	2003
1, 2 and 3	Detailed Design					
	Land Acquisition and Resettlement					
	Construction					

6. ECONOMIC EVALUATION

Financial Indicators	Project as a whole
NPV 1)	3.03
IRR 2)	3.84

Note: 1) In case the Project implemented by private sector (BOT project)

2) In case the Project implemented by the Government

O-D	Origin-Destination
O/M	Operation and Maintenance
Pass. or Pas.	Passenger
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3. NUMBER OF LANE AND TYPICAL CROSS SECTIONS

Package No.	Section	Design Speed	Number of Lane	Typical Cross Section *
1	Thanh Tri Bridge	100 km/hr	6	Type A
2	Thanh Tri Section of SHTRR	100 km/hr	4	Type C or D
3	Gia Lam Section of SHTRR	100 km/hr	4	Type B or C

* Note: See Figure 1.

4. PROJECT COST

- Unit: Million Dong
- January 1993 Prices
- 1 US$=12,950 Dong

Package No.	Section	Road/Bridge Length	Project Cost		
			Foreign Exchange	Local Currency	Total
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Package No.	Description	1999	2000	2001	2002	2003
1, 2 and 3	Detailed Design					
1	Land Acquisition and Resettlement					
	Construction					
2	Land Acquisition and Resettlement					
	Construction					
3	Land Acquisition and Resettlement					
	Construction					

6. ECONOMIC AND FINANCIAL INDICATORS

Economic Indicators	Project as a whole
EIRR (%)	13.14
NPV (Million Dong)	329,449
B/C Ratio	1.12

Note: NPV and B/C ratio were calculated based on a discount rate of 12 % p.a.

Financial Indicators	Project as a whole
FIRR 1)	5.63
FIRR 2)	5.64

Note: 1) In case the Project implemented by private sector (BOT project)
2) In case the Project implemented by the Government

7. RECOMMENDATIONS

1. The results of the Study indicate that the Project is technically sound (no serious technical difficulty is anticipated for the construction) and economically feasible. Taking into account the direct and enormous indirect benefits towards regional development other than the quantified savings in travel costs, the Project should be implemented at the earliest opportunity.
2. Delay of implementation would entail increasingly difficult land acquisition and resettlement due to the rapid development of the region, especially in Thanh Tri area. Arrangement of land acquisition and resettlement should commence immediately.
3. Proposed implementation schedule is to emphasize simultaneous commencement of services in all three construction sections, subject to due consideration on inevitable lead-time for land acquisition and resettlement, to optimize investment schedule.
4. Such a stage construction scheme as widening from four lanes to six lanes in due time will entail diverse technical difficulties when applied to Thanh Tri Bridge. Thus it is recommendable to provide whole six lanes in the initial and single construction stage.

OUTLINE OF THE STUDY

The Socialist Republic of Vietnam, Feasibility Study on Thanh Tri Bridge and the Southern Section of Ring Road No.3 in Hanoi

- Study Period: July, 1997 - September, 1998
- Counterpart Agency: Project Management Unit Thanh Long, Ministry of Transport

1. Background

Since an effective transport system is a basic requirement to achieve the future socio-economic development of the region, a number of transport infrastructures improvement projects are either planned or under construction.

Many industrial zones are now either in operation or in the construction stage around Hanoi and along the major transport arteries. The traffic entering in and originating from Hanoi will increase drastically in the near future.

In Hanoi, the total length of the road network is not sufficient for this increased usage, a ring road system has not been implemented, road widths are insufficient to allow heavy vehicles, and bridges are deteriorating.

2. Study Objectives

The objectives of the Study are to study feasibility of the construction of Thanh Tri Bridge over the Red River, the Southern Section of Ring Road No. 3 between the intersection of National Highway No. 1 and the intersection of National Highway No. 5 in Hanoi, and further to transfer technology to the Vietnamese counterparts during the execution of the Study.

3. Study Area

The Study Area is defined as the direct and indirect influence area of the Project. This includes such administrative districts as Hanoi City and its surrounding 6 provinces (Ha Tay, Vinh Phuc, Thai Nguyen, Bac Gian, Bac Ninh and Hung Yen).

4. Project Outline

4.1 Basic Policy

Although the official target year of the plan is the year 2010, additional supplementary demand forecast for the year 2020 will also be conducted in order to provide a grasp of further future conditions.

4.2 Content

Plans for the construction of Thanh Tri Bridge and the Southern section of Hanoi Third Ring Road (SHTRR) were made in reference to the basic policy stated above.

The results of the Study are stated below.

(1) Forecast Future Traffic Volume

A forecast of future traffic volume based on present volume and the future socio-economic framework of the Study Area is shown in Table 1.

Table 1 Future Traffic Volume

Package No.		1	2	3
Section		Thanh Tri Bridge	Thanh Tri Section of SHTRR	Gia Lam Section of SHTRR
Road/Bridge Length		3.1 km	6.1 km	3.2 km
Traffic Volume (PCU/day)	Year 2010	73,100	57,600 / 73,100	73,100
	Year 2020	111,700	86,400 / 111,700	111,700

(2) Number of Lanes and Standard Cross Section

Judging from future traffic volume and traffic capacity, the number of required lanes was considered. Road geometric standard, which includes design speed and cross-section structure, was determined in consideration of the characteristics of each package (Table 2).

Table 2 Number of Lane and Typical Cross Sections

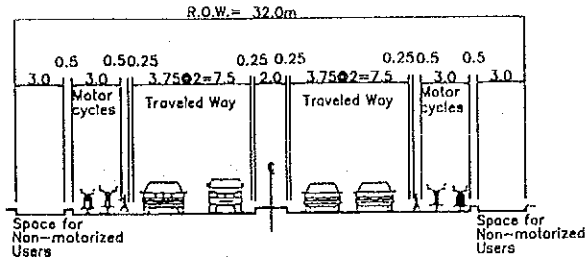
Pakege No.	Section	Design Speed	Number of Lane	Typical Cross Section *
1	Thanh Tri Bridge	100 km / hr	6	Type A
2	Thanh Tri Section of SHTRR	100 km / hr	4	Type C or D
3	Gia Lam Section of SHTRR	100 km / hr	4	Type B or C

* Note: See Figure 1.

(3) Preliminary Design, Construction Planning, and Estimation of Project Cost

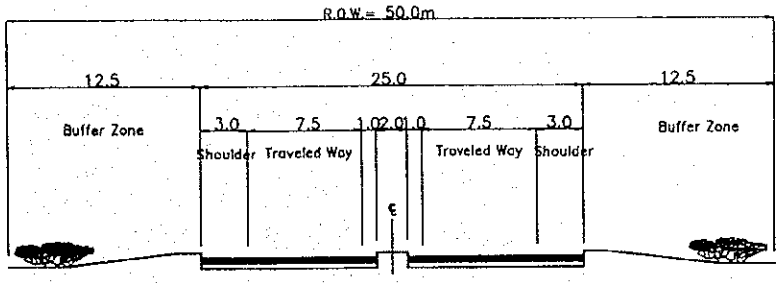
Based upon the highway's geometric standard, route selection was made with efforts to keep influences on the human and natural environments to a minimum. At the same time, preliminary design and construction planning were conducted. The project cost estimation was made in consideration of these aspects.

Type A



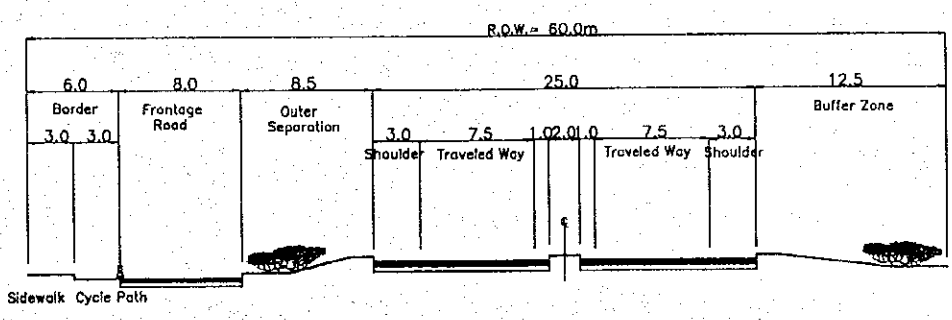
Motor Cycle Separation Scheme

Type B



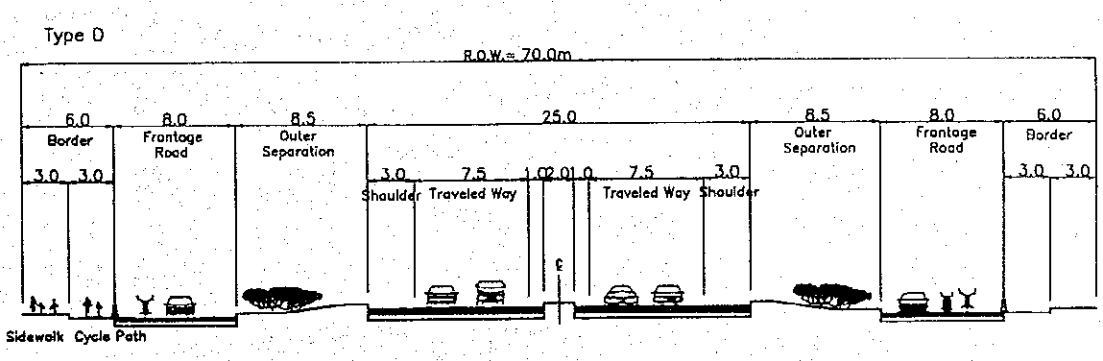
Through Traveled Ways with Buffer Zone

Type C



Through Traveled Ways with Frontage Road and Buffer Zone

Type D



Through Traveled Ways with Frontage Road on Both Sides

Figure 1 Typical Cross Sections

(4) Outline of Project

Construction is divided into three packages:

- Package 1 : Thanh Tri Bridge

  Construction of 2 x 15.0 m effective widths of main bridge as well as approach and dyke bridges.

- Package 2 : Than Tri Section of SHTRR

  Main construction works in Package 2 are the construction of:

  - Four lane throughways, frontage roads and border facilities;
  - One partial cloverleaf type interchange to connect SHTRR and National Highway No.1 including flyover bridge;
  - One Y-type interchange to connect SHTRR and New National Highway No.1 including ramp bridges;
  - One half-diamond type interchange to connect Thanh Tri bridge and dyke road; and
  - Three prestressed concrete girder throughway bridges.

- Package 3 : Gia Lam Section of SHTRR

  Main construction works in package 3 are the construction of:

  - Four lane throughways, frontage roads and border facilities;
  - One partial cloverleaf type interchange to connect SHTRR and National Highway No.5 including flyover bridge;
  - One half-diamond type interchange to connect Thanh Tri bridge and dyke road;
  - One barrier type toll plaza; and
  - One prestressed concrete girder throughway bridges.

5. Project costs

The estimated project costs in exchange rates effective in January 1998 (1US$ = 12,950 Dong) for each package is shown in Table 3.

Table 3 Estimated Project Cost in 1998 Prices

Package No.	Section	Road/Bridge Length	Project Cost		
			Foreign Exchange	Local Currency	Total
1	Thanh Tri Bridge	3.1 km	1,782,803	1,146,152	2,928,955
2	Thanh Tri Section of SHTRR	6.1 km	581,208	485,903	1,067,111
3	Gia Lam Section of SHTRR	3.2 km	350,668	239,855	590,523
Total		12.4 km	2,714,679	1,871,910	4,586,589

6. Project Evaluation

6.1 Economic Analysis

The economic indicators for the project are shown in Table 4. The Project is deemed economically feasible.

Table 4 Results of Economic Analysis

Economic Indicators	Project as a whole
EIRR (%)	13.14
NPV (Million Dong)	329,449
B/C Ratio	1.12

Note: NPV and B/C ratio were calculated based on a discount rate of 12 % p.a.

6.2 Financial Analysis

The financial analysis revealed that:

- In case the Project was implemented by the Government, calculated FIRR showed 5.64 % which is higher than the weighted average interest rate of 4.61 % (soft loan 70 % and bank loan 30 %) and judged to be financially feasible; and
- In case the Project was implemented by private sector (build operate transfer - BOT), calculated FIRR showed 5.63 % which is much lower than the average interest of 8.5 % (equity 30 % and bank loan 70%), therefore it is judged to be financially not feasible.

FIRRs for the above cases are shown in Table 5.

Table 5

Financial Indicators	Project as a whole	Judgement
FIRR (%) 1)	5.63	Not Feasible
FIRR (%) 2)	5.64	Feasible

Note: 1) In case the Project implemented by private sector (BOT project)
2) In case the Project implemented by the Government

6.3 Environmental Aspects

The construction of Thanh Tri Bridge and SHTRR will entail a great amount of favorable impacts on society and the economy of the people along the highway as well as the state, but with adverse effects. Appropriate compensation should be made for land and properties affected by the Project.

7. Implementation Schedule

Tentative project implementation time schedule is drawn up as shown in Figure 2.

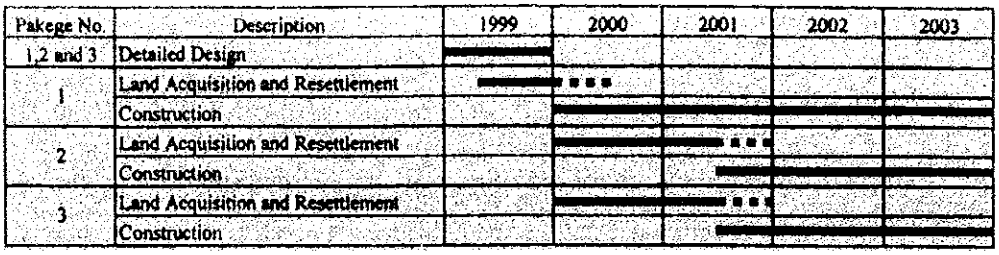


Figure 2 Project Implementation Schedule

As shown in Figure 2, the completion of the construction in all packages will be set at the same time of the end of 2003 to attain the optimum investment schedule and to consider the time required for land acquisition and resettlement.

8. Recommendations

(1) Implementation of the Project

The results of the Study indicate that the Project is technically sound (no serious technical difficulty is anticipated for the construction) and economically feasible. Taking into account the direct and enormous indirect benefits towards regional development other than the quantified savings in travel costs, the Project should be implemented at the earliest opportunity.

(2) Land Acquisition and Resettlement

Delay of implementation would entail increasingly difficult land acquisition and resettlement due to the rapid development of the region, especially in Thanh Tri area. Arrangement of land acquisition and resettlement should commence immediately.

(3) Project Implementation Schedule

Proposed implementation schedule is to emphasize simultaneous commencement of services in all three construction sections, subject to due consideration on inevitable lead-time for land acquisition and resettlement, to optimize investment schedule.

(4) Construction Scheme for Thanh Tri Bridge

Such a stage construction scheme as widening from four lanes to six lanes in due time will entail diverse technical difficulties when applied to Thanh Tri Bridge. Thus it is recommendable to provide whole six lanes in the initial and single construction stage.

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OF RING ROAD NO. 3
IN HANOI
IN
THE SOCIALIST REPUBLIC OF VIETNAM

FINAL REPORT

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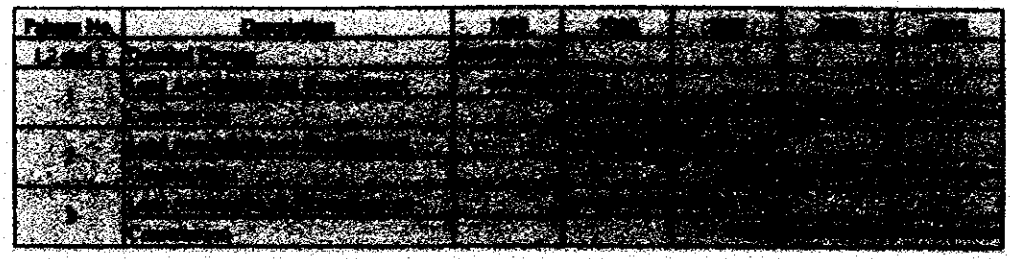

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1. INTRODUCTION

1.1 Project Background

The Government of the Socialist Republic of Vietnam (hereinafter referred to as "the government") has embarked on a profound remodeling of the country under the "Doi Moi" policy and introduced the marketing economy principle. The economic growth in recent years has been quite rapid. Hanoi, the capital city, has approximately 2.3 million population at present and is the main focus of human activities of the nation and the centre of commerce, finance, industry and transportation in the Red River Delta and Northern Focal Economic Area.

Since an effective transport system is a basic requirement to achieve the future socio-economic development of the region, a number of transport infrastructures improvement projects are either planned or under construction.

National Highway No. 5 which connects Hanoi and Hai Phong is now under construction with completion scheduled in 1998. National Highway No. 1 which is the main transportation artery connecting Northern, Central and Southern Provinces with Hanoi is now being implemented. A new by-pass of National Highway No. 1 is at the detailed design stage and some sections are under construction. National Highway No. 18 starts at Noi Bai International Airport, traverses Quang Ninh Province and terminates at Bac Luan border gate. Some stretches of National Highway No. 18 are under construction and the remaining sections are scheduled to start detailed design shortly.

Many industrial zones are now either in operation or in the construction stage around Hanoi and along the transport arteries mentioned above. The traffic entering in and originating from Hanoi will increase drastically in the near future.

In Hanoi, the total length of the road network is not sufficient for this increased usage, a ring road system has not been implemented, road widths are insufficient to allow heavy vehicles, pavement structure is poor and bridges are deteriorating. Two wheeled vehicles are predominant and traffic congestion is always observed in the central area of Hanoi and there is no room for access by larger vehicles.

In order to solve the above-mentioned problems, the Master Plan of Urban Transport for Hanoi City was formulated by JICA in 1996. According to results of the study, the existing bridges over the Red River have not enough traffic capacity corresponding with increasing traffic volume in the future. And the concept of Hanoi Third Ring Road

(hereinafter referred to as "HTRR") to collect and distribute all incoming and outgoing traffic was proposed.

Under such circumstances, the Government has decided to construct the most urgent section of HTRR that is the Southern Section of Ring Road No. 3 in Hanoi including Thanh Tri Bridge. (hereinafter referred to as "the Project").

In regards to the background mentioned above, the Government requested the Government of Japan to implement a feasibility study on Thanh Tri Bridge and the Southern Section of Ring Road No. 3 in Hanoi.

In response to the request of the Government, the Government of Japan decided to conduct the Feasibility Study on Thanh Tri Bridge and the Southern Section of Ring Road No. 3 in Hanoi (hereinafter referred to as "the Study") in accordance with the relevant laws and regulations in force in Japan.

The Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of the technical cooperation programmes of the Government of Japan, carried out the Study in close cooperation with the concerned authorities of the Government.

Project Management Unit Thang Long (hereinafter referred to as "PMU Thang Long") had act as the counterpart agency to the Japanese Study Team (hereinafter referred to as "the Study Team") and coordination with other relevant organizations had been exercised in order to accomplish a smooth implementation of the Study.

JICA sent to Vietnam the Study Team, several times between August 1997 and July 1998 and the Study Team held discussions with PMU Thang Long and the concerned officials of the Government and conducted field surveys and studies in Vietnam.

After the Study Team returned to Japan, further studies were made and the present report was prepared.

1.2 Study Objective

The objective of the Study is to study feasibility of the construction of Thanh Tri Bridge over the Red River and the Southern Section of Ring Road No. 3 between the intersection of National Highway No. 1 and the intersection of National Highway No. 5 in Hanoi, and further to transfer technology to the Vietnamese counterparts during the execution of the Study.

1.3 Study Area

The Study Area is defined as the direct and indirect influence area of the Project. This includes such administrative districts as Hanoi City and its surrounding 6 provinces (Ha Tay, Vinh Phuc, Thai Nguyen, Bac Gian, Bac Ninh and Hung Yen).

1.4 Basic Study Approach and General Work Flow

In principle, the Study was carried out based on the scope of work which was agreed upon between PMU Thang Long and JICA Preparatory Study Team in March 1997. The Study was carried out in the following 7 steps:

Step 1; Review of the existing data and preparation of inception report
Step 2; Data collection, field survey and formulation of the alternative plans
Step 3; Selection of the best alternative plan
Step 4; Preliminary design
Step 5; Project evaluation
Step 6; Explanation of the draft final report
Step 7; Preparation of the final report

The basic flow diagram, which identifies major work items to be carried out in each step, is indicated in Figure 1.1. A general work diagram of the Study, which indicates both approximate timing to carry out each work item and their relation, is shown in Figure 1.2.

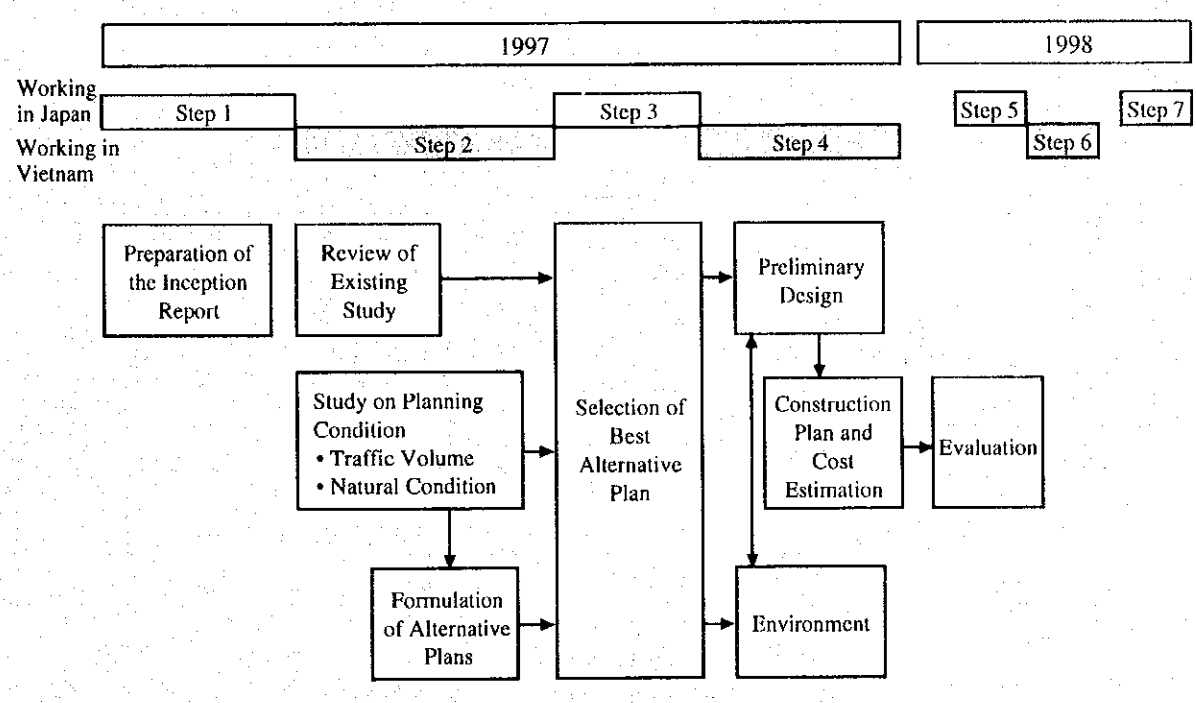
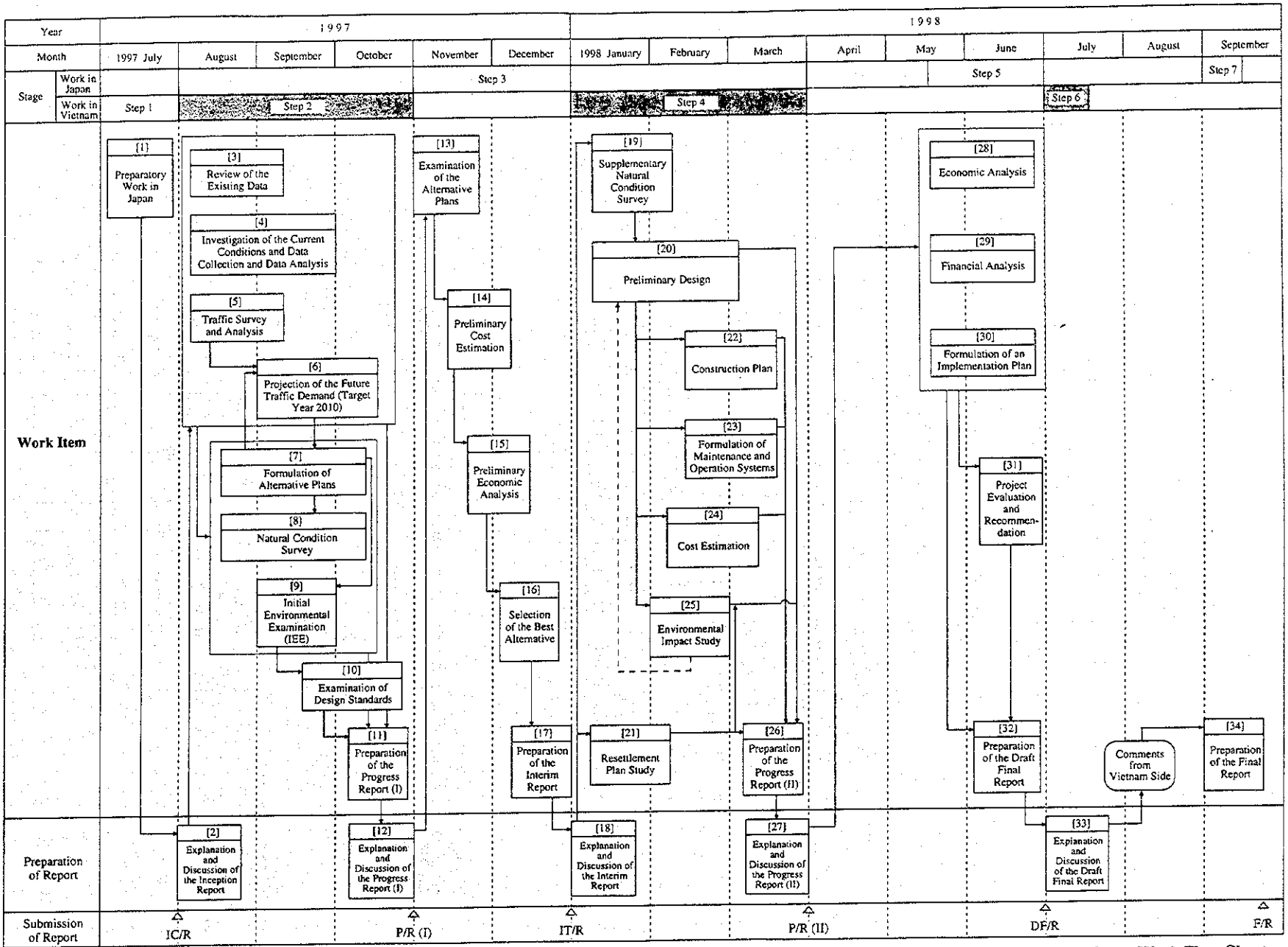


Figure 1.1 Basic Flow of the Study



IC/R: Inception Report, P/R (I): Progress Report (I), IT/R: Interim Report
P/R (II): Progress Report (II), DF/R: Draft Final Report, F/R: Final Report

Figure 1.2 Work Flow Chart

2. SOCIO-ECONOMIC CONDITIONS

2.1 Population

The population of the Study Area is summarized by province (1996 administrative unit system) as shown in Table 2.1. Each province had 1.2 to 2.7 million population and population density varied from 2 to 24 persons per hectare in 1994. The share of urban population was quite high in Hanoi in comparison with other provinces, because it is one of the most urbanized area in the country. The population growth by province indicated almost same rate from 1993 to 1994.

Table 2.1 Population of the Study Area, 1993 & 94

Province	Area (km^2)	Population in 1994				Population in 1993 (thous. pers.)	1994/93
		Population (thous. pers.)	Density (pers./km^2)	Urban (thous. pers.)	Rural (thous. pers.)		
Hanoi City	921	2,194.4	2,383	1,150.8	1,043.6	2,160.8	1.016
Ha Tay	2,148	2,256.7	1,051	173.1	2,083.6	2,216.6	1.018
Vinh Phuc	4,827	2,248.7	466	163.5	2,085.2	2,202.9	1.021
Bac Thai	6,503	1,168.0	180	219.6	948.4	1,143.4	1.022
Ha Bac	4,616	2,308.2	500	114.8	2,193.4	2,276.7	1.014
Hai Hung	2,550	2,708.6	1,747	140.9	2,567.7	2,662.5	1.017
Study Area Total	**21,565**	**12,884.6**	**597**	**1,962.7**	**10,921.9**	**12,662.9**	**1.018**
Whole Country	**330,991**	**72,509.5**	**219**	**14,139.3**	**57,325.5**	**71,025.6**	**1.021**

Source: Statistical Year Book, 1995

The urban population of Hanoi was 1,150 thousand in 1994 (total population is 2,194 thousand), one of the most urbanized in the country, and growth rates (3.0 to 6.3 % per annum from 1989 to 1996) are quite large in comparison with other area and provinces (1.2 to 2.6 %). Moreover, the gross density of population by urban district of Hanoi shows 200 to 400 persons per hectare.

2.2 Employment

The labor structure in Vietnam was almost stable from 1990 to 1994; 73 % for primary sector, 13 % for secondary and 14 % for service sectors as shown in Table 2.2.

However, there is no current data on labor structure of Hanoi. An estimation indicates 884.0 thousand employment in 1989 and 1,133.2 thousand in 1996. Composition by sector in 1989 reveals a quite different feature from that of whole country; 51.6 % for primary, 20.4 % for secondary and 28.0 % for service sector, respectively.

Table 2.2 Labor Structure of Vietnam

(Thousand Persons)

	1990	1991	1992	1993	1994
Total	**26,021 100 %**	**30,294 100 %**	**30,975 100 %**	**31,818 100 %**	**32,718 100 %**
Primary Sector	**19,024 73.1 %**	**21,925 72.4 %**	**22,513 72.7 %**	**23,238 73.0 %**	**23,929 73.1 %**
Agriculture	18,979	21,895	22,483	23,208	23,898
Forestry & Fishery	45	30	30	30	31
Secondary	**3,631 14.0 %**	**4,210 13.9 %**	**4,214 13.6 %**	**4,275 13.4 %**	**4,370 13.4 %**
Industry	2,800	3,392	3,394	3,450	3,522
Construction	831	818	820	825	848
Service	**3,366 12.9 %**	**4,159 13.7 %**	**4,248 13.7 %**	**4,305 13.5 %**	**4,419 13.5 %**
Transportation and Telecommunication	479	513	527	534	549
Trade	1,117	1,681	1,719	1,735	1,776
Finance, Banking and Insurance	76	91	118	114	117
State, Science, Education, Health	1,354	1,443	1,449	1,478	1,509
Housing, Tourism, Hotel, Consumer goods	340	431	435	444	468

Source: HUTMP

2.3 Gross Domestic Product (GDP)

Though the growth of GRDP indicates rather high annual rates both for the whole country (6.0 to 9.5 %, 1990-96) and for Hanoi (8.7 %, average in 1989-96), the growth of per capita GRDP of Hanoi is extremely high; 13.4 % average between 1989-96, while 5.5 % for the whole country.

The trends shows tremendous growth in every sectors and drastic shifts of composition from primary sector to secondary and tertiary sectors. Real growths in every sector also can be seen, especially in industry, construction, finance and trade sub-sectors. (as shown in Table 2.2.6 of Main Report)

The economy of Hanoi constituted 5. 9 %of the national economy in 1990 and 6.5 % in 1993 (as shown in Table 2.2.7 of Main Report), in terms of gross regional domestic product (GRDP) with annual growth rate of 7.5 % to 12.3% from 1990 to 1993. Some sub-sectors in service sector indicate very high growth such as tourism and finance. The composition by sector was also different from that of whole country; significant share was occupied by industry, commercial and culture sub-sectors.

2.4 Future Socio-Economic Framework

A projection of GRDP for the year 2000 is carried out by General Statistical Office, and the results are summarized in Table 2.3.

Table 2.3 Projection of GRDP in the Study Area

GDP Projection at 1989 constant price (Bill. VND)

	1996	Share	2000	Share
Whole Country	**47,888**		**66,972**	
Hanoi	2,990	48.8%	4,340	50.2%
Thai Nguyen	440	7.2%	580	6.7%
Bac Giang	558	9.1%	777	9.0%
Bac Ninh	422	6.9%	589	6.8%
Hung Yen	375	6.1%	488	5.6%
Ha Tay	923	15.1%	1,285	14.9%
Vinh Phuc	413	6.7%	582	6.7%
Total Study Area	**6,121**	**100%**	**8,641**	**100%**

Source: General Statistical Office

3. CURRENT ROAD TRANSPORT PROFILE

3.1 Transport in the Study Area

As there are all kinds of transportation services in the area, such as road, railway, inland water way and air transport, each mode has a different role and significance.

The network of National Highways composed of NH1, 2, 3, 5, 6, 18, 21, 32, etc. contributes significant land transportation in the Area.

Vietnamese National Railway (VNR) has links from Hanoi to major regional centres of the whole country such as Hai Phong (102 km), Ho Chi Minh City (1,726 km), Thai Nguyen (75 km), Lang Son (148 km) and Lao Cai (283 km). Also, there are 11 stations in Hanoi City.

Inland water way is also one of the major transport modes, especially for bulk cargo in the Red River region, and air transport is also important both for domestic and international transport.

3.2 General Road Transport Condition in the Study Area

An analysis on the general transport condition in the Study Area was carried out based on the existing data.

Trend of total transport volume:

- Increasing transport volume both in freight and passenger; and
- Road transport plays a dominant role in passenger transport, however inland water transport has a certain role in freight transport.

Road Network:

- The network density as a whole is not inferior to other Asian countries; and
- Though all national roads are paved, other roads are still in poor surface condition.

Motorization:

- Number of vehicles (excluding motorcycle) in Hanoi has increased from 21 thousand in 1990 to 72 thousand in 1997; at average annual growth rate of 19 %;
- Motorcycle shows more rapid increases from 1980 to 1994; 22 to 50 % over previous years (512 thousand in 1997); and

- Traffic count survey results conducted by VRA indicates certain increasing trend of automobile traffic from 1990 to 1996, at most of the station of national highways.

Two kinds of traffic surveys were carried out in order to analyze the present traffic condition and to obtain necessary data for updating the existing O-D tables.

- Traffic count survey: 17 stations
- Roadside O-D interview: 3 stations

The results of 12 hours traffic count are shown in Figures 3.1 and 3.2.

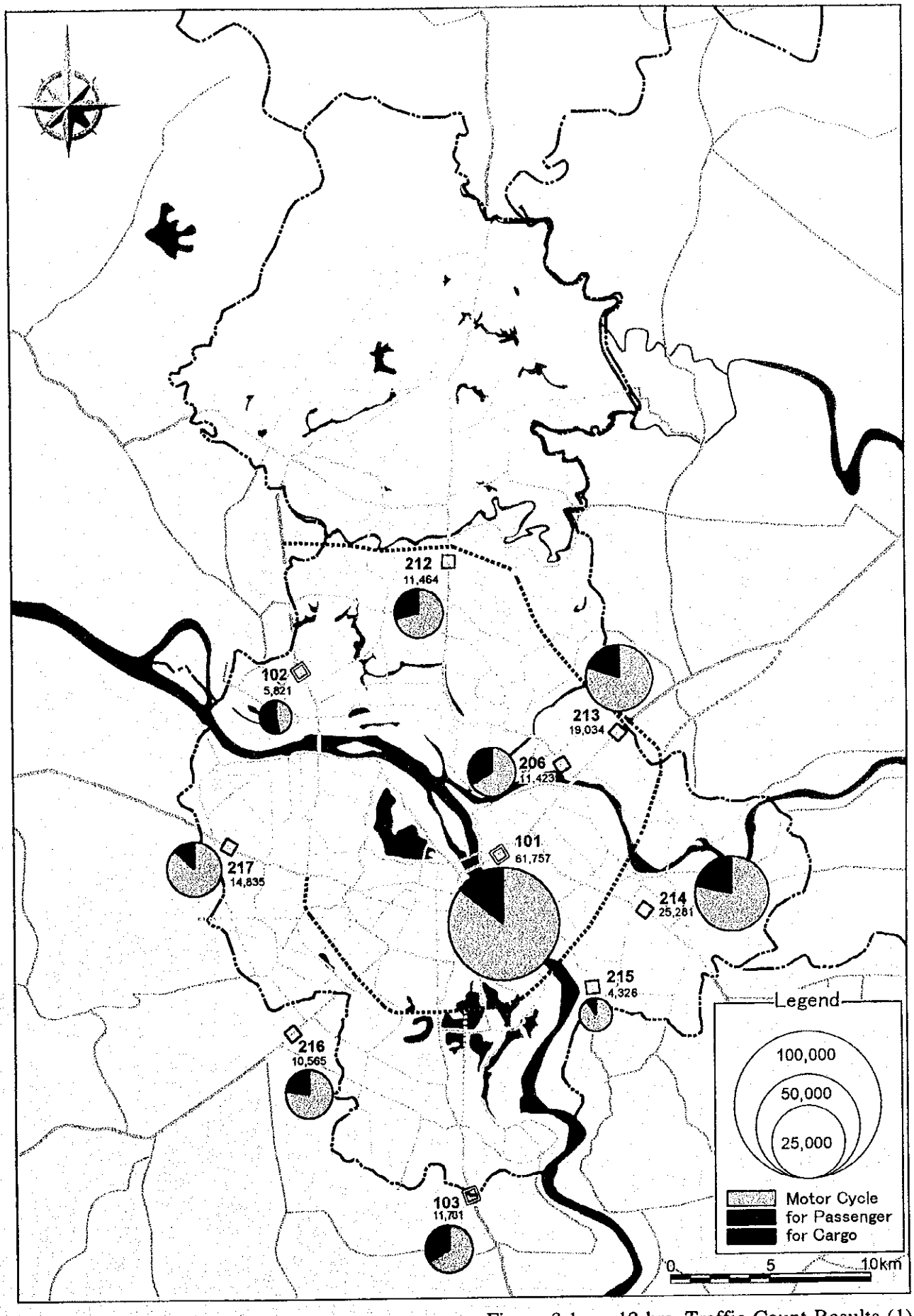


Figure 3.1 12 hrs. Traffic Count Results (1)

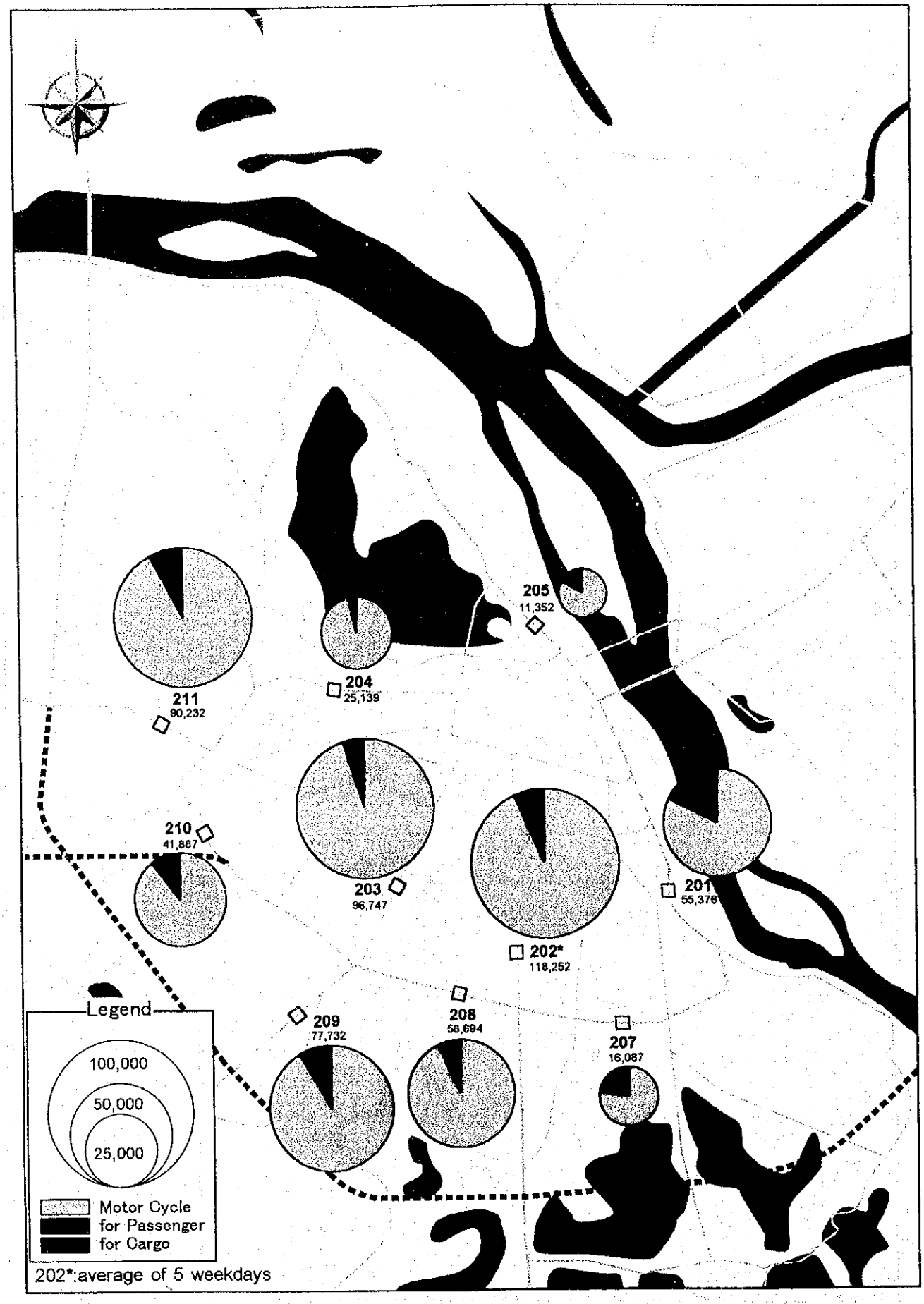


Figure 3.2 12 hrs. Traffic Count Results (2)

4. TRAFFIC DEMAND FORECAST

4.1 Methodology

The comprehensive Hanoi Urban Transport Master Plan Study (HUTMP) conducted by JICA in 1997 analyzed future traffic demands based on "person-trip" from various viewpoints. For the sake of consistency, and in consideration of the great amount of useful data obtainable from that study, practically the same methodology is applied to traffic demand forecast in the Study.

Overall methodology of traffic demand forecast in the Study is explained as shown in Figure 4.1.

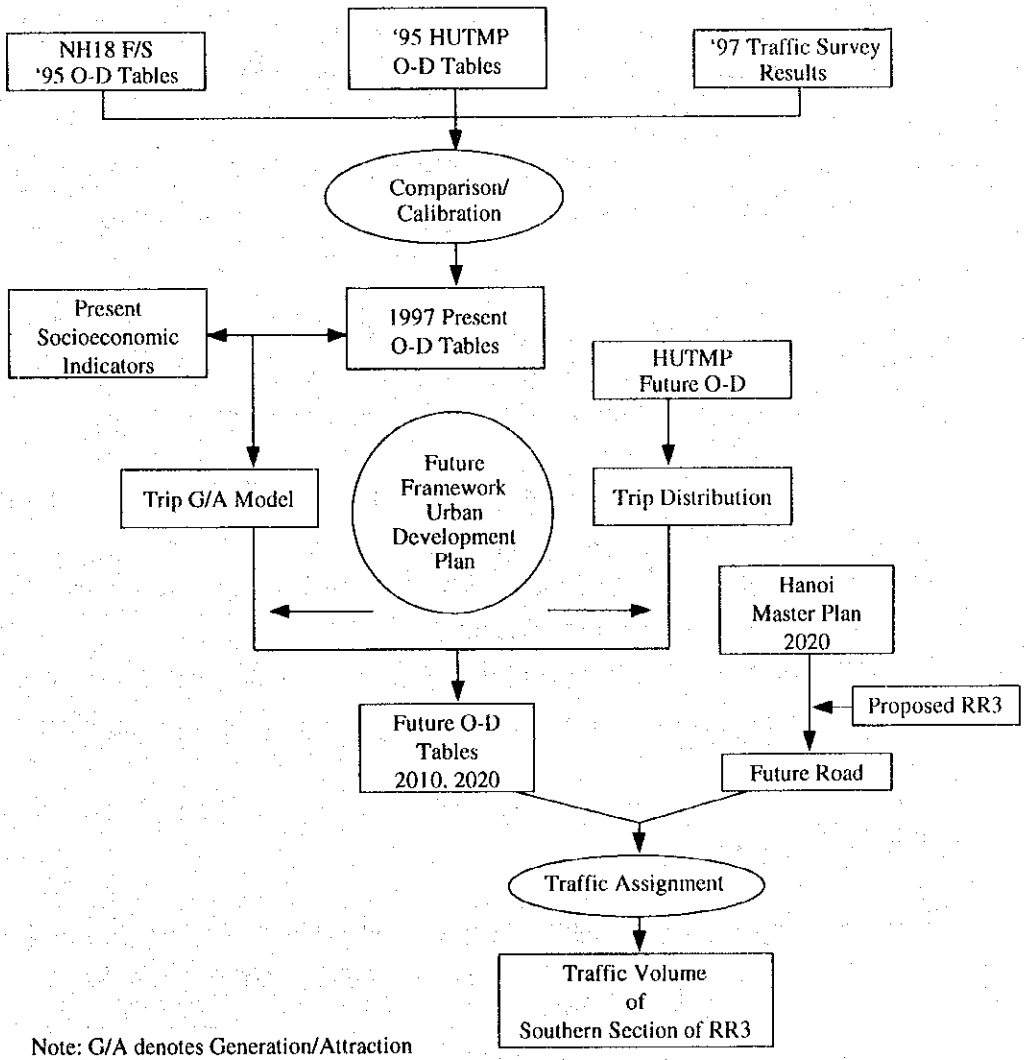


Figure 4.1 General Flow Chart of Traffic Demand Forecast

4.2 Basic Premises

The following conditions were set for traffic demand forecast of the proposed Southern section of Hanoi Third Ring Road (SHTRR).

i) Since Hanoi Third Ring Road (HTRR) plays a significant role in the arterial road network of the Hanoi metropolitan area, the traffic demand analysis should be conducted not as the independent road section but as a part of of HTRR.
ii) Traffic demand is forecast in terms of vehicle volume in AADT (Average Annual Daily Traffic) by type of vehicle, that is, four (4) types; motorcycle, passenger car, bus and truck.
iii) Basic traffic movement studied in HUTMP, in the form of O-D tables, is used with the necessary modifications both for present and future figures.
iv) Though the official target year of the plan is the year 2010, additional supplementary demand forecast for the year 2020 will also be conducted in order to provide a grasp of further future conditions.
v) JICA STRADA (System for Traffic Demand Analysis) model will be fully utilized throughout the traffic demand forecast procedure in the Study.

4.3 Present O-D Tables

Based on the 1995 O-D tables in HUTMP, the present 1997 O-D tables by vehicle type were formulated as a result of the following review and adjustments:

i) Zone integration/disintegration in accordance with the new zoning system;
ii) Overall review of O-D distribution/flow;
iii) Examination of O-D traffic based on the results of roadside O-D interview conducted in October, 1997; and
iv) Comparison and calibration of basic traffic volume assumed from 1995 O-D table to the updated cordon-line and screen-line traffic volume estimated by traffic count survey results.

4.4 Future O-D Tables

Five (5) O-D tables were examined in the Study, each one O-D table was selected as the base case; case 2 for 2010 and case 4 for 2020 respectively (Table 4.1).

Table 4.1 Alternatives of Future O-D Tables

Case	Year	O-D Distribution	Modal Split	Total Volume (thousand)	
1	2010 1	Present Pattern	General Trend	Motorcycle	1,545
				Pass. Car	69
				Bus	31
				Truck	107
2	2010 2	2005/2015 Pattern	General Trend	Motorcycle	1,732
				Pass. Car	75
				Bus	36
				Truck	117
3	2010 3	2005/2015 Pattern	Additional Shift from M/C to Pass. Car	Motorcycle	1,212
				Pass. Car	326
				Bus	36
				Truck	117
4	2020 1	2015 Pattern	General Trend	Motorcycle	1,442
				Pass. Car	857
				Bus	64
				Truck	244
5	2020 2	2015 Pattern	Additional Shift from M/C to Bus	Motorcycle	865
				Pass. Car	857
				Bus	116
				Truck	244

Visual summaries of the above future O-D tables (Cases 2 and 4) in the form of "desired lines" by an 18-zone system are illustrated in Figures 4.2 and 4.3.

4.5 Future Traffic Demand of Southern Section of Hanoi Third Ring Road (SHTRR)

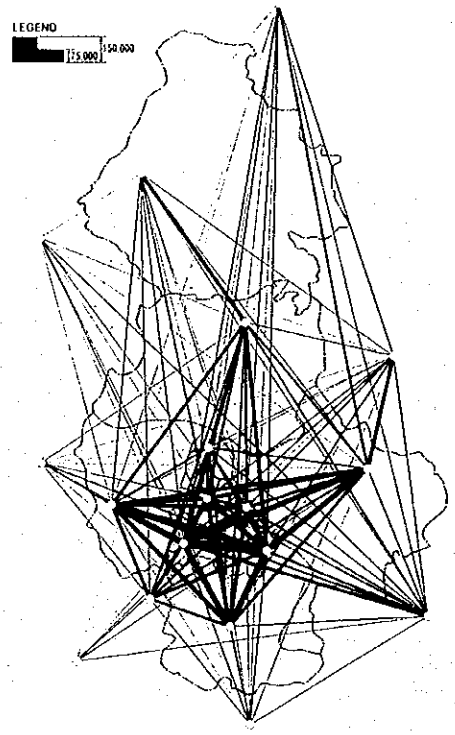
The future traffic demand along the proposed SHTRR was forecast through traffic assignment simulation based on the future O-D tables estimated in the previous step and future road network.

The total traffic demand of SHTRR is forecast to reach to 58 to 73 thousand PCU in 2010; that is, almost the same volume as the existing traffic volume at Chuong Duong bridge. It will reach to 86 to 112 thousand PCU (1.5 times of that in 2010) in 2020.

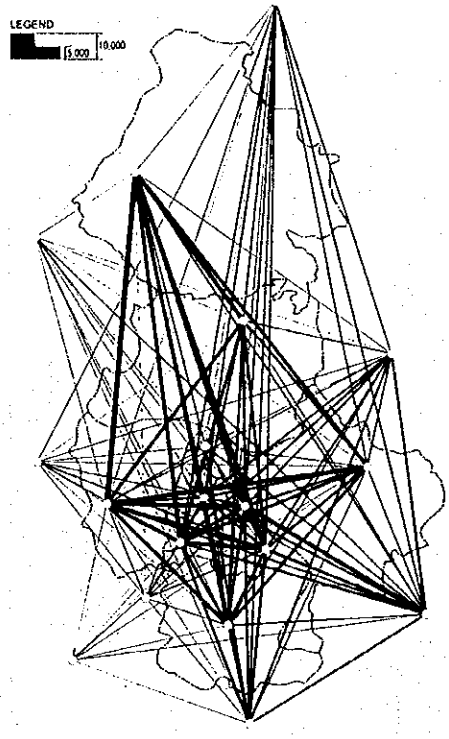
The composition by vehicle type in 2010 shows a dominant share by motorcycle even in PCU; 40 % by motorcycle, 10 % by passenger car, 15 % by bus and 35 % by truck.

Detailed results of future traffic demand forecast for 2010 and 2020 are shown in Figure 4.4. Traffic volumes of SHTRR by section are shown in PCU together with the volumes in the sections of crossing roads and extension of SHTRR.

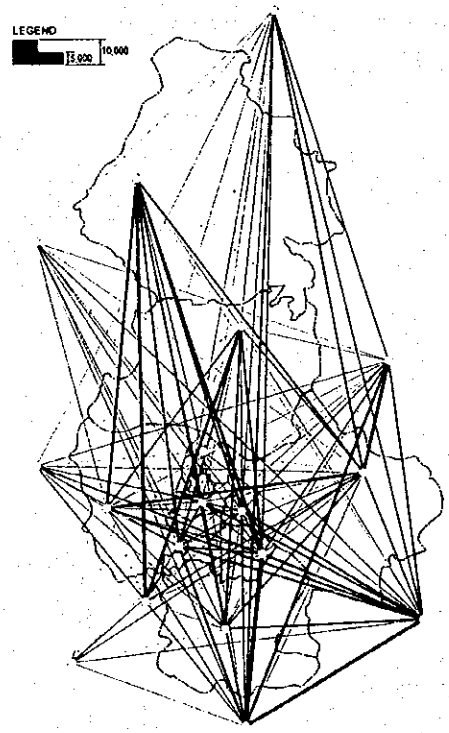
Motorcycle



Passenger Car



Bus



Truck

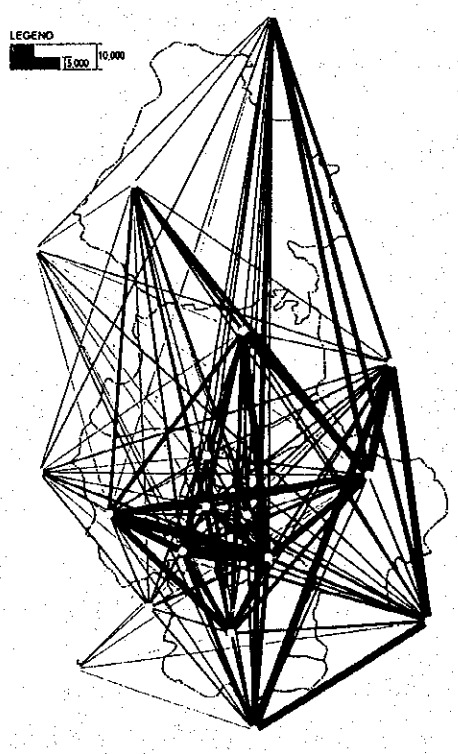
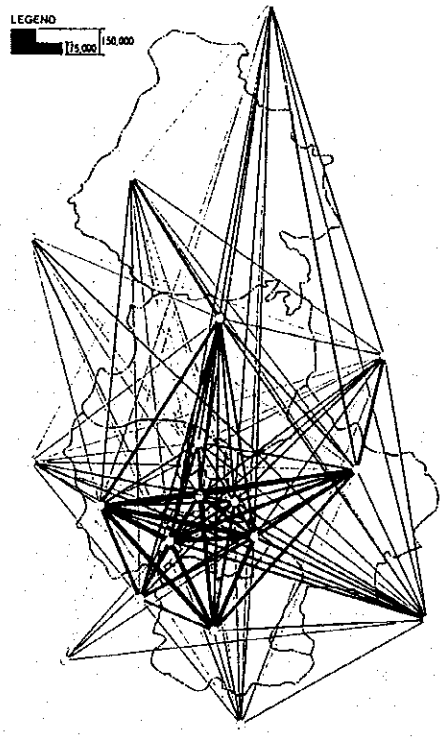
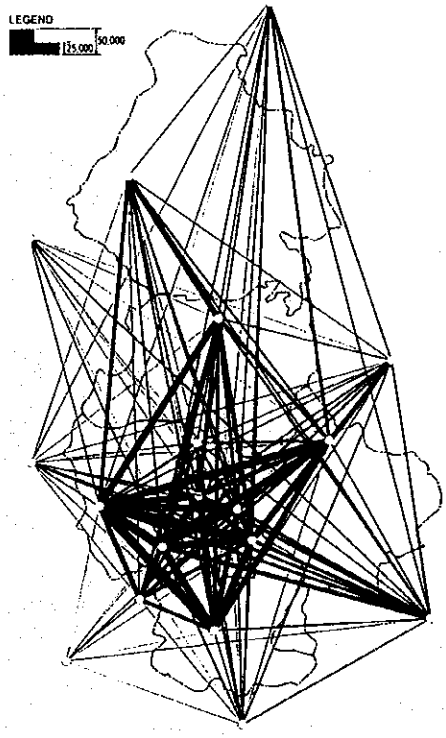


Figure 4.2 Desired Lines, 2010

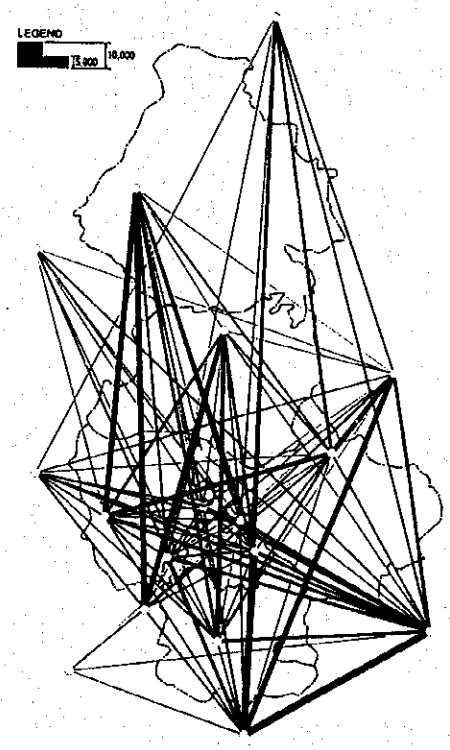
Motorcycle



Passenger Car



Bus



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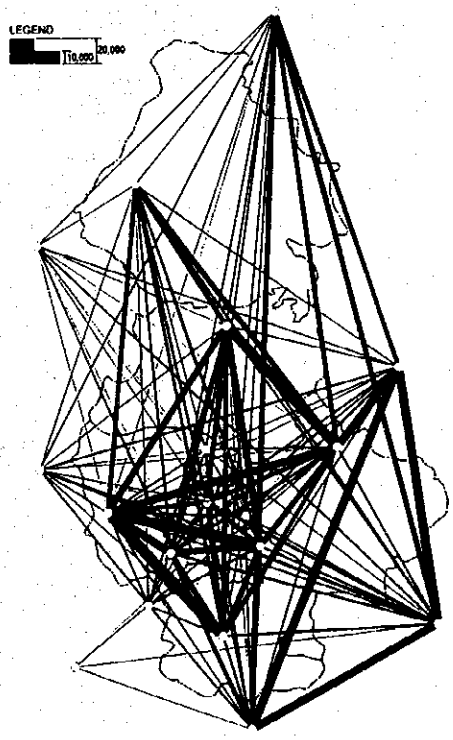
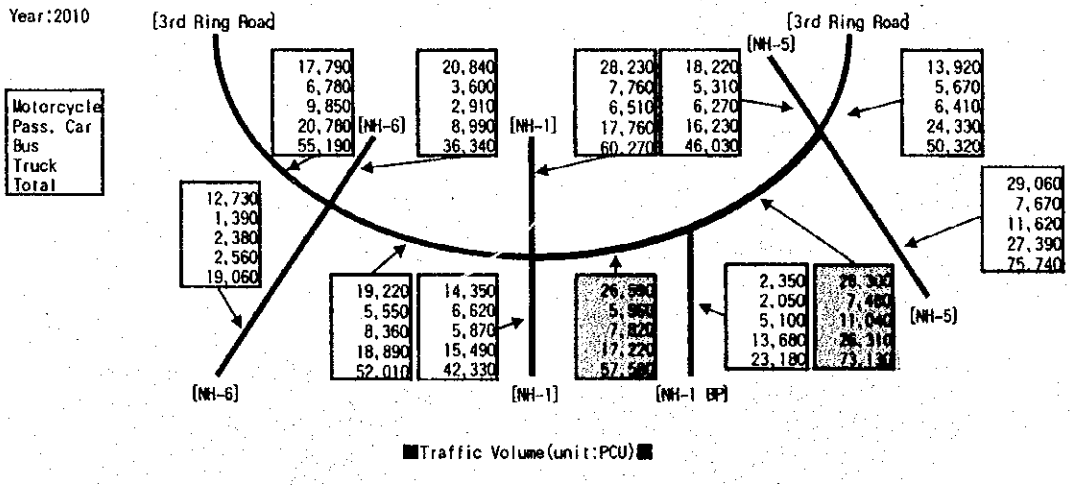
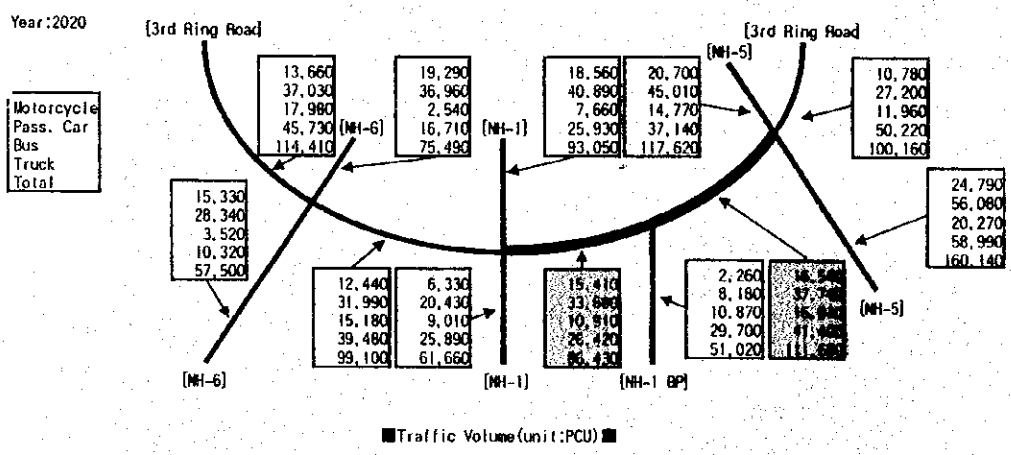


Figure 4.3 Desired Lines, 2020



Traffic Demand by Section, 2010



Traffic Demand by Section, 2020

Figure 4.4 Traffic Demand by Section, 2010 and 2020