

JAPAN INTERNATIONAL COOPERATION AGENCY

HANOI PEOPLE'S COMMITTEE
SOCIALIST REPUBLIC OF VIET NAM

THE MASTER PLAN OF URBAN TRANSPORT
FOR HANOI CITY
IN VIET NAM

EXECUTIVE SUMMARY

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JANUARY 1997

YACHIYO ENGINEERING CO.LTD
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In this report, project costs are estimated at June 1997 price
and at an exchange rate of 1US\$=11,000 VND=¥110

Preface

In response to a request from the Socialist Republic of Vietnam, the Government of Japan decided to conduct the Master Plan of Urban Transport in Hanoi and entrusted the study to the Japan International Cooperation Agency (JICA).

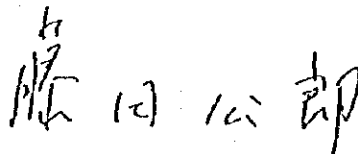
JICA sent to Vietnam a study team headed by Dr. Juro KODERA of Yachiyo Engineering Co. Ltd. (YEC) two times between September 1995 and October 1996.

The team held discussions with the officials concerned of the Government of Vietnam, and conducted field surveys at the study area. After the team returned to Japan, further studies were made and 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 the Socialist Republic of Vietnam for their close cooperation extended to the team.

January 1997



Kimio Fujita
President

Japan International Cooperation Agency

Executive Summary

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Outline of the Study

1. Background of the Study

Since the "Doi Moi" policy was introduced 10 years ago, Vietnam's economy has grown rapidly, and Hanoi has experienced the rapid motorization and urbanization increase. The Government of Vietnam and the authorities of Hanoi City were well aware of the traffic congestion problems, which would hamper Hanoi's development as the center for the nation's administration, business and tourism. They, therefore requested the formulation of an Urban Transport Master Plan with a time horizon of 2015, to Japan. In response to this request, the Government of Japan decided to conduct the study, and the Scope of Works for the Study was signed by the preparatory team, sent by the Japan International Cooperation Agency (JICA) on March, 1995. The Study was commenced on September, 1996 and this Final Report was prepared on January, 1997. The Hanoi Peoples' Committee (HPC) acted as a counterpart agency to the Japanese study team and also as a coordinating body in relation with other organizations concerned for the smooth implementation of the Study.

The objectives of the study were as follows:

- To formulate a Master Plan for strategic urban transportation for Hanoi City.
- To conduct feasibility studies for selected top priority projects among the master plan projects.

The target year of the Master Plan was set at 2015. The target year for the short term priority projects was set at 2005. The study area covers the city of Hanoi with an area of 927 km², including four Hanoi urban (since 1996 it changed to five) and five rural districts.

2. Master Plan

The present built-up area is only 47 Km². About 1.1 million (1995) citizens are living within a 4 Km radius area. The annual

growth rate of Hanoi urban area population is forecast to reach to 6% on average over the next 5 years. The total population in the study area was estimated at 2.4 million in 1995 and is forecast to increase in 2015 to 4.68 million or 2.0 times, out of which 3.4 million will reside in the area surrounding the present built-up area.

The average Gross Domestic Product (GDP) growth in real terms in the 1989 - 1993 period showed the high rate of 6.9% per annum. This high economic growth is forecast to be continued in the future. The economic growth in the Northern Region including Hanoi is forecast to be at the higher rate of 7 - 9% per annum over the next 20 years. GDP per capita in Hanoi will reach to 1,100 US\$ in the target year of 2015.

The share of the motorcycle trips in the built-up area is 57%. However, bicycle trips prevail in the rural areas and the share of bicycle trips is about 70% of all the trips in whole study area. The share of passenger car trips is less than 5%. The share of public transport passengers, mostly bus passengers, is 3% in the urban area, and 5% including inter-city buses between the Hanoi built-up area and settlements scattered in the study area.

The total numbers of trips in the study area will increase from 3.30 million trips/day in 1995 to 8.93 million trips/day or 2.7 times in 2015. Bicycle trips will increase by 1.7 times over the present by 2015. However, the bicycle share will decrease from 61.3% at present to 32.1% in 2015. On the other hand, motorcycle trips will increase by 5.2 times the present and the share will also increase from 31.6% at present to 50.4% in 2015. Passenger car trips will increase by 11.1 times and the share will increase from 0.7% at present to 2.4%. Public transport passenger trips will also increase by 7.7 times and the share will increase from 5.6% to 13.2%.

The development of comprehensive and better quality infrastructure, to attract a part of the commercial and business activities from the present built-up area to the sub-urban area, will reduce the traffic demand concentration in future. The case where a development area will absorb commercial and business activities in the sub-urban area, will reduce the number of trips having their origins or destinations within the present built-up area and the person-Km within the same area by 30% and 16% in 2015 respectively, compared with the case where the individual residences are developed in the sub-urban area as in the present and the commercial and business activities are concentrated in the present built-up area. The area development which provides collectors and feeders will also contribute to the efficient utilization of the space surrounded by trunk roads

The development cores are located at Soc Son, Don Anh, Tang Long North and Gia Lam on the opposite side of the Red River, and Xuan La, Yen Hoa and Dai Kim on the same side as the present built-up area. On the opposite side of the Red River, larger scale, mainly industrial and self-sustained developments are planned, and the main tasks for the transportation network planning are to secure accesses to these development sites. On the other hand, on the same side as the built-up area, smaller scale and individual developments are sprawling continuously from the built-up area to the sub-urban area and land use plans should be prepared urgently and the area should be developed comprehensively. The commercial and business activities should be allocated at each development core.

The development or widening of streets in the present built-up area requires more than 10 times higher compensation cost than the road development in the sub-urban area. Public funds should be mostly invested on road development in the sub-urban area in the near and mid term future from the view point of efficient use of the limited funds. The effective use of the existing transportation facilities should be planned in the present built-up area.

Based on these policies, the Transport Master Plan was formulated by prioritizing each project schemes from the view points of cost performance and the social impacts such as resettlement of residents. The required investment for the Master Plan is estimated at 45,725B.VND, of which 39,388 B.VND is for the road development.

unit: B.VND

Project	1996-2000	2001-2005	2006-2015	Total
Road	6,080.8	12,009.4	21,298.1	39,388.3
MOTC	2,620.1	4,171.9	10,318.9	17,110.9
TUVPS	2,173.6	6,479.4	8,495.9	17,148.9
Road Development	1,875.0	4,663.1	5,431.3	11,969.4
Land Development	298.6	1,816.3	3,064.6	5,179.5
DPC	451.2	522.2	811.5	1,784.9
Others	835.9	835.9	1,671.8	3,343.6
Traffic Management	104.3	75.5	68.4	248.2
Public Transport	646.5	2,453.5	2,583.9	5,683.9
Bus	646.5	1,328.5	662.5	2,637.5
Fleet	642.1	1,285.7	634.2	2,562.0
Terminal/M.Center	4.4	42.8	28.3	75.5
Rail	0.0	1,125.0	1,921.4	3,046.4
Freight/Port	0.0	131.4	273.1	404.5
Total	6,831.6	14,669.8	24,223.5	45,724.9

The available funds of MOTC for the next 20 years are estimated at 18,640 B.VND, and this can cover all the required investment. The total available funds for the next 20 years of TUVPS is estimated at 4,904 B.VND, which covers only 35% of the total amount required. The total available funds of the 5 district people's committees for the next 20 years are estimated at 1,077 B.VND, which amounts 60% of the total required amount.

In 2015, the road length having a V/C of more than 1.5 will comprise 30% of the total road network in the present built-up area on the Do-Nothing Case. In the Master Plan Case, it will reduce to 2%, and 88% of the road network will have V/C of less than 0.5, which is almost the same level as at present.

UNIT:Km

Road Project	1995-2000	2001-2005	2006-2015	TOTAL
MOTC	17.6	54.0	74.0	145.9
TUPWS(Road)	16.5	47.2	55.3	119.0
TUPWS(Land)	5.8	84.9	182.7	273.4
DISTRICT	90.8	90.8	181.6	363.2
OTHERS	72.0	72.0	144.0	288.0
TOTAL	202.8	348.9	637.6	1,189.6

The Net Present Value (NPV), the difference of the total estimated economic cost of the road network development and the economic benefit derived from the Vehicle Operating Cost (VOC) saving by the implementation of the Master Plan network, is calculated at 1,035 B.VND with a discount rate of 12% p.a. The B/C is 1.11 and Economic Internal Rate of Return (EIRR) is 12.86%. The Master Plan network is economically viable, therefore, a system to return the development profit to the public funds should be established to cover the difference between the required investment amount and the estimated available funds.

Among the master plan projects, it is concluded the vital projects in the road network plan by phase are as listed below.

Year	Code	Project
1996 - 2000	A02	National Highway No. 3 Improvement
	A07	South Ring Road No. 3 Construction
	C03	Red River Dike Improvement
	C0607	South Thang Long - Buoi Street
	E02	South Thang Long Road
2001 - 2005	A03	National Highway No. 5 Extension
	A04	National Highway No. 32 Improvement
	C09	Hanoi Bridge Capacity Increase Project
	E03	New Ring Road No. 2 Construction
	E04	New CBD Road Network
2006 - 2015	A08	North Ring Road No. 3 Construction
	C08	Hanoi Interchange Construction Project
	D01	Dong Anh Highway Construction
	F010	Yen Hoa New City Road Network
	F011	Dai Kim New City Road Network

Roads/bridges belonging to MOTC are arterial and early implementation is desirable to support the economic growth in the Study Area.

The listed road projects, other than those related to MOTC, are located in the sub-urban area surrounding the present built-up area. The road network in this area should be developed together with the comprehensive area development. Individual road development will not be efficient. As the estimated budget of TUPWS, which is responsible for these road network developments, cannot cover all the required costs, the expected profit from the land development should be captured for the infrastructure development. As urbanization in the sub-urban area is progressing rapidly, the area development in the sub-urban area

was considered as the most urgent priority project and was adopted as a succeeding Feasibility Study Project to the Master Plan Study.

Improvement of the bus network is required urgently. Fleet reinforcement, however, requires a large budget of 2,638 BVND. The Master Plan proposed the most promising solution of the foundation of a "Bus Holding Company". Therefore, it is recommended that the "Bus Holding Company" should be formed at an early stage.

3. Feasibility Study

The Xuan La site was chosen for the New CBD site, because the site is located along Ring Road No. 3 and has easy to access from National Highway No. 32. Many foreign investment projects are planned in the surrounding area and the development area scale is the minimum based on the preliminary city planning work.

Area	592ha
Population	165,000
Population Density	276 person/ha
Employment	375,000

The ratios of roads and residential areas would be in the range of 28 - 29 % and the ratios of park and the green network would have a similar ratio to business/commercial of 13-14 % to ensure a high level of amenity.

The required investment for the New CBD project is 4,043.3 B.VND, of which 1,258.9 or 31.1% is for the land acquisition. The project was planned to be implemented from 1998 and to be completed in 2005.

The financial evaluation on New CBD development in Xuan La area showed the high return of 6,043.3 B.VND in terms of the accumulative surplus in the last year of the project in 2008. The economic return shows also sufficiently high figures with NPV of 2,771.4 B.VND at a discount rate of 12%, B/C of 1.33 and EIRR of 20.4% based on the economic benefits including VOC saving, cost saving by the integrated land

development, and the land productivity increase.

The environmental impact assessment indicated almost no negative impact on the natural and social environment, except for affect on the farmers earning most of their income from paddy fields in the study area. Some 4,500 households will be compensated and new job opportunities will be created in the New CBD area, where some 165,000 residents and 375,000 employees are expected in the year 2015.

Unit: B.VND

Work Item	1 st Stage	2 nd Stage	3 rd Stage	Total
Road Construction	256.7	204.8	163.2	624.8
Reclamation	219.0	216.4	204.0	639.5
R/C Box Culvert	7.5	15.3	11.4	34.2
Utility Tunnel	293.7	122.3	142.9	559.0
Structure	0.0	0.0	149.7	149.7
Green Belt	63.8	31.0	58.9	153.8
Park	22.6	12.3	11.0	46.0
Disposition Area	116.0	0.0	0.0	116.0
Parking	11.7	0.0	0.0	11.7
Water Supply	40.8	12.5	13.2	66.6
Sewage Pipe	44.6	13.2	13.2	71.1
Power Supply	6.6	0.0	0.0	6.6
Telecommunication	6.6	0.0	0.0	6.6
Construction Total	1,089.9	628.2	767.9	2,486.1
Engineering	183.9	57.2	57.2	298.3
Land Acquisition	423.7	464.9	370.3	1,258.9
Grand Total	1,697.5	1,150.3	1,195.4	4,043.3

Note: Road Area: 1st Stage 70.196ha(2000/2001)
 2nd Stage 53.8523ha(2002/2003)
 3rd Stage 44.490ha(2004/2005)

The feasibility study concludes that the New CBD project is financially and economically viable, will contribute to the improvement of the living and business environment of the urban population, will not affect the public investment funds and has less negative environmental impact than individual developments.

The master plan proposed the comprehensive development of the sub-urban area as the Hanoi Urban Development Corridor (HUDC). The New CBD development in Xuan La must be the first step in the HUDC plan. It is recommended that the project be started immediately.

A New Development Body is necessary to develop land in a systematic and comprehensive way. The Study Team proposed three alternatives for the Development Body, which are: a development corporation established by HPC and MOC; a control authority of private developers established by HPC; and an entrusted development company guided by HPC. All three alternatives would be guided by the HUDC development master plan and controlled by HPC.

It is recommended that HPC should set up a committee to study the organization of the development body as soon as possible.

Subsequently a development body should be established to initiate the New CBD project. The body will be fully responsible for the development.

The preliminary financial analysis of HUDC project shows 47,878.1 B.VND of the accumulative surplus in the assumed last year of the project in 2019. It exceeds the total required investment under the TUPWS responsibility. Therefore, it is recommended that HPC or the new development body should begin a feasibility study on all the HUDC area prior to the commencement of the construction of Ring Road No.3.



1. Background of the Study

In recent years major cities in Asia have been confronted with serious issues resulting from increased road traffic congestion caused by the rapid growth of motorized traffic. This growth is the result of rapidly increasing economic prosperity and the associated trend towards increased urbanization.

Since the "Doi Moi" policy was introduced 10 years ago, Vietnam's economic growth has been rapid. Although motorization and urbanization have increased over this period Hanoi City has not yet been seriously affected by traffic congestion. However, given Vietnam's continuing rapid growth it is only a matter of time before Hanoi is subjected to high levels of traffic congestion, which will retard its further economic development.

The main area of traffic growth on Hanoi has been the rapid increase on motorcycle use. These have replaced the bicycle as the main mode of transport. These two wheeled vehicles are most suitable for Hanoi, which are not accessible to larger vehicles. The proportion of 4 or more wheeled vehicles is currently low, but growing rapidly. Public transport is very poor with few bus routes and no effective urban rail system. In consequence, the vast majority of trip makers use private transport modes.

The Government of Vietnam and the authorities of Hanoi City were well aware of the problems which would be caused by traffic congestion. They are also aware that such congestion would hamper Hanoi's development as the natural administrative centre and a major centre for business and tourism. They, therefore decided that a Master Plan of Urban Transport should be developed with a time horizon of 2015, to ensure that Hanoi is not

subjected to the traffic congestion which is strangling other major Asian cities.

In response to the request of the Government of the Socialist Republic of Vietnam, the Government of Japan decided to conduct the study on urban transportation for Hanoi City in Vietnam, and the Japan International Cooperation Agency (JICA), the official agency responsible for the implementation of technical cooperation programs of the Government of Japan, send a Preparatory Team. The Scope of Work for the Study was agreed upon between both sides, and signed on March, 1995. Following the submission of Inception report on Sept. 1995, Progress Report (1) on Dec., Interim Report on March, 1996, and Progress Report (2) on July 1996, the Draft Final Report was prepared.

The Hanoi Peoples' Committee (HPC) acted as a counterpart agency to the Japanese study team and also as a coordinating body in relation with other governmental and non-governmental organizations concerned for the smooth implementation of the Study.

The objectives of the study were as follows:

- To formulate a Master Plan for strategic urban transportation for Hanoi City.
- To conduct feasibility and solution for selected top priority projects in response to future transport demand.

The target year of the Master Plan was set at 2015. The target year for the short term priority projects was set at 2005. The study area covers the city of Hanoi with an area of 927 km², including four Hanoi urban (since 1996 it changed to five) and five rural districts.

The Master Plan of Urban Transportation for Hanoi City in Viet Nam
Master Plan

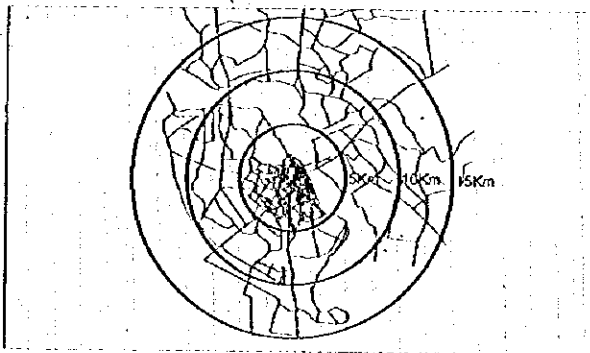
2. Present Issues-1: Rapid Population Increase and Expansion of Urban Area

The study area covers 927 Km², however the present built-up area is only 47 Km² or about 1/20 of all the study area. About 1.1 million (1995) citizens are living within a 4 Km radius area. The city size is relatively small compared with other capital cities in South Asian countries such as Bangkok, Manila, and Jakarta, or even with Ho Chi Min City, the main city in Southern Viet Nam.

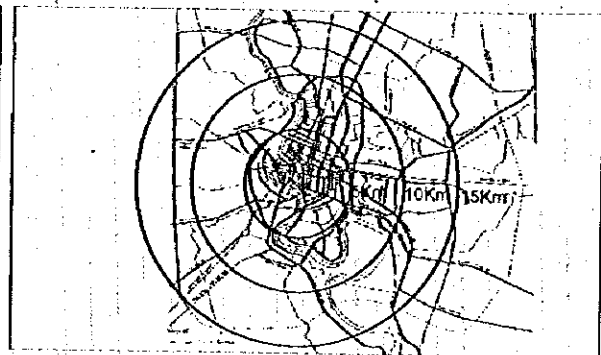
As the market economy has been progressing under the *Doi Moi* policy since 1986, the share of urban population engaged in commercial and business sectors will continue to increase. The urban population increase in Hanoi recorded the high rate of 3.7% per annum in 1995, and the annual growth rate is forecast to reach to 6% on average over the

next five years. This growth rate is higher than the record of 4.3% per annum in Bangkok in the 1970s. The total population in the study area was estimated at 2.4 million in 1995 and is forecast to increase in 2015 to 4.68 million or 2.0 times, out of which 3.4 million will reside in the area surrounding the present built-up area.

In the rural area within the Study area, large scale and clustered developments, which aim at mainly industrial development such as the Export Processing Zone (EPZ), are planned to absorb a part of the increasing population. Establishment of individual manufacturing industries has already started in the Gia Lam area, which is located adjacent to the built-up area on the opposite side of the Red River.



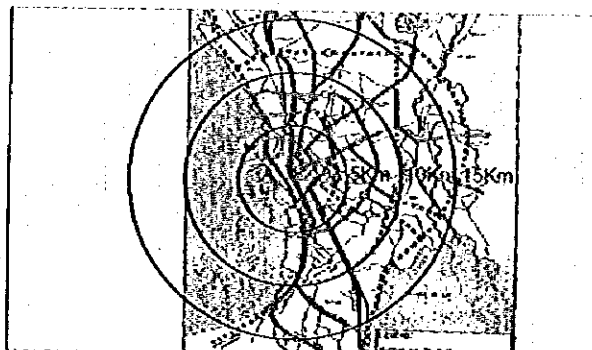
HANOI



BANGKOK



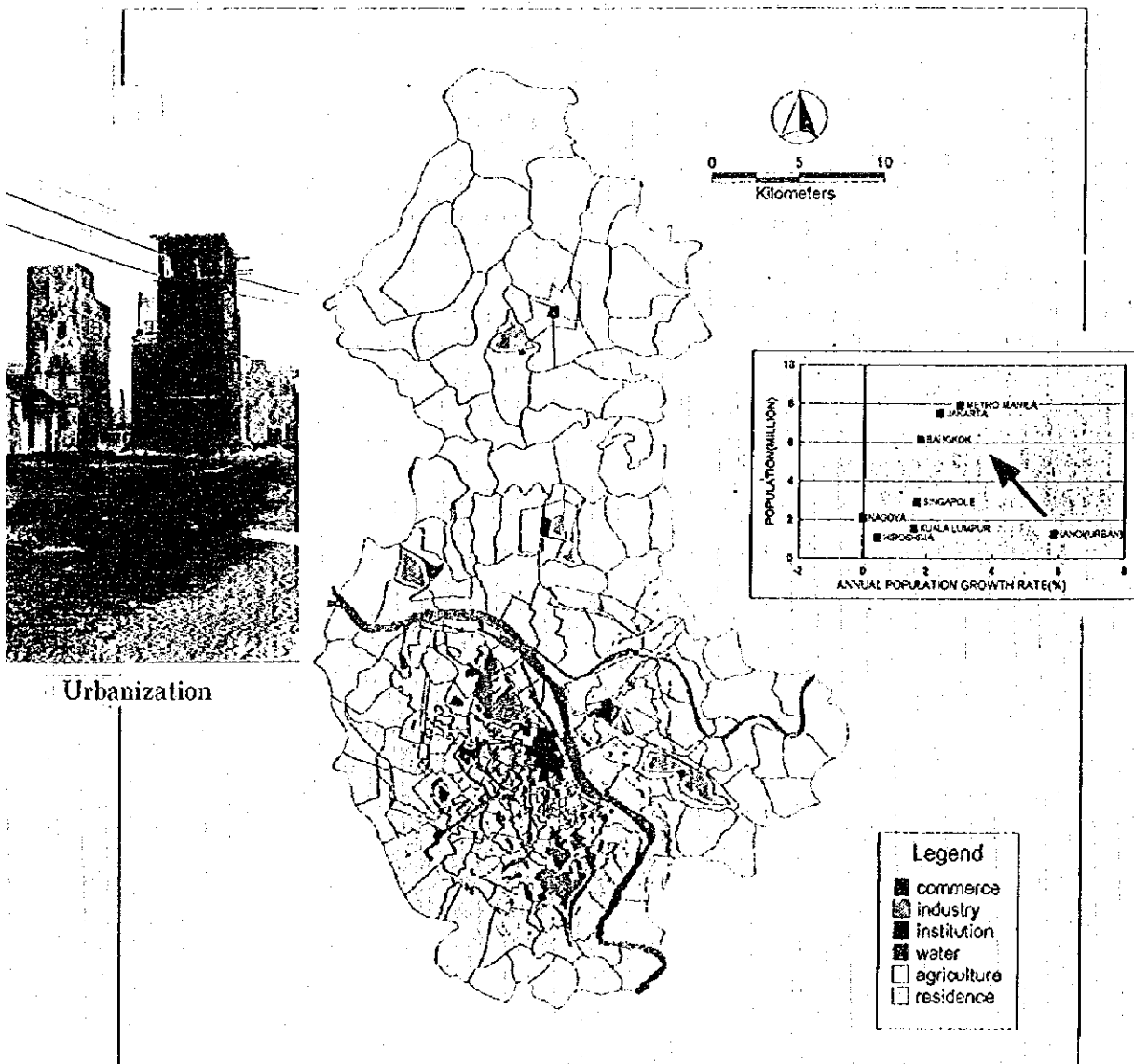
JAKARTA



MANILA

The urban area will expand to 3.6 times the present size in the next 20 years, even if the same growth rate as the population is assumed, and an area with 7 Km radius will be urbanized. If the present low rise and high density crowded living conditions, with the population density of 260 persons/ha in average or 1,000 persons/ha at the Ancient Quarter, changes towards lower density, the urbanized area will expand more.

The expansion of the urbanization has already started. Individual housing developments without sufficient infrastructure are seen in the sub-urban area surrounding the present built-up area. Therefore, the infrastructure development should be planned in advance of the urbanization from the long term point of view.



2015 Land Use

The Master Plan of Urban Transportation for Hanoi City in Viet Nam
Master Plan

3. Present Issues-2: Rapid Economic Growth and Motorization

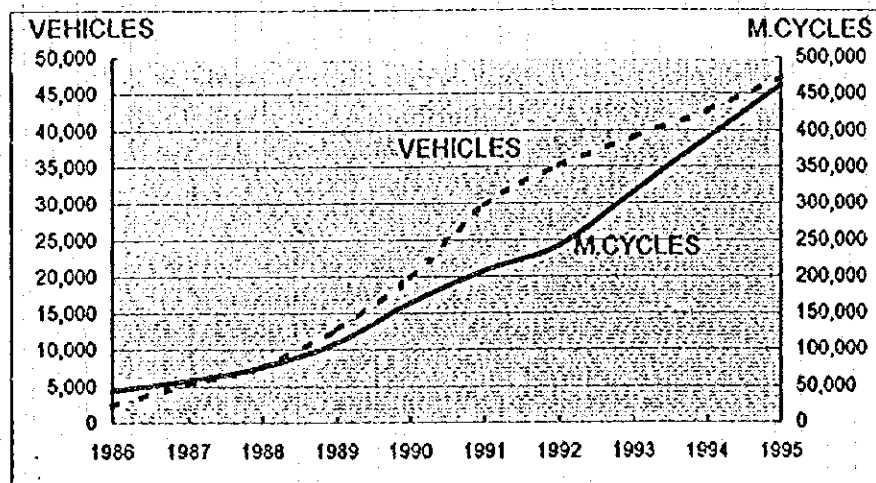
The average Gross Domestic Product (GDP) growth in real terms in the 1989 - 1993 period showed the high rate of 6.9% per annum. This high economic growth is forecast to be continued in the future. The economic growth in the Northern Region including Hanoi is forecast to be higher rate of 7 - 9% per annum over the next 20 years.

The total number of registered vehicles in 1995 in Hanoi was 47,300, of which 12,600 vehicles were passenger cars. The passenger car ownership was calculated at about 40 cars per 1,000 inhabitants, which is about 1/4 of the ownership of about 170 per 1,000 inhabitants in Bangkok in 1990. On the other hand, in accordance with the market economy policy, the Foreign Investment Law was promulgated in 1988. Consequently, 13 car manufacturing joint ventures are already approved in all Viet Nam and 2 more joint ventures are waiting for approval at present.

The number of registered motorcycles in Hanoi in 1995 was 462,000, and the ownership

was 1 motorcycle per 2.4 inhabitants. Among the motorcycles, the growth rate of the 70 - 150 cc class motorcycles recorded the very high rate of 57.4% per annum on average in the 1992 - 1995 period. The share of this class exceeded that of the motorcycles of less than 150cc is only 0.6% at present, however the growth rate is 9.0% per annum.

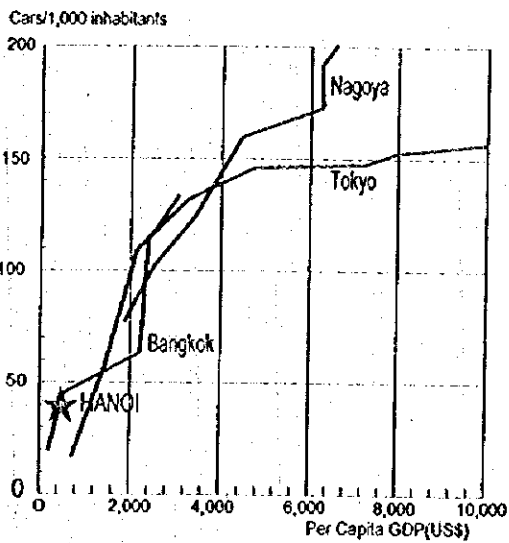
The share of the motorcycle trips in the built-up area is 57%, which is more than the half of the total trips. However, the motorcycle is still expensive compared with the average income, therefore bicycle trips prevail in the rural areas and the share of bicycle trips is about 70% of all the trips in whole study area. The share of passenger car trips is less than 5%. The share of public transport passengers, mostly bus passengers, is 3% in the urban area, and 5% including inter-city buses between the Hanoi built-up area and settlements scattered in the study area.



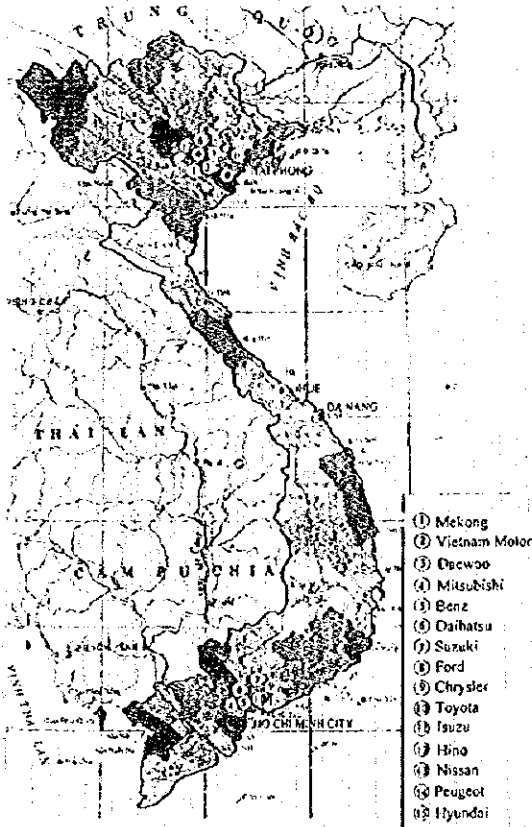
Vehicle Registration

If the Viet Nam economy continues to increase with the annual growth rate of 7 - 9% in real terms for the next 20 years, GDP per capita in Hanoi will reach to 1,100 US\$ in the target year of 2015. Accordingly the passenger car ownership is forecast to increase by 3 times,

and the number will increase by 10 times, based on the past trend in the other cities. If all the approved car manufacturing joint ventures start to operate, the numbers of cars in the country may increase more.



Per Capita GDP and Car Ownership



Car Manufacturing Industries



The Master Plan of Urban Transportation for Hanoi City in Viet Nam
Master Plan

4. Present Issues-3: Poor Transport Infrastructure

The road area rate in the Hoan Kiem District in the center of the Hanoi built-up area is 22.9%, which provides a convenient living and business environment. However in Don Da District adjacent to Hoan Kiem District, the network consists of only trunk roads with about a 1 Km interval and the rate reduces to 3.2%. A labyrinth of narrow streets of 3 - 5 m in width run within the blocks surrounded by the trunk roads. Four wheel vehicles cannot access these streets, while the access of such emergency vehicles such as ambulance or fire cars is indispensable for a safe living environment.

In view of the above, the road development in these areas imposes high burden on public

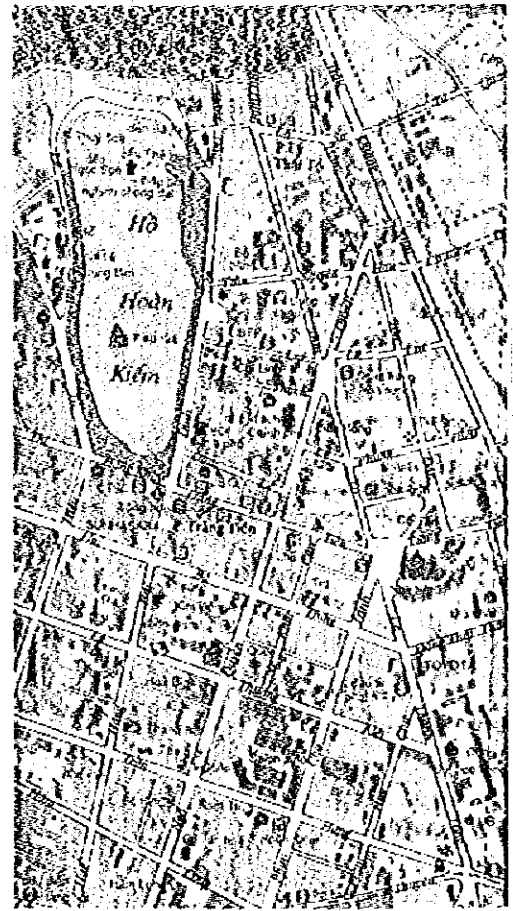
funds because of high ROW and compensation costs.

Non-motorized traffic, mostly bicycle, and motorized traffic are not segregated on most roads, and the mixed traffic causes a speed reduction for 4 wheel vehicles and safety problems for non-motorized traffic.

In the sub-urban area adjacent to the present built-up area surrounded by ring road No. 2, only 6 radial roads of National Highways No.1-A, 1-B, No.6, No.32 and the Red River Dike Road are paved and well developed. The urbanization is expanding along these radial roads and other narrow agricultural roads.



DONG DA DISTRICT



FRENCH QUARTER

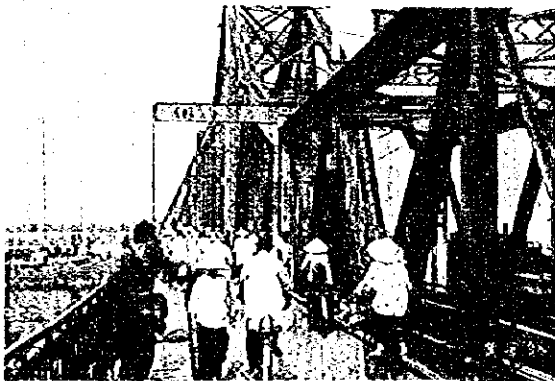
The present built-up area and the opposite side of the Red River, where various land developments are planned, are connected by only 3 bridges;

- Chuong Duong Bridge, having 2 lanes for 4 wheelers and 2 side lanes for motorcycles
- Long Bien Bridge, having a single track railway and 2 side lanes for bicycles; and
- Thang Long Bridge, having a double deck with 4 lanes for motorized vehicles on the upper deck and a double track railway and 2 side lanes for bicycles on the lower deck.

The total traffic capacity of these 3 bridges will not be sufficient for the future traffic demand. A part of Long Bien Bridge was destroyed by the bombing during Viet Nam

War, and is at present supported by the temporary piers. Also most of the steel members are heavily corroded.

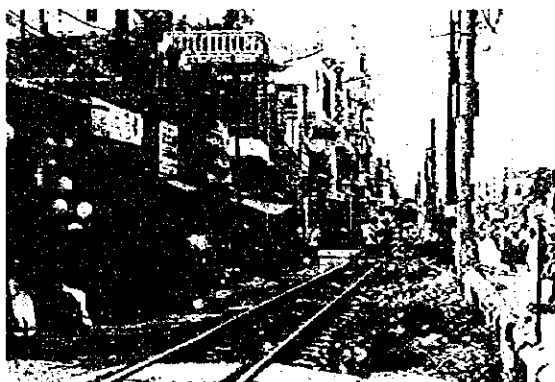
The single track railway line runs North-South direction at the center of the present built-up area with many houses close to the line. The operation between Gia Lam and Giap Bat stations at the sub-urban area was stopped in early 1996, except for few trains, which run with very low speed over the Long Bien Bridge and through the built-up area. The 76 public buses out of a fleet of 177 are operated by Hanoi Bus Company. The main models are KFW, and Karossa made in the former East Germany and Czechoslovakia respectively. Bus passengers are less than 100,000 a day and are reducing due to the increase in motorcycle use



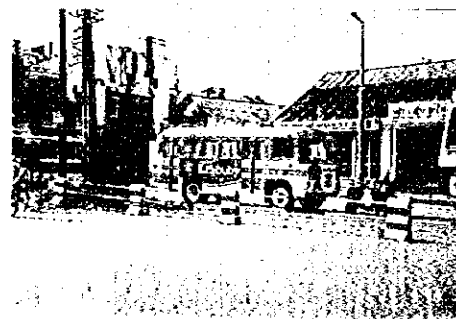
Deteriorating Bridge



Narrow Street



Shops along Railway



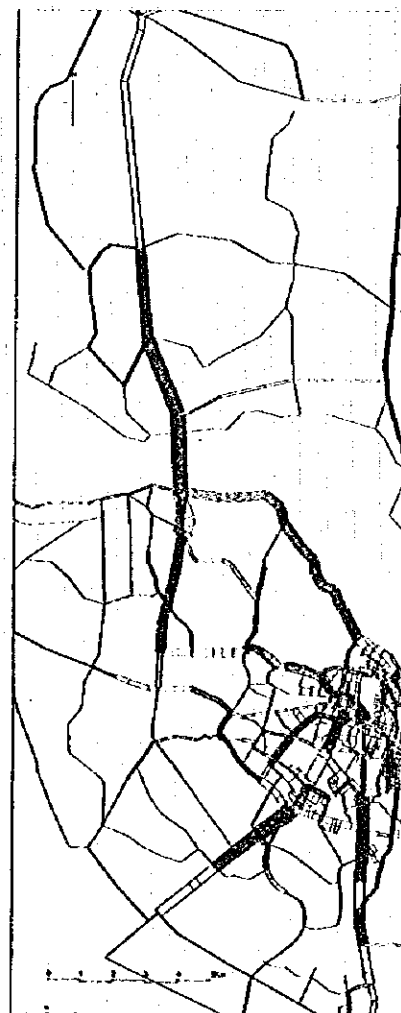
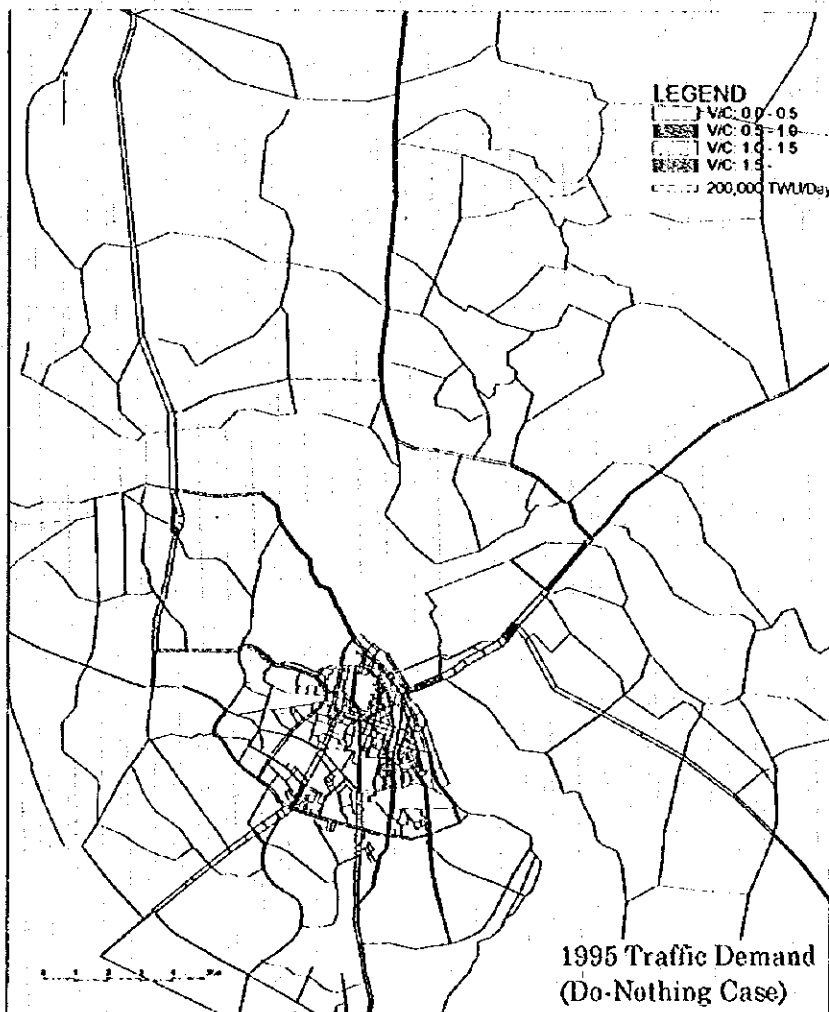
Present Bus Fleet

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Master Plan

5. Transport Demand Forecast

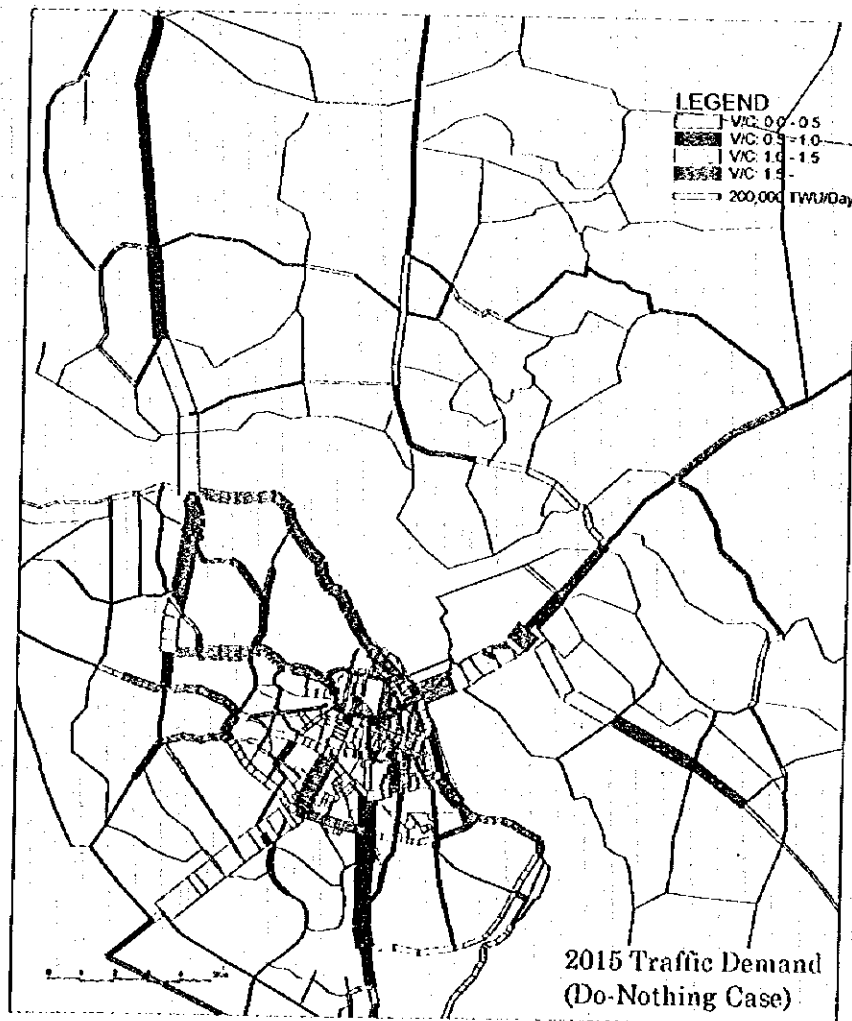
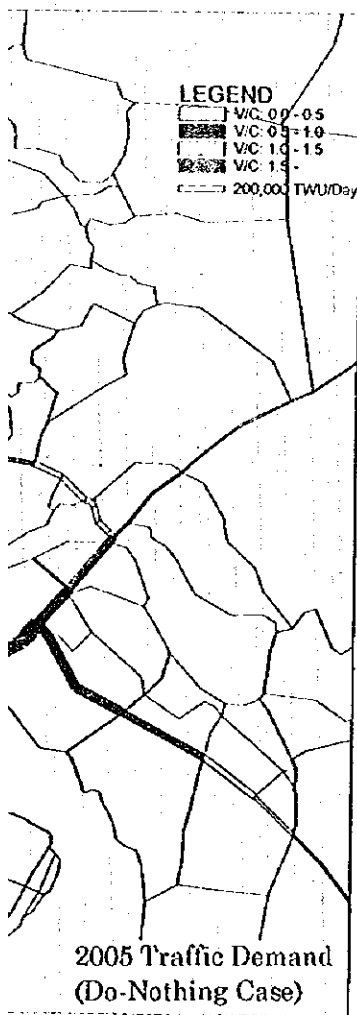
The total numbers of trips in the study area will increase from 3.30 million trips/day in 1995 to 8.93 million trips/day or 2.7 times in 2015. The trips within the area south west of the Red River, where the present built-up area is located, will increase from 2.00 million trips/day in 1995 to 5.73 million trips/day or 2.9 times. The trips crossing the Red River will increase from 0.42 million trips/day to 1.43 million trips/day or 3.4 times, and the trips within the area north east of the Red River will increase from 0.87 million trips/day to 1.78 million trips/day or 2.0 times.

Bicycle trips will increase by 1.7 times over the present by 2015. However, the bicycle share will decrease from 61.3% at present to 32.1% in 2015. On the other hand, motorcycle trips will increase by 5.2 times the present and the share will also increase from 31.6% at present to 50.4% in 2015. Passenger car trips will increase by 11.1 times and the share will increase from 0.7% at present to 2.4%. Public transport passenger trips will also increase by 7.7 times and the share will increase from 5.6% to 13.2%.



If no transport network is developed, the share of the road length with the volume to capacity ratio (V/C) of less than 0.5 will decrease from 93% in 1995 to 35%, and the share of roads having V/C of more than 1.5, which is considered the allowable maximum limit, will increase to 20%.

The passenger-Km will increase from 17,356 million person-Km to 57,987 million or 3.3 times. The investment to develop the transport network to secure a traffic capacity growth rate, which is the same as that of person-Km, is required to maintain at least the present level of service.



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6. Master Plan Formulation Policy

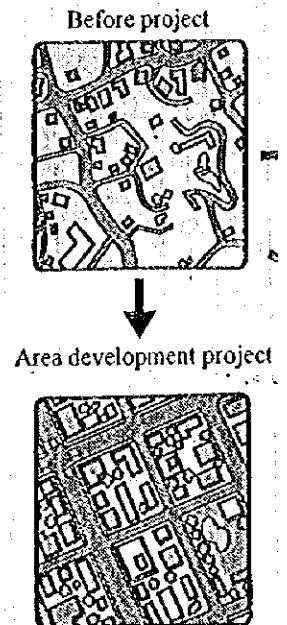
The trunk road network development to accommodate the future traffic demand cannot reduce the future demand concentration at the present city center, generated by individual development in the sub-urban area. The development of comprehensive and better quality infrastructure, to attract a part of the commercial and business activities from the present built-up area to the sub-urban area, will reduce the traffic demand concentration in future. The case where a development area will absorb commercial and business activities in the sub-urban area, will reduce the number of trips having their origins or destinations within the present built-up area and the person-Km within the same area by 30% and 16% in 2015 respectively, compared with the case where the individual residences are developed in the sub-urban area as in the present and the commercial and business activities are concentrated in the present built-up area. The area development which provides collectors and

feeders will also contribute to the efficient utilization of the space surrounded by trunk roads

The development cores are located at Soc Son, Don Anh, Tang Long North and Gia Lam on the opposite side of the Red River, and Xuan La, Yen Hoa and Dai Kim on the same side as the present built-up area. On the opposite side of the Red River, larger scale, mainly industrial and self-sustained developments are planned, and the main tasks for the transportation network planning are to secure accesses to these development sites. On the other hand, on the same side as the built-up area, smaller scale and individual developments are sprawling continuously from the built-up area to the sub-urban area and land use plans should be prepared urgently and the area should be developed comprehensively. The commercial and business activities should be allocated at each development core.

Comparison of Motorcycle, Bus and Passenger Car

Descriptions	Motorcycle	Bus	Passenger Car	M.Cycle P.Car	Bus/P.Car
PCU	0.3	2.0	1.0	0.30	2.0
Occupancy (Hanoi)	1.40	24.09	2.90	0.48	8.31
Lane (3.5m) Capacity					
Unit/Hr	7,000	1,000	2,000	3.50	0.5
PCU/Hr	2,100	2,000	2,000	1.05	1.0
Trip/Hr	9,800	24,090	4,200	2.33	5.74
Fuel Consumption Rate					
litter/100Km/Unit	3.25	35.0	10.8	0.30	3.24
litter/100Km/Trip	2.32	1.45	5.14	0.45	0.28
Economic VOC					
VND/Km/Unit	349.10	5,153.46	2,121.95	0.16	2.43
VND/Km/Trip	249.36	213.93	1,010.45	0.25	0.21

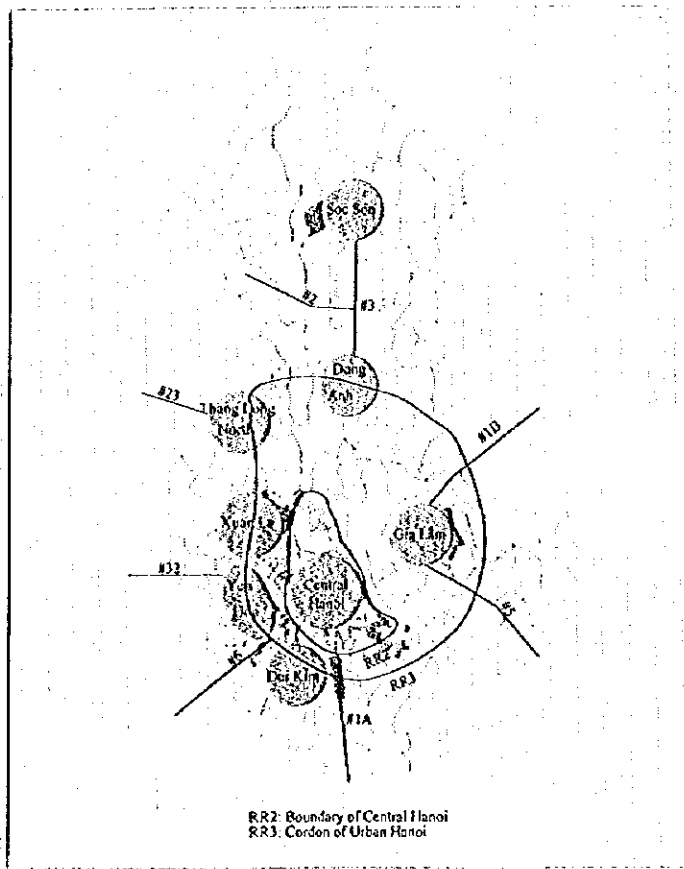
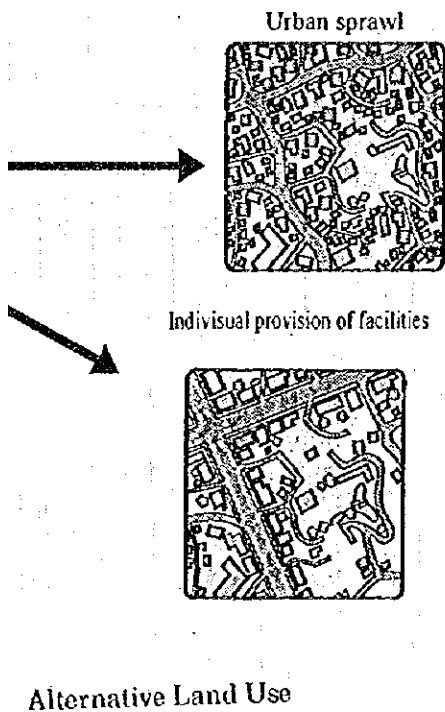


The development or widening of streets in the present built-up area requires more than 10 times higher compensation cost than the road development in the sub-urban area. Public funds should be mostly invested on road development in the sub-urban area in the near and mid term future from the view point of efficient use of the limited funds. The effective use of the existing transportation facilities should be planned in the present built-up area.

Two wheel vehicles will continue to be the major transport mode in the study area. If passenger car use increases without any control, traffic congestion will occur in many parts of the present built-up area. Car use should be discouraged by the restriction of car

entry in such area as the Ancient Quarter, or by the limitation of car parking construction in the present built-up area.

The use of public transport should be encouraged, while passenger car use should be discouraged. The bus fleet should be developed in accordance with the demand increase, however the mode shift from the private to the public mode should be promoted to reduce car use. The railway will be planned mainly to use the existing lines. The study of the railway will focus on the clarification of the relationship between necessary cost and revenue from the forecast demand. The introduction of urban railways will be recommended if financially and economically viable.



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7: Red River Crossing Bridges Plan

The traffic demand crossing the Red River is forecast to increase from 0.48 million trips/day in 1995 to 1.48 million in 2015 or 3.05 times. If the capacity is not increased, the V/C of the Red River crossings will also increase from 0.46 in 1995 to 1.39 in 2015, which is about the allowable limit.

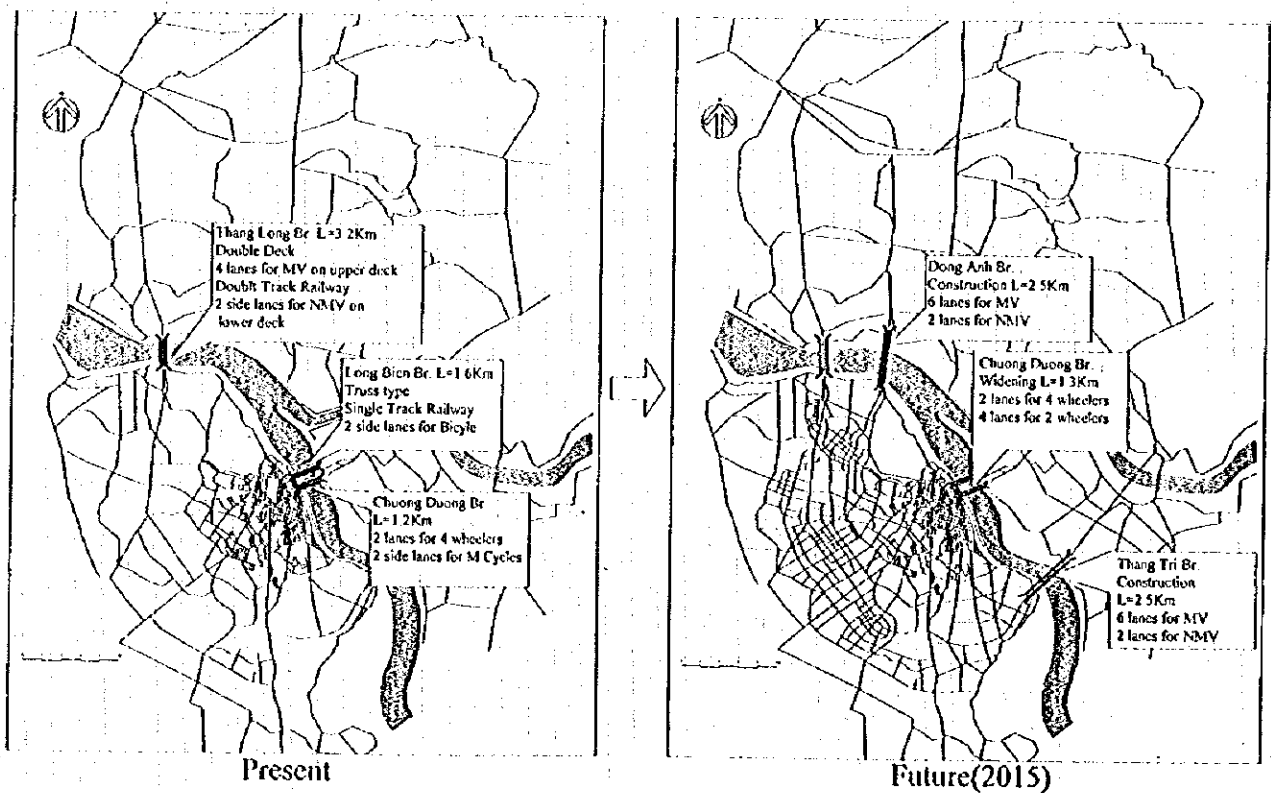
The traffic crossing the Red River is at present served by the 3 bridges:

- Chuong Duong Bridge exclusively for motorized vehicles;
- Long Bien Bridge for the railway with side lanes for bicycles; and
- Thang Long Bridge for vehicles and a railway having double deck.

The present traffic demand on the Chuong

Duong and Long Bien bridges combined, and on Thang Long Bridge are estimated at about 80,000 pcu/day and 66,000 pcu/day respectively. These demands will increase in 2015 to 24,100 pcu/day or 3.0 times, and 20,700 pcu/day or 3.1 times respectively, and they will exceed the traffic capacities.

A new bridge, Thang Tri Bridge, is planned south of the Long Bien and Chuong Duong bridges as a part of Ring Road No.3, connecting with the National Highway No.1-A to the south of the built-up area and No.5 in Gia Lam District, to act as a bypass for the traffic from Hai Phuong Port. Another new bridge, Don Anh Bridge, which has not been planned, is proposed east of Thang Long bridge, as the extended section of the new ring road No.2.



Bridge Plan

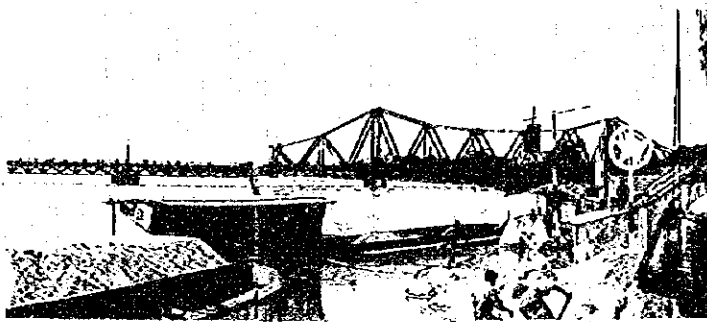
One more new bridge parallel to the existing Chuong Duong Bridge is planned to accommodate the future traffic demand. This would also accommodate the railway replacing the existing Long Bien Bridge, which has safety problems caused by the corrosion of members and by the temporary piers repaired after the collapse caused by the bombing

The investment to provide a new railway bridge will not be justified from the view point of securing an urban transport capacity.

Therefore the investment for the railway bridge would be planned from the view point of securing a nation wide railway network.

The estimated costs for the Red River crossing bridges are;

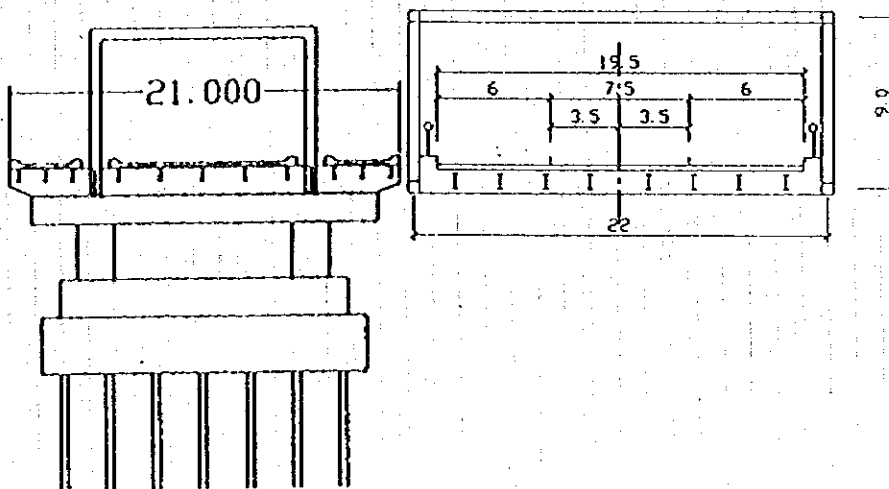
Name	Length(Km)	Cost(B.VND)
Tang Tri	2.5	4,189.0
Chong Duong	1.3	654.9
Don Anh	2.5	3,808.0



Long Bien Bridge



Corroded Member



Chong Duong Bridge Improvement

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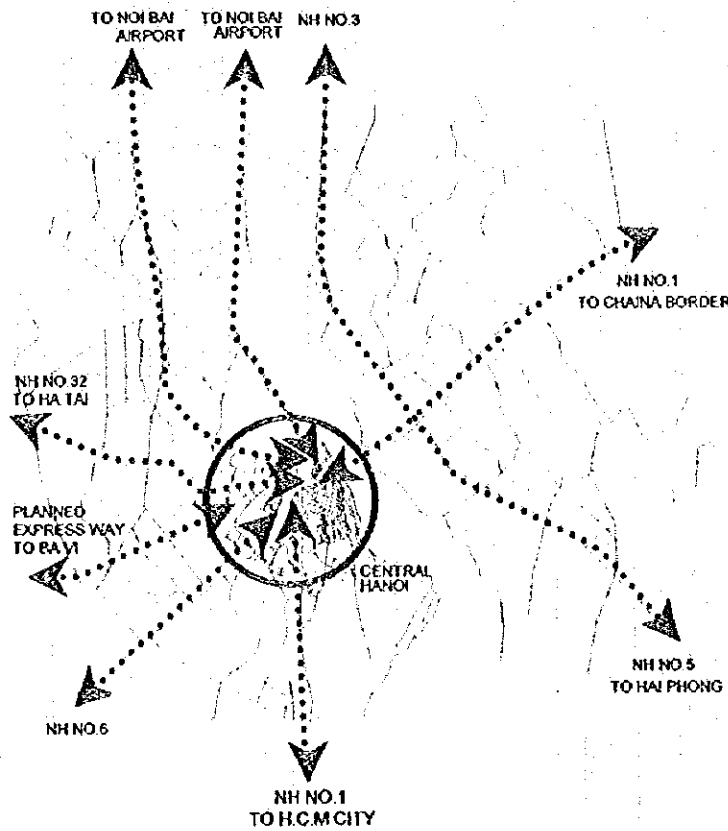
8. Radial and Circular Roads Development

The existing radial roads from the Hanoi built-up area consist of 7 roads of National Highways No.1-A and No.1-B, No.3, No.5, No.6, No.32 and the Noi-Bai Airport expressway. The improvement of National Highways No.1 and 5 is under way and National Highway No.6 and the Noi Bai Airport Expressway have sufficient width and good surface condition. Therefore, the improvement plans for National Highway No. 3 and No.32 are proposed in this study. Two additional radial roads are proposed, one runs towards a new city located west of Hanoi and another as the extension of the new ring road No.2 through Don Anh district toward the Noi Bai Airport.

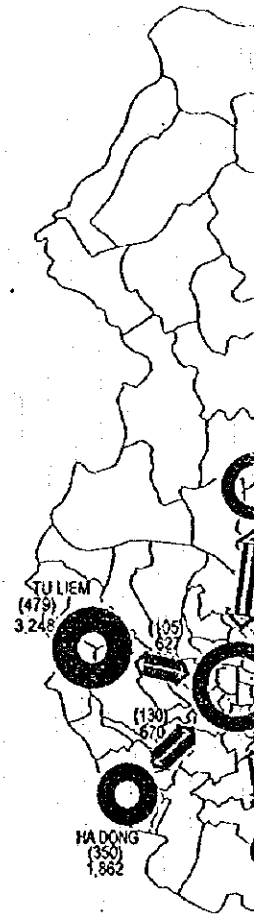
The national highway No.3, which is the north to south trunk road through the study area and

provides the main access to Soc Son and Don Anh industrial development areas, is an 8m wide 2 lane road at present, and is planned to be widened to 4 - 8 lanes for motorized vehicles having 2 side lanes for bicycles. National highway No.32, which is the trunk road to serve traffic to the west of Hanoi, is an 8m wide 2 lane road at present, and is planned to be widened to 4 - 6 lanes for motorized vehicles with 2 side lanes for bicycles.

An expressway to connect Hanoi with a new city planned in Ha Tai Province is planned to be a 14m wide 2 lane road in the current plan. A new radial road between National Highway No.3 and the Noi Bai Airport Expressway is planned to be 6 lanes for motorized vehicles with 2 side lanes for bicycles.



Radial Roads



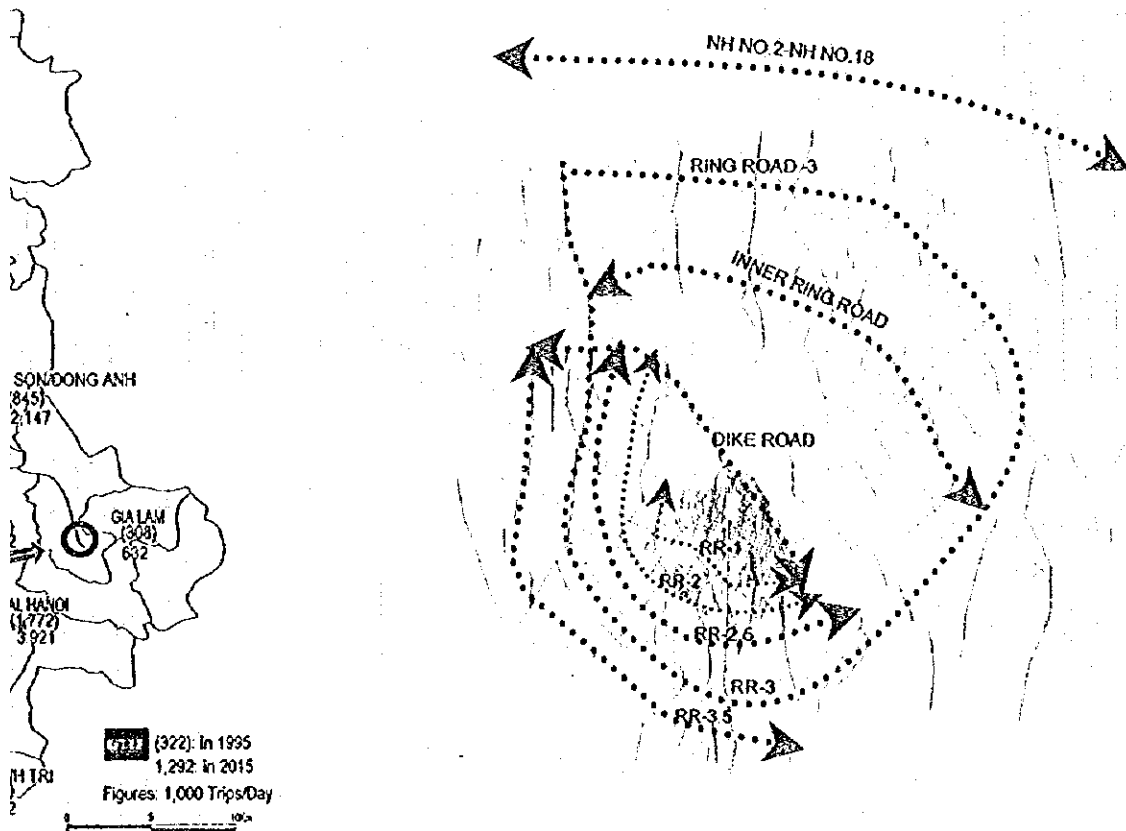
Traffic Demand

The ring roads No.1, No.2 and No.3 have currently been defined in the Hanoi urban area. A part of the Ring Road No.1 is a 60m wide divided 6 lane road. However most sections are undivided 2 lane, and some sections have a narrow width, where only two wheel vehicles can pass. In practice, the road does not form a full ring. Most of the sections of the Ring Road No.2 are undivided 2 lanes, and the road forms a full ring together with the Red River Dike Road. However, many houses are already located along the road, and the widening to a divided 4 lane road will face serious difficulties.

Ring Road No.3 does not exist at present. Except for the section duplicated with the Noi Bai Airport Expressway, the planned align-

ment runs on agricultural roads or on vacant land, and the compensation for residents will be small. However, it should be developed urgently as the urbanization is expanding gradually to this area. The road is planned to be 40m wide having 4 lanes for motorized vehicles with 2 side lanes for bicycles.

In addition to ring roads No.1 through No.3, a half ring road to supplement ring roads No.2 and No.3, and another half ring road along the Nue river, which forms the outer limit of the Hanoi urban area in 2015, are planned in the western part of the built-up area. On the opposite side of the Red River of the built-up area, a half ring road extended from the existing national highway No.5 is planned.



Circular Roads

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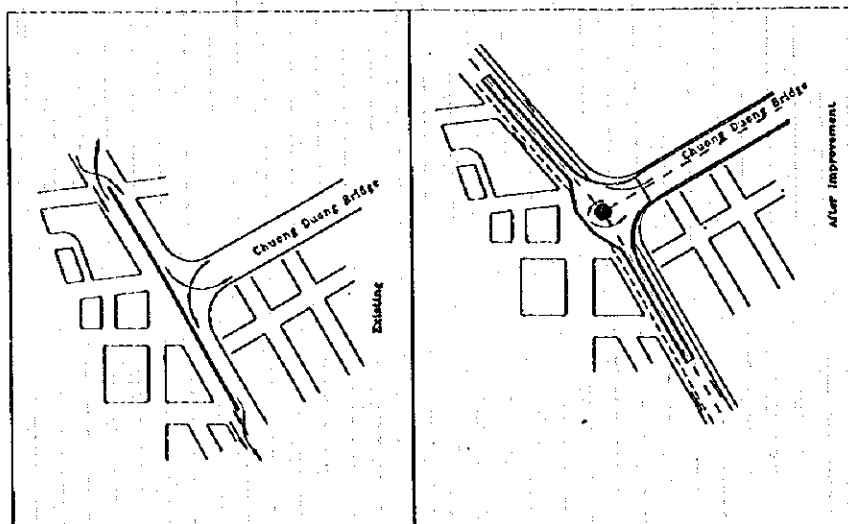
9. Road Development Plans in Built-up Area

The plans such as the completion of the Ring Road No.1, the improvement of the railway crossing of Nguyen Khuyen St., which is one of the bottle necks of traffic flow, the widening of Tay Son St. from the intersection with the highway No.6 and the Ring Road No.2, the widening of the city center section of Kim Ma St., and the width adjustment of Chua Boc St. against the illegally occupied houses in the ROW are considered as urgent projects in the present built-up area.

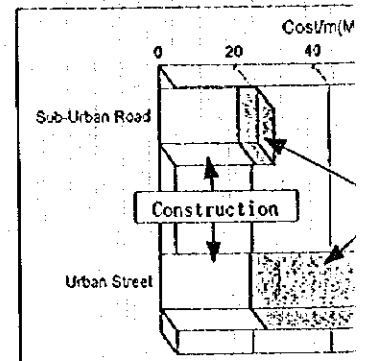
However, the road development in the built-up area requires 4 times higher development cost, caused by 10 times higher compensation cost than the costs in the sub-urban area. On the other hand, if the land use is adequately guided in future, the traffic demand increase in the next 20 years in the built-up area will be 0.8 times the increase in the sub-urban area. Consequently, the investment in the road development in the present built-up area is much more

inefficient compared to the investment in the sub-urban area in medium to long term.

In the built-up area, the road network in the area called the Ancient Quarter is well developed despite of the insufficient road widths. In the area called the French Quarter, the network is also well developed in the grid pattern with sufficient road widths. The road network in Hoan Kiem District, which includes the both areas, is well developed. while the coarse road networks in the other 3 urban districts cause the extreme concentration of traffic demand on the trunk roads. The development of trunk roads, collectors and feeders is necessary in these areas. However, because of the inefficiency of the investment at present, the road network development in these areas would be planned after the development of the sub-urban area, which is expected to absorb a part of the demand.



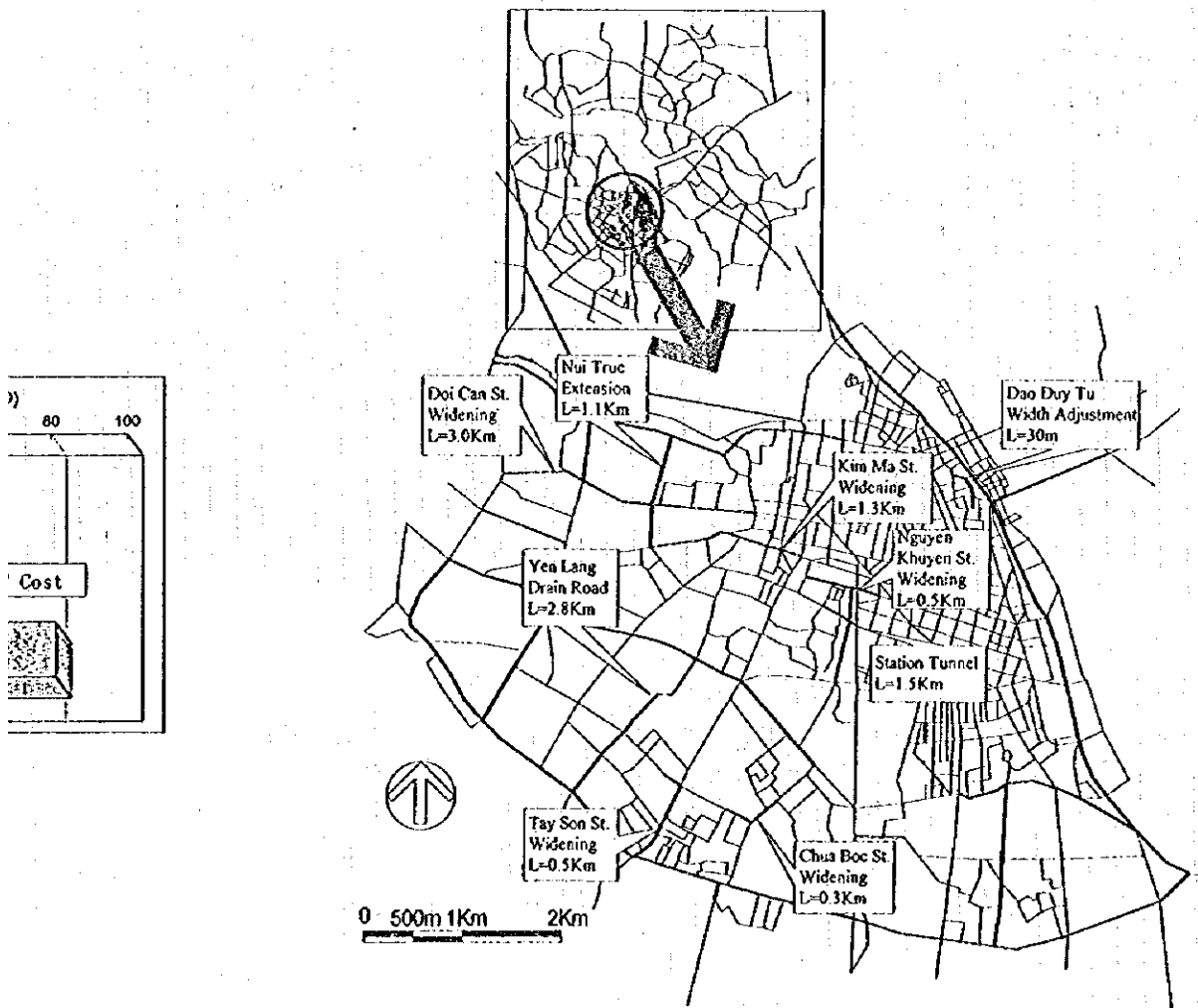
Chong Duong Bridge Interchange



Cost Comparison

In the road sections which are considered to be improved urgently, the necessary ROW should be established by means of the legal process. Construction within the ROW should be controlled to protect the land from more illegal

housing. By these processes, the land will be secured gradually, and after that, the actual construction works should be implemented to avoid conflict with residents.



Road Projects in Built-up Area

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10. Road Development in Sub-Urban and Rural Area

Roads in Sub-Urban Area

If only trunk roads are developed in the sub-urban area adjacent to the present built-up area, houses will be constructed facing these trunk roads and the land surrounded by the trunk roads will not be utilized efficiently. This has happened in the western part of the present built-up area.

To avoid this situation, collector and feeder roads are planned in the sub-urban area to achieve effective land use. They will not contribute much to the future traffic demand and supply balance.

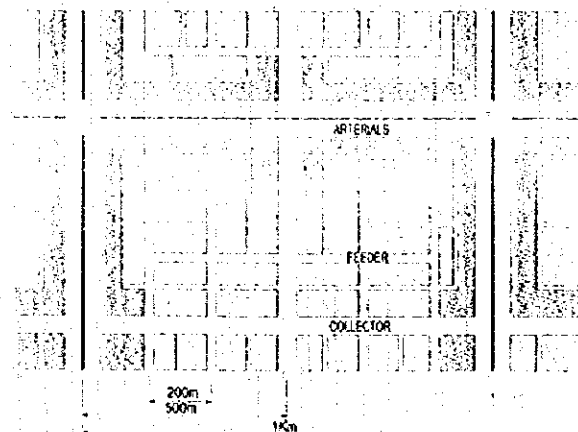
The collectors and feeders are planned based on the following policies:

- To form hierarchical road network
- Collectors will supplement the trunk road network, and are planned with about a 1 Km interval.
- Feeders are planned to form 200 - 250 m blocks at the locations where commercial and business activities are expected in future.

The road length excluding trunk roads by development area are as follows.

Unit: Km

Road Classification	Xuan La	Yem Hoa	Dai Kim
Collector	8.90	47.54	9.43
Feeder	9.48	50.63	10.03
Non motorized Road	0.54	2.86	0.57
Total	18.92	101.06	20.03



Road Hierarchy



Non-motorized Street

Rural Roads

In the Hanoi rural area, there exist about 360 Km rural roads. The improvement of these roads will not be justified from the view point of economic efficiency based on VOC savings. However, at least the same rate of the investment to the past should be continued to be spent fulfill the basic human needs to support the lives of rural population.

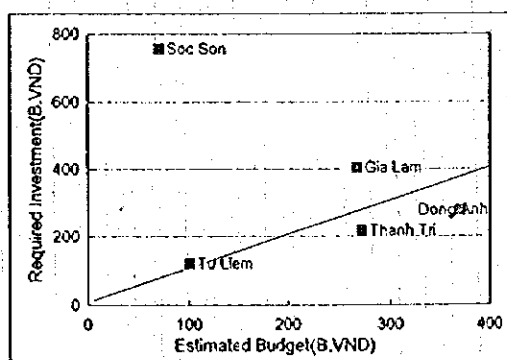
These rural roads are planned to be upgraded to all weather roads of at least 6m wide to allow the entry of 4 wheel vehicles. The priority of each road section was evaluated based on population directly affected by the section.

When comparing the required investment amount in each district for the next 20 years with the estimated available funds based on

the past records, in Soc Son District, which is located in the most remote area from the built-up area, rural road improvement requires about 8 times higher investment than at present, while in other districts the investment will be almost the same level as present. In Don Anh and Thanh Tri districts, the rural roads are well developed and the investment in the next 20 years will be slightly lower than the past.

The total required investment for the 5 districts is estimated at 1,785 B.VND, which exceeds the estimated available funds for the next 20 years of 1,078 B.VND. The budget in Soc Son district should be increased at least to the same level as in the other districts, or in proportion to the area.

District	Length(Km)	Bridge(No.)
Soc Son	155.3	5
Dong Anh	56.2	3
Tu Liem	25.0	-
Gia Lam	82.7	1
Thanh Tri	43.9	1
Total	363.2	10



Rural Road Budget and Required Investment



Rural Road

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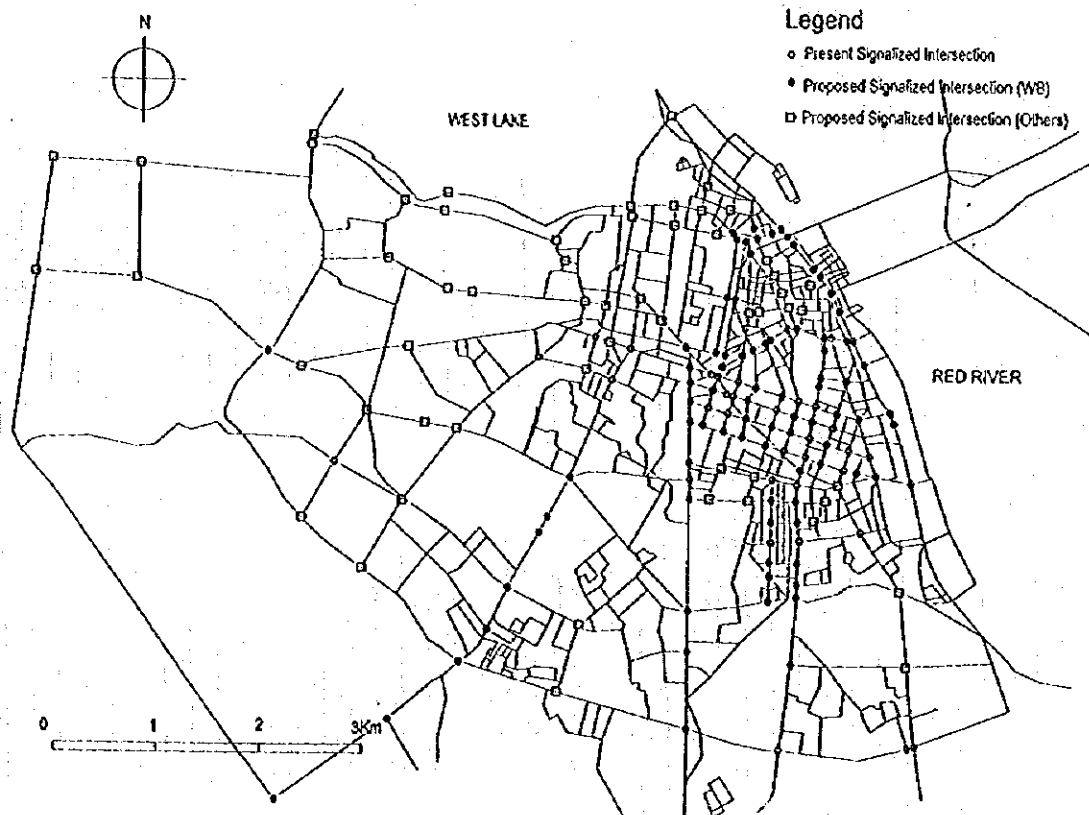
11. Traffic Management

Very high motorcycle use (100cc size) is major feature in Hanoi. Motorcycles are replacing bicycles as the main mode and this trend is increasing year by year. Thus, a "Motorcycle oriented transport environment" has been created. The proportion of four wheel vehicles is currently small but growing steadily.

In such a circumstance the current infrastructure for road transport will not be able to accommodate the dramatic population and vehicle use increase in Hanoi. Countermeasures to restrain such demands are urgently required. By improving available infrastructure a smoother, safer and more comfortable transport environment would be produced.

Traffic signal installation is a vital requirement for urban traffic, to provide effective control of intersecting traffic and to achieve optimal network performance. Signal installation has to be conducted for an extensive area in accordance with the French Government and the World Bank projects.

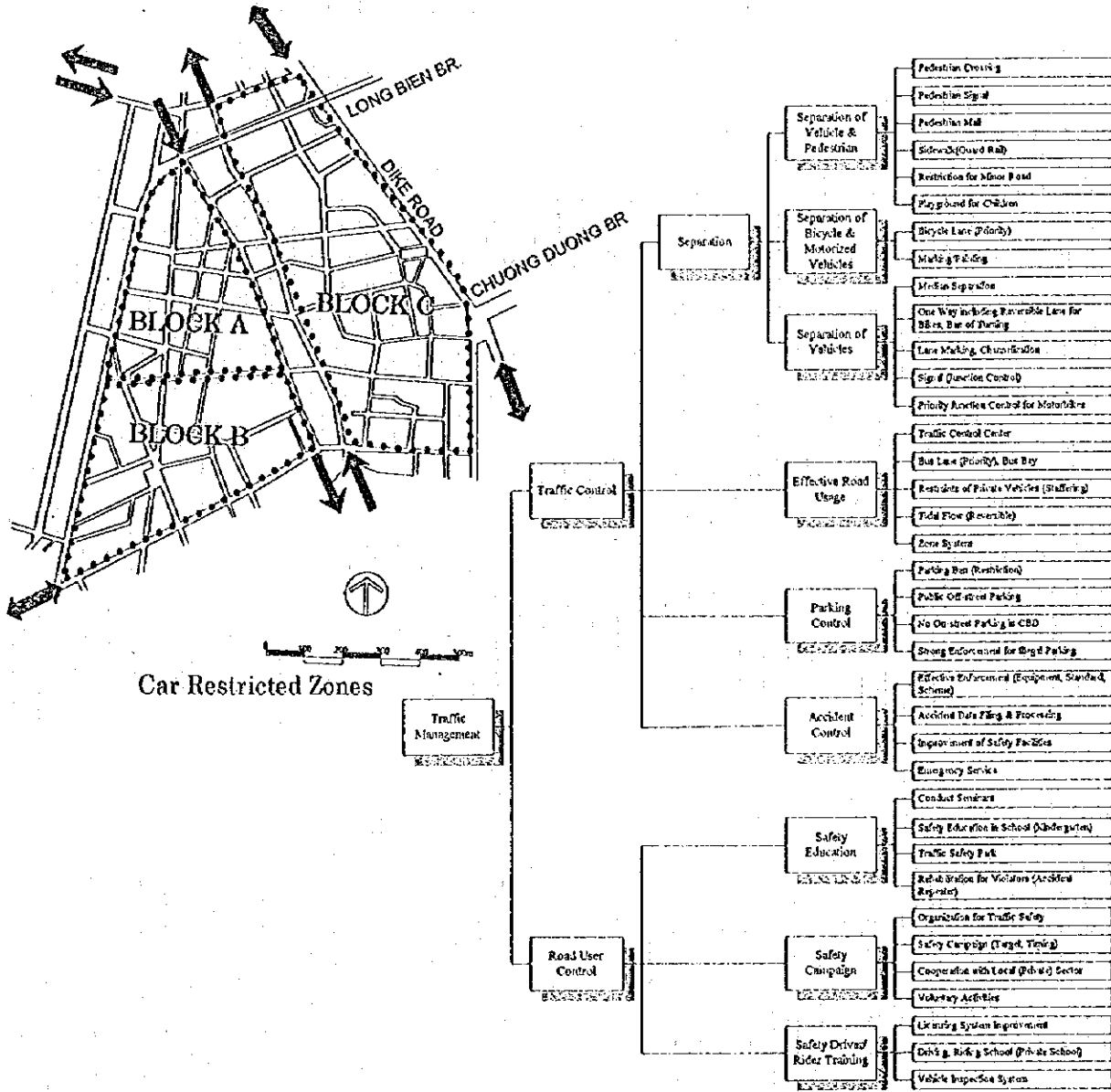
Segregation of non-motorized traffic from motorized traffic is another issue. Motorized traffic is almost always impeded by such slow moving traffic. Traffic segregation should be implemented on suburban roads where no median separations are available. Fatal accidents, particularly involving motorcycles, would be drastically reduced.



Intersection Signalization

Most road users in Hanoi are indifferent to traffic rules and regulations. This has been derived from habits formulated by the uncontrolled riding of bicycles. Strong emphasis should be placed on education, training and campaigns to modify such road users attitudes and behavior. In addition, optimum and effi-

cient enforcement by traffic police is indispensable. Also, current traffic laws and regulations should be amended to cater for the growing traffic demand. Furthermore, the public transport system should be upgraded to satisfy user's demand for a more convenient, punctual and comfortable service.



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12 Bus Plan

When bus is sole public transport mode, 1,600 micro/mini buses and 2,800 regular size buses are required to transport public transport demand in 2005. In 2015 these numbers increase to 2,500 micro/mini buses and 3,600 regular size buses.

Judging from operation of Hanoi Bus Company based on field survey, it is estimated the company loses 96 million Dongs a day from route bus operation. The cases of break even due to fare increase are calculated using same data with assumption of indirect costs equal to direct costs. Results are 2.5 times fare increase to 4 % decrease of ridership, or 3 times fare increase to 20 % of decrease of ridership. These results clearly show the difficulty of bus operation by a private company.

Indirect costs cause such a financial difficulties. In case of personal operator he can make profits in scale of 36 million Dong a year because of small indirect costs. Many countries have syndicate of personal bus operators and they make money from cheap fare system. Personal bus operator tends to pursue profits rather than to work for public benefit. In order to regulate personal operator's services, establishment of a public company which holds bus fleet and to regulate bus operation through rent contracts was proposed.

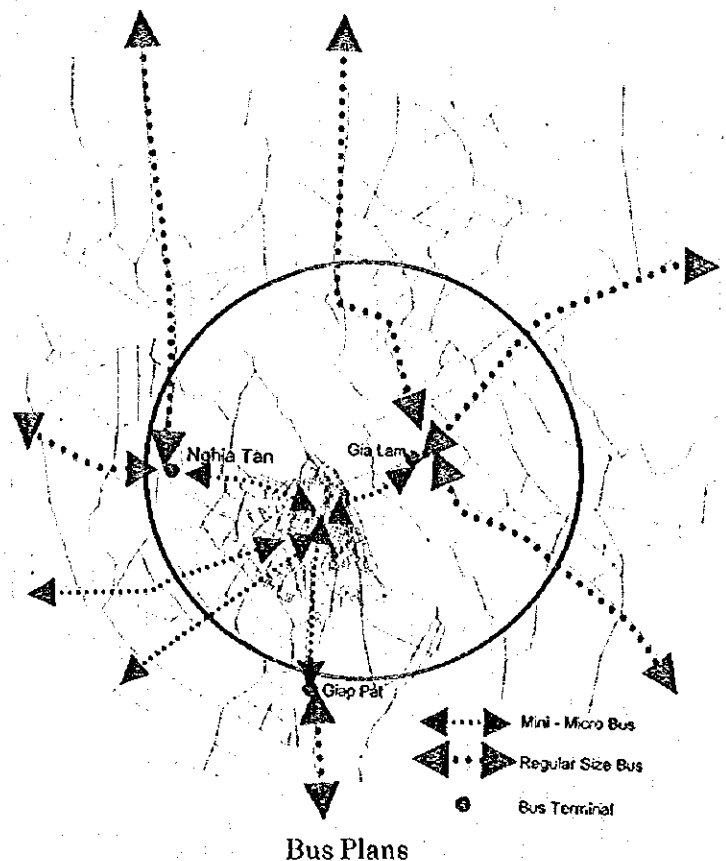
The bus holding company makes a contract including condition of operation with a private person. Through the contract the company can control operator but also can produce job opportunity. Profitability of the company is rather high and then the company can implement or improve bus terminals and a maintenance center.

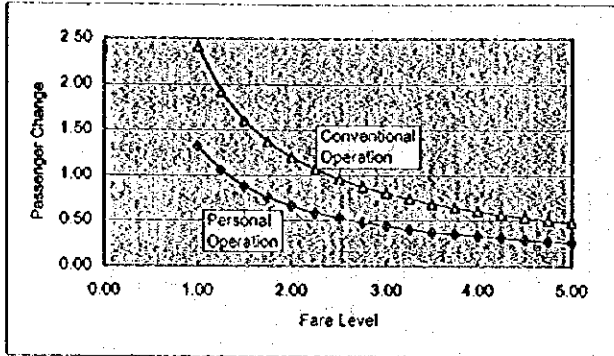
Bus fleet consists of micro, mini and regular size buses. Regular size buses are used mainly for long distance routes such as Soc Son Town to inner city of Hanoi. Mini buses are applied

to medium distance routes like Gia Lam to Hanoi inner city and micro buses are used in Hanoi built-up area.

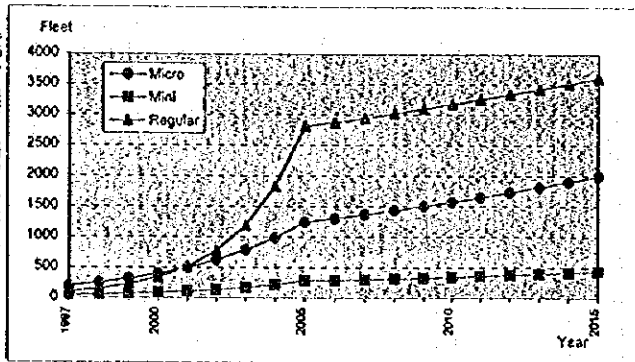
Three transfer terminals are programmed. These terminals are two existing (Giap Bat and Gia Lam) and one new terminal (Nghia Tan). No terminals are programmed except large bus stop in front of the Hanoi Station.

The bus holding company concept is quite new and a little radical. It is recommended that a pilot enterprise should be established to execute small scale social experiment. Two years experimental operation of 40 buses gives many lessons and HPC can evaluate the viability and benefits of the bus holding company concept. When the experimental business result in success, establishment of the bus holding company will become easy task.

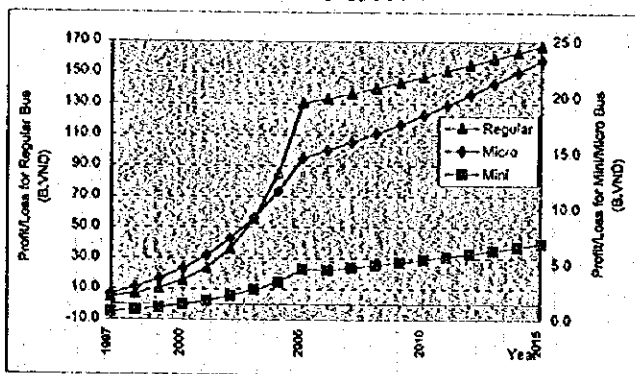




Break-even Points of Bus Operation



Required Bus Fleets



Bus Operation Balance

HPC should form a committee to study the bus holding company as soon as possible. The first alternative for the bus holding company is for HPC to employ several experts experienced in management, operation and finance, and establishes a bus holding company by itself.

The second alternative is for HPC to reorganize the existing Hanoi Bus Company to form a bus holding business. This is the most realistic alternative. The success of this alternative depends on the person in charge, because a bus operators tend to be experienced in bus operation rather than bus rental. It may be good idea to recruit a new manager of the bus holding and renting division.

The third alternative is to select a company as a partner and establish the bus holding company together. HPC would entrust the partner to manage the company. A newspaper reported that the Daewoo Co. had an interest in operating a bus service in Hanoi. Also the paper reported a comment of a Daewoo manager that Daewoo could compensate the loss on the bus operation by other businesses activities. The bus holding company concept is mutually beneficial. Daewoo would not need to lose money endlessly due to unprofitable bus operation. HPC would not need to be afraid of that Daewoo will cease bus operation at some future date. Similar operations may be available in the case of newly established bus manufacturers in Vietnam. They would be able to sell exclusively a large amount of buses to the bus holding company. In addition, they can expect some profit share from the bus holding company operation. In both cases HPC can procure the bus services necessary for the citizens of Hanoi.

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13 Railway Network Plan

The proposed railway network of Hanoi consists of four lines. Hanoi - Noi Bai line (Line No.1) extends from Hanoi to Van Tri through the New CBD area. This line will be extended to Noi Bai airport. Giap Bat - Thang Long line (Line No.2) connects Giap Bat and Thang Long (new station in New CBD, where the newly constructed section of the Line No.1 meets to the existing line.) through the HUDC. The Line No.2 meets to existing lines at terminal stations of both sides. Ha Dong - Kim Ma line (Line No.3) connects Ha Dong and Kim Ma bus terminal via National Highway No. 6, Tu Liem River and Lang Ha street. Yen Vien - Van Dien line (Line No.4) is a plan to utilize this section of the existing railway line for commuter service.

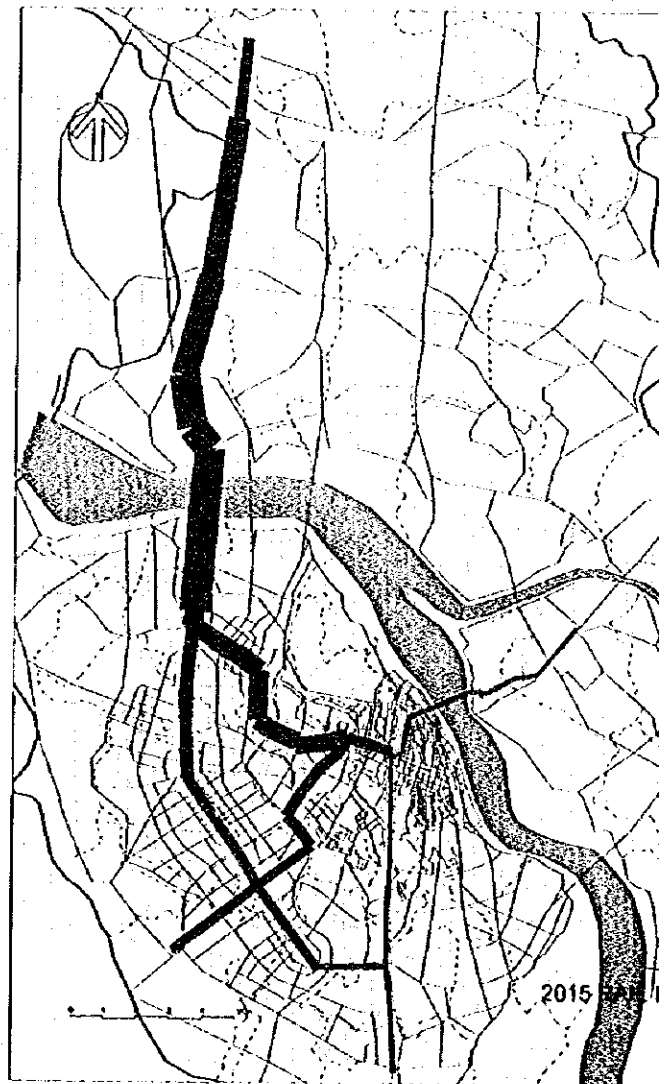
Assignment of public transport demand for 2015 onto this rail network assuming the same fare system as for bus, shows that Line #1 would transport the largest number of passengers. This is caused by the development of the south Thang Long area and New CBD.

The Line No.1 will start to operate from 2005. A total of 9 km of railway would be constructed as an elevated railway. Improvement of the existing line is for the 8.5 km from Thang Long Station. Each train would consist of two diesel cars. Initial investment costs are covered by the surplus of the development of New CBD. Electrification will be considered in the future.

In the case where Line No.1 only operates in 2015, it needs 28 cars to accommodate the demand. An average fare of 3,070 VND would cover maintenance and operating costs excluding depreciation expenses of the initial investment.

Line No.2 would be constructed in coordination of the HUDC development. Operation of Line No.2 will contribute to increase patron-

age on Line No.1, Thanh Long - Van Tri section. The bus route along Line No.3 transports 27,000 passengers per day at present, which is the largest demand of the overall routes. Construction of Line No.3 will be examined in coordination with the HUDC development and the construction of Line No.2. Line No.4 requires a high investment for the development of commuter services, because of required replace of Long Bien Bridge to double track. Without any upgrading, it can operate in a 50 minutes headway. Therefore the improvement of Line No.4 is not included in this master plan.



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14 Freight Transport Plan

Freight movements in the study area was processed to produce OD tables at present and in the future, and these movements were assigned to the road network together with other transport movements. These movements are taken into account in the road network improvement plan. This section, therefore, deals with inter province freight movements.

The National Transportation Sector Review implemented by UNDP in 1992 projected that the total freight tonnage to Hanoi would become 33 million tons in 2010. Because the total freight to Hanoi in 1991 was 4.8 million tons, the average annual growth of freight tonnage will be more than 10 %.

The majority of freight will be transported by road, which will transport 70 % of the total freight tonnage. The growth rate of road freight transport will be similar to all modes at 10 %.

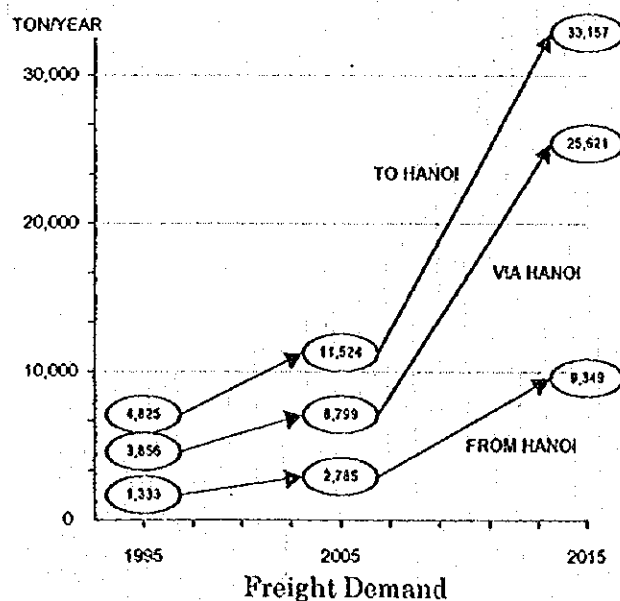
It should be noted that 16.5 million tons freight will pass through Hanoi in 2010. Comparing this figure with freight to Hanoi transported by roads in 2010, which is 22.9 million tons, through traffic is around 70 % of to Hanoi traffic.

From the bypass effect point of view, the early start of the Ring Road No. 3 construction was recommended. The section between National Highways No. 1-A and No. 5 is the earliest project of the master plan projects.

As a part of the National Highway No.5 improvement project, construction of a short cut road is planned to connect National Highways No.5 to No.3. After completion of both roads, the roads will act as a bypass between National Highways No.1-A and No.3.

To prevent large size trucks and trailers entering the Hanoi built-up area, two public truck terminals are planned. One terminal is located North of Hanoi and another South. Both are planned to be located along Ring Road No.3.

In this study period the north truck terminal will be constructed. The Co Loa switch yard is considered as appropriate site location. The plan proposes to construct the freight terminal for railway transport and for truck transport. It will handle 4,400 tons/day after completion of the first construction stage and 18,000 tons/day after completion of the second construction stage.

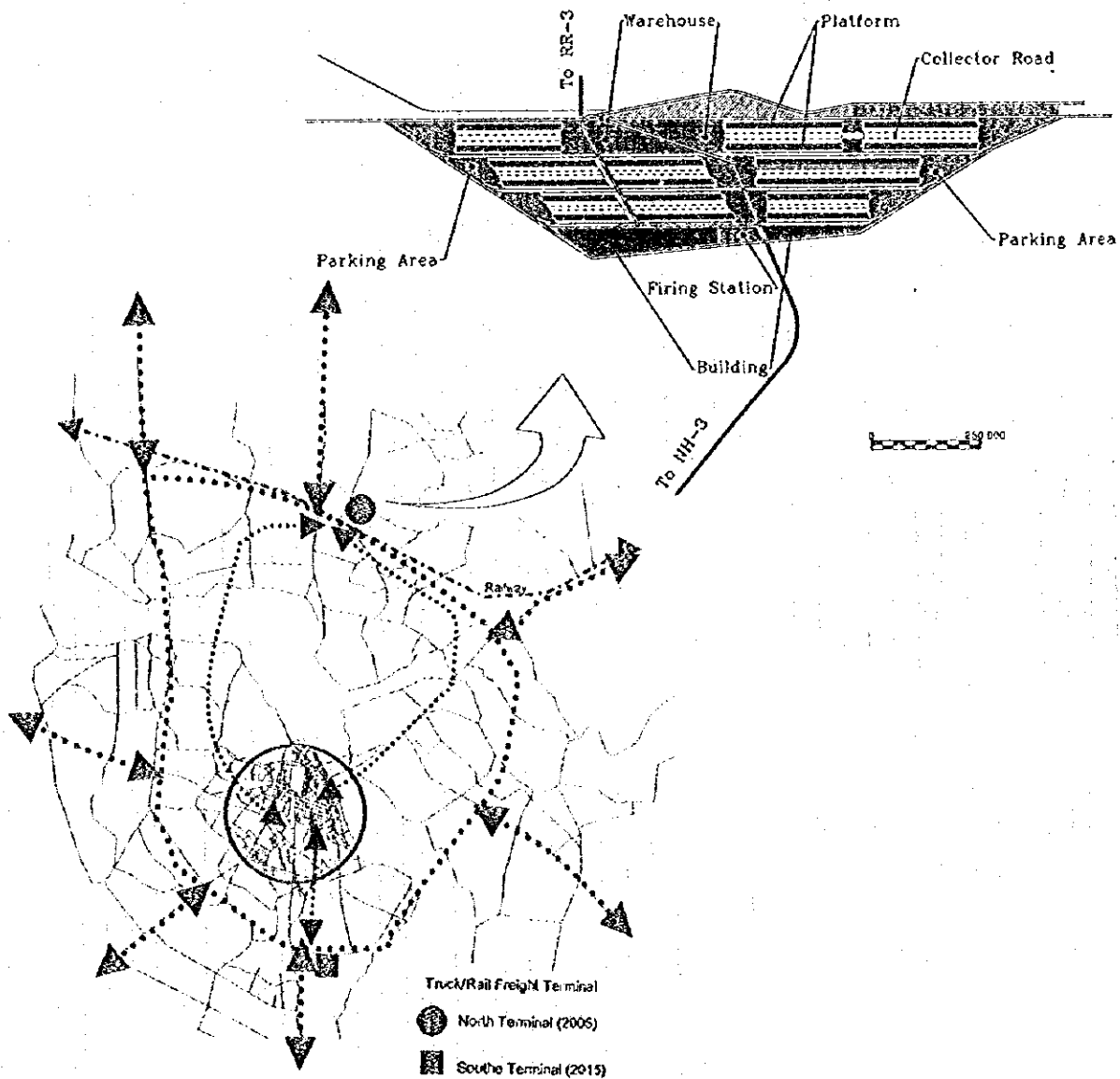


The first stage is planned to be completed in 2005 and the second stage in 2015. During this period the improvement project of the Cai Lan Port will be completed and it is considered that the improvement and extension project of the Cai Lan Line will be required.

Hanoi Port has poor facilities. The first step of the Hanoi port improvement does not include an increase of berths but an increase of the

number of cranes from the existing six to nine. Eight cranes will be used at eight berths and another will be used for dredging purposes.

Item	1st Stage	2nd Stage
Total Space (ha)	7	31
No. of Berth	182	745
Handling Capacity (tons/day)	4,400	18,000



Freight Plan

The Master Plan of Urban Transportation for Hanoi City in Viet Nam
Master Plan

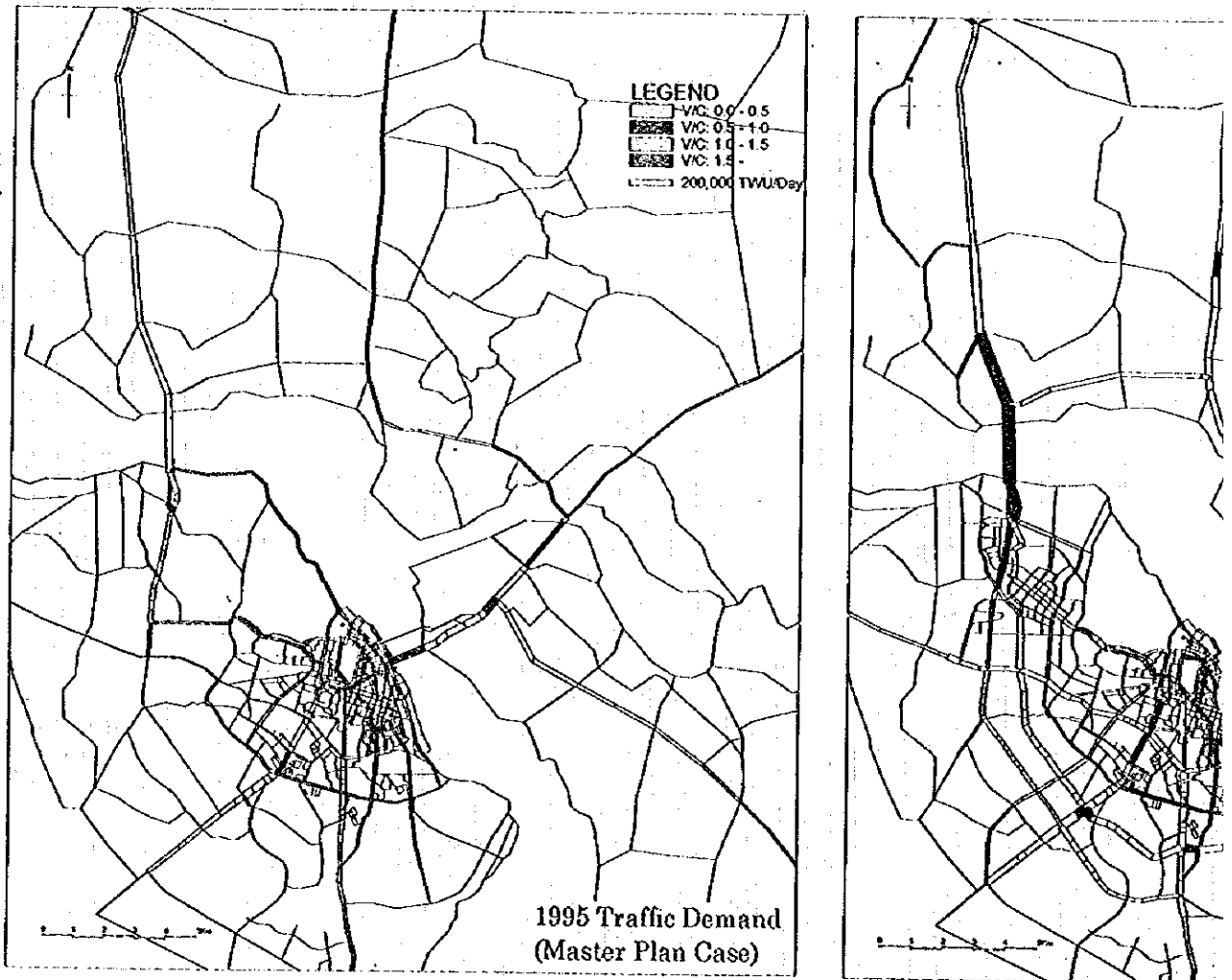
15. Transport Master Plan (1)

In 2015, the road length having a V/C of more than 1.5 will comprise 30% of the total road network in the present built-up area on the Do-Nothing Case. In the Master Plan Case, it will reduce to 2%, and 88% of the road network will have V/C of less than 0.5, which is almost the same level as at present.

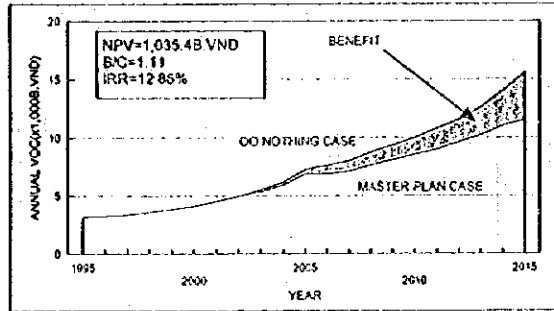
The total investment amount for the Master Plan network is estimated at 39,388 B.VND, of which 17112 B.VND is under the responsibility of MOTC. A road development cost amounting to 17,149 B.VND is under the responsibility of HPC. However, it includes the roads in the land development area, and if

the costs of these sections is covered by the land development profit, the remaining investment amounts at 11,969 B.VND.

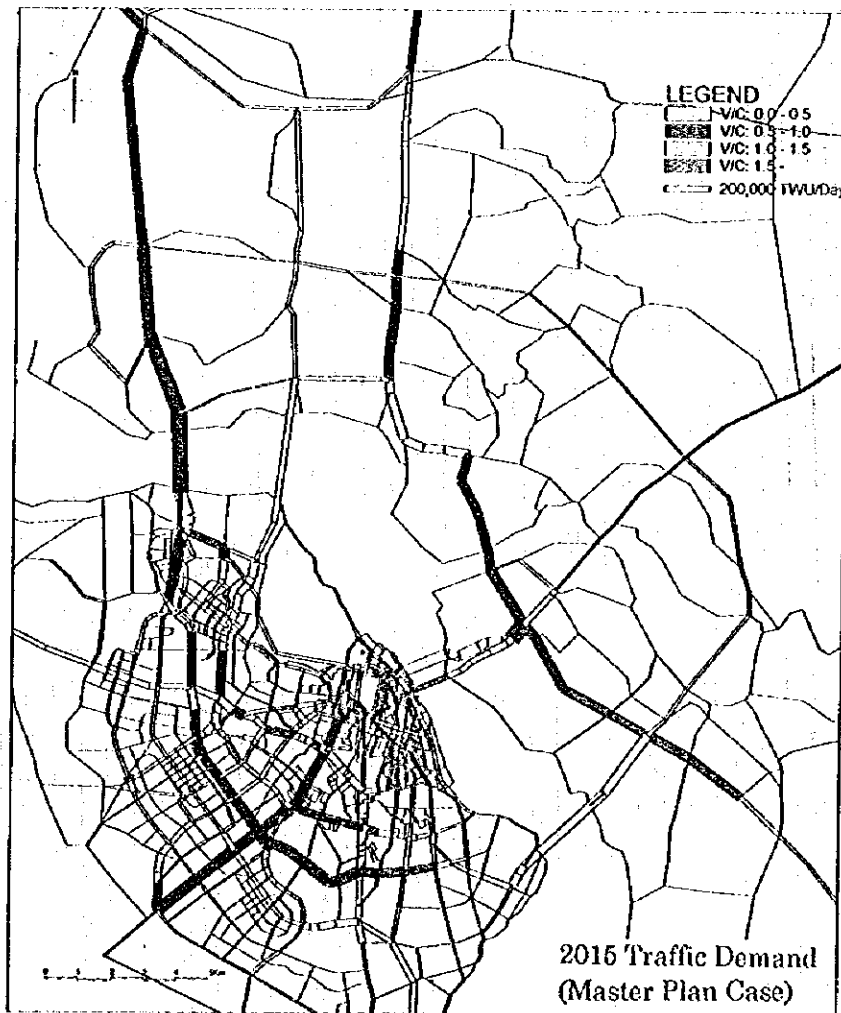
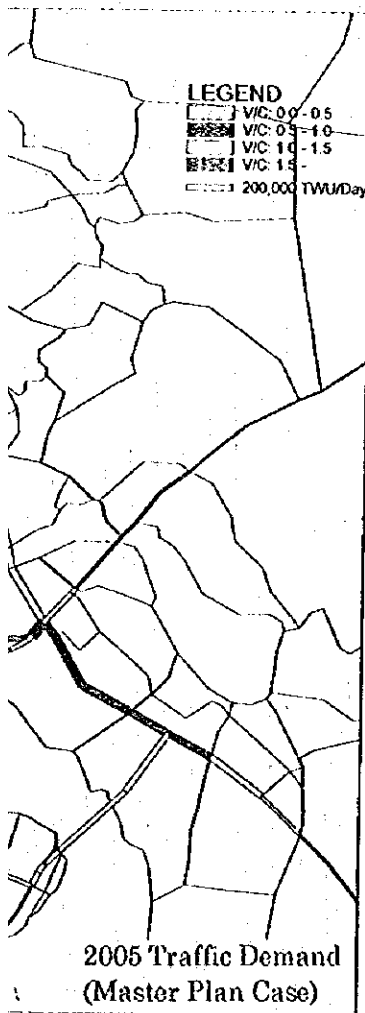
The available funds of MOTC for the next 20 years are estimated at 18,640 B.VND, and this can cover all the required investment. The total available funds for the next 20 years of TUWPS is estimated at 4,004 B.VND, which covers only 35% of the total amount required. The total available funds of the 5 district people's committees for the next 20 years are estimated at 1,077 B.VND, which amounts 60% of the total required amount.



The Net Present Value (NPV), the difference of the total estimated economic cost of the road network development and the economic benefit derived from the Vehicle Operating Cost (VOC) saving by the implementation of the Master Plan network, is calculated at 1,035 B.VND with a discount rate of 12% p.a. The B/C is 1.11 and Economic Internal Rate of Return (EIRR) is 12.86%. The Master Plan network is economically viable, therefore, a system to return the development profit to the public funds should be established to cover the difference between the required investment amount and the estimated available funds.



VOC Saving (Master Plan Case)



*The Master Plan of Urban Transportation for Hanoi City in Viet Nam
Feasibility Study*

17 Site Selection for Feasibility Study

Increases of Hanoi urban population are projected as 0.62 million (1995 - 2005) and 0.66 million (2006 - 2015). On the other hand MOC and HPC declared a population control policy (0.8 million in 2020) in the built-up area of Hanoi in the land use plan of Hanoi for 2020. Population in the built-up area at present is 1.1 million. Following the population control policy 0.3 million must migrate to the outskirts of Hanoi. Due to this, total migration demand of 1.58 million would be produced.

Young people living in rural area will migrate to the urban area seeking better jobs. Industrial estates located on the north side of the Red River will absorb some of this labor force, and four industrial cities (Gia Lam, Soc Son, Dong Dah and North Thang Long) will be developed. The capital function of Hanoi will continue to be concentrated on the south side of the Red River. The population to sustain the capital function of Hanoi is the 1.58 million and 0.8 million living in the built-up area.

The increase of the number of passenger cars will be accelerated. In this master plan 3 times the car ownership rate or 10 times in number of cars are expected and this plan can cope with such an increase. However, the increase

of the car fleet will continue after the master plan period is over and some day will come catastrophic congestion of transport in Hanoi. It is necessary to develop areas to absorb car traffic (shopping centers, business centers, amusement centers) before the catastrophe occurs.

The transport sector budget of TUPWS is not enough to realize this master plan. It is proposed to construct roads and bridges in coordination with land development and to utilize profits arising from land development to fund the construction of roads and bridges. In such a way the shortage of TUPWS budget shall be covered and secured to realize the master plan.

Most of the 1.58 million aforementioned migrants will reside in Tu Liem and west Thanh Tri. The method of development will continue the development style of Dong Da and Ba Dinh. Development will concentrate in the Xuan La, Yen Hoa and Dai Kim areas. The proposal is to develop these three sites in order and to accommodate the maximum population in this area. This proposal is named the Hanoi Urban Development Corridor (HUDC) project.

Item	Xuan La	Yen Hoa	Dai Kim
Total Area	592	1,879	814
Public Land(ha)	346	869	361
Private Land(ha)	246	816	328
Water Area(ha)	0	194	125
Population(x1,000)	151	479	207

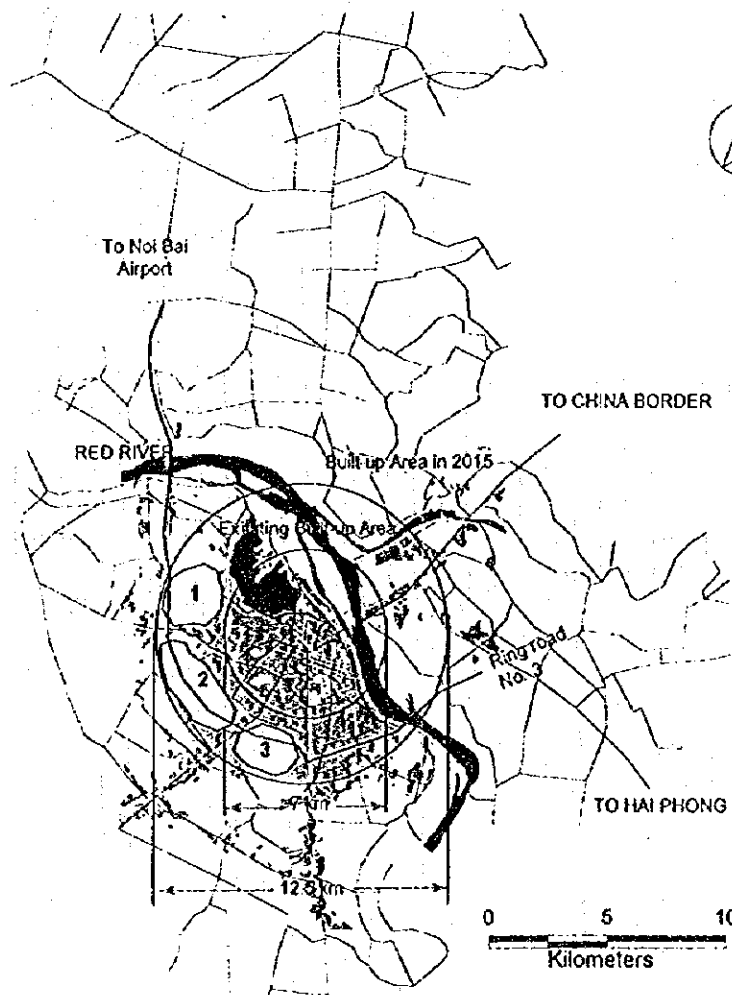
These areas are developed by block. The first development site includes a business district and a commercial center. Criteria of the first site selection are

- (a) smaller scale;
- (b) existing development demand; and
- (c) good access to an arterial road.

The Xuan La site is located along Ring Road

No. 3 and is easy to access from National Highway No. 32. Many foreign investment projects are planned in the surrounding area and the development area scale is the minimum based on the preliminary city planning work undertaken by the study team.

Due to the above, Xuan La (Site No.1) was chosen for the New CBD site.



Candidate Sites

18. Natural and Social Environment

Tu Liem District lies on the alluvial plain of the Red River Delta. It consists of clay and silt in the upper 15m layer and sand in lower layers. The proposed New CBD area is now occupied mainly by paddy fields which cover more than 90% of the whole area. In Tu Liem District, there are simple local networks of drainage, two lakes and a canal system which have the function of irrigation and rain water drainage for the area. Prior to this project, the effect of rain water run off from the city had already been surveyed, therefore, the reservoirs are planned to cater for this.

Land owners are registered in HPC or each settlements people's committee. The areas which are registered in HPC are only 1-5% of the whole area. The rights of use of agricultural lands are possessed by the groups who cultivate them.

Water quality for the agriculture within the site is not the most suitable for cultivation. For instance, the concentration of COD in the rivers and the lakes is high ($110\text{mg}/\text{m}^3$), compared with the agricultural standard of water quality (less than $6\text{mg}/\text{m}^3$). Generally speaking, the water quality of Hanoi's rivers and lakes has been deteriorating due to urbanization, therefore, the paddy rice cultivation surrounding the urban city will be even more affected by pollution in the future.

Concerning fauna and flora, the area mainly comprises existing paddy fields, therefore, the vegetation is paddy rice and valuable flora

does not exist. As well as flora, valuable fauna does not exist in the paddy fields and various birds who use the area are not verified.

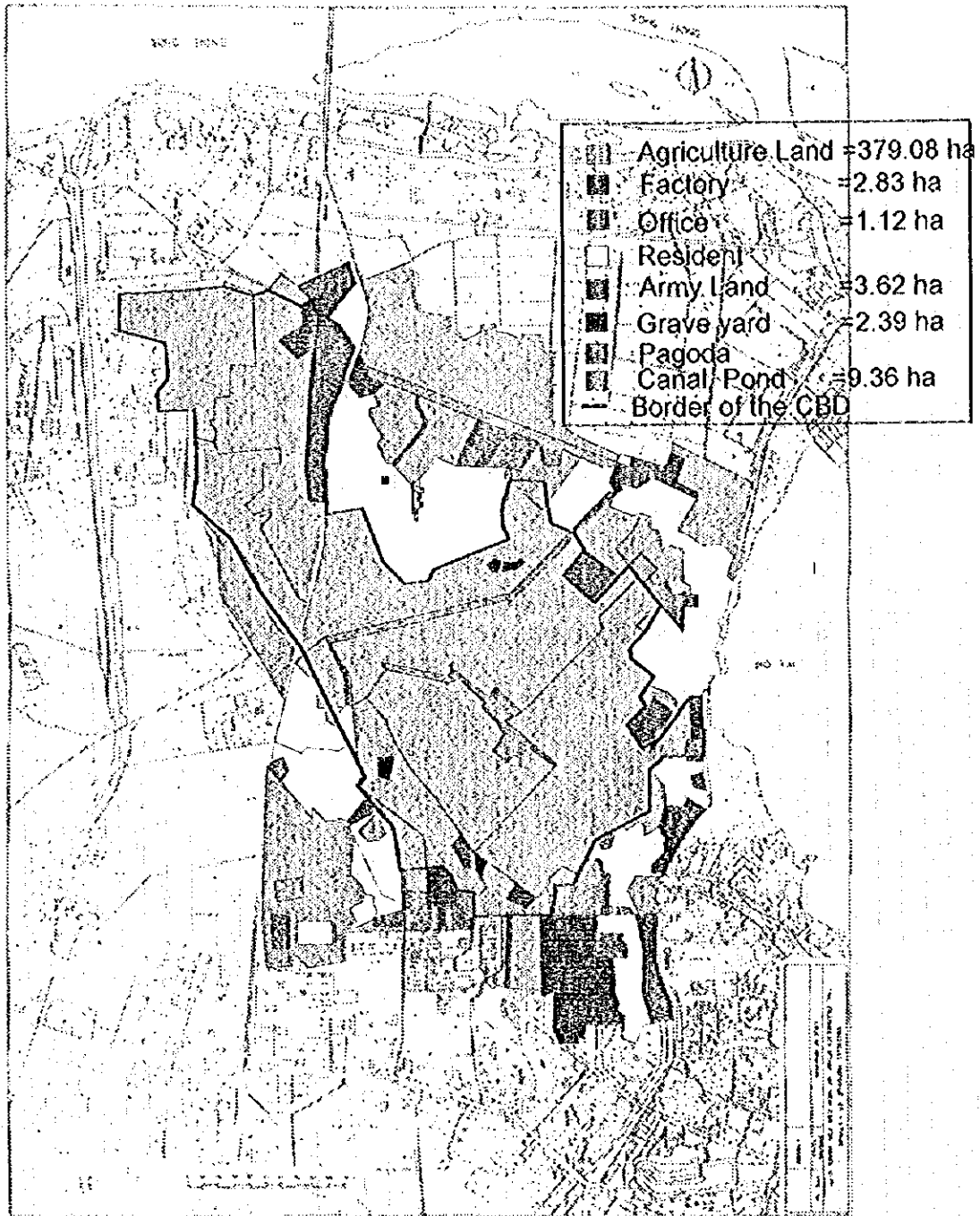
The environmental impacts which will be caused by the construction of the New CBD are as follows:

(1) In the construction period

The dust, noise and vibration caused by construction equipment and muddy water caused by rain during construction is anticipated.

(2) After completion

- Socio-economy: There are farm villages around the paddy fields. Therefore, it is necessary to consider how the farmers would earn their living after completion of the development. For the shops with a housing relocated along the existing roads, compensation will also be needed.
- Drainage/waste: it is necessary to consider the waste effluents and the municipal waste from households and offices after completion. In addition, an adequate plan regarding rain water, such as drainage canals, is needed.
- New roads: it is necessary to consider environmental impacts concerning air, noise and vibration caused by the forecast traffic flow
- Urban plan: it is necessary to create a pleasant urban environment with consideration for greenery and rain penetration for vegetation.



Xuan La Present Land Use

The Master Plan of Urban Transportation for Hanoi City in Viet Nam Feasibility Study

19 Site Plan

In the New CBD, there are three ring roads running from north to south in parallel. Ring Road No.3 is the existing arterial road connecting Noi Bai International Airport and National Highway No.32. Ring Road No.2 extension and a new Ring Road No.1 are proposed in this study.

The New City Boulevard (South Thang Long Road) is planned to connect with those 3 ring roads, and in addition to the inner city of Hanoi. A new railway line is proposed in the center of this boulevard, and stations are planned at convenient intervals to serve the New CBD. The New city center and sub centers are located along this boulevard,

The hierarchical urban structure concept is adopted. One urban district consists of four neighborhoods (one neighborhood is based on the service area of an elementary school) while one city consists of several urban districts.

Urban centers will be located in accordance with the aforementioned space structure. A neighborhood is a basic unit (socially and

physically) of the New CBD, with one neighborhood center serving the neighborhood. A district center will serve the neighborhood contained in the district. In the same manner, the city center will serve the districts developed in the New CBD.

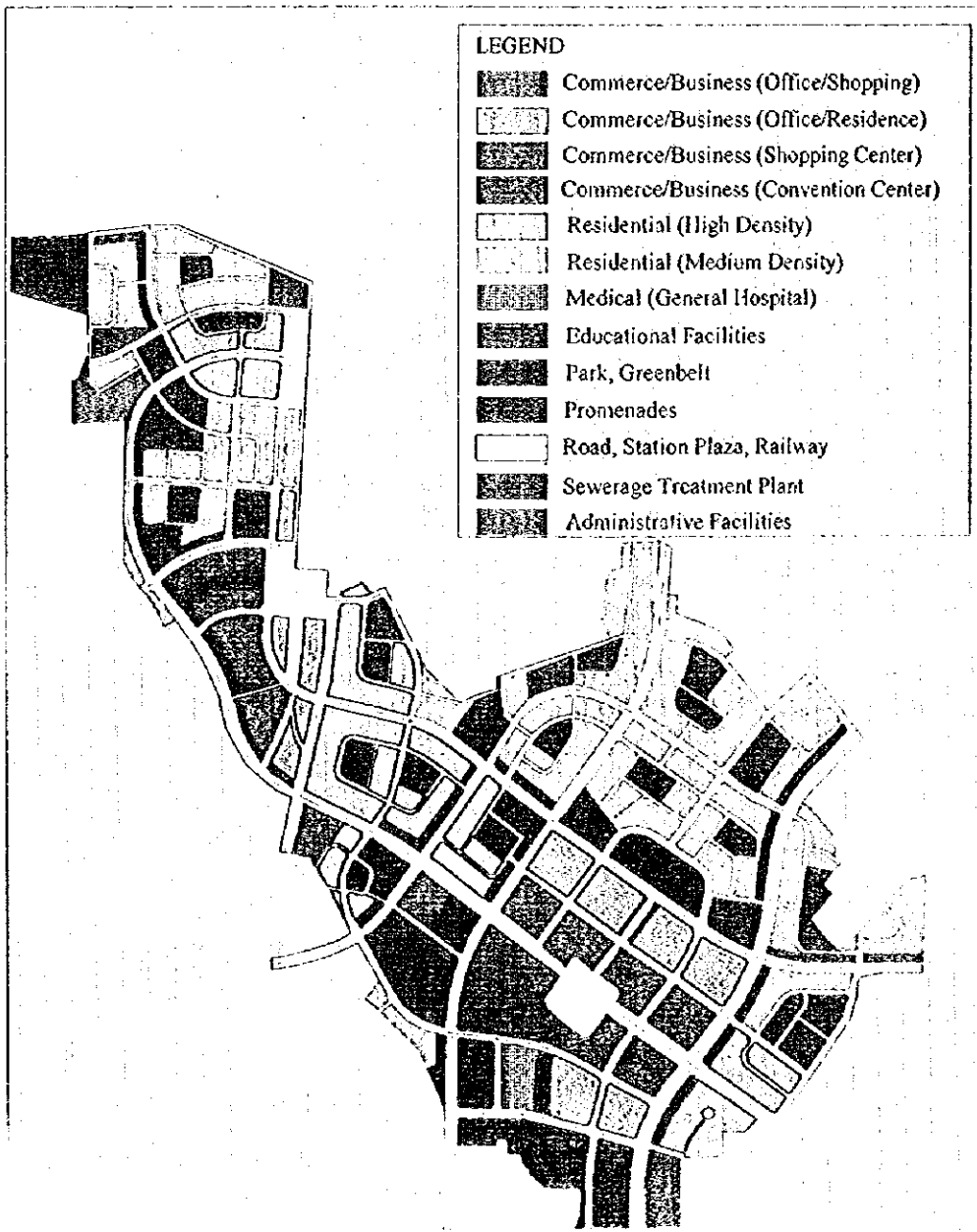
A hierarchical road network is proposed. The arterial roads would be basically shape the districts while the major/minor roads shape the neighborhoods. The major/minor roads will manage the traffic within the districts. The access roads will be provided in the neighborhoods, connecting the major and minor roads with arterial roads. Direct access from access roads to arterial roads would be restricted to ensure smooth flow on the arterial roads.

The park and green network also have hierarchical structure. A Play Lot is allotted within a 250m service radius, a Neighborhood Park is allocated within a 500m service radius and a District Park is located in a district. A Greenbelt is placed to separate residential land from commercial/business land.

Land Use	Area(ha)	Sahre(%)
Total	592.2	100.0
Public Use	346.1	58.4
Hospital	5.5	0.9
Education Facilities	48.1	8.1
Park	83.2	14.0
Roads	173.1	29.2
Parking Facilities	4.7	0.8
Sewerage Treatment Facilities	9.2	1.6
Administrative Facilities	14.2	2.4
Convention Center	8.3	1.4
Private Use	246.1	41.6
Office/Shop	29.5	5.0
Office/Residence	31.1	5.3
Shopping Center	18.5	3.1
Residence	167.1	28.2

The drainage system in the New CBD is planned in accordance with "The Study on Urban Drainage and Wastewater Disposal System in Hanoi City" by JICA and HPC in 1995. The canals are well be located within greenbelts, and the reservoirs, which would be located in the district park, are planned to

regulate the run-off discharged from the area. The ratios of roads and residential areas would be in the same range of 28 - 29 % and the ratios of park and the green network would have a similar ratio to business/commercial of 13 - 14 % to ensure a city with a high level of amenity.



Land Use Plan

The Master Plan of Urban Transportation for Hanoi City in Viet Nam Feasibility Study

20 Implementation Organization

The required investment for the New CBD project is 4,043.3 B.VND, of which 1,258.9 or 31.1% is for the land acquisition. The project was planned to be implemented from 1998 and to be completed in 2005.

Transport sector budget of TUPWS is not enough to realize the proposed master plan projects. Based on this fact, the Study Team proposes to develop transport infrastructure in connection to development of land so as to utilize development profits to fund on transport infrastructure. To achieve this, necessity of an independent accounting system is self explanatory matter.

There are two organizations with same purpose as the proposed. One is "Etablissement Public pour l'Amenagement de La Defense (EPAD)" in French. EPAD was established to develop La Defense near Paris. Another is "London Docklands Development Corporation (LDDC)" in UK. LDDC was founded to redevelop Docklands near London. Both of them were empowered to buy land in priority bases, to make city plan, to control land use, to undertake projects in priority and to sell land.

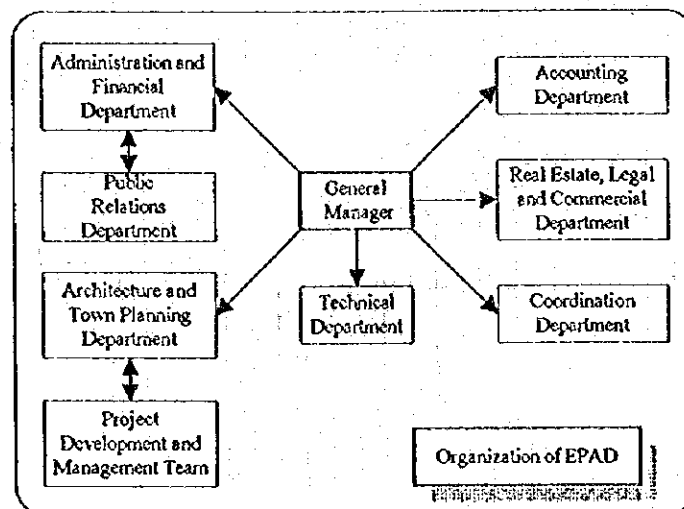
Both of them develop land exclusively but they did not construct buildings. In fact EPAD had

invested 12 billion Franc while private industries had invested 42 billion Franc. LDDC had invested 0.4 billion Pounds, while private companies had invested 4.4 billion Pounds.

The proposed organization is fundamentally the same as the above two organizations. More creditability is required because it is necessary to borrow a larger amount of money than the total assets of the organization. A national level public corporation may be better than municipal level organization from creditability point of view.

Necessary conditions of the proposed organization are as follows;

- The organization can make contract for soft loan of international aid scheme;
- The organization must be empowered to buy land in priority, to make city plan exclusively, to control land use with law enforcement power, to undertake projects in priority and to sell land exclusively;
- The organization must be set up as a non profit organization and exempt from taxation; and
- The organization must be controlled in the manner of a private company.

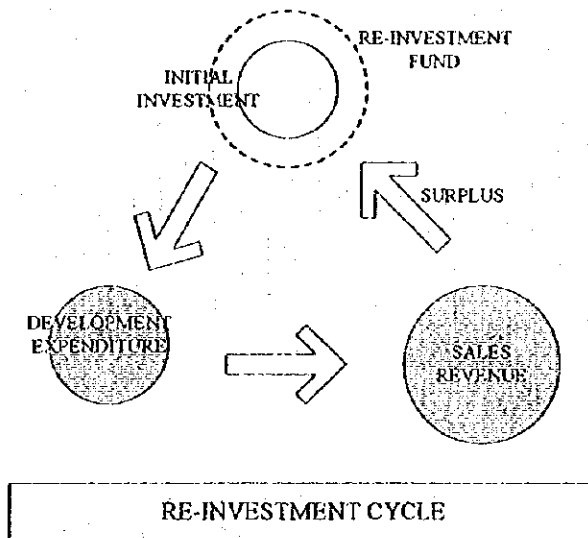


It would be ideal for HPC and MOTC to establish a Development Corporation and to employ staff who are highly experienced in real estate, land development and financial business, and let them manage the company. However, there are also some difficulties. The biggest obstacle is the shortage of operating funds during the developing period.

An alternative organization is a control authority of private developers. There are many applications from foreign developers who hope to develop land in Hanoi. HPC would establish a control authority, and this authority would offer land for development and select the highest bidder of the qualified developers. In this manner HPC can develop land under the HUDC development master plan and collect money for the necessary infrastructure

improvement. This process is easy to start but progress depends on developers' demand. Profitable land may attract many applicants but land in a bad development condition would not attract them.

The other alternative organization is a mixture of the above alternatives. In this case HPC would select one private developer as the partner and establish a joint venture development company. HPC would give the joint venture the privilege of developing of HUDC in accordance with the HUDC development master plan and profits would be shared. HPC would invest money received from soft loan and entrust this company to develop HUDC. This is a promising option. However, the developments success depends on the developer's demand and capability.



Scope	EPAD	LDDC	Dev. Corp. (Hanoi)
Land Acquisition		Own Account	
City Planning and Land Use		Own Account	
Building construction		Private Developers	

21 Financial Evaluation

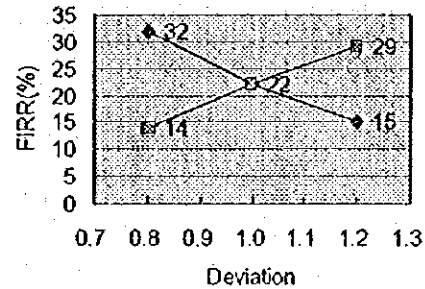
Costs consist of construction costs, land acquisition costs and sales costs. Revenue arises from the sale of land. Of the construction costs, 70% are expected to be funded from foreign soft loans and the remaining 30 % of construction costs, land acquisition costs and sales costs are to be funded by short term loans from city banks.

Construction starts in 1998 and ends in 2005. Land sale is programmed to start in 2002 and end in 2008.

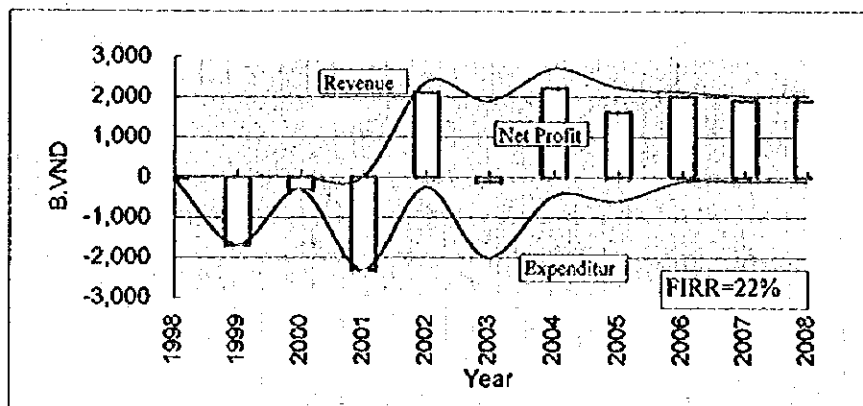
The Financial Internal Rate of Return (FIRR) is understood as the maximum interest rate payable from the project. The FIRR of this project is 22 % and the weighted average of loan interest is 4.8 %. The difference between interest rates, which is 17 %, is termed the surplus. The surplus looks sufficiently large to provoke and adequate safety range.

However, the FIRR is very sensitive to the changes of both cost and profit. In the case of a 20 % cost increase and a 20 % of sales decrease, the FIRR will fall to 7 %.

Fluctuation of sales is inevitable but the accuracy of cost projection can be improved. At the detail design stage much effort should be devoted to cost estimation.



Sensitivity of FIRR

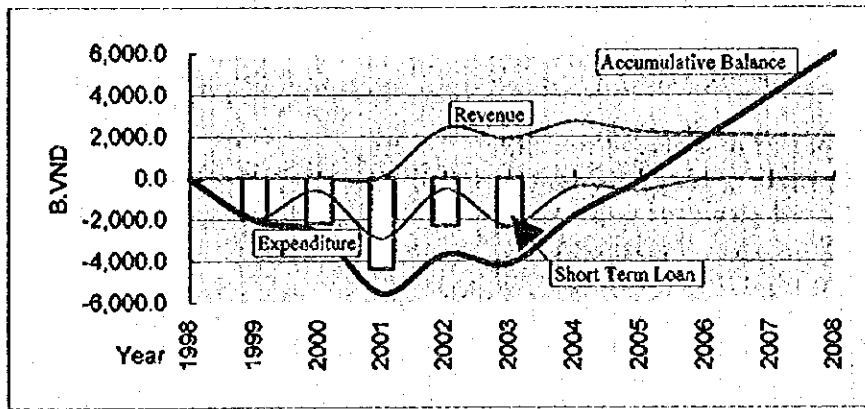


Profit and Revenue

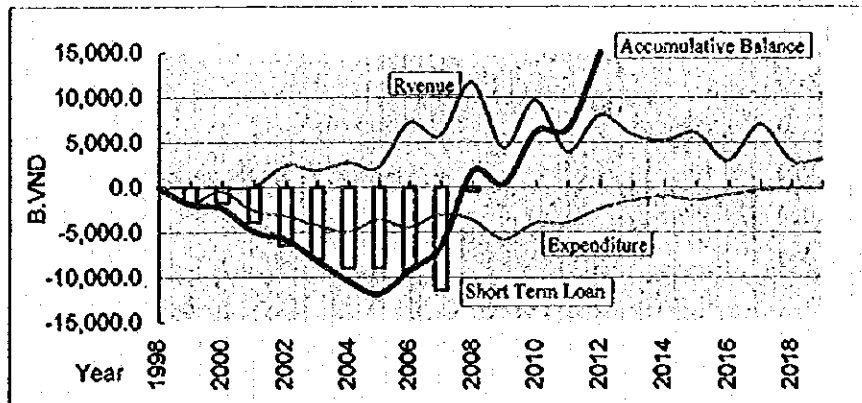
From the Profit/Loss Statement the largest cumulative loss, 5,600 B.VND, occurs in 2001 and on Cash Flow Table, and a short term loan of 4,300 B.VND are required to correspond with that big cumulative loss. Total assets at that time is only 2,800 B.VND on the Balance Sheet. Due to these facts, the executing body is required to have enough creditability to borrow 4,300 B.VND in the security of 2,800 B.VND. After 2001, the profit/loss balance begins to improve and finally yield a cumulative surplus of 6,000 B.VND. A part of this surplus is planned to be invested in the development of the Hanoi - Noi

Bai railway line.

In the same manner, the total development cash flow of HUDC was calculated. The largest cumulative loss of 14,700 B.VND occurs in 2005 and the maximum short term loan borrowing of 11,500 B.VND occurs in 2007. The cumulative surplus at the end of project would be 47,900 B.VND. A part of this surplus would be invested in the development of Thang Long - Giap Bat railway line and the improvement/widening of roads in the built-up area. The rest would be invested in the next development project.



Balance of Xuan La Development



Balance of HUDC Development

*The Master Plan of Urban Transportation for Hanoi City in Viet Nam
Feasibility Study*

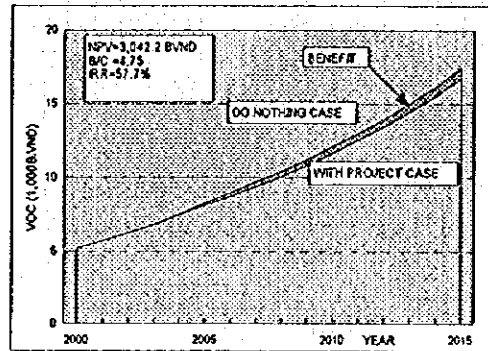
22 Economic Evaluation

Two types of economic evaluation were undertaken. The first was to evaluate the New CBD project as a road network improvement project. The second was to evaluate the New CBD project as a land development project. The Economic Internal Rate of Return (EIRR), which is the discount rate to make economic costs and economic benefits equal, was calculated in the economic evaluation.

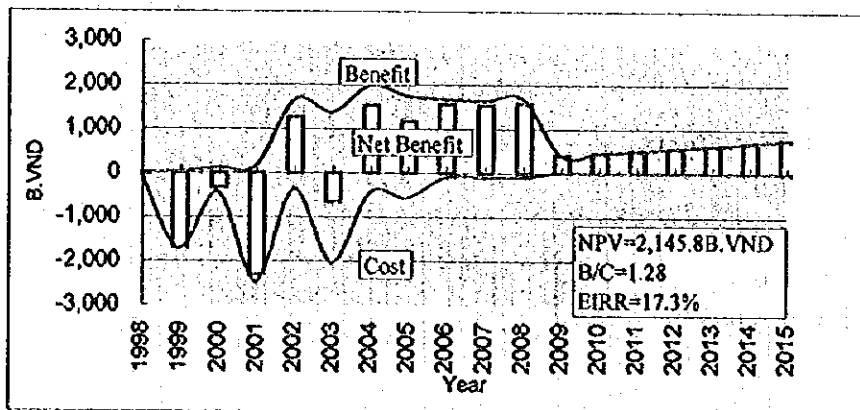
The evaluation of the road network improvement effects shows a 58 % of EIRR. The south Thang Long road construction project contributes greatly to the EIRR. In the economic evaluation, the financial cost of road construction was converted to the economic costs and the VOC savings due to new road construction and existing road improvement was used as the economic benefit.

The evaluation of land development considers three types of benefits including VOC savings, the increase of land productivity due to the change of land use, and the infrastructure construction cost savings due to the planned development. Also the evaluation considers all costs of land development including road development costs in economic terms.

The EIRR of land development is 20 %. In spite of the increase of economic benefits, the EIRR is less than the partial evaluation (EIRR of road development). This is because the increase of economic costs exceeds the increase of benefits.



VOC Saving (F/S Project)

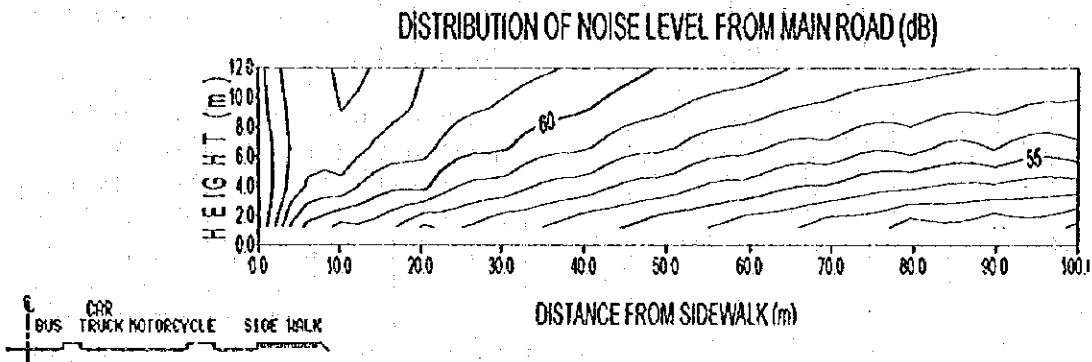


Economic Cost and Benefit Balance

Environmental Impact Assessment

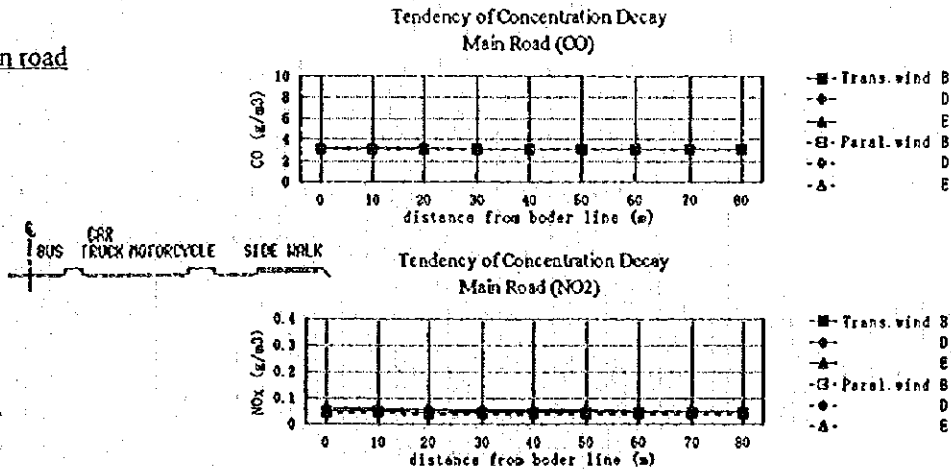
The evaluation was undertaken for the periods during construction and after completion. As regards the period during construction, dust, noise and vibration caused by construction equipment and muddy water caused by rain will be anticipated. Therefore, it is especially necessary to consider the environmental impact of the construction on the neighboring living space and paddy fields.

As regards after completion, a pleasant urban environment should be created. Therefore, suitable areas of tree-planting, rain penetration for vegetation and a sewage treatment plant are planned. Environmental impacts produced by road traffic through the new CBD were predicted. As a result, although air pollutants concentration and vibration levels meet the Standard, the noise level is equal to the upper limit. The noise level in the future will meet the Standard if vehicle horn use control is planned in the New CBD.



Distribution of Noise Level

Main road



The Master Plan of Urban Transportation for Hanoi City in Viet Nam
Master Plan/Feasibility Study

23. Conclusions and Recommendations

Master Plan

The Master Plan is economically viable and will ensure uncongested traffic flow until 2015 providing that the Master Plan program is implemented on schedule. It is concluded that the Master Plan should be institutionally arranged to implement completely.

The total required investment for the Master Plan is 45,724.9 B.VND.

Project	B.VND
Road	39,388.3
MOTC	17,110.9
TUPWS	17,148.9
DPC	1,784.9
Others	3,343.6
Traffic Management	248.2
Public Transport	5,683.9
Freight	404.5
Total	45,724.9

Among the master plan projects, it is concluded the vital projects in the road network plan by phase are as listed below.

Period to Start	Code	Project	Cost(B.VND)
1996 - 2000	A02	National Highway No. 3 Improvement	648.8
	A07	South Ring Road No. 3 Construction	4,797.7
	C03	Red River Dike Improvement	1,626.9
	C0607	South Thang Long - Bui Street	100.9
	E02	South Thang Long Road	87.4
2001 - 2005	A03	National Highway No. 5 Extension Construction	637.0
	A04	National Highway No. 32 Improvement	427.1
	C09	Hanoi Bridge Capacity Increase Project	654.9
	E03	New Ring Road No. 2 Construction	179.7
	E04	New CBD Road Network	740.5
2006 - 2015	A08	North Ring Road No. 3 Construction	4,570.7
	C08	Ring Road No.2 Improvement	2,340.1
	D01	Dong Anh Highway Construction	4,010.2
	F10	Yen Hoa New City Road Network	1,660.2
	F11	Dai Kim New City Road Network	329.1

Roads/bridges belonging to MOTC are arterial and early implementation is desirable to support the economic growth in the Study Area. If the transport sector budget, which was assumed to be 2% of GDP and 10% of which would be allocated to the Hanoi area, is secured, the earlier implementation can be achieved using soft loans from foreign aids.

The listed road projects, other than those related to MOTC, are located in the sub-urban area surrounding the present built-up area. The road network in this area should be developed together with the comprehensive area development. Individual road development will not be efficient.

The estimated budget of TUPWS can cover only 35% of the total required investment. If annually 492,000 VND is collected from all the registered motorcycles, the 20 years required investment of 12,697.6 B.VND for road network under TUPWS responsibility other than the road in the development area, bus terminals, truck terminals and a river port can be covered. However, this system requires institutional arrangement.

The expected profit from the land development should be captured for the infrastructure development, and as urbanization in the sub-urban area is progressing rapidly, the area development in the sub-urban area was considered as the most urgent priority project and was adopted as a succeeding Feasibility Study Project to the Master Plan Study.

Improvement of the bus network is required urgently. Fleet reinforcement, however, requires a large budget of 2,638 BVND. The Master Plan proposed the most promising solution of the foundation of a "Bus Holding Company". Therefore, it is recommended that the "Bus Holding Company" should be formed at an early stage.

Feasibility Study

The financial and economic evaluations of the feasibility study on New CBD development in Xuan La area showed the high financial return of 6,043.3 B.VND in terms of the accumulative surplus in the last year of the project in 2008. The economic return shows also sufficiently high figures with NPV of 2,771.4 B.VND at a discount rate of 12%, B/C of 1.33 and EIRR of 20.4%.

The environmental impact assessment indicated almost no negative impact on the natural and social environment, except for affect on the farmers earning most of their income from paddy fields in the study area. Some 4,500 households will be compensated and new job opportunities will be created in the New CBD area, where some 165,000 residents and 375,000 employees are expected in the year 2015.

The feasibility study concludes that the New CBD project is financially and economically viable, will contribute to the improvement of

the living and business environment of the urban population and has less negative environmental impact than individual developments.

The master plan proposed the comprehensive development of the sub-urban area as the Hanoi Urban Development Corridor (HUDC). The New CBD development in Xuan La must be the first step in the HUDC plan. It is recommended that the project be started immediately.

A New Development Body is necessary to develop land in a systematic and comprehensive way. The Study Team proposed three alternatives for the Development Body, which are: a development corporation established by HPC and MOC; a control authority of private developers established by HPC; and an entrusted development company guided by HPC. All three alternatives would be guided by the HUDC development master plan and controlled by HPC.

It is recommended that HPC should set up a committee to study the organization of the development body as soon as possible. Subsequently a development body should be established to initiate the New CBD project. The body will be fully responsible for the development.

The preliminary financial analysis of HUDC project shows 47,878.1 B.VND of the accumulative surplus in the assumed last year of the project in 2019. It exceeds the total required investment under the TUPWS responsibility. Therefore, it is recommended that HPC or the new development body should begin a feasibility study on all the HUDC area prior to the commencement of the construction of Ring Road No.3.

List of Participants

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Mr. Do Hoan An	Vice Chairman, HPC	Mr. Koji Nakayama	Ministry of Transport
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