

**SOCIALIST REPUBLIC OF VIETNAM
MINISTRY OF TRANSPORT
VIETNAM RAILWAY ADMINISTRATION**

**SOCIALIST REPUBLIC OF VIETNAM
THE PREPARATORY SURVEY ON
HANOI CITY URBAN RAILWAY
CONSTRUCTION PROJECT (LINE5)**

**FINAL REPORT
(Full Version)**

February 2013

JAPAN INTERNATIONAL COOPERATION AGENCY(JICA)

**JAPAN INTERNATIONAL CONSULTANTS FOR
TRANSPORTATION CO., LTD.**

KEIHAN ELECTRIC RAILWAY CO., LTD.

NOMURA RESEARCH INSTITUTE, LTD.

OS
CR(10)
13-002

Table of Contents

Abbreviation

Chapter 1 Preface.....	1-1
1.1 Current Hanoi city	1-1
1.2 Planning on the urban and transport development of Hanoi City.....	1-8
1.3 Needs of PPP projects	1-20
1.4 Urban development along the Line No5 and a real-estate-development situation ..	1-25
1.5 Necessity to carry out the project	1-28
1.6 Law and Regulation	1-32
Chapter 2 Traffic Demand Forecast.....	2-1
2.1 Establishment of a traffic demand forecasting model	2-1
2.2 Basic data collection	2-2
2.3 Analysis of basic data	2-4
2.4 preconditions of demand forecast	2-15
2.5 Result of demand forecast	2-20
2.6 Sensitivity of price and estimation of income	2-24
Chapter 3 Adoption of Project Plan.....	3-1
3.1 Route selection	3-1
3.2 Rolling stock equipment	3-30
3.3 Operation plan	3-41
3.4 Plan of civil engineering facilities	3-54
3.5 Maintenance center	3-98
3.6 Substations and electrical facilities	3-106
3.7 Signaling and communication facilities.....	3-121
3.8 Plan of Automatic Fare Collection (AFC) systems	3-135
3.9 Station square	3-140
3.10 Technical terms and other considered matters	3-145
3.11 Requirements for St.10, depot, and St.8	3-175
Chapter 4 Project Implementation Plan	4-1
4.1 Equipment/materials procurement plan	4-1
4.2 Project cost estimation	4-4
4.3 Alleviating the government debt burden	4-17
4.4 Construction schedule	4-31

Chapter 5 Framework for Project Implementation, Operation and Maintenance	5-1
5.1 Project implementation scheme	5-1
5.2 Construction project implementation system	5-12
5.3 Operation and maintenance framework	5-15
5.4 Annual operation and maintenance costs	5-24
5.5 Advantages and characteristics of Japanese railway operators	5-35
Chapter 6 Economic and Financial Risk Analysis	6-1
6.1 Formulation of fare levels	6-1
6.2 Financial analysis	6-4
6.3 Risk analysis	6-32
6.4. Investigation of risk hedging measures	6-38
Chapter 7 Security package	7-1
7.1 Project scheme framework.....	7-1
7.2 Security package.....	7-4
7.3 Creation of term sheet (draft).....	7-5
Chapter 8 Assessment of Viability	8-1
8.1 Suitability of railway plan.....	8-1
8.2 Suitability of operating plan.....	8-2
8.3 Suitability of economic and financial analysis.....	8-3
8.4 Assessment of project scheme	8-4
8.5 Effects of opening railway	8-6
8.6 Measures of effect of operation	8-7
8.7 Conclusion	8-7
Chapter 9 Environmental and Social Considerations	9-1
9.1 Making of Draft IEE Report	9-1
9.2 Making of RPF Draft	9-29
9.3 Drafting the check list	9-40

Abbreviation

ADB . . .	Asian Development Bank
ATP . . .	Automatic Train Protection
BOT . . .	Build Operate Transfer
BT . . .	Build Transfer
BTO . . .	Build Transfer Operate
CBTC . . .	Communication Based Train Control
CTC . . .	Centralized Train Control
D/E ratio . . .	Debt Equity Ratio
DF/R . . .	Draft Final Report
EIA . . .	Environmental Impact Assessment
EIRR . . .	Economic Internal Rate of Return
FIRR . . .	Financial Internal Rate of Return
FKE . . .	Fukken Engineering Co., Ltd.
F/R . . .	Final Report
FS . . .	Feasible Study
GDP . . .	Gross Domestic Product
HAIDEP . . .	Hanoi Integrated Development and Environment Program JICA
HPC . . .	Hanoi People's Committee
HRB . . .	HPC Hanoi Metropolitan Rail Transport Project Board
ICOCA . . .	IC Operating Card
IC/R . . .	Inception Report
IEE . . .	Initial Environmental Evaluation
IT/R . . .	Interim Report
JARTS . . .	Japan Railway Technical Service
JICA . . .	Japan International Cooperation Agency
KEIHAN . . .	Keihan Electric Railway Co., Ltd.
MARD . . .	Ministry of Agriculture and Rural Development
MOC . . .	Ministry of Construction
MOF . . .	Ministry of Finance
MOFA . . .	Ministry of Foreign Affairs
MOIT . . .	Ministry of Industry and Trade
MOJ . . .	Ministry of Justice
MONRE . . .	Ministry of Natural Resources and Environment
MOPS . . .	Ministry of Public Security
MPI . . .	Ministry of Planning and Investment

MOST . . .	Ministry of Science and Technology
MOT . . .	Ministry of Transport
MRB . . .	Hanoi Metropolitan Railway Management Board
NFC . . .	Near Field Communication
NRI . . .	Nomura Research Institute
NPV . . .	Net Present Value
ODA . . .	Official Development Assistance
PPP . . .	Private Public Partnership
RAP . . .	Resettlement Action Plan
ROE . . .	Return on Equity
ROI . . .	Return on Investment
RPF . . .	Resettlement Policy Framework
SUICA . . .	Super Urban Intelligent Card
TRICC . . .	Transport Investment and Construction Consultant
VNR . . .	Vietnam Railways
VNRA . . .	MOT Vietnam Railway Administration

Chapter 1 Preface

1.1 Current Hanoi city

1.1.1 Natural environment

(1) Topography

Hanoi is composed of two kinds of topographical features; the delta and the Middle Region of the North. Most of the deltaic land lies on both sides of the Red River and its tributaries. The Middle Region is comprised of Soc Son district and a portion of Dong Anh district, a prolongation of the Tam Dao mountainous mass stretching towards the Delta which is 7-10 m or sometimes even hundreds of meters above the sea level. This is why Hanoi topography has an inclination in the direction North-South.

Many rivers flow through Hanoi. The first is the 1,183 km long Red River flowing from its source in China. The section flowing through Hanoi from Dong Anh district to Thanh Tri district is 40 km long. The second largest river, the Duong separates from the Red River at Xuan Canh then flows through Ngoc Thuy and Yen Thuong communes then cuts the National High Way 1A at the Duong Bridge before passing through the territory of old Ha Bac province to empty itself into the Thai Binh River. Beside these two rivers, Hanoi has many other waterways, ponds and lakes.

(2) Climate

Hanoi features a warm humid subtropical climate with plentiful precipitation. The city experiences the typical climate of northern Vietnam, where summers are hot and humid, and winters are, by natural standards, relatively cool and dry. Summers, lasting from May to September, are hot and humid, receiving the majority of the annual 1,680 millimeters of rain fall. The winters are short, relatively dry, and mild, while spring can bring light rains.

Together with the characteristic that rivers and lakes are abundant while gradient is low, Hanoi is annually affected by heavy rains causing large-scale floods. The typical case is the flood in 1971 when the water level in Hanoi rose up to 14.3 m, in 1986 when the water level reached 11.9 m and in 1996 with water level height at 13.3 m.

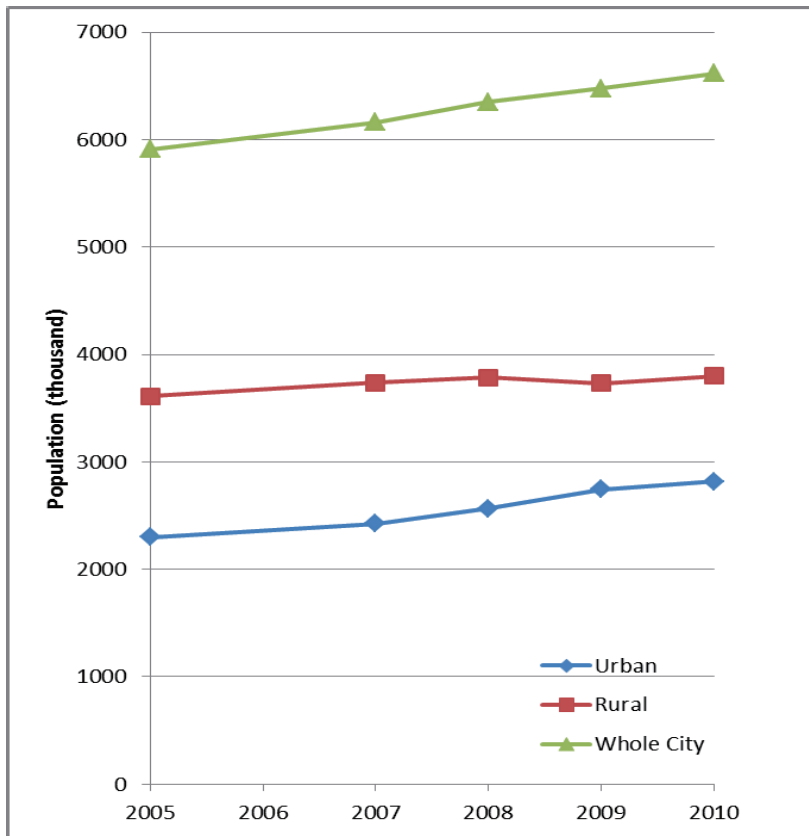
1.1.2 Social environment

Hanoi is the capital of Vietnam. On May, 2008, it was decided that Ha Tay Province, Vinh Phuc Province's Me Linh district and 4 communes of Luong Son District, Hoa Binh be merged into the metropolitan area of Hanoi from August 1, 2008. Hanoi's total area then increased to 3,325 km² with the new population being 6,470 thousand. Hanoi is composed of 10 urban districts, 1 town and 18 rural districts.

Recently, the Government plans a preferential strategic program to develop Hanoi into an international large-scale city as well as a national political and administrative center, and a large-scale center of culture, education, economy and international transaction.

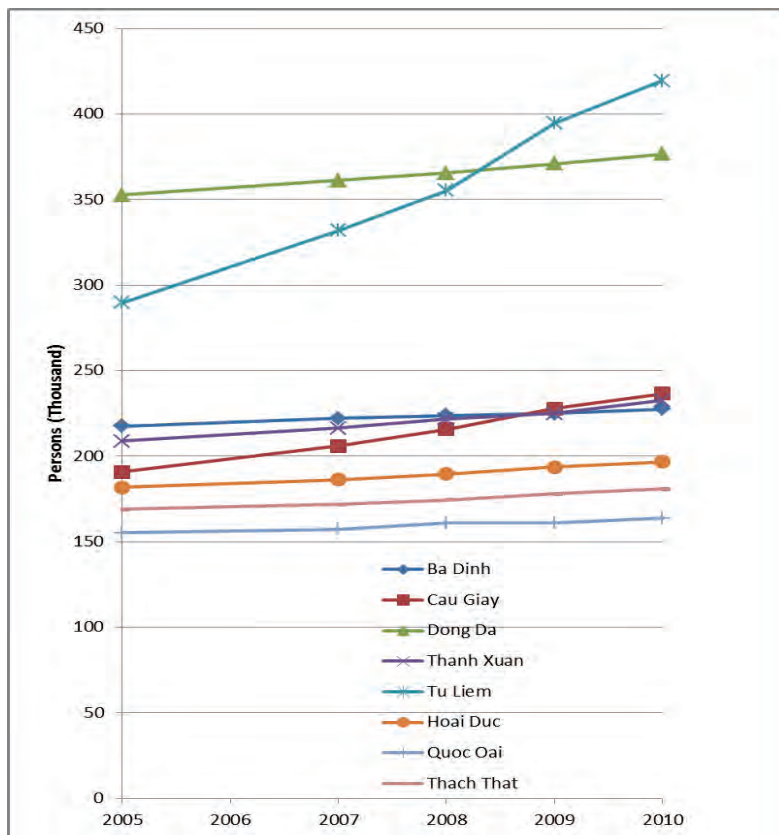
(1) Population

The figure 1.1.1 below shows the population of Hanoi from 2005 to 2010. The rate of increase in whole city from 2005 to 2010 is about 20%, and that in urban area is higher than that in rural area. Urban population is predicted to increase by from approximately 30% currently to 50% by 2050. Population and population density of districts along Line 5 are shown at Fig. 1.1.2 and Fig. 1.1.3 respectively.



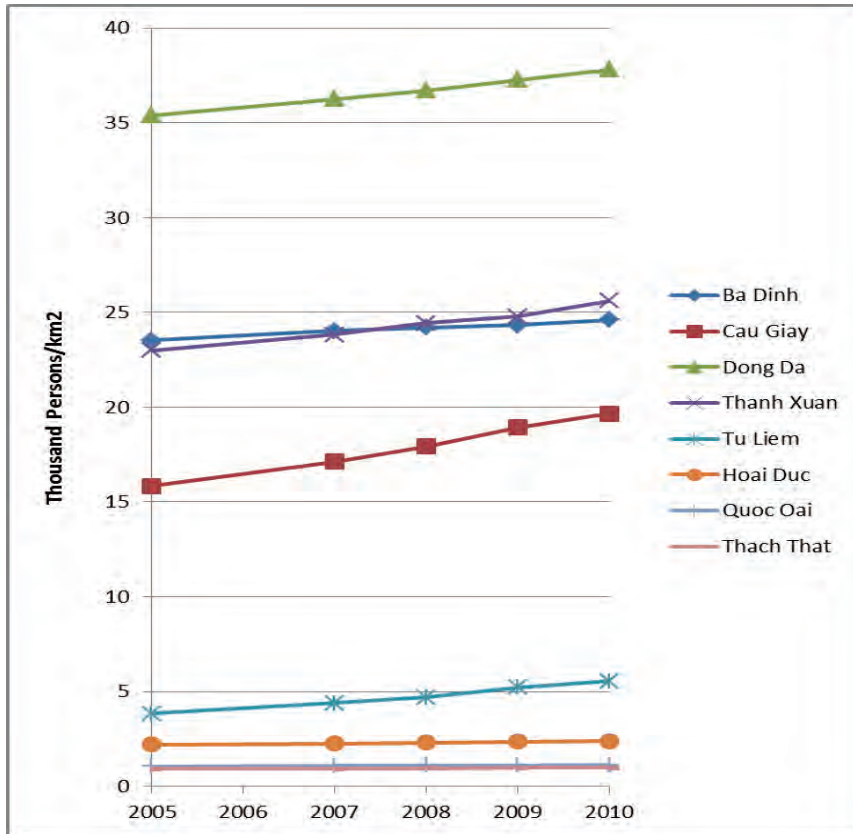
Source: Hanoi Statistical Yearbook 2010

Figure 1.1.1 Population in Hanoi



Source: Hanoi Statistical Yearbook 2010

Figure 1.1.2 Population of districts along Line 5

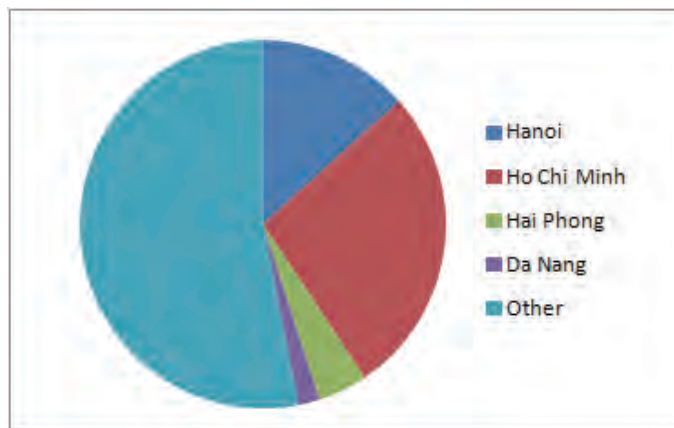


Source: Hanoi Statistical Yearbook 2010

Figure 1.1.3 Population density of districts along Line 5

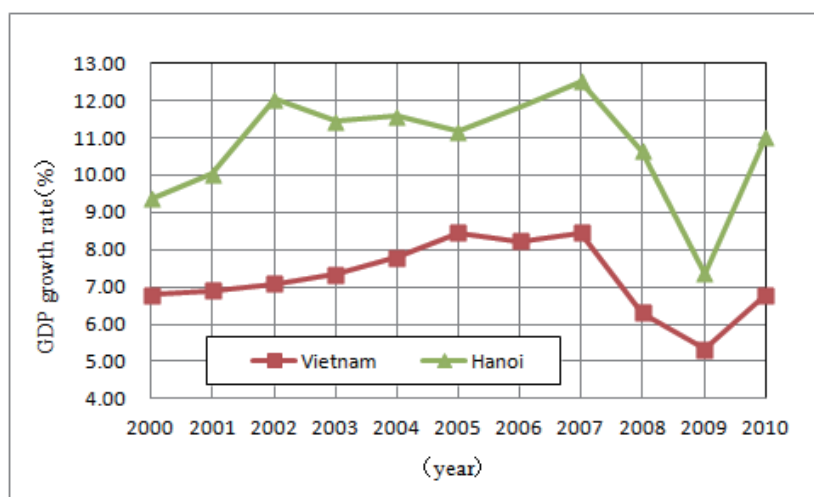
(2) GDP

The GDP in Hanoi in 2010 is USD 12.3 billion, and that is 13% of the GDP in Vietnam. The economy of Hanoi has steadily developed in recent years. As a matter of fact, the average real economic growth rate of the city over the last 10 years is 10% or over, which is higher than the corresponding figure of the country as a whole. The average GDP growth rate in Hanoi during the last ten years is more than 10%, and higher than that in Vietnam. The GDP per capita in Hanoi in 2009 is USD 1,950, higher than the national average, USD 1,064.



Source: Hanoi Statistical Yearbook 2010

Figure 1.1.4 the GDP in 2010



Source: Hanoi Statistical Yearbook 2010

Figure 1.1.5 GDP in the real terms from 2000 to 2010

(3) Economy

Hanoi Capital after ‘Doi moi’ (renovation) policy in 1986 achieved radical economic growths owing to the opening and liberalization of the domestic market. Thereby, Hanoi’s economy always maintained sustainable growth rate over the last decade.

Industrial production in the city has experienced a rapid boom since the 1990s, with average annual growth of 19.1 percent from 1991-1995, 15.9 percent from 1996-2000, and 20.9 percent from 2001-2003. Recently the average annual growth is 11.6 percent from 2006-2010. Service production is another strong sector of the city. The average annual growth is 10.6 percent from 2006-2010. The economic structure also underwent important shifts, with tourism, finance, and banking now playing an increasingly important role.

Agriculture, previously a pillar in Hanoi’s economy, has striven to reform itself, introducing new high-yield plant varieties and livestock, and applying modern farming techniques.

Similar to Ho Chi Minh City, Hanoi enjoys a rapidly developing real estate market. The metropolis’s economy growth does not seem correlative to its infrastructure. Overloading population requires a much larger supply of accommodations, while constructing celerity of both transport system and new urban areas are too low.

Together with economic growth, Hanoi’s appearance has also changed significantly in recent years. Infrastructure is constantly being upgraded, with new roads, railways, and improved public transportation system.

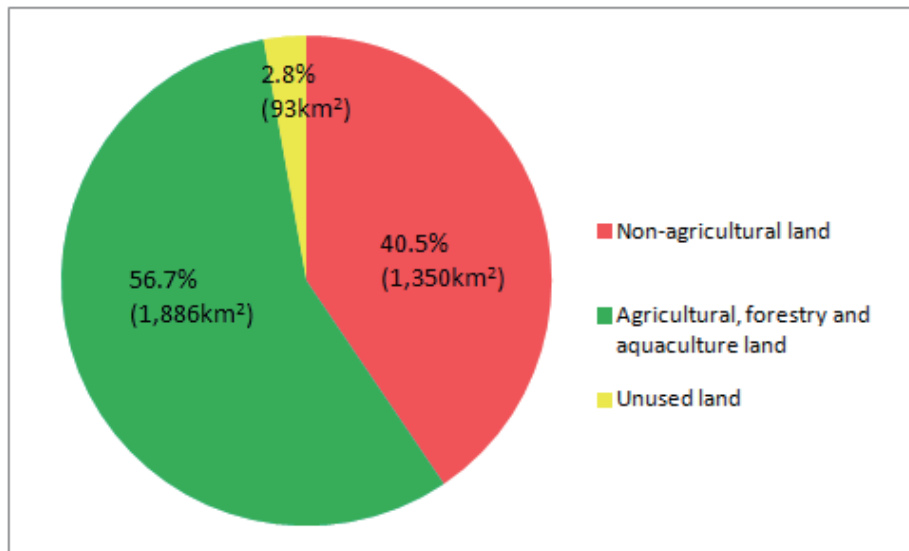
Table 1.1.1 Some main indicators per capita

Indicator	Unit	2005	2007	2008	2009	2010
Total value of exports in Hanoi	USD	508.1	823.5	1087.2	977.0	1225.3
Total value of local imports	USD	651.8	1088.4	1405.2	1159.0	1330.2
Gross output of industry (At price of 1994)	Mill. dongs	8.3	11.7	13.3	14.7	16.4
Gross output of agriculture (At price of 1994)	Mill. dongs	1.1	1.1	1.2	1.1	1.2
Social investment	Mill. dongs	7.2	14.0	14.7	22.8	26.2

Source: Hanoi Statistical Yearbook 2010

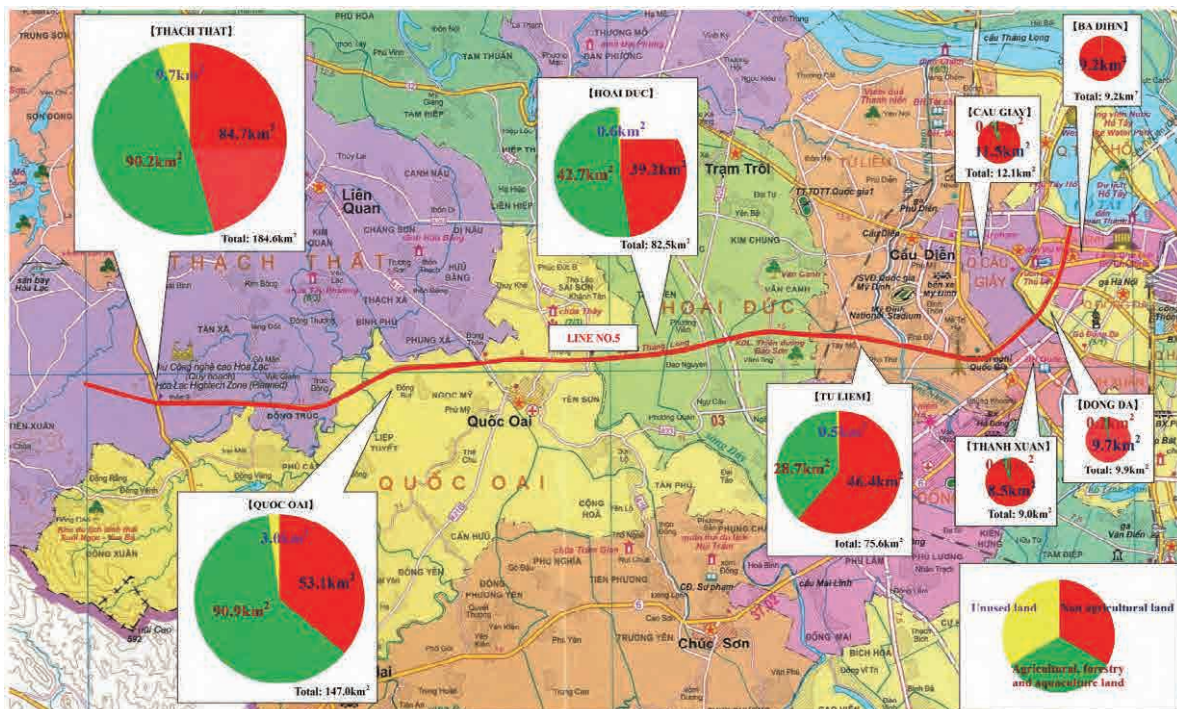
1.1.3 Land utilization

Existing land use in Hanoi city is shown at Fig 1.1.6. About 40 percent of land is used for non-agricultural land. The further the land is from the downtown area, the more land is used for agricultural, forestry and aquaculture land. The existing land use of districts along Line5 is shown at Fig. 1.1.7.



Source: Hanoi Statistical Yearbook 2010

Figure 1.1.6 Existing land use in Hanoi city

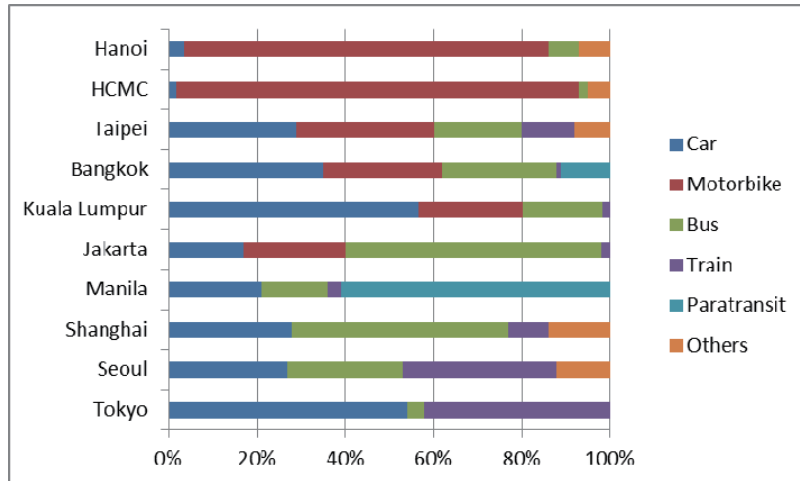


Source: Hanoi Statistical Yearbook 2010

Figure 1.1.7 Existing land use of districts along Line 5 (Size of each circle defines the size of municipal area)

1.1.4 Transport

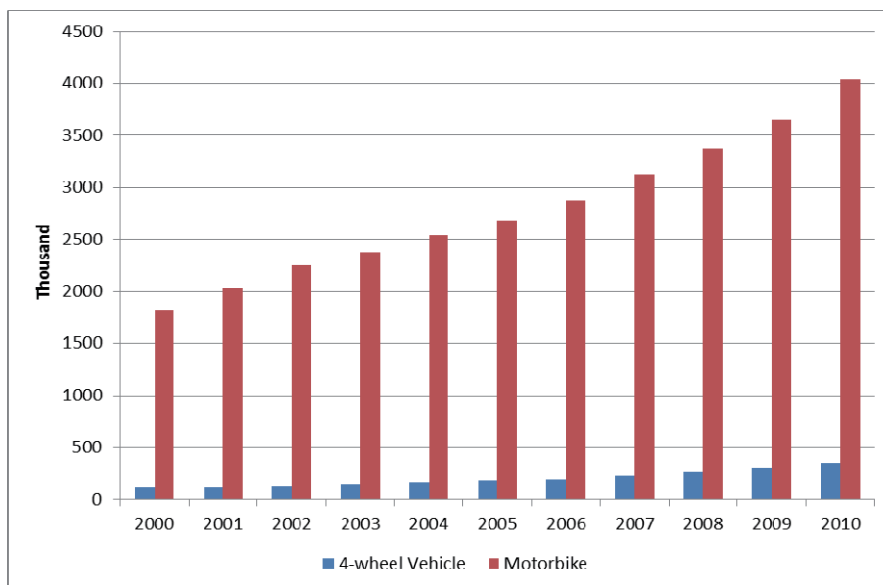
The main means of transport within the city are motorbikes, buses, taxis, and bicycles. Buses are the only public transport means that had a market share of 25 to 30% in the 1980s. As a result of the Doi Moi policy that cut subsidies to public undertakings, however, the routes and frequency of bus operation were curtailed. According to the policy to expand bus routes thereafter, however, the number of bus users rallied from 11 million in 2000 to 403 million in 2009 to recover the market share to about 10%, which is still hovering low when compared with that in major cities in southeast Asian countries.



Source: Institution for Transport Policy Studies Rail Seminar in Tokyo, March 21, 2012)

Figure 1.1.8 Market shares of different transport facilities in the major cities in Southeast Asian countries

Motorization has progressed in Hanoi, with the number of registered cars reaching 350,000 in 2010, which is double that in 2000, and there are now 670 motorbikes per 1,000 persons or 4.04 million in total.



Source: JICA Home Page

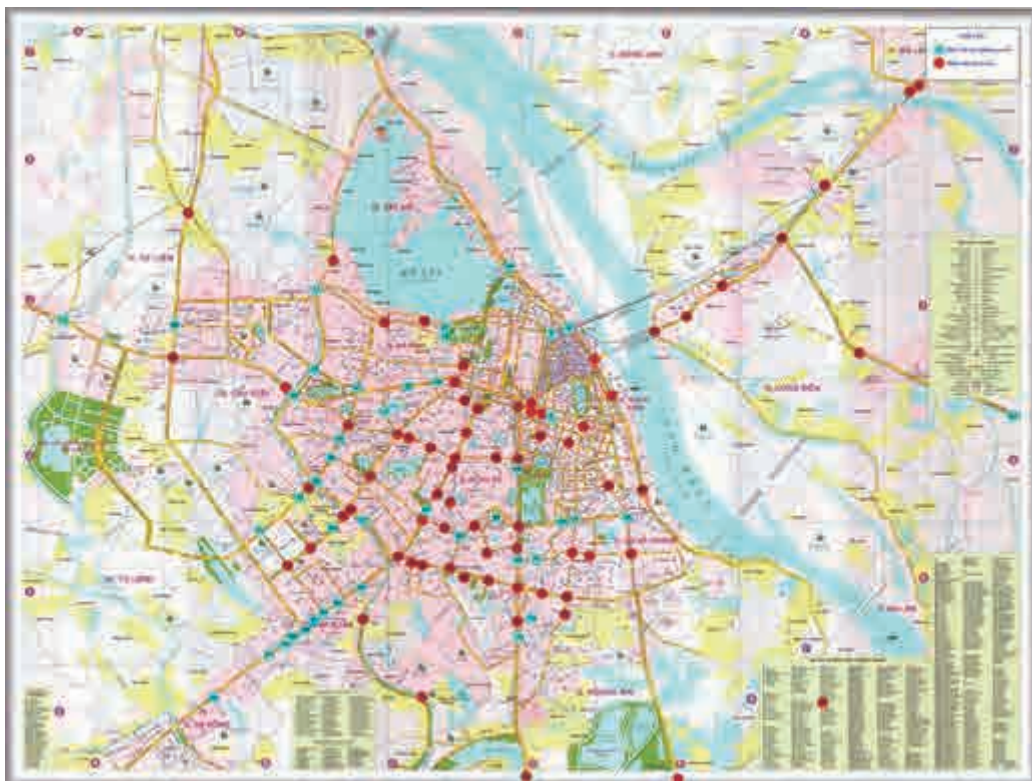
Figure 1.1.9 Motorization in Hanoi

Construction of roads is far from satisfactory, however, causing frequent traffic jams across the city or at about 70 intersections. It typically takes about one hour to move 2 km in the city center by taxi in the evening on rainy days. A comparison of survey results in 2005 HAIDEP and 2009 TRAHUD definitely proves worsening traffic conditions.



Source: JICA Home Page

Figure 1.1.10 Traffic jams sections in HAIDEP and TRHUD



Source: JICA Home Page

Figure 1.1.11 Traffic jams sections extracted by TRAUD Project

To relax traffic congestion, the Vietnamese government has put in force a tentative policy to change the hours for students/pupils to go to school and those for public officers to commute to their offices. Nevertheless, as a result of rapid economic growth and urbanization in recent years, traffic demands are consistently increasing. As a drastic measure to solve the problem, therefore, the Hanoi city expects the construction of the eight urban railway lines in the city targeted to complete in 2050, which is adopted in the 2030 Hanoi construction master plan.

1.2 Planning on the urban and transport development of Hanoi City

1.2.1 Land utilization and urban development orientation

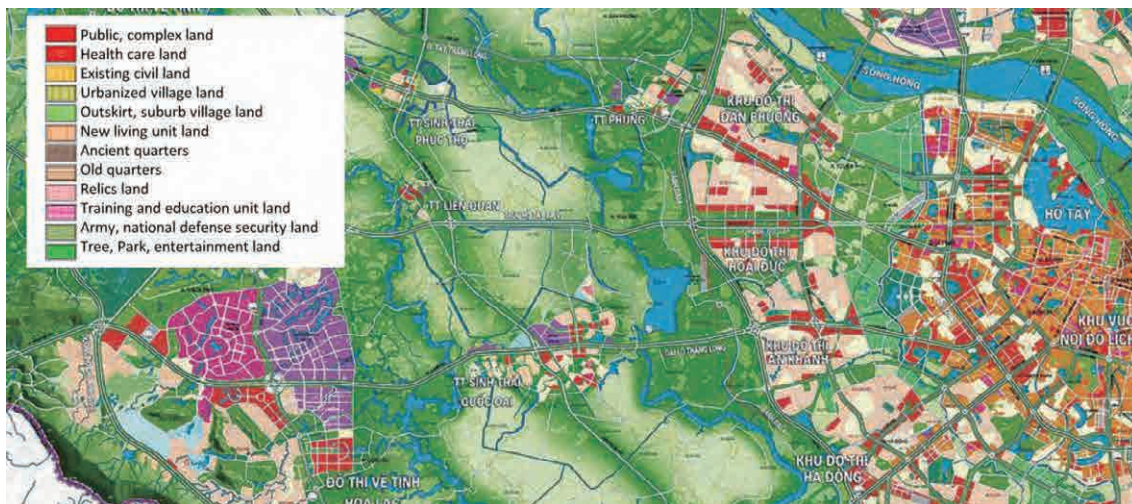
(1) Hanoi city master plan

The Hanoi city master plan up to 2020 was approved on June 20, 1998, by the prime minister as the Decision No. 108/1998.

After that, the Comprehensive Urban Development Program in the Hanoi Capital City (HAIDEP) was completed in 2007 for Hanoi and its peripheral areas through the cooperation of JICA. Based on the results, the prime minister approved the Hanoi capital city construction plan by Decision No. 490/Od-TTg dated May 5th, 2008 based on the vision up to 2050, setting fiscal 2020 as the target year.

The boundary between the Hanoi city and its adjacent areas was changed by the Resolution No. 15/2008/QH12 at the Diet on May 29, 2008, to compose an expanded Hanoi metropolis zone having a total area about 3.6 times as large and a population twice as large, with the conventional city area of Hanoi added with the whole areas of Ha Tay Province, Me Linh Prefecture in the Binh Phuoc Province and four villages in the Luong Son Prefecture of the Hoa Binh Province.

The prime minister approved the traffic master plan, Hanoi city, including an urban railway construction plan up to 2020, on July 9, 2008, by the Decision No. 90/2008/QD-TTg and a plan to construct an expanded Hanoi Metropolis zone with the target year of completion set at 2030 (foreseeing 2050) on December 22, 2008, by the Decision No. 1878/QD-TTg.



Source: Internet Architect, Magazine of the American Institute of Architects
Figure 1.2.1 A map in the Hanoi City master plan (part)

For the Hanoi city construction master plan to cover a city area of 3,344.6 km², the Minister of Construction selected such international consultants as Perkins Eastman (US), Posco Engineering and Construction (Korea) and Jina (Korea) on September 23, 2008, and compiled a report jointly with Vietnam Institute for Architecture, Urban and Rural Planning (VIAP), a government organization, based on which the master plan was drawn up by the Vietnamese government.

The prime minister also approved the Hanoi construction master plan setting the target year of completion at 2030 (foreseeing 2050) on July 26, 2011. It is predicted that the population will be approximately 9.0 – 9.2 million people and urbanization rate will be 65 – 68% by 2030.

(2) A regional development plan and western areas including Hoa Lac

The government specifies the old urban area of Hanoi, from the west of the Hong River to Ring Road 2, as a historic site where development is carefully regulated considering aesthetic squares, building height, etc. The area from Ring Road 2 to the Nhue River outside Ring Road 3 is an expanded urban development area. The area outside of this, west of the Nhue River, to Ring Road 4, north of Hong River, is an urban development area.

Five satellite city areas, Hoa Lac, Son Tay, Xuan Mai, Phu Xuyen and Soc Son, are planned remotely from the city center, to bear part of the city functions of Hanoi, for housing, education and training, industries and services. These satellite cities are expected to have a population of 1.3 to 1.4 million and a development area of 35,200 ha in total in 2030.

Among these satellite cities, Hoa Lac is positioned as an area of science, technology and training having such important facilities as the Hanoi University, the Hoa Lac High-Tech Park, the Dong Mo health resort and a Vietnamese Ethnic Culture-Tourism Village. As a result of such development, Hoa Lac is expected to have a population of 600,000 in 2020 (eventually 750,000), an intact natural area of 20, 113 ha, a density of land utilization of 80 to 90 m²/person and a maximum development area of 18,000 ha.



Source HHTP Authority

Figure 1.2.2 The Overhead view of Hoa Lac High-Tech Park

As a western entrance to Hanoi City, Hoa Lac also connects to Ba Vi, Dong Mo, Tich River, National Road 21, Ho Chi Minh Road and the city center through the Thang Long Road.

For Quac Oai and other districts located along the Thang Long Road at the center between the Hanoi midtown and Hoa Lac, the government plans to develop social infrastructures and facilities for power/water supply, traffic and environments, workshops and other plants for production, while paying attention to environmental preservation, and construct urban parks and green belts along the Nhue River as a buffer zone for expansion of urban areas.

Between the western satellites and the Ring Road 4 along the Day and Tich Rivers, the government will also construct green belts or a green corridor to prevent floods and preserve/protect traditional cultures, environments, creatures and the beauty of natural scenes.

1.2.2 Orientation for road construction

(1) Trunk road network

According to the Hanoi Capital construction master plan, there are seven trunk roads leading to the city center shall be improved, including: Hanoi – Thai Nguyen, Hanoi – Lao Cai, Hanoi – Ha Long, Hanoi – Hai Phong, Hanoi – Hoa Binh, Tay Bac Expressway – National Highway No. 5, and Hanoi – Ninh Binh – Thanh Hoa.

Also, it is planned to newly construct and improve Ho Chi Minh road, stage 2; complete ring road No. 3, 4 and 5; repair and upgrade national highway routes: NH No. 1A, 6, 21B, 32, 2, 3 and 5.

The transport axes connecting the city center with suburbs shall be newly constructed, comprised of: Ngoc Hoi – Phu Xuyen, Ha Dong – Xuan Mai, Ho Tay – Ba Vi axis, Tay Thang Long, Do Xa – Quan Son, North- South economic axis, Mieu Mon – Huong Son, Southern economic axis, extended Le Van Luong – Chuc Son and principal centripetal provincial roads.

The government will construct eight new bridges or tunnels to cross the Hong River, three new bridges while repairing two existing bridges to cross the Duong River and two bridges to cross the Da River in the west of Ba Vi. The government will also construct parking lots and bus terminals in local areas.

Regarding the road to Hoa Lac, the prime minister approved the master plan to construct an expressway between Lang and Hoa Lac by the Decision No. 855/QD-TTg on September 27, 2002.

(2) Roads along the urban railway line 5

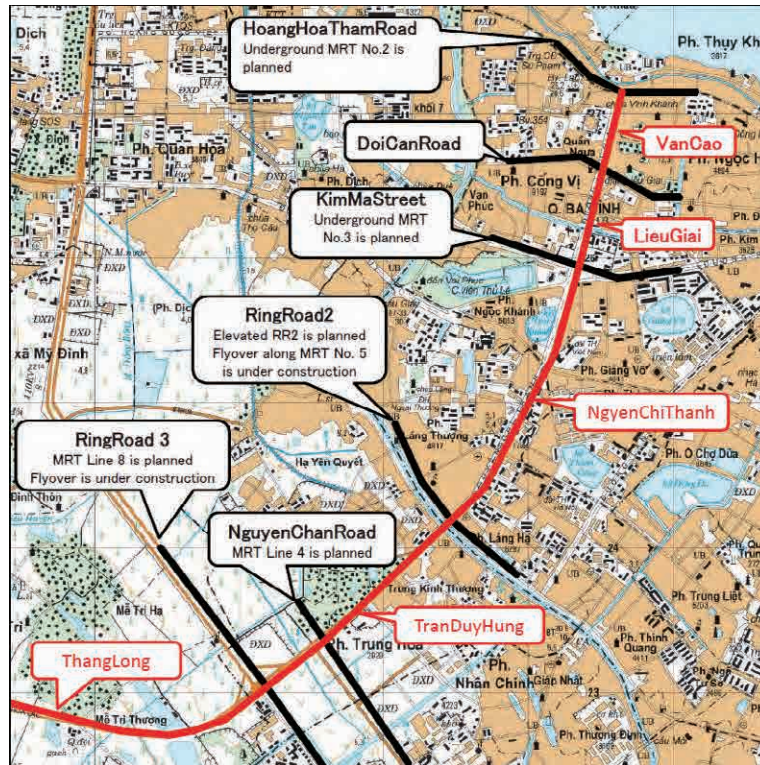
The Hanoi urban railway line 5 starts at a point near the intersection between the Van Cao Street and the Hoang Hoa Tham Street where the urban railway line 2 will be constructed and passes the Van Cao Street and the Lieu Giai Street to lead to the Kim Ma Street where the urban railway line 3 will be laid. The road expansion work has been completed mostly along these Roads.

In the south of the Kim Ma Street, the Hanoi urban railway line 5 leads to the intersection with the Ring Road 3 after passing the Nguyen Chi Thanh and Tran Duy Hung Streets, where the road construction work has been completed, though there remain partly small median strips. The grade separation work is planned at the intersections of the urban railway line 5 with the Ring Roads 2 and 3, which will be constructed totally as an elevated structure according to an existing plan.



Source: JICA Study Team

Figure 1.2.3 A scene near the intersection between Lieu Giai Street and Kim Ma Street



Source: JICA Study Team

Figure 1.2.4 Roads along the urban railway line 5

Beyond the intersection with the Ring Road 3, the urban railway line 5 extends westward up to Hoa Lac along the Thang Long Road, where the construction of the 6- to 8-lane Ring Road 4, width 120 m and length 60 km, is planned near the boundary between the city center and the green belt area for protection of natural environments.



Source: JICA Study Team

Figure 1.2.5 A scene of the Thang Long Road

The construction of the Thang Long Road has been completed between the National Convention Center by the Ring road 3 and the intersection with the National Road 21 in the Hoa Lac district to have a width of 140 m, six main line lanes and four frontage lanes. According to the master plan, the railway line will also be constructed within the right of way of the Road.

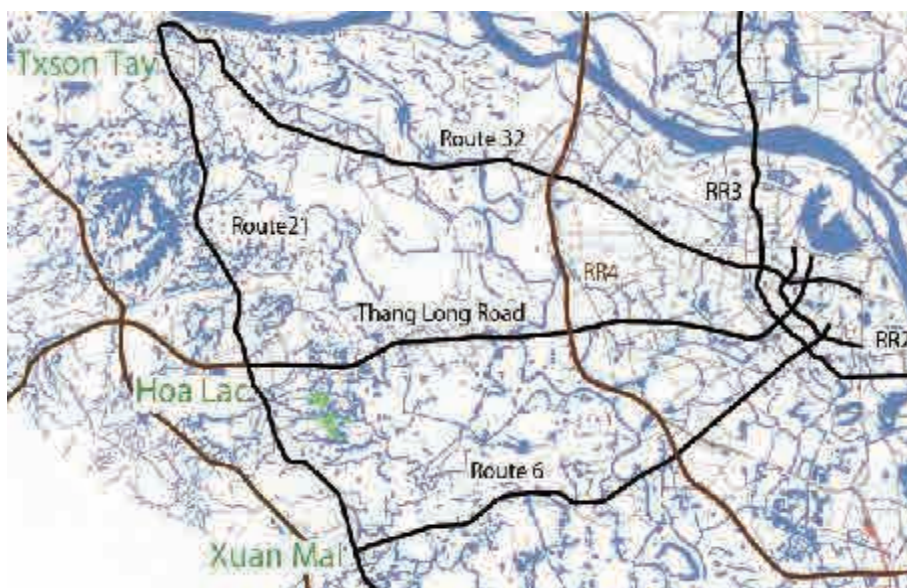
Besides a plan to extend the Thang Long road up to Hoa Binh, there is an idea to construct a road from Hoa Lac to Trung Ha near the Da River Bridge of the National Road 32 in the southwest of Ba Vi, which has not been concretized yet, however. Therefore, the section of the Hanoi urban railway line 5 in the west of Hoa Lac will be studied in consideration of the conformity with the master plan and other plans related thereto.

(3) Roads in the western part of the Hanoi city

There are three important roads in the western part of the Hanoi city: National Road 32, Thang Long Road and National Road 6, which are running in the northwest, west and southwest directions, respectively, from the Hanoi city. The government plans to construct three satellite cities, each at the ends of these roads, Son Tay, Hoa Lac and Xuan Mai.

These three satellite cities will be connected by the National Road 21 to compose a large-scale road network. The National Road 21 passes the boundary between the plain and the hilly country in the western part of the Hanoi city to be positioned as an outmost corridor around the city. On the other hand, the Hanoi Construction master plan conceives an idea to improve the Ho Chi Minh road running at the further west side of the National Road 21 and construct a road to Mieu Mon in the south from Trung Ha through Son Tay and Ho Lac.

On the city center side, the construction of the Ring Roads 2 and 3 is now under way to establish a road network with the aforementioned three radial roads. The Ring Road 3 will pass near the boundary between the Hanoi urban area and suburbs.



*: Black lines: existing Roads, Brown Lines: planned roads

Source : Hanoi Construction Master Plan up to 2030(Decision No. 1259/QD-TTg)

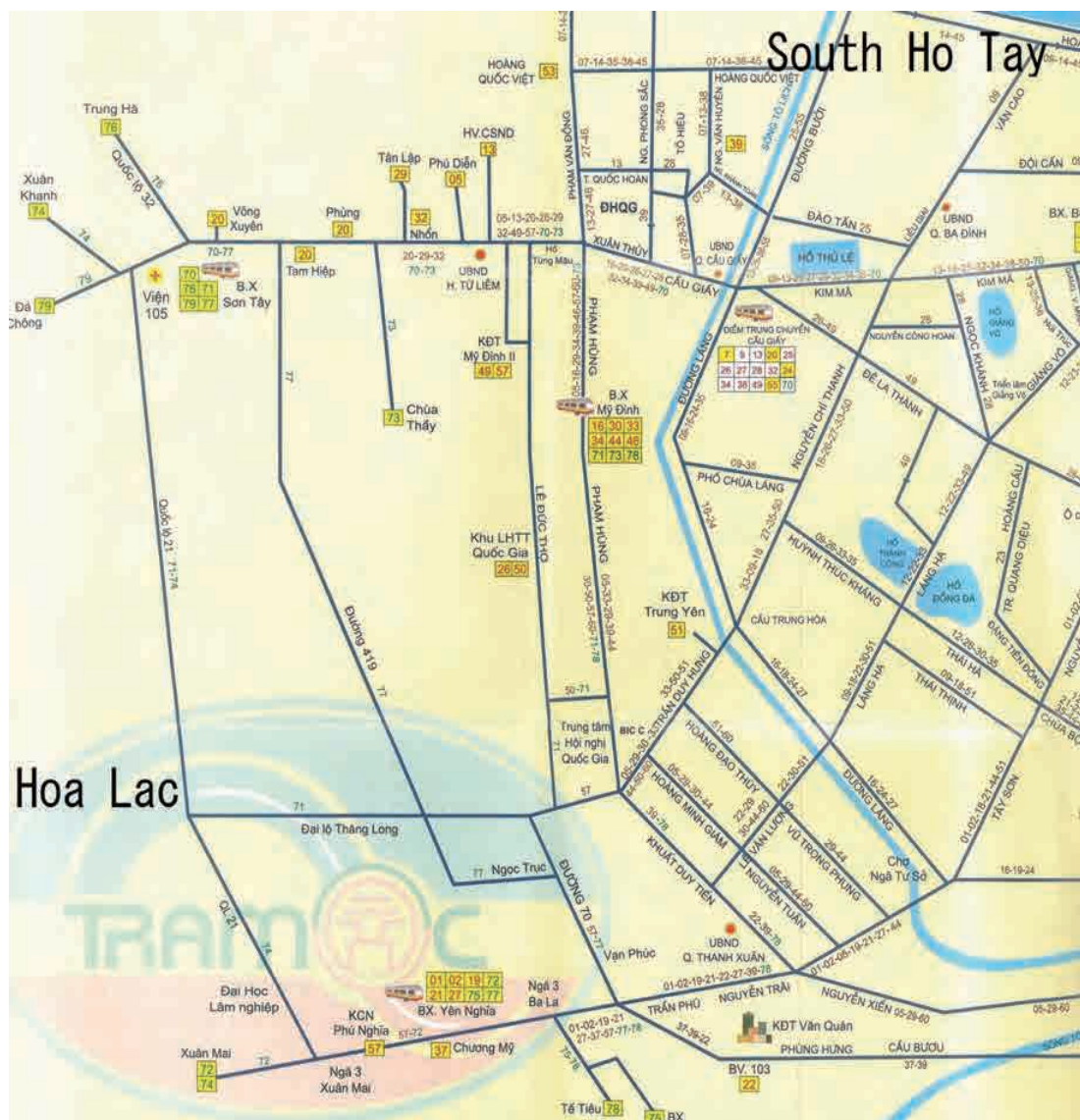
Figure 1.2.6 Western Hanoi Road Construction Plans

1.2.3 Orientation for public transport development

(1) Present status of public transport

People frequently use motorbikes in Hanoi as the public transport facilities are not developed sufficiently. The public transport in the city currently relies solely on buses that are in operation as an urban public transport means under the supervision of the Hanoi Urban Transport Management and Operation Center (TRAMOC). There are four bus operation companies subsidized by the Hanoi city and five non-subsidized companies that are in operation in old Ha Tay, a district newly included into the city. In the future, all bus operation companies will be entitled to the subventions from the city. TRAMOC determines fares, routes and stops. Each bus operator operates buses on the fixed routes, assigned in a one-operator one-route principle by means of bidding.

Buses are used dispersedly to avoid traffic congestion. See Fig. 1.2.7 for the 70 bus routes in Hanoi as of 2011. Several sections along the planned alignment of Hanoi urban railway Line 5 to be constructed in the future are now served separately by the following bus routes: No. 5, 9, 18, 26, 27, 29, 30, 33, 35, 50, 51, 57 and 72.



Source: Hanoi Bus Map, HUTMOC, Hanoi Department of Transport
Figure 1.2.7 Hanoi city bus map

Buses are now in operation for the sections: Linh Dam-Phu Dien (Line 5) , Bo Ho – Cau Giay (Line 9), Kim Ma – Long Bien (Line 18), Mai Dong – Quoc Gia (Line 26), Yen Nghia – Nam Thang Long (Line 27), Giap Bat – Dong Ngac (Line 29), Mai Dong- My Dinh (Line 30), My Dinh – Xuan Dinh (Line 33), Kanz – Merin (Line 35), Long Bien – Quoc Gia (Line 50), Tran Khanh Du – Trung Yen(Line 51), My Dinh – Phu NGiA (Line 57) and Yen Nghia – Xuan Mai (Line 72).

Bus fares are 3,000 Dong flat within the city, 5,000 Dong on the Lines 35 and 57 extending into the suburbs and 8,000 to 20,000 Dong for the Thang Long road sections of the Line 71.

According to the Hanoi city construction master plan, the space inside the Ring Road 4 will contain the roads constructed for exclusive use for bus operation (bus rapid transit systems(BRTs)), together with plural traffic roads including those for urban railways. In this area, 20 to 26% of the land for urban development will be used for public transport, thereby bearing 35% and 55% of the volume of passenger transport in 2020 and 2030, respectively. In the satellite cities using 18 to 23% of the land for urban development on the other hand, the corresponding figures of public transport are planned to be 26 and 43%, respectively. The midtown center and satellite cities will be connected by suburban railways, BRTs or conventional buses.

Table 1.2.1 excerpts the bus operation routes in the plan of urban mass transport routes.

Table 1.2.1 Plan of urban bus mass transport routes

	Line	Midway towns	Length (km)	Remarks
1	Priority Bus Line 1	Ba La Bong Do – Expressway 6– Nguyen Trai – Lang Ha – Kim Ma – Ba La Bong Do – Xuan Mai	43.5	Connection between the city center and satellite cities
2	Priority Bus line 2	Vinh Quynh – Giai Phong – Dai Co Viet – Pho Hue – Hang Bai – Vinh Quynh – Phu Xuyen	50.5	Connection with the trunk lines at the center and satellite cities

Source: Hanoi Capital Construction Master Plan until 2030 and vision to 2050

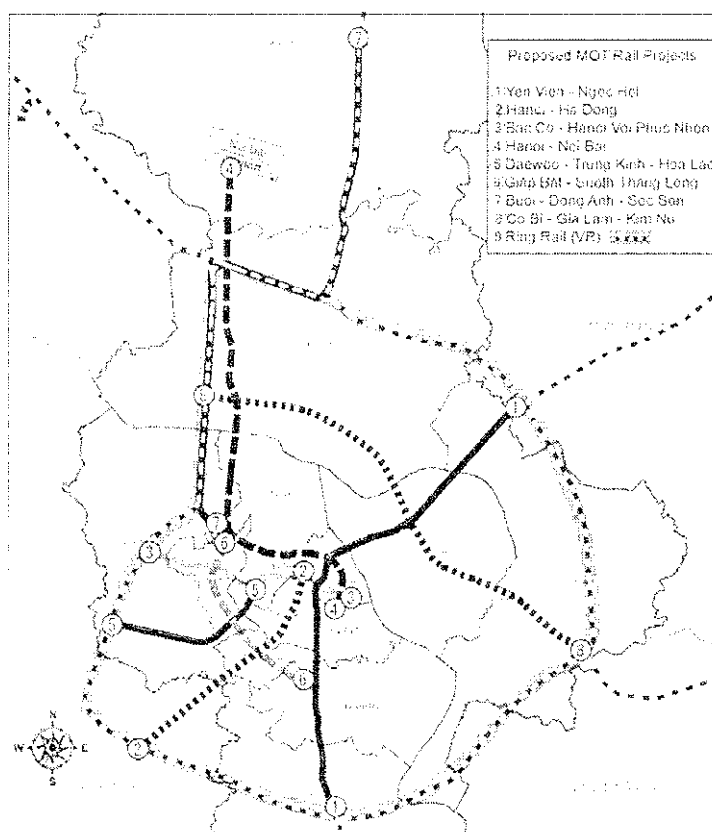
(2) Railway

Table 1.2.2 shows the draft plan up to 2020, which is prescribed in the Comprehensive Urban Development Program in the Hanoi Capital City (HAIDEP), March 2007. The report reproduces the MOT railway master plan. See Fig. 1.2.8. The mark (5) indicates the downtown section of the Hanoi urban railway line 5 under survey.

Table 1.2.2 Mass transit route proposed in HAIDEP

Line	Length of railway line (km)	Length of BRT (km)	Total (km)	Midway points
Line 1	38.7	-	38.7	Ngoc Hoi-Hanoi St.-Yen Vien, Nhu Quynh
Line 2	41.5	33.9	75.4	Ha Dong-City Center-Tu Liem-Noi Bai, Soc Sn
Line 3	21.0	12.0	33.0	Nhon, Hoa Lac-Hai Ba Trung, Ba Dinh-Hong Mai
Line 4	0	53.1	53.1	Tu Liem-Co Bi, Noi Bai Route of ring road 2.5
Total	101.2	99.0	200.2	

Source: HAIDEP report, 03/2007



Source: HAIDEP Report March, 2007, p8-66
Figure 1.2.8 MOT Master Plan

See Table 1.2.3 for the urban railways in the suburbs of Hanoi prescribed in the railway transport development master plan up to 2020, which was approved by the Prime Minister's Office as the Decision No. 1436/QD-TTg, on September 10, 2009, in which the section containing the Hanoi Urban railway line 5 under survey is shown as the line 6.

Table 1.2.3 Railway master plan (Hanoi urban railways)

No.	Midway points	Length (km)	Construction cost (billion VND)
1	Ngoc Hoi – Yen Vien – Nhu Quynh	38.7	38,390
2	Hanoi – Ha Dong – Xuan Mai	38	26,675
3	Noi Bai – city center – Thuong Dinh	33.9	44,715
4	Son Tay – Nhon – Hanoi St. – Hoang Mai	41	67,659
5	Dong Anh – Sai Dong – Hoang Mai – Thanh Xuan – Tu Liem – Thuong Cat – Me Linh	53.1	6,107
6	Southern Ho Tay – Ngoc Khanh – Hoa Lac – Ba Vi	51.5	25,908

Source: Decision (No.1436/QD-TTg, Sept. 10, 2009)

According to the Hanoi construction master plan up to 2030 (General Planning on Construction of Hanoi Capital up to 2030 with a vision to 2050 (1259/QD-TTg)), the government will improve five principal national railway lines by electrification and track doubling to raise train speed to 70-80 km/h and construct a ring railway line to run in parallel with the Ring Road 4.

To connect satellite cities, eight urban railway lines will be constructed to a total length of 284.5km in harmony with BRTs. In addition to the already approved five lines, the railway construction plan has adopted three new lines: the Mai Dich – Yen So line along the Ring Road 3, the Mai Dich – Ngoc Hoi line or the existing national railway Hanoi western line and the Me Linh – An Khanh – Ngoc Hoi line.

A government document, Document No. 1496/VPCP-KTN, March 10, 2010, was released on the Hanoi urban railway construction project for the Ho Tay Lake South – Ba Vi section. The

Minister of Transport approved the formulation of the urban railway line construction project for the section Ho Tay Lake South – Ngoc Khanh – Lang – Hoa Lac–Ba Vi by the Decision No. 713/QD-BGTVT on March 22, 2010.

See Table 1.2.4 and Fig. 1.2.7 for the urban railway lines projected in the Hanoi construction master plan, in which the Hanoi urban railway line 5 under this survey is indicated as the line 5. The paragraph on the Hoa Lac area in Section 10.1 “Transport Plan,” Chapter 10, also remarks that the development of Hoa Lac shall be related to the surrounding transport routes and specifies the Hanoi urban railway line 5 along with several other roads as concrete transport routes.

Table 1.2.4 Hanoi urban railway lines under planning

Line	Midway points	Length (km)	Remarks
Line 1	Ngoc Hoi – Hanoi St. – Yien Vien, Nhu Quynh	34.7	Common use with the VNR’s interurban railway Connects the suburban areas in the northeast and those in the south of Hanoi through the city center.
Line 2	Noi Bai – City center – Thuong Dinh	50	A route to the south-west from the airport via the old quarter area to the north of the Hong River
Line 2A	Cat Linh – Hao Nam – La Than – Thai Ha – Lang street – Nga Tu So – National Highway 6 – Thuong Dinh – Ha Dong – Ba La	13.03	Connects the city western center to the southern and northern parts.
Line 3	Nhon – Hanoi St. – Hoang Mai	26.0	Connects the western part of the city to the southern part through the city center.
Line 4	Me Linh -Dong Anh – Sai Dong – Vinh Tuy/ Hoang Mai – Than Xuan – Tu Liem – Thuong Cat – Co Nhue	54	A loop line running at the periphery of the city center Connects urban railway lines 1, 2, 3 and 5 with a BRT.
Line 5	South of West Lake – Ngoc Khanh - Lang - Hoa Lac	25.6	Connects the western part of the city center and Hoa Lac along the Thang Long road.
Line 6	Noi Bai – Phu Dien – Ha Dong – Ngoc Hoi	43.2	Connects the airport through the elevated VNR west-bound freight line to Ngoc Hoi terminal of the line 1.
Line 7	Me Linh – An Khanh - Duong Noi	35.7	Connects the western parts of the city to be in parallel to the east side of the Ring Road 4.
Line 8	Co Nhue - Mai Dich – Yen So – Linh Nam – Duong Xa	36.4	Connects the new urban areas along the Ring Road 3.

Source: Hanoi Capital Construction Master Plan until 2030 and vision to 2050



Source: Hanoi Transport Master Plan up to 2030(Decision No. 1259/QĐ-TTg)
Figure 1.2.9 Map of planned urban railways in Hanoi

In March, 2008, the Hanoi city concluded an L/A on a yen credit to start a project for a 15 km section in the “Hanoi urban railway project (line 1) with VNR as the project owner.

In March, 2009, the Hanoi city also concluded an L/A on a yen credit to start a project on the 11.5 km Nam Thang Long – Tran Hung Dao section, line 2, in the “Hanoi urban railway construction project with the Hanoi Railway Bureau (HRB) under the Hanoi City People’s Committee as the project owner.

Furthermore, the Asian Development Bank (ADB) determined to provide a credit for the Hanoi urban railway Line 3 (12.5 km section between the Hanoi station and Nhon) in March 2011 to promote the project with HRB as the project owner together with a joint credit by the French government and the European investment bank (EIB). The construction of the Hanoi urban railway Line 2A (13 km section between Cat Linh and Ha Dong) was also started with the assistance of China in 2011 with VNRA as the project owner.

Under the circumstances, the Japan-Vietnam joint declaration on October 31, 2011, described that the two leaders from Japan and Vietnam had intense discussions on the continuation of the survey related to the Hanoi urban railway line 5 which was led by a Japanese joint venture.

The Hanoi construction master plan cites the 10 lines in Table 1.2.5 as planned for suburban railway transport, which includes the line from Hanoi to Son Tay and Hoa Binh through Hoa Lac. At the moment, however, surveys have not progressed yet on a concrete construction plan.

Table 1.2.5 Lines in the suburban railway construction plan

Line No.	Line	Length (km)	Remarks
1	Hanoi – Vinh Yen – Viet Tri	75.0	Performs transport in suburbs by using national railway lines.
2	Hanoi – Thai Nguyen	60.0	
3	Hanoi – Bac Ninh – Bac Giang	50.0	
4	Hanoi – Chi Linh (Sao Do)	60.0	
5	Hanoi – Hai Duong	60.0	
6	Hanoi – Phu Ly – Ninh Binh	85.0	
7	Hanoi – Hoa Lac - Son Tay	65.0	New lines
8	Hanoi – Hoa Lac – Hoa Binh	65.0	
9	Hanoi – Quan Son, Huang Pagoda	45.0	
10	Hanoi – Hung Yen	35.0	

Source: Hanoi Construction Master Plan

(3) Transportation Projects Along Line No.5

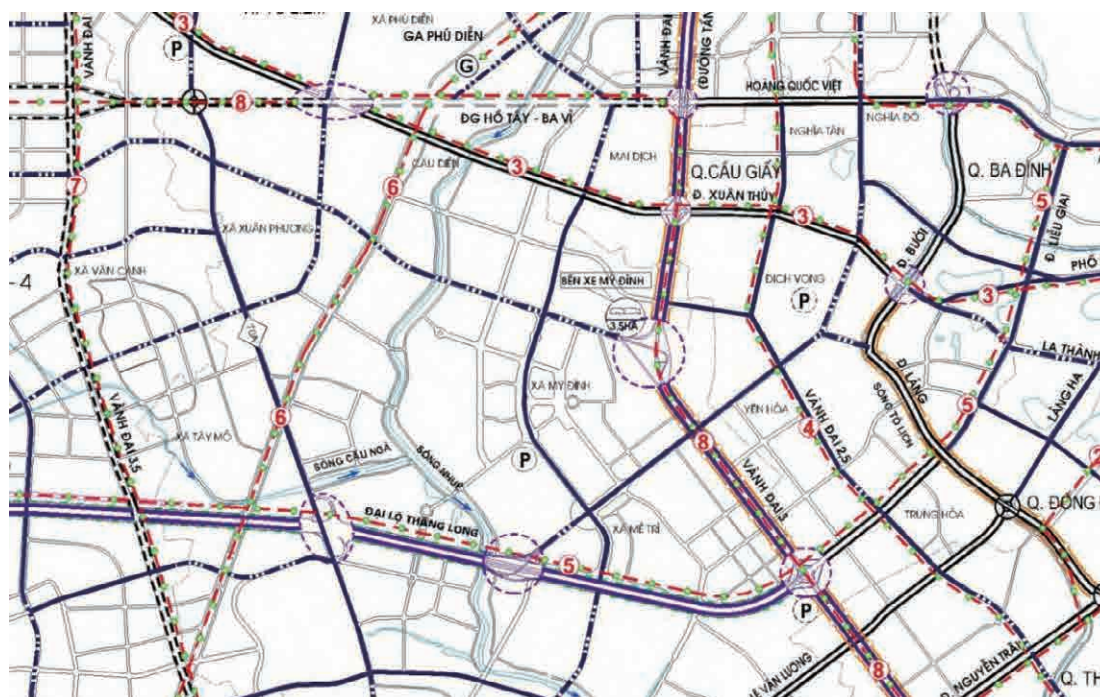
The transportation plan of Hanoi is indicated on the Hanoi Construction Master Plan up to 2030, and the railway crossing section with NO.5 is shown on the table 1-2-6.

Table 1.2.6 Crossing Lines and Sections with Line No.5

Line	Crossing Section
No.2	Hoang Hoa Tham Road
No.3	Kim MA Road
No.4	Nguyen Chan Road
NO.8	Ring Road 3
No.6	National Railway
Mo.7	Le Trong Tan Road

Source : Hanoi Construction Master Plan up to 2030(Decision No. 1259/QĐ-TTg)

The construction plans of roads, interchange, parking areas along line No.5 on the master plan is figured as fig.1.2.10, and area development plans or transportation related business plan is figured as Table 1.2.7.



Source: Hanoi Construction Master Plan up to 2030(Decision No. 1259/QĐ-TTg)

Figure 1.2.10 Transportation construction plan along line No.5

Table 1.2.7 Area development plans and transportation related business along Line No.5

Type of Business	Name	Remarks
Area Development Related	Quoc Oai Area development	Residential area development Quoc Oai area, Southern part of of Thang Long road
	Hoa Lac High Tech Park	Construction and development of High Tech Industrial Park and research center in Hoa Lac are, with support of JICA
	Hanoi University relocation	Relocation of Hanoi University from urban area of Hanoi to western Hoa Lac
	Residential Area development by Vinaconex	Having acquired development approval, Vinaconex is planning a large scale development on along the Thang Long road.
Transportation Related	TRAMOC in Hanoi authorized Bus business	TRAMOC states the route, bus stop location, price etc of bus line in Hanoi and newly integrated area
	VNR Railway Business	Despite VNR operates railway from Hanoi station, not being utilized for commuting, due to only few trains are operated per day on direction. There is also a plan to utilize the western part of freight line via Thang Long Bridge as Urban railway No.6. This line is not used for passenger transportation currently
	Priority Bus Business	By Utilizing new planned ring road, there is a plan to establish a business priority bus (BRT) business.

Source: JICA Study Team

1.3 Needs of PPP projects

1.3.1 Issues and needs of PPP in Vietnam

In recent years, Vietnam's investment in infrastructure, the adoption of an alternative scheme to traditional loan-funded by ODA is being promoted.

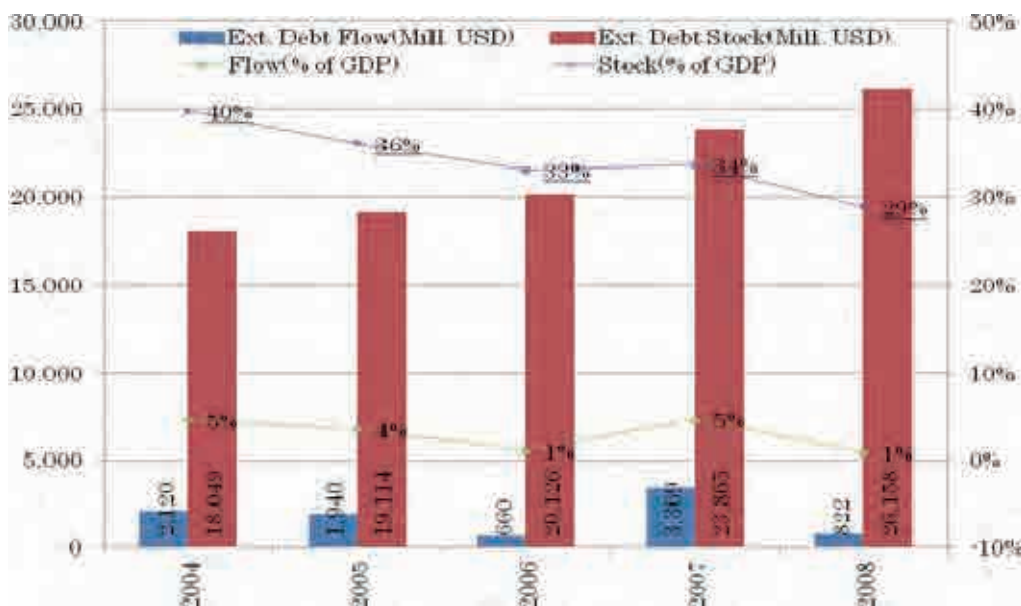
As a part of environment maintaining, and with the purpose of attracting and activating the investment of foreign investor, common Investment law and Unifies Enterprise law has been enacted on year 2006. Decree on Investment on the basis of Build-Operate-transfer (BOT), Build-Transfer-Operate (BTO) , and Build –Transfer(BT)Contracts enacted on year 2007 (Decree No.78/2007/ND-CP) and was updated on 2009 (Decree108/2009/ND-CP) ,with intention of promoting foreign investor for the construction of road infrastructure, ports, airports, railways, bridges, water, and power. Furthermore, on year 2010, Decision 71(Decision 71/2010/QĐ-TTg) was approved by Prime Minister Nguyen Tan Dung regulating the investment in pilot Public Partnership (“PPP”) projects, and has come into effect from January, 2011. Within the decision, Railways and Urban Transportation are stated as one of the target domains.

Vietnamese government's financial situation may be cited as a background of promoting private capital into infrastructure sector.

Accumulated foreign debt, one of the factors of a constant current account deficit, is amounted to \$ 26.2 billion in 2008, and keeps on growing ever year, even tends to decline the GDP ratio. Furthermore, the risks related to accumulation of foreign debt and of inflation trends are concerns of investors, even public sectors faces challenges for financing.

On the other hand, infrastructure needs in Vietnam have been rising rapidly, due to vast growth of urban population. According to Vietnam Chamber of Commerce and Industry, it is estimated to cost 70-80billion dollars for construction of domestic infrastructure in Vietnam for next decade.

Regarding the background and situation, PPP needs, utilizing and private sector into public sector, is expected to increase higher.



Source : World Bank

Figure 1.3.1 Foreign balance (single year/accumulation)

The private investment to Infrastructure sector has started from year1994, and has 69 cases until 2011. The main sector of investment is energy area.

Table 1.3.1 Private investment in Infrastructure project

Year	Energy	Communication	Transportation	Water /sewage	Total
94~2006	14	3	4	3	24
2007	8	0	1	0	9
2008	2	0	2	0	4
2009	3	1	1	0	5
2010	17	0	1	0	18
2011	9	0	0	0	9
Total	53	4	9	3	69

Source: World Bank

1.3.2 Validity, effectiveness, efficiency of PPP method

By May 2012, there has been no project started as PPP pilot project yet, there has been BOT/BTO/BT projects conducted in Vietnam. Within this study the study team had several discussions with governments, with MOT (Ministry of Transport) the counterpart of this study, and related ministries such as MOF (Ministry of Finance), MOC (Ministry of Construction), as well as other related agencies for viability of PPP in this project.

With the aim of contributing to the reduction of foreign debt, idea of adopting one of the PPP scheme such as BT, is consent at the moment. However, at present the overall PPP scheme projects has entered a period of reviewing its validity, effect, for efficiency, acquired information and auditing all the previous projects.

Therefore, it is said that without conclusion of the review, it is not the stage of expressing public intention. The determination of PPP scheme implementation is on Vietnamese side to be discussed and decided in the future.

Table 1.3.2 PPP Projects in Vietnam

	Project	Financial closure	Type of PPI	subtype	Contract method	Contract period (year)	Primary Sector	% of Private
1	Phu My Port	09/1994	Greenfield project	BOT	N.A	25	Transport	60
2	Vietnam Mobile Telecom Service Company	07/1995	Concession	BROT	N.A	10	Telecom	80
3	Hiep Phuoc Power Company	01/1996	Concession	ROT	N.A	50	Energy	70
4	Bourbon Suger Mill Power Plant	01/1996	Greenfield project	BOO	Direct negotiation		Energy	100
5	Nomura Haiphong Industrial Zone Power Plant	06/1996	Greenfield project	BOO	N.A		Energy	100
6	Ho chi Minh City Airport Cargo Services	01/1996	Greenfield project	BOT	N.A		Transport	30
7	Amata Power Bien Hoa Ltd.	12/1997	Greenfield project	BOT	N.A	30	Energy	100
8	Tan Thuan Dong container port	05/1997	Greenfield project	BOT	N.A		Transport	N.A
9	Binh An Water Corp Ltd.	07/1998	Greenfield project	BOT	N.A	20	water and sewerage	100
10	Phu My I Power Plant	12/1999	Greenfield project	BOT	N.A	20	Energy	100
11	Hung Nghiep Formosa power plant	06/2001	Greenfield project	BOO	Direct negotiation		Energy	100
12	Thu Duc Water Project	07/2001	Greenfield project	BOT	N.A	25	water and sewerage	100
13	Nam Con Son Gas Pipeline	12/2002	Greenfield project	BOO	competitive bidding		Energy	49
14	Phu My 2.2	10/2002	Greenfield project	BOT	competitive bidding	20	Energy	100
15	S-Fone Network	06/2003	Greenfield project	Merchant	N.A	15	Telecom	50
16	Phu My 3	06/2003	Greenfield project	BOT	competitive bidding	23	Energy	100
17	Vinh Son-Song Hinh Hydropower JSC	03/2005	Divestiture (partial)	-	competitive bidding		Energy	40
18	Khanh Hoa Power Company	03/2005	Divestiture (partial)	-	competitive bidding		Energy	49
19	Pha Lai Thermal Electricity Power JSC	11/2005	Divestiture (partial)	-	competitive bidding		Energy	1
20	Thac Ba Hydropower JSC	12/2005	Divestiture (partial)	-	competitive bidding		Energy	35

	Project	Financial closure	Type of PPI	subtype	Contract method	Contract period (year)	Primary Sector	% of Private
21	Thu Duc Water Project(Second Contract)	12/2005	Greenfield project	BOO	competitive bidding		water and sewerage	100
22	Hutchison Telecom Vietnam	01/2006	Greenfield project	Merchant	Direct negotiation	15	Telecom	50
23	Phu My Bridge	11/2006	Greenfield project	BOT	N.A	29	Transport	100
24	Xiaozhong River Hydropower Station	11/2007	Greenfield project	BOT	Direct negotiation		Energy	N.A
25	Thac Mo Hydropower Company	03/2007	Divestiture (partial)	-	competitive bidding		Energy	20
26	Ninh Binh Thermal Power Company	04/2007	Divestiture (partial)	-	competitive bidding		Energy	31.8
27	Ba Ria Thermal Power Company	03/2007			competitive bidding		Energy	20
28	Saigon International Terminals VietnamLtd	12/2007	Greenfield project	BOT	Directnegotiation	50	Transport	70
29	Ba Ria-Vung Tau International Container Terminal	05/2008	Greenfield project	BOT	Direct negotiation		Transport	49
30	Saigon Premier Container Terminal	01/2008	Greenfield project	BOT	Direct negotiation	44	Transport	80
31	GTEL-Mobile Joint Stock Company	07/2009	Greenfield project	Merchant	Direct negotiation	15	Telecom	100
32	Cai Mep International Terminal(CMIT)	02/2009	Greenfield project	BOT	Direct negotiation		Transport	49

Source: Vietnam PPP Infra-project Study (May, 2011; JICA)

Note: Divestiture (partial) in Type of PPP means partial selling project of State owned stock (Tender of simple price completion)

1.3.3 Overview of support by other donors to the PPP sector

(1) Views on highway PPP project of the World Bank

World Bank recognizes the bilateral aids or international financial institutions are the sensible choice so far. Because of the short experience of highway, in Vietnam, it is hard to estimate long term traffic growth, revenue increase, and operation cost, and the uncertainty leads difficulty for taking method for private financing. Therefore, it acknowledges financing through bilateral aid or from international financial institutions as realistic options at this time.

In addition, by raising public funds to a number of road traffic volume is expected to be leased to the private sector in service after the O&M, can also be referred to as a private investment. For implementation, it may utilize government-linked company (SOE), transfer O&M to Joint venture, securitization, or leasing may be one of the method. With the scheme, it is referred to as an important that to transfer design and construction consistently to the private sector to as source of

profit.

The latest development strategy of the World Bank in Vietnam, is "Country Assistance Strategy" established in 2007,

In the strategy, the World Bank cited the financial system reform as an issue of private sector development in Vietnam. As part of this effort, the World Bank is implementing a project to support capacity building of private financial institutions that do finance SME, microfinance, and housing finance.

(2) "Country strategy and program," the ADB

As the latest development strategy of Vietnam ADB, "country strategy program." was established in 2006. In the document, ADB mention that the government is becoming aware of the importance of the private sector in job creation and economic growth. Along with the government, ADB supports to continue to create jobs and strengthen competitiveness and promote the development of private sector investments and markets.

ADB also describes the constraint that the private sector in Vietnam is facing, are access to financing, land, human resources, and traffic is large compared to other East Asian countries.

As for main projects in Vietnam, ADB has been conducting Mong Duong Thermal Power, Phu My 2.2, Phu My 3 Power and as for technical support, O Mon Gas Pipeline etc

In addition from 2012 to 2020, there are plans of several projects 1. GMS Ben Luc-Long Thanh Expressway Project, 2. Ho Chi Minh City Mass Rapid Transit Line 2 Project, 3. Hanoi Metro Rail System Project, 4. O Mon Gas Pipeline Project, 5. Guarantee to the Socialist Republic of Viet Nam for a Commercial Loan to Hanoi Power Company

(3) USAID Support of PPP infrastructure development and financing mechanisms

So far, USAID has implemented a support system to turn to the development of PPP in Vietnam, and other workshops with JICA. Such as "Assist MPI to develop new regulatory framework for PPP", "Coordinate with World Bank and ADB on technical assistance to state agencies to develop new legal framework", "Sponsor workshops and training activities to build consensus for new policies and regulations" etc). In addition, on August 2011, USAID announced corroborative support with JICA, stating USAID to guarantee 50% of the loan amount for projects for the \$0.4 billion-0.5 billion USD scale fund provided by JICA, contribute to the power plant, information technology, water supply, and sewage facilities in Vietnam.

In addition, Line 2A (ODA of China) and Line 3 (ODA of France) in Hanoi are supported by Donors and ADB, AFD, EIB, etc. are also to be supporting urban railway construction.

1.3.4 Significance of implementing PPP scheme on this project, the intention of the Government of Vietnam

Adaption of the PPP method aimed not only the reduction of national debt, but also to utilize technology and know-how of the private sector and operational efficiency in the public sector.

Particularly in emerging markets, finance and technology transfer by foreign private entity is highly expected. Also in Vietnam, detailed regulations on investment in the form of BOT contract was enacted in 1993 and, has been developing the legislation related BOT · PPP, aiming to meet the needs infrastructure growth.

With high economic growth, there has been arising rapid urbanization and infrastructure needs in Vietnam. Responding to the high growth, the external debt of the country increased by more than 14% per annum in three years last year (to November 09), (JETRO has extended to \$ 503 billion at the year 2011 in response to this: Aug 2012 currently 17th).

Therefore, as the corresponding needs for infrastructure development growing in the future, from the perspective of reducing the government debt, and to absorb the foreign company's advanced technology the government of Vietnam is focused on introduction of private sector through the PPP. With adoption of PPP scheme, it is assumed to be enabled to reduce the initial investment of government funds.

MOT, the counterpart of this study, is considering to utilize private investment, regardless of adopting Decision 71. MPI, the agency to conduct PPP Pilot project, has suggested at the discussion with study team, to conduct the project out of Decision 71's framework, and to provide case and implements to legislation of PPP law in Vietnam.

1.4 Urban development along the Line No5 and a real-estate-development situation

Study team aims at formulation of the strategic mechanism which the construction of the Hanoi line No.5 raise the added value of an area along this railroad line, and this added value makes return to the project of Hanoi line No.5 as the function of the cost reduction. So, study team grasped status of development along the railroad line and the trend of a property market first here. Specifically, study team investigated the trend of a land acquisition (right to development) and the existence of forward planning, along the area between start station and final station of this railroad line. And more, study team made the hearing of the opinion of developers (example: SUDICO, Vinaconex, Him Lam, Kinh Bac City, etc.) and a related governmental agency about land acquisition schemes including BT (BuildTransfer) etc.

1.4.1 Real estate deal and land development trend survey along the railroad line

It is a thing that the owner has determined mostly the land within the sphere of 10km centering on the area along the Hanoi No. 5 line according to the hearing to a local developer and the project is planned.

However, a project is classified into following four according to progress.

- (1) The project under operation / construction
- (2) The project from which construction has not begun although it is ending with project recognition (the first term)
- (3) The project by which recognition examination of the project application is carried out (the second term)
- (4) The project by which recognition examination of the project application is not carried out (the third term)

Since at the present, Hanoi-city government is looking over the use classification of land (it is due to end at the beginning of the month in 2012), the project after the first term of the above has stopped. Therefore, it is assumed by some local developers after the second term of the above that the project itself may be stopped.

1.4.2 Trend survey of private enterprises (a local and foreign capital)

In the area along the Hanoi No.5 line, SUDICO is building the upper-layers institution containing an office and the complex facility of a low layer institution containing a residence or a cottage at south An Khanh. The site area is 300ha. SUDICO are most focused on this project.

Moreover, at Huai Duc area, Him Lam is developing a residence, shopping centers and a park. The site area is 300ha. In addition to this above, Him Lam is carrying out 3 projects, although a scale is small.

Otherwise, Vinaconex is projecting at the North An Khanh.

1.4.3 Development trend in urban development sector and transportation sector

The possession relation of real estate is subdivided, It is complicated and the opinion of the right of private property is strong in Vietnam.

The binding force of the use specification in city planning is weak, and development by a developer is progressing in the form which lacked unification by permission by case-by-case screening.

Consistency with the development zone of the developer who adjoins the road plan in the zone which obtained development permission in order that a developer may further development uniquely at first is in the situation which is hard to take. For this reason, It occurs the problem that junction of a road with an adjoining development area becomes discontinuous. The following table shows the big company of the stock market capitalization among the companies which have listed with the real estate sector of Vietnam.

Table 1.4.1 Real estate company in Vietnam

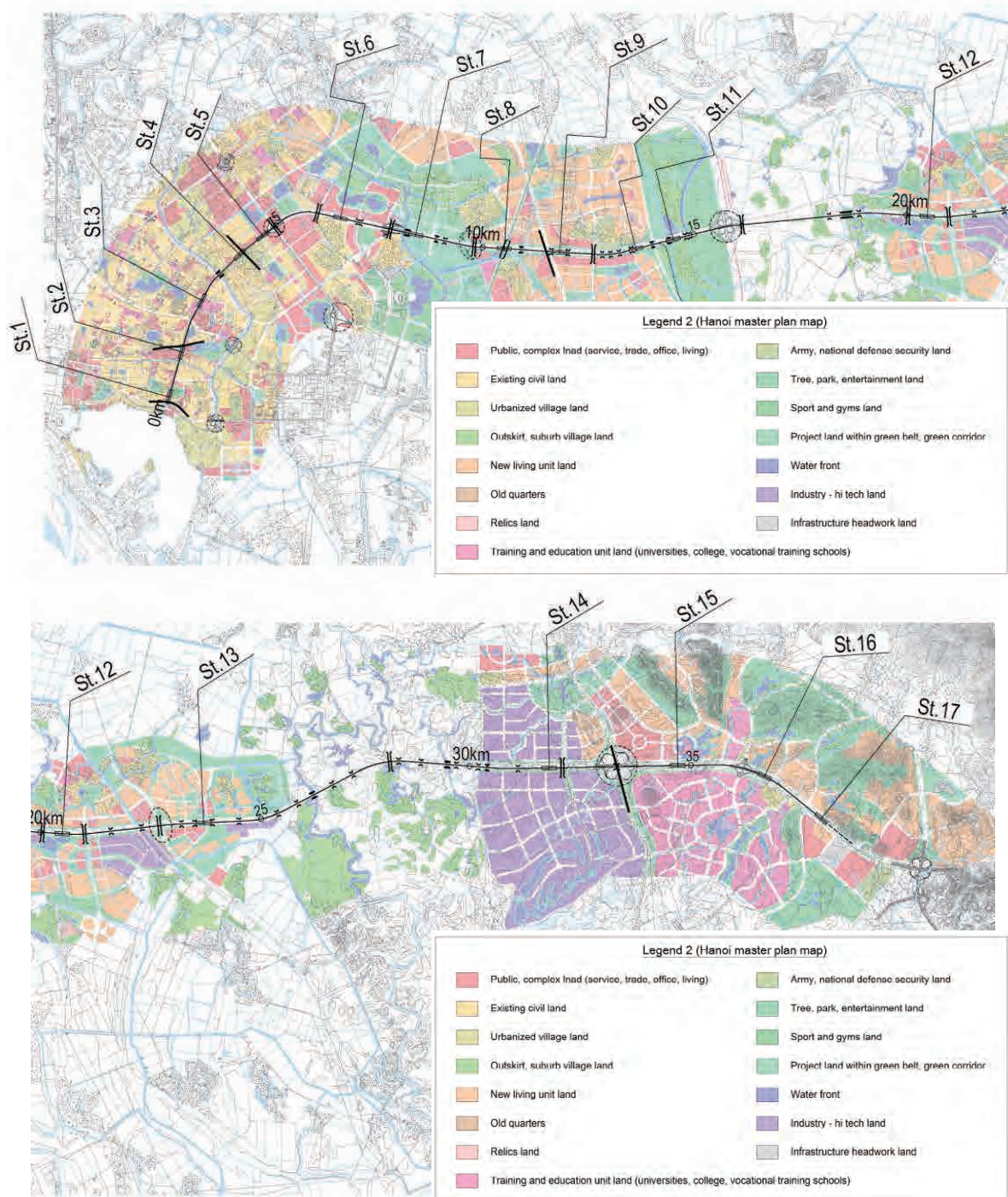
Company name	Stock market capitalization	Remarks
Binh Chanh Construction Investment Dhareholding Company	3,900 million yen	This company group deal with electric system construction and irrigation works other than real estate management.
Hoang Anh Enterprise	38,300 million yen	The conglomerate which performs crude rubber, mining, hydraulic power, and real estate development.
TAN TAO INVESTMENT INDUSTRY CORPORATION	9,400 million yen	The infrastructure building and management of a Tan Tao industrial complex, construction and management of an industrial complex and a residential compound, lease of an infrastructure building finishing lot, lease, sale of the factory built in the industrial complex, etc.
Kinh Bac City Development Share Holding Corporation	14,200 million yen	Real estate management which has the head office in a Bac Ninh prefecture, This company groups deal with the investment for development of an industrial complex and a new city, etc. It manages a Bac Ninh prefecture QUE VO industrial complex. They are highly motivated to work also on the urban development in the Hanoi suburbs.
PHAT DAT REAL ESTATE DEVELOPMENT CORPORATION	7,400 million yen	An exclusive apartment house, development of recreational facilities.
PFV Investment and Trading JSC	7,500 million yen	Real estate investment. Office apartment lease. Restaurant hotel management
SONG DA URBAN & INDUSTRIAL ZONE INVESTMENT AND DEVELOPMENT JOINT STOCK COMPANY	7,100 million yen	Real estate development. City infrastructure development.
VINGROUP JOINT STOCK COMPANY	140,300 million yen	Real estate management. Office lease.
Vinaconex: Vietnam Construction and Import-Export Joint Stock Corporation	10,400 million yen	Construction industry. Construction material sale. Real estate management. Worker dispatching. Having proposed monorail construction in Hanoi and Ho Chi Minh City, and also am projecting on the North An Khanh. This company groups build the collective housing of 22 stories in the Hanoi Cau Giay district.

Source: JICA Study team

The map of the following page shows the land use plan decision situation in this business area along the railroad line. In the map, St.1 - St.17 shows the station position in this enterprise tentatively. According to this, there are many portions as which a land use is already determined about the center of Hanoi and a Hoa Lac area, and the plan of a development project etc. is also recognized.

In the suburban parts (between St.11 - St.12, between St.13. - St.14, etc.) inserted into the center of Tokyo and a Hoa Lac area on the other hand, The part where the land use plan is not yet formulated can see. It seems that government and people's development project etc. will be formulated also in such an area from now on.

After this, Study team investigated the mechanism of profit return which required to land owners of the area along the Hanoi No. 5 line. And it is important to find out the scheme of the reduction-of-incidence policy of this enterprise.



Source: It is investigating commission creation based on the Vietnam Ministry of Construction data.

Figure 1.4.1 Land use plan decision situation in this business area along the railroad line

1.5 Necessity to carry out the project

1.5.1 Position of the project in Hanoi City Development Plan

(1) Expansion of the city area

Since the introduction of the Doi Moi policy, the capital of Vietnam, Hanoi, has rapidly developed, while recording an average yearly economic growth rate of 11.6% from 2006 to 2010. The city area and population expanded about 3.6 times and twice, respectively, when it was integrated with adjacent areas in 2008. As of 2009, it has a population of 6.45 million in a city area of 3,344.6 km².

Under the circumstances, the government intends to strategically develop the Hanoi city on a priority basis into a large-scale international city and trading center of political, cultural, scientific, educational and economic importance. On July 21, 2011, therefore, the government adopted the Hanoi construction master plan that assumes a population of 9.0 to 9.2 million in the target year of 2030.

According to the master plan, the government specifies (1) the old urban area from the west of the Hong River to the Ring Road 2 as a historically important district where development is regulated, (2) the area from the Ring road 2 to the Nhue River outside the Ring Road 3 as an expanded urban development district and (3) the area outside thereof from the west of the Nhue River and the north of Hong River to the Ring Road 4 as an urban development district.

The government also plans five satellite city areas of Hoa Lac, Son Tay, Xuan Mai, Phu Xuyen and Soc Son at remote places from the city center, where part of the functions of Hanoi for housing, education/training, industries and services will be delegated. These five satellite cities are assumed to have a population of 1.3 to 1.4 million and a development area of 35, 200 ha in total in 2030.

The Hanoi urban areas and the satellite cities will be connected with Ring Roads and radial roads, with a green belt constructed in between to improve the living environment.

The master plan further prescribes that mass transport facilities be constructed including the Hanoi urban railway line 5 as the social infrastructure facilities in the Hanoi metropolis zone.

(2) Growing volume of traffic

Traffic demands are rapidly increasing as a result of economic growth and increases in population in Hanoi, with people using motor bikes, buses, taxis and bicycles for moving within the city.

As the public transport means is limited to buses, railways do not contribute to urban transport. The market share of bus operation accounted for 25 to 30% in the 1980s. Since the Doi Moi policy was introduced, however, subsidies for public undertakings were cut to shrink the frequency and routes of bus operation. A policy was implemented later to expand the bus operation network. This increased the number of bus users from 11 million in 2000 to 403 million in 2009 and recovered the market share to about 10%, which is still lower than the figures of the major cities in the southeast Asian countries, however.

In Hanoi, motorization has progressed to double the number of registered automobiles during the period from 2000 to 2010, which now stands at about 350,000. At the same time, the number of motorbikes exceeded 404 million to reach 670 per 1,000 persons. On the other hand, roads are being constructed at a snail's pace to cause traffic jams at various places in the city. There are about 70 crossing points subjected to frequent congestions, where people are often required to consume one hour in moving 2 km by taxi in midtown areas in the wet evening.

As a result, problems such as traffic congestion and accidents have arisen in the city along with serious environmental issues. From now on, economy is expected to develop further, people may use more and more four-wheel automobiles to subsequently push up traffic demands further.

When the statistics in 2005 and 2020 in HAIDEP are compared, the total population increases from 3.1 million to 4.5 million and the per capita GDP follows suit to increase from 1,350 dollars to 6,000 dollars. On the other hand, it is predicted that the ratio of motorbike owners drops to 72.0% from 83.9%, while that of car owners increases from 1.6% to 20% during the same period.

Under the circumstances, as buses, taxis and other existing transport systems alone cannot cope with the ever-increasing traffic volume, the development of high-speed mass transport systems are keenly awaited for the Hanoi city. In other words, utilization of existing transport facilities is cited

as an urgent subject and construction of high-speed mass transport systems as a long- and mid-term subject for the city.

(3) A technological corridor to Hoa Lac

Among the five satellite cities, Hoa Lac is positioned as a center of science, technology and training having such important facilities as the Hanoi University, Hoa Lac High-Tech Park, Dong Mo resort as a cultural health village and a Vietnamese Ethnic Culture-Tourism Village. As a result of such development, Hoa Lac is expected to have a population of 600,000 in 2020 (eventually 750,000), an intact natural area of 20, 113ha, a density of land utilization of 80 to 90 m²/person and a maximum development area of 18,000 ha.

As a western entrance to Hanoi city, Hoa Lac also connects to Ba Vi, Dong Mo, Tich River, National Road 21, Ho Chi Minh Road and the city center through the Thang Long Road.

For Quac Oai and other existing districts located along the Thang Long Road at the center between Hanoi and Hoa Lac, the government plans to develop social infrastructures and facilities for power/water supply, traffic and environments, workshops and other plants for production, while paying attention to environmental preservation, and construct urban parks and green belts along the Nhue River as a buffer zone for expansion of urban areas. Between the western satellites and the Ring Road 4 along the Day and Tich Rivers, the government will also construct green belts or a green corridor to prevent floods and preserve/protect traditional cultures, environments, creatures and the beauty of natural scenes.

According to Decision No. 855/QĐ-TTĐ dated September 27th 2002 issued by the Prime Minister approving the Orientation for Lang-Hoa Lac Construction Master Plan by 2020, it is clearly stated that “Lang-Hoa Lac Highway is a highway and a technical corridor connecting Hanoi capital with Hoa Lac urban area aimed to meet the development demand of the series of Mieu Mon-Xuan Mai-Hoa Lac-Son Tay urban areas in Hanoi metropolitan region. This route is an important landscape and spatial axis which plays a significant role in aspects of population distribution, economy and national defense and motivates the development of Hanoi metropolitan region.”

In addition to the construction of Lang-Hoa Lac road, Vietnam also attaches importance to that of the urban railway to connect the Hanoi city center and Hoa Lac High Tech Park. The government of Vietnam approved the Traffic/Transport Master plan including the Hanoi City Urban Railway Construction Plan based on HAIDEP by JICA in July 2008, the Railway Transport Development Master Plan in September 2009 and the Hanoi Construction Master Plan up to 2030 in July 2011, all of which refer to the line 5 projects.

A part of the roughly completed Lang-Hoa Lac road is secured as the land for the Hanoi-Hoa Lac-Ba Vi urban railway line.

Once constructed, the urban railway line will facilitate the transportation of passengers and shorten the distance between the center of Hanoi and Hoa Lac, making commuting and traveling convenient for people working in industrial zones and tourism in service premises. According to the survey by the study team, the daily traffic demand at the time of inauguration of the line in 2021 is estimated to be 158,000 passengers and 400,000 in 2030, as shown in Chapter 2.

The railway passenger demand of No.5 line demand will be 171,000 passengers at the 2021 and 432,000 passengers at the 2030 including connection passengers with a No. 2 and No.3 line. The railway will also mitigate traffic congestion and environmental problems.

This line 5 project is to connect the Hanoi city center to Hoa Lac, one of the satellite cities, where a high tech park, 1,586 ha in area, is under construction supported by JICA, not as a mere industrial complex but as an academic research city to raise human resources at three universities located on the periphery in conjunction with high tech projects and academic/technological research activities/businesses.

1.5.2 Necessity, effectiveness and appropriateness of the support to the project implementation

(1) Viewpoint from Japan

Development of infrastructures under Public Private Partnership (PPP) scheme utilizing Japanese private sector's technologies and knowhow is recommended in the Japanese Country Assistance Program for Vietnam (as of July 2009). Also development of urban mass rapid transit system is one of the main assistance strategies under the JICA's Rolling Plan within the Urban

Development, Network Development for Transportation under Promotion of Economic Growth and Strengthening International Competitiveness.

Thus, this project is entirely consistent with Japanese and JICA's Developmental Priority Areas in terms of its contribution to mitigating the increasing traffic congestion which ultimately contribute to the reduction of greenhouse gas.

(2) Coordination with higher-rank plans

The Vietnamese government has launched the Hanoi capital construction Master plan until 2030 and vision to 2050 on July 26th 2011(Decision No. 1259/QD-TTg). This Master plan shows a comprehensive plan for Hanoi that encompasses all areas of land use planning, transportation, communication, and power. This line 5 project is stated one of issues needs to be achieved, and urban railway planning is listed on transportation related plan.

1) Related transport facilities

On the master plan, urban railways are listed such as Line 2&3, which are progressing ahead of Line5, and Line 4, 6, 7 and 8 which are to be embodied in near future, with expectation of effective networking, to ease traffic congestion, and contribute to environmental protection in the future.

Along the Line 5, on the Thang Long Road, a Bus terminal plan is also listed. Through the railway station square, establishment of the smooth transportation communication scheme is required.

2) Stations

The locations of stations are not specified on the Master plan. Nevertheless, Line 2&3 progressing ahead of line 5 are planning to locate a station at the crossing point with Line 5. Line 5 is also expected to locate stations at crossing spot with other lines, to ease passenger transfer by 1 practical connection.

The location of depot is listed on the Master plan.

3) Wayside urban development

A high-tech park is now under development in Hoa Lac. This project is one of the three large-scale projects including those on the construction of roads and high-speed railways to connect the south and north of the country that were agreed upon between the prime ministers of Japan and Vietnam in October, 2006. JICA is also involved in the plans to develop these transport networks. The project of the Hoa Lac High-Tech Park is an object of the yen credit providing agreement concluded between the two countries on March 30, 2012.

The Park will not only be an industrial complex but also become a research and science city to have residences and educational facilities. It will have zones for industrial plants, golf courses, residences, leisure facilities, hospitals, research and development institutes and education and training facilities in a total area of 1,586 ha.

The industrial complex has a capacity to accommodate 100 enterprises or over, with 17 already started operation and 54 acquired approval for investment in December, 2011. It is expected that the Park will have a population of 220,000 people in 2020.

In an adjacent area, the Hanoi National University will be constructed to have a total area of 1,000 ha, where 60,000 and 100.000 students are expected to study in 2020 and 2050, respectively.

To develop in the future, the High-Tech Park indispensably necessitates a railway line to connect to Hanoi. In return, railway users are expected from the Park. In this manner, the railway line and the High-Tech Park will compose a mutually dependent relation.

(3) Needs of PPP projects

From the viewpoint of cutting the governmental debts, the government of Vietnam recognizes the importance of the introduction of private funds. The accumulated amount of foreign debts is increasing year after year to reach 26.2 billion US dollars as of 2008. Inflation and risks in the international balance of payment are now pending questions among foreign investors even to make it difficult to raise funds by public sectors. On the other hand, the needs for the construction

of infrastructures are hovering high as a result of rapid urbanization.

Under the circumstances, the government of Vietnam enacted laws to vitalize the investment from abroad and adopted the Decision 71 in November 2010 to indicate a tentative system framework for that purpose, bearing in mind the enactment of the PPP Law. This framework includes railways and transport facilities in large cities as its objects on a trial basis.

The introduction of PPP schemes makes it possible to reduce the governmental funds at least in the initial investment and possibly cuts the running costs at the management stage. However, with perspective of business risk such as capital collection, or country risks, private entities' concern and may hesitate to invest and participate in PPP projects. To make easier for private enterprises to participate in these schemes, however, it is desired to prepare appropriate measures on risk sharing between the government and private entities for those in the private sector.

Railway construction projects, such as the object of this survey, entail an enormous amount of construction cost that can hardly be repaid with the income from revenue services after the completion of the projects. Furthermore, in most countries across the world, it is often the case that the project owners cannot bear even the routine running costs with the amount of fares and fees paid by users.

In this survey, therefore, the study team places preference on the construction of infrastructures with ODA in principle, with private capitals invested only into the procurement of rolling stock and railway facilities. The study team assumes that the transport charges are all appropriated for the income of public organizations while the management, control and upkeep of facilities are all implemented by private enterprises under contract with public organizations.

1.6 Law and Regulation

This project is intended to be done under the legal system of Vietnam, and it is necessary to organize collecting relevant laws, standards, standards, conducting surveys to avoid omissions. The study team has investigated the laws and regulations related to the following that are considered particularly important

- 1) Legislation and standards related to railway development
- 2) Legal system on PPP infrastructure
- 3) Related land transactions
- 4) Land acquisition and resettlement
- 5) Environment

1.6.1 Legislation and criteria on railway construction

(1) Legislation on railways

The Vietnam Railway Corporation (VNR), or the former Vietnam Railway, has been only one railway business undertaker for more than 100 years since the inauguration of railway operation in Vietnam. In the meantime, the government has adopted technical regulations on single-track and non-electrified railways, special handling for train operation at stations, facilities and equipment and manuals on the maintenance of rolling stock.

In 2003, the Vietnamese National Railways was privatized with the Vietnam Railway Administration (VNRA) organized in the Ministry of Transport (MOT) as an administrative entity to manage, control and supervise railways as a whole. In 2005, the government enacted the Railway Law (09/2005/L-CTN).

The Railway Law sets forth only a framework for railway businesses but does not specify detailed rules for actual implementation of services. After 2005, therefore, technical rules were adopted in VNR as a decision or direction (Ministerial Ordinance) by the Minister of Transport, after following the procedure to implement technical criteria and standards.

As the Railway Law and the existing technical rules are for conventional non-electrified railways, they do not necessarily correspond to electrification or high-frequency high-speed operation by urban railways or high-speed railways. Specifications on the qualification of train crew also assume the system of assistant engine drivers at the age of steam locomotives, which do not suit the training of the drivers for modern powering cars, either. Therefore, a proposal is offered for licensing EMU drivers in a JICA technical cooperation scheme for the Urban Railway Bureaus, Hanoi and Ho Chi Minh.

In 2009, the government of Vietnam adopted Technical Regulations and Urban Railway Standards through the cooperation by Japan, based on which the Ministry of Transport issued the new railway technical criteria in February 2011. On the other hand, the Ministry of Construction issued the National Building Code (QCVN 08:2009/BXD Vietnam Building Code for Urban Underground Structures) in 2009 based on the subway standards in Russia, which is now under review, however, as it is inconsistent with the subway standards in Japan and Western Europe and contains particulars that cannot cope with advanced technologies.

In 2011, the government of Vietnam also adopted three Vietnamese National Standards, i.e., (1) Vietnam Standard TCVN 8893:2011 Grading for Railway lines, (2) Vietnam Standard QCVN 06:2011/BGTVT National Technical Regulation on Railway Signaling and (3) Vietnam Standard QCVN 08:2011/BGTVT National Technical Regulation on Railway Operation, by revising correspondingly the VNR regulations in the past on the grading of railway lines, signaling and railway operation.

In Vietnam, foreign countries constructing railways in the country with their own capitals are allowed to rely on their own technical criteria. Therefore, it will be possible for Japan to apply Japanese criteria to the Japan's ODA scheme to construct new urban railways or high-speed railways in Vietnam. Nevertheless, it is necessary to help Vietnam prepare its own technical standards and design railways accordingly as far as possible, as taking over and managing railways constructed to different criteria of different countries would cause inconvenience and economic disadvantages to Vietnam.

Vietnam is now introducing technologies on urban railways, electrification, subways and high-speed railways from EU and Japan. China is also providing widely-ranged technological regulations on conventional railways, including those on geological surveys, three-rail tracks,

tracks for exclusive use by freight trains, terre armee retaining walls, stations, yards, diesel locomotive depots, rolling stock bases, environmental preservation measures, track construction work, control of the schedule of construction work, completion inspection, water supply and draining systems and track maintenance work.

(2) Legislation required for the implementation of public projects

In Vietnam, laws required for the implementation of public projects are virtually comprehensive in a sense.

Lands shall be acquired in accordance with the Land and Railway Laws. After approving a project, the government sets the Committee for Land Acquisition in the District People's Committee to create a plan for land acquisition. For the Land Acquisition Committee, the government nominates the Vice Chairman of the District People's Committee as the Chairman and the project promoter as a member, respectively. In case the relocation of inhabitants is required, a framework for life restoration is created based on a plan prepared beforehand. The inhabitant relocation plan is prepared first, which is submitted for approval to the government for the projects approved by the government or to local governments for those approved at local levels. Those approved by the central government need not be re-submitted to local governments. After the approval of a railway project, local governments will take charge of land acquisition at the cost of the project promoter. The procedures to acquire railway lands starting from the installation of demarcation posts are prescribed in the revised Railway Law 03/2012/ND-CP. There are three objects for compensation: lands, buildings, and business for daily life, for each of which the contents of compensation are set forth in prefectural ordinances (Ordinance No. 108 for Hanoi). The indemnification for lands basically involves providing lands prepared by the project promoter or payment of compensation money.

It is pointed out by mass communication media that there are problems in the costs and periods of the construction work for public facilities in Vietnam. Regarding the land acquisition implemented consistently under difficult conditions in particular, the government is required to set standards on the fair amount of compensation money and institute systems to authorize the evaluation thereof. In the case of land acquisition for road construction in the past, it is reported that the costs of the lands remained unsold in the areas adjacent to newly constructed roads skyrocketed after the construction work when compared with the cost at which lands were sold to constructors, to cause feeling of unfairness and complaint among land sellers. Similar problems were also reported in Japan. One possible solution is to exchange lands with those of reduced areas for land readjustment or with those of multilevel replotting for urban redevelopment. It is expected that Vietnam will create lands for public use through land readjustment in the railway construction and road improvement projects in urban areas and social systems so that the profit from development can be uniformly enjoyed by all people living in the area for development. The land readjustment is a technique to share lands among those living in the relevant area in constructing roads, parks, railways, stations and other public facilities, in order to promote the development of communities.

Although project plans have been prepared in accordance with the Urban Planning Law and other laws, the formulation of plans for railways, roads, urban construction and development has been contracted individually with consultants. This involves problems of insufficient coordination between different plans due to the lack of comprehensive and transversal management. As possible solution for the problems, it is desirable to adopt a system similar to that in Japan to perform prior consensus-building between different divisions through meetings among related personnel, summarize all public projects and regulations on land utilization eventually in a planning sheet and make them widely known to those concerned.

Article 4, State Budget Law No. 01/2002/QH11, December 16, 2002, stipulates that the budget of local People's Committee is included in the national budget. This means that some amount in the national budget is also allocated to the projects implemented by the Hanoi City People's Committee, because the local governments are regarded as the local organizations of the central government in Vietnam. In railway construction projects in Japan, it is often the case that station plazas and frontage roads are constructed with the cost shared with local autonomous bodies. In contrast, even the cost for the work executed through consultation with local governments is required for and supplied from the central government in Vietnam. It seems, therefore, that local

governments do not bear the cost separately for the projects in which the central government involves.

(3) Necessity to enact laws in the future

It is strongly desired to introduce a system that emphasizes the public nature and efficiency by setting up an organization for consultation to focus on coordination between different ministries and agencies.

The success of railway undertakings depends on the operation and management after construction. As experienced in the case of Japanese National Railways, railways unwanted by railway operators, even if constructed, eventually end as unprofitable assets that are difficult to manage. Therefore, in order to avoid such situation, railway operators shall participate in railway project plans protected by due responsibilities and rights. In recent years, railway operators do not actively become involved in investing in infrastructures as a result of the movement to separate the upper-structures and sub-structures of railway assets. To make railways sustainable, however, a system is required to discuss operational problems sufficiently at the time of planning and to reflect the results in the constructed railways.

General-purpose environmental regulations are now applied to railway noise. It is necessary, however, to implement relevant regulations including measuring methods to address the problems of passing noise such as that emitted by railways.

Regarding the organizations to certify the safety of newly constructed railway facilities and rolling stock, there are no competent organizations for urban railways and high-speed railways in Vietnam. It is urgently required for the government of Vietnam to train engineers and set certifying organizations under its responsibility.

Table 1.6.1 summarizes the existing laws and criteria on railways.

Table 1.6.1 Legislations related railway construction in Vietnam

Legislation	Law No.	Date of enactment
Railway		
Vietnam Railway Law	No.35/2005/QH11	2005-6-27
Detailed Rules on Railway Law Implementation	Decree 109/2006/ND-CP	2006-9-22
Roles of Railway Policies and Rules	Decree34/2003/ND-CP	2003-4-
Rolling Stock Safety Environment Inspection Rules	Decision 58/2005/QD-BGTVT	2006-1-1
Construction, Land		
Construction Law	No.16/ 2003/ QH11	2003-11-26
Law on Vietnam Criteria and Technical Codes	No.68/ 2006/ QH11 Revised 1/01/2007	2006-6-29
Composition and Application of Technical Standard	Circular No.21/ 2007/ TT-BKHCHN	2007-9-28
Procedures for Technical Standard	Circular No.23/ 2007/ TT-BKHCHN	2007-9-28
Construction of Urban Underground Structures	No.41/2007/ND-CP, Government Ordinance	2007-3-22
Quality Control for Construction Facilities	No.209/2004/ND-CP, Government Ordinance	2004-12-16
Land Law	No.13/2003/QH11	2003-11-26
Urban Planning Law	No.30/2009/QH12	2010-01-01
Approval, Control and Evaluation of Urban Plans	Decree 37/2010/ND-CP	2010-5-25
Urban Plans and Construction Work	Directive 30/1999/CT-TTg	1999-10-26
Control of Urban Plan Law	Decree 91/CP 17/08/1994	1994-8-17
Land Utilization for Public Purposes	Decree 181/ 2004	2004-
Hanoi City Land Ordinance	Hanoi PC Decision 108/2009	2009
Environment		
Environment Protection Law	No.52/2005/QH11	2006-7-1
Strategic Environment Evaluation and Protection Involvement	Decree No. 29/2011/ ND-CP	2011-4-18
MONRE Law Supplement Rules	Circular No. 26/2011/ TT-BTNMT	2011-7-18
Additional Rules for Land Acquisition	No.84/2007/NĐ-CP	2007-5-25
Land Acquisition Additional Rules	Decree on No.69/2009/NĐ-CP	2009-8-13
Supplement of Land Law on Land Acquisition	Decree No. 84/2007/NĐ-CP	2007-5-25
MONRE Detailed Rules on Land Acquisition	Circular No.14/2009/TT-BTNMT	2009-10-1
MONRE Guidance Items	Circular No.06/2007/TT-BTNMT	2007-6-15
Natural Resources Environment Survey Organization and Implementation	Decree65/ 2006/ ND-CP	2006-6-23
Detailed Rules on the Implementation of Environment Protection	Decree 80/ 2006/ ND-CP	2006-8-9
Rules related to Environment Protection	Decree 140/ 2006/ ND-CP	2006-11-22
Environment Protection Charges for Drainage	Decree67/ 2003/ ND-CP	2003-6
Control of Extinction-Threatened Creatures	Decree32/ 2006/ ND-CP	2006-3-30

Legislation	Law No.	Date of enactment
Control of Extinction-Threatened Florae	Decree48/ 2002/ ND-CP	2002-4-22
Technical Standard		
Classes of Railway Technologies	2011: TCVN 8893	2011-
Standards on the Design of Road and Railway Tunnels (Railway Edition)	TCVN4527-88 National Committee on Fundamental Construction	1988-2-05
Design Codes on the Formation Stability Measures	22TCN-171-87 Ministry of Transport	1987-12-11
Technical Criteria on the Design of 1,000 mm-Gauge Tracks	Ministry of Transport	1976-2-9
Technical Criteria on the Design of 1,435 mm-Gauge Tracks	TCVN-4117-1985 Ministry of construction	1985
Design of Civil Construction for Traffic and Rules on the Evaluation of Environment Assessment	22TCN-242-9 Ministry of Transport	1998-3-27
Standard Design of Civil Structures for Traffic in Earthquake Areas	22TCN-221-95 Ministry of Transport	1995-5-03
Technical Norms for Railway Operation (Civil Engineering Edition) *Norms of Operation and Electric Power	22TCN-340-05 Ministry of Transport	2005-12-30
Urban Railway Standard for Mass Rapid Transit (MRT)	TCVN 8585:2011	2011-2-22
Building Code for Underground Structure	QCVN08/ 2009/ BXD	2009-10-1
Building Code for Underground Structure Second Edition	QCVN08/ 2009/ BXD Second Edition	2009
Notification on Transport	No.01/ 2006/ QD-BGTVT	2006
Technical Norms for operation of Vietnam Railways	No.1597/ GTVT-KHCN	2/08/1999
Procedure of train operation	No.76/ 2005/ QD-BGTVT 22TCN-342-05	30/12/2005
Railway Engineering Classifications	22TCN-362-07	25/07/2007
Technical Norm on Railway Management	22TCN-340-05	30/12/2005
Permanent way maintenance Rule Regulation for Railway Track Maintenance	396/DS-PC	12/03/1981
National Technical Regulation on Railway Operation	QCVN 08:2011 BGTVT	2011
Guideline of transport	No.519/ QD-DS	
Order for Construction of underground facilities in urban area	No.41/ 2007/ ND-CP	22/03/2007
Order for Quality management of Facilities Construction	No.209/ 2004/ ND-CP	16/12/2004
Circular on guiding construction - related judicial assessment	No.35/ 2009/ TT-BXD	5/10/2009
Circular on application of foreign construction standards to construction activities in Vietnam	No.40/ 2009/ TT-BXD	9/12/2009
Design Standard on road and railway Tunnels	TCVN 4527-88	5/02/1988

Legislation	Law No.	Date of enactment
Technical Standard of design of 1435mm gauge lines	TCVN-4117-1985	1985
Design rule on bridges and drainage ditches based on the critical state	22TCN 18-79	19/09/1979
Decision Promulgating Vietnam construction standard	TCXDVN 395 2007	2007
Topographical measurement	96TCN 43-90	
Highway survey	22TCN 263-2000	
Geologic test hole drilling	22TCN 259-2000	
Design survey on highway foundation on soft ground	22TCN 262-2000	
Defining general elasticity module for highway pavement by Benkelman deflection measurement	22TCN 251-98	
Environmental impact assessment during the formation of feasibility project and transportation work designing	22TCN 220-95	
Expressway – Design requirement	TCVN 5729-2012	
Highway – Design requirement	TCVN 4054-2005	
Highway design standard	22TCN 273-01	
Street, square and urban design	20TCN 104-83	
Soft pavement design	22TCN 211-2006	
Solid pavement design	22TCN 223-95	
Flood run-off properties analysis	22TCN 220-95	
Drainage network design	TCXDVN 51-84	
Road, street and square lighting design standard	TCXDVN 295:2001	
Design of bridge and culvert in limit state	22TCN 18-79	
Bridge design standard	22TCN 272-05	
Power transmission system	11TCN 19-2006	
Traffic signal regulation	22TCN 237-01	
Green-space quota	529/BXD/VTK-1997	
Order Execution guide and detail regulation	No.105/ 2005/ ND-CP	2005
Order High pressure circuit safety	No.106/ 2005/ ND-CP	2005
Industry Standard Technical Norms for Operation of Vietnam Railway	22 TCN-240-99	
National Technical Regulation on Railway Signaling	QCVN 06:2011/BGTVT	2011
Order Declaration of Law on Environment	No 19/ 2005/ L-CTN	1/01/2005
Order on Implementation of Standard Act	No.127/ 2007/ ND-CP	8/2007
Norm on the License of Standard	No.24/ 2007/ QD-BKHCH	2007
Decision Promulgating branch standard “Technical and environmental protection requirements of railway means of transport”	22/2006/QD-BGTVT 22 TCN 348-06:	04/06/2006
Decision On compulsory application of Vietnamese Standard (TCVN) on the Environment	22/ 2006/ QD-BTNMT	18/12/2006

Legislation	Law No.	Date of enactment
Decision On issue the Orientation for Sustainable Development Strategy in Vietnam	153/ 2004/ QD-TTg	08/2004
Circular On organization of Appraisal Council for SEA, EIA report	13/ 2006/ TT-BTNMT	8/09/2006
Circular Guidance the SEA, EIA and Environmental Protection Undertakings	08/ 2006/ TT-BTNMT	8/09/2006
Decision Issue the regulations, organization and operation of Appraisal Council for SEA, EIA reports	13/ 2006/ QD-BTNMT	8/09/2006
(MOT) EIA procedure in preparation the F/S and design for transportation works	22 – TCN 242 - 98	27/03/1998
The National Technical Standards for noise	QCVN 26:2010/BTNMT	
The National Technical Standards for vibration	QCVN 27:2010/BTNMT	
Vibration caused by means of road transport Environmental allowable limits in public and residential areas.	TCVN 7210 : 2002	

* Because the above laws and regulations have been amended and abolished as required, the latest version should be checked in the implementation phase.

Source : JICA Study Team

Legend: TCN: Standard of the Ministry

TCVN: Standard of Vietnam Government

DS-PC: Regulation of VNR (Implementation criteria of companies)

(4) Considerations on railway-related laws and regulations

The underlying law on railways in Vietnam is Railways law listed on Table 1.6.1, and is a method that is listed at the beginning of Table 6.1.1. There are a number of laws and regulations on the basis of this Railway law and among them, railway technical standards and urban railway standard are deeply related. Overview and considerations are listed in the following table.

Table 1.6.2 Laws and standards related to railway development

Legislation	Overview	Consideration
Railway law	Issued on year 2005 Establish a framework of railway operations Classify railway into National Railway, Urban railway, and special purpose railway. VNRA authorized the principal railway operation body. The operation bodies of National railway is VNR, and Urban railway is Provincial People's Committee	Bylaws of the working level are not included. If there is an international agreement, it will override that. There are provisions that do not conform to the urban railway (Driving assistant system role, the employee railway signal system)
Railway technical standards	Established under Japanese technical assistance, but unapproved yet	The provisions of marginal level Be enforced on all railway
Urban railway standard	Established under Japanese technical assistance, authorized on year 2011.	Define the technical characteristics and management requirements Applies at will

Source : JICA Study Team

Classification on technical standards and the railway law is as follows.

Table 1.6.3 Criteria and applicable laws and regulations National for Railway development

Technical standard	Railway law	National Railway	Urban railway	Special purpose railway
Ordinal railway (under 150km/h, Unless special railway)		Applied	Applied	Applied
Semi- High speed rail (Under 200km/h)		Applied	—	—
High speed rail (Under 350km/h)		Applied	—	—
Special Railway (Ex: Monorail, levitation railway)		—	Applied (excluding Wire rope and tram)	—

Source: JICA Study Team

Currently, only urban railway standard has been authorized and technical standard is unapproved. However, criteria have been discussed with technical perspective, and study team assumes it will not be an issue for designing and planning of Line 5.

1.6.2 Legal system on PPP infrastructure

In this study, with assumption of project implementation by the vertical separation, the study team has investigated the financial scheme of the lower part to be conducted by the Vietnamese government.

There are two typical Infrastructure PPP related regulations in Vietnam. One is the Decree on Investment on the basis of Build-Operate-transfer (BOT), Build-Transfer-Operate (BTO), and Build –Transfer(BT)Contracts enacted on year 2007, which is updated on 2009 (Decree 108/2009/ND-CP), here in after the New BOT law. The Second is Decision 71 (Decision 71/2010/QĐ-TTg), here in after PPP pilot law.

Two regulations clarify industry, finance, Government guarantee, approval scheme, etc, but it is not stated how to differentiate one another in terms of adoption for specific project (source; JICA-Study on PPP project in Vietnam).

Currently, a task force team has been established under organization of MPI, formed by representative members from each ministry, aiming at the implementation of pilot projects on the basis of PPP pilot law. Though there has been no project which led to the implementation at the time of May 2012, it is aimed to implement the result of pilot cases to state the PPP legislation in the near future

As stated on Decision 71, projects selected for PPP Pilot law is to be proposed by ministries, related agencies, or investors as candidates, and pilot projects are selected with process shown below. Since this project has not been proposed as one of candidates, it is out of candidate list.

Table 1.6.4 New BOT Law and PPP pilot Law

	New BOT Law	PPP pilot Law
1. Type of project	BOT,BTO,BT Contract Project	Infrastructure development project under PPP method
2. Industry	1. Road, Bridge, Tunnels, Doc 2. Railway, Bridge, Tunnels 3. Airport, Seaport, River port 4. Water supply and sewerage facilities 5. Power generation and Transmission 6. Other Public and infrastructure services determined by prime Minister	1. Road, Bridge, Tunnels, Doc 2. Railway, Bridge, Tunnels 3. Urban transportation 4. Airport, Seaport, River port 5. Water supply 6. Power plant 7. Health and Sanitation (Hospital) 8. Environment Facilities (sewerage facilities) 9. Other Public and infrastructure services determined by prime Minister
3. Official Support	Credit guaranteed by the government and National budget. Development investment credit by the state. Investment for Development capital by state-owned enterprises. Other	Credit guaranteed by the national budget, ODA, Government Bond, government guarantee Development investment credit by the state, Investment for Development capital by state-owned enterprises, Other
4. Capital Structure	Varies under 1.5 trillion or more than 1.5 trillion VND	Not specified
(1) Investment Capital		
(2) Public Fund Ratio	Under 49%	Under 30%
(3) Equity Capital	<ul style="list-style-type: none"> • If Investment Capital is under 1.5 trillion VN : Over 15% • If Investment Capital is over 1.5 trillion VND, 15%. For amount over 1.5 trillion, 10% 	Over 21%
(4) Loan and Other capital source	Not specified	Under 49%
5. Bidding	Competitive bidding principles. However, after the advertised bid for 30 days, if there is no additional proposal from investors other than the proposed project investor, the right to negotiation is to be granted to the investor. Selection criteria is defined as (ability, experience, etc.)	Competitive bidding (No explicit provision unopposed) The selection criteria or specifications not described
6. Related agencies	MPI, MOF, Ministry of Justice, Local committee, Inter-branch working group	MPI, MOF, Ministry of Justice , State bank of Vietnam (Inter-sectorial Task Force)

Source : JICA- Study on PPP infrastructure project in Vietnam, IPBA Journal June 2011, JICA- Study on Eco-friendly industrial park

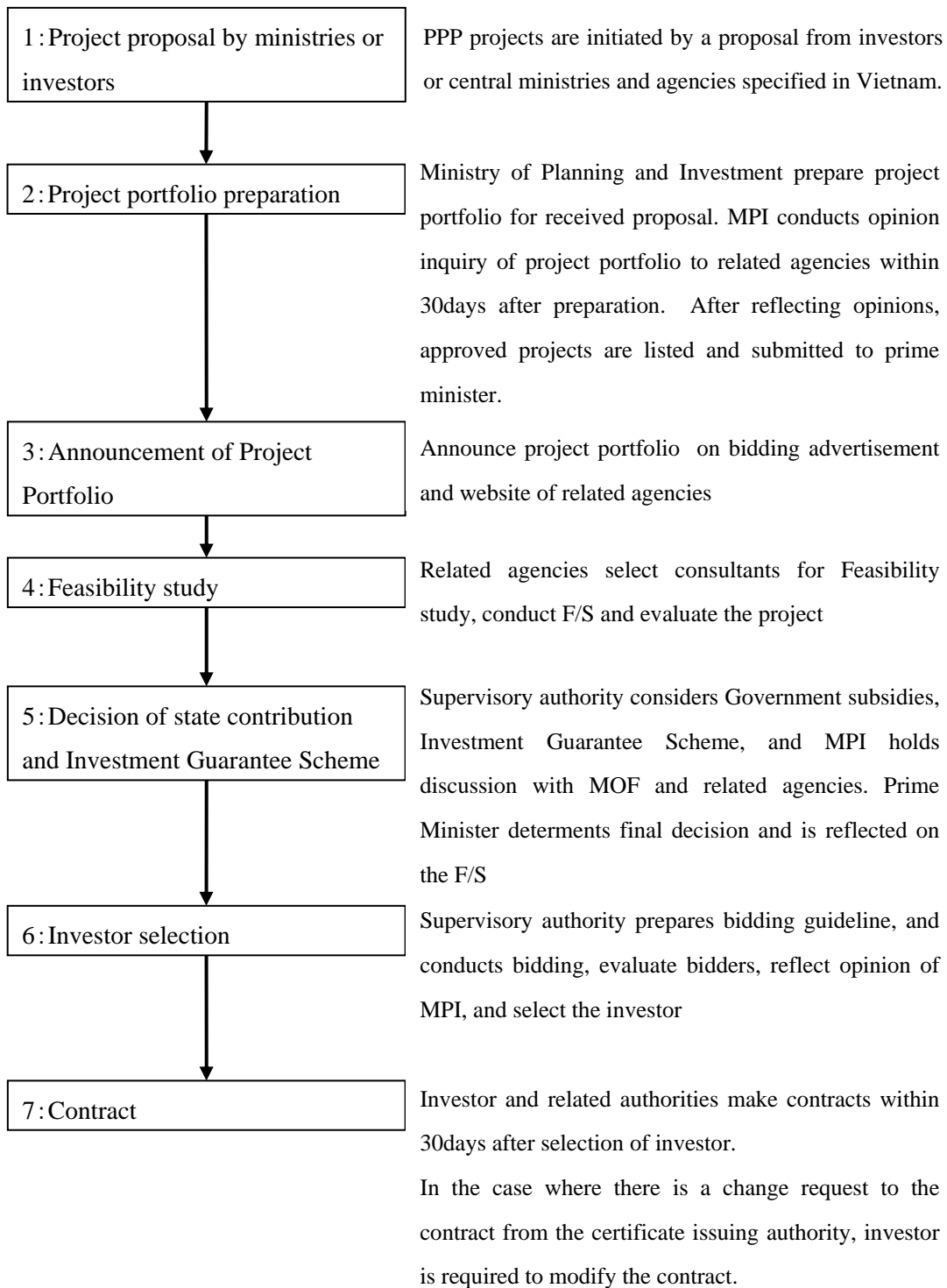
As for progress of PPP Pilot project, by May 2012, there is no project being under bidding process. On Table 1.6.5, the list of projects being announced as candidate projects or priority projects are shown.

Table 1.6.5 PPP pilot project candidate project list

No	Projects	Basic Data	ASA
1	Investment for Highway Ninh Binh - Thanh Hoa	126.7km, 6 lanes, total investment 33,000 bill VND	MOT
2	Investment for Highway Ben Luc - Hiep Phuoc	25km, 4-6 lanes, total investment 15,000 bill VND	
3	Investment for Highway Nghi Son - Bai Vot	93km, 4-6 lanes, total investment 23,000 bill VND	
4	Investment for Highway Long Thanh International Airport	Total investment 1,403 mil USD	
5	Investment for Highway Ho Chi Minh Highway, Cam Lo - La Son Section	103km, 4 lanes (2 lanes to be completed first), Total investment 16,000 bill VND	
6	Investment for Highway Dau Giay - Lien Khuong	200km, 4 lanes, total investment 48,324 bill VND	
7	Investment for Highway Ha Long - Mong Cai	128km, 4-6 lanes, total investment 25,000 bill VND	
8	Investment for Highway Bien Hoa - Vung Tau	77km, total investment 16,033 bill VND	
9	Hau Giang River Thermal Power Plan No.1, Hau Giang Province	Capacity: 1200MW, 2 turbines (600MW/unit) Estimate total investment capital: 2 bill USD/project	MOIT
10	Quang Tri Thermolectricity Project, Quang Tri Province		
11	Quynh Lap Thermolectricity Project, Nghe An Province		
12	Song Hau River Water Plant No.1	Expected capacity: Phase1: 500,000 m3 day Phase2: 1,000,000 m3 day	MOC
13	Song Hau River Water Plant No.2		
14	Song Hau River Water Plant No.3		
15	Ngoc Hoi bridge and approach ramps on both ends on 3.5 road	5km, total investment 10,000 bill VND	Hanoi PC
16	Southern Logistics Center - Hanoi	10-20ha, total investment 300 bill VND	
17	Eastern Logistics Center - Hanoi		
18	Son Tay Port - Hanoi	0.5-1ha, total investment 400 bill VND	
19	Hong Van Port - Hanoi	1-1.5ha, total investment 300 bill VND	
20	Khuyen Luong Port - Hanoi	1.5-2ha, total investment 500 bill VND	
21	Wate plant supplying clean water from Red River surface water	Expected capacity 100,000-150,000m3/day total investment 2,000 bill VND	
22	Investment in train terminals connecting to urban railways	Not yet defined exact location, Received technical support on development of connecting stations and surrounding areas from Japan	
23	Phu Xuyen General Hospital (1000 beds)	1000 gurong, total investment 3,400 bill VND	
24	Gia Lam General Hospital (1000 beds)		
25	Investment for ring road No.4, Hanoi (National Road 3- National Road 32 Section)		
26	Extension ofding National road 22 (trans - Asia road)	20km, 4 lanes, total investment 12,850 bill VND	HCMC PC
27	Elevated highway No.1 HUMC	11.7km	
28	Investment for Highway Ha long - Hai Phong	25km, total investment 10,000 bill VND	UBND tỉnh Quang Ninh
Projects in bold are wich approved to use National Budget to do preparation			

Source: MPI

(Reference) Project selection process under Decision 71



Source: JICA's Preparatory study on utility management project in eco-friendly industrial park in Vietnam

1.6.3 Ownership restrictions for foreign companies

Since there is no detailed description of railway transportation service on the foreign regulatory law it is required to discuss closely with the Ministry of Planning and Investment. Whereas railway transportation service is one of the businesses that are specified in the conditional investment fields, there is a limit to investment ratio (Detailing the implementation of the Commercial Law regarding conditions on logistics service provision and liability limits of traders providing logistics services).

As for foreign entity, it is required to establish as a Joint Venture with a local company, and foreign companies shall not exceed 49% of legal capital of the joint venture.

In addition, regarding the provisions of the 65% ordinary resolution of the company law, although it is possible to take mitigation measures in the contract that 51% (JV) between shareholders and the Articles of Incorporation as member countries WTO, local sponsor is required to establish a controlling stake anyway.

Table 1.6.6 Ownership restrictions for foreign companies (Examples)

Business Domain	Restriction
Agriculture, hunting and forestry services (CPC881)	Establishment of joint venture or business cooperation contract is only possibilities. Of the foreign investment ratio shall not exceed 51% of the joint venture capital
Mine development related services (CPC883)	After the date of accession WTO, the foreign investment ratio should not exceed 49% of the joint venture. After three years from the date of accession, investment ratio shall not exceed 51% of legal capital of the joint venture. Two years later, in the establishment of 100% foreign-owned companies is possible from it.
.
.
Railway transportation service	Stake in a foreign company shall not exceed 49% of legal capital of the joint Venture
.

Source: JETRO, "Labor law, tax, accounting, Investment companies in Vietnam (TCG publisher)

【Reference】Enterprise law (Decree No. 139/2007/ND-CP-20)

- Establishment of a subsidiary with 100% foreign investment
- Establishment of a joint venture subsidiary joint venture, and Vietnamese enterprises (state-owned and private individuals)
- Business cooperation contract (corporate contract-Business contract BCC) Contract BOT, agreement BTO, BT contracts
- Representative offices of foreign service providers, indirect investment (mergers and acquisitions, stock purchase)
- Others (such as contract manufacturing)

Chapter 2 Traffic Demand Forecast

2.1 Establishment of a traffic demand forecasting model

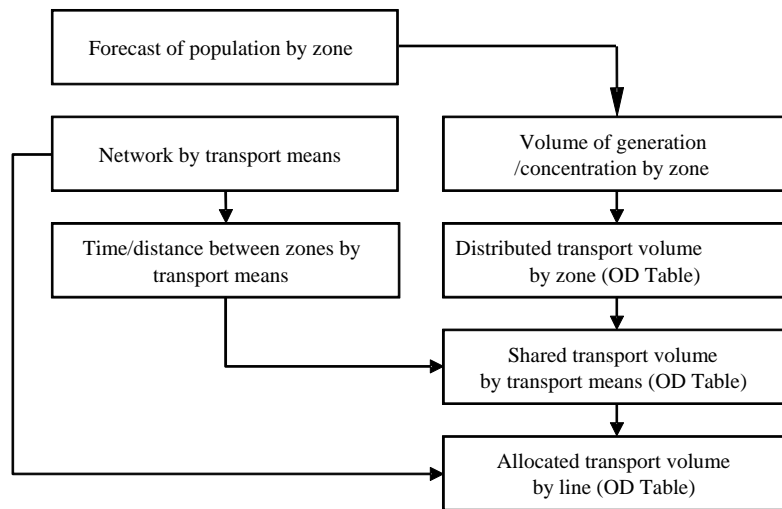
Transport demand forecasting is based on the present condition value (2011) and future predicted value (2030) of a passenger flow between zones of "Hanoi Urban Railway Construction Investment Project" on the person trip survey as of 2011 by TEDI during the same period of this survey.

In this survey, the station coverage area, the transport share and the peak hour concentration ratio are set originally.

As the technique of demand forecast, ST used a classical "four-stage estimating method," which is used to estimate the traffic volume of passengers on different lines at four stages: "generation/concentration," "distribution," "sharing" and "allocation."

See the chart on the following page for the concept of the "four-stage estimating method." The input quantities are the "population estimated for each zone" and the "network of each transport means," while the eventual output quantities are the traffic volume for each road and line (for public traffic). Calculation of the traffic volume at the said four stages requires estimating parameter

The figure of this technique is shown below.

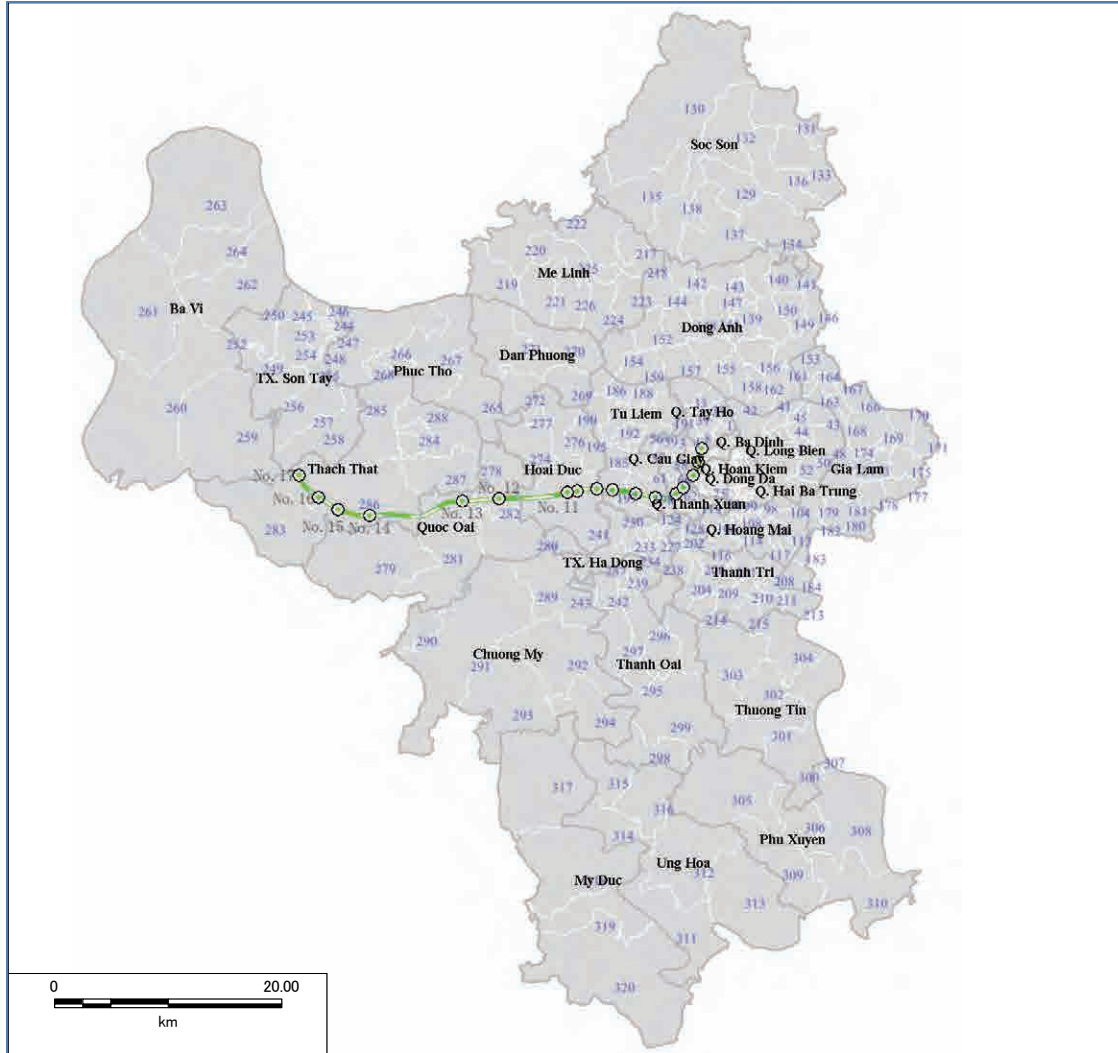


Source: JICA Study Team

Figure 2.1.1 Demand forecast flow by the four-stage estimating method

2.2 Basic data collection

At "Hanoi Urban Railway Construction Investment Project" by TEDI, it predicts by dividing the whole Hanoi city zone into the zone of 320. In this survey, the demographic data (the area along the Hanoi No. 5 line is included) of the whole city zone has been grasped based on this. It is required for transport demand forecasting. And GDM (geographical data matrix) arranged according to each zone was created.



Source: JICA Study Team

Figure 2.2.1 Division of each zone in "Hanoi Urban Railway Construction Investment Project" (Whole Hanoi region)



Source: JICA Study Team

Figure 2.2.2 Division of each zone on "Hanoi Urban Railway Construction Investment Project" (Central part of Hanoi)

2.3 Analysis of basic data

(1) Transition of population and employed population, and development along the line

1) Population and employed population for every zone in Hanoi

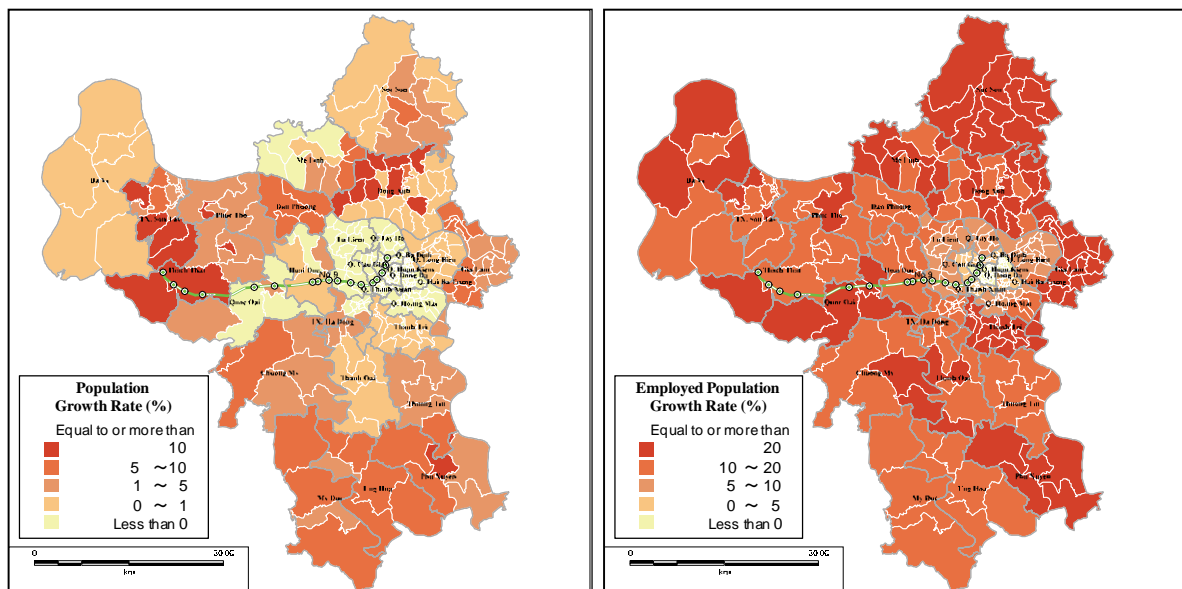
The population and the employed population in Hanoi, preconditions of the demand forecast are followings.

The population in Hanoi is increasing in 2011 to 2050. It will be increasing 1.8% of an annual rate in 2011 to 20, and the pace of increase will become slow after that. Then, the population will exceed 10 million in 2050.

By each zone, some zone's population in a suburban part will increase and some will decrease in a suburban part in 2011 to 2020. In a suburban part, the zones exceeding 10% will be also seen. In these zones, it is thought that population increase by housing development is taken into consideration.

About the employed population, it is mostly saturated in the central part and the high-rating zones are distributed in the suburban part. It is thought that new job opportunities are formed by such developments as factories and commercial institutions in the suburban parts.

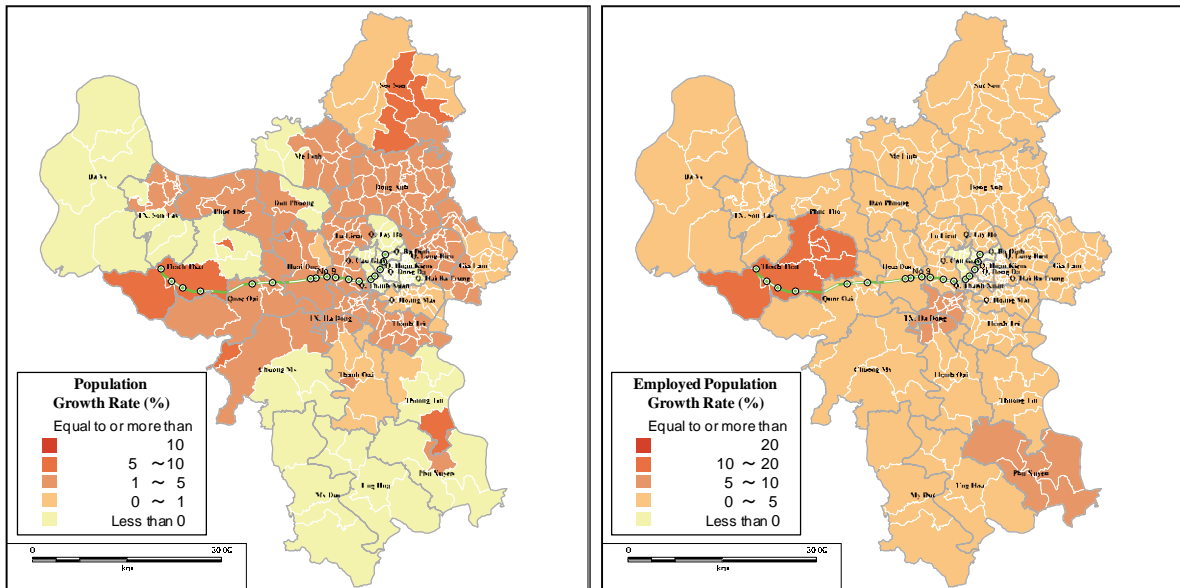
As for population and employed population, the tendency of suburbanizing continuously until 2020. The variation in the rate of increase for each zone becomes small.



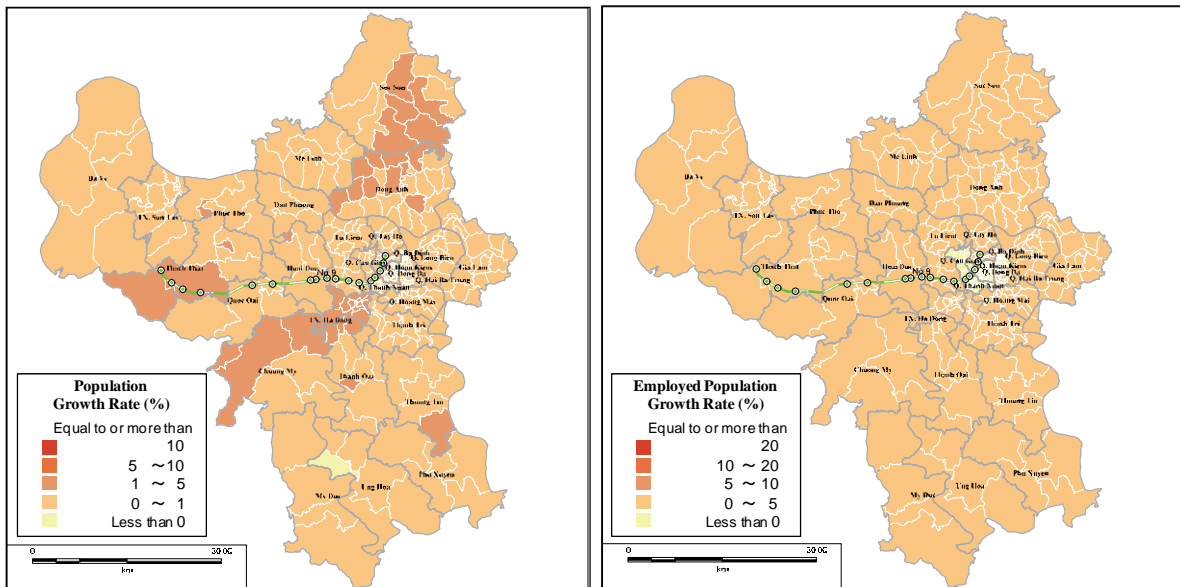
Source : JICA Study Team based on TEDI's survey

Figure 2.3.1 Transition of population and employed population of Hanoi in "Hanoi Urban Railway Construction Investment Project" (2011 to 2020)

From this, the developments in the suburban part are concentrated on until 2020 from now on. The population and the employed population are set based on the scenario that the urbanization process will be maturing until 2030.



Source: JICA Study Team based on TEDI's survey
 Figure 2.3.2 Transition of the population and the employed population in Hanoi on "Hanoi Urban Railway Construction Investment Project" (2020 to 2030)



Source: JICA Study Team based on TEDI's survey
 Figure 2.3.3 Transition of the population and the employed population in Hanoi on "Hanoi Urban Railway Construction Investment Project" (2030 to 2050)

2) Preconditioned Development Projects

It cannot be checking how much population and employed population are contained in each development project in the prediction of the future population and employed population.

The zones considered that development projects are included based on the rate of increase (2011-2020) of the population and the employed population are extracted as followings.

The extracted zones of 53 where the population growth rate exceeds 5% show the very high increase-in-population tendency compared with the rate of the whole Hanoi region. It is thought that various large and small development projects are included in these zones.

Table 2.3.1 Rapid population-increase zones considered that development projects are included.

Zone Name	Population					Average Growth Rate (%)				Share (%)				
	2011	2020	2030	2040	2050	2011	30/20	40/30	50/30	2011	2020	2030	2040	2050
Total in Hanoi	6,779,294	7,956,200	9,135,300	9,874,323	10,712,200	1.8	1.4	0.8	0.8	100.00	100.00	100.00	100.00	100.00
1 283 Thị trấn Tây Đằng ○	16,382	92,169	225,548	257,028	292,902	21.2	9.4	1.3	1.3	0.24	1.16	2.47	2.60	2.73
2 284 Xã Phú Cường	7,120	33,210	81,269	92,612	105,538	18.7	9.4	1.3	1.3	0.11	0.42	0.89	0.94	0.99
3 286 Xã Tân Hồng ◎	25,907	98,674	213,991	242,579	274,985	16.0	8.0	1.3	1.3	0.38	1.24	2.34	2.46	2.57
4 257 Phường La Khê	10,331	38,641	23,184	23,877	24,589	15.8	-5.0	0.3	0.3	0.15	0.49	0.25	0.24	0.23
5 258 Phường Phú La	11,077	41,430	24,858	25,600	26,365	15.8	-5.0	0.3	0.3	0.16	0.52	0.27	0.26	0.25
6 256 Phường Quang Trung	4,769	17,837	10,702	11,022	11,351	15.8	-5.0	0.3	0.3	0.07	0.22	0.12	0.11	0.11
7 268 Phường Lê Lợi	8,690	27,500	33,000	36,783	41,000	13.7	1.8	1.1	1.1	0.13	0.35	0.36	0.37	0.38
8 307 Xã Tân Lĩnh	5,909	16,813	22,595	24,961	27,576	12.3	3.0	1.0	1.0	0.09	0.21	0.25	0.25	0.26
9 306 Xã Thuận Mỹ	20,497	57,081	73,943	81,499	89,827	12.1	2.6	1.0	1.0	0.30	0.72	0.81	0.83	0.84
10 252 Phường Mộ Lao	6,466	17,959	15,378	16,399	17,487	12.0	-1.5	0.6	0.6	0.10	0.23	0.17	0.17	0.16
11 144 Xã Việt Long	13,150	34,392	45,914	52,270	59,506	11.3	2.9	1.3	1.3	0.19	0.43	0.50	0.53	0.56
12 151 Xã Phú Cường	12,979	33,945	45,317	51,590	58,732	11.3	2.9	1.3	1.3	0.19	0.43	0.50	0.52	0.55
13 145 Xã Xuân Giang	16,075	42,042	56,126	63,896	72,742	11.3	2.9	1.3	1.3	0.24	0.53	0.61	0.65	0.68
14 143 Xã Tiên Dược	13,359	34,938	46,643	53,100	60,451	11.3	2.9	1.3	1.3	0.20	0.44	0.51	0.54	0.56
15 156 Xã Xuân Nôn	17,472	45,695	61,004	69,449	79,063	11.3	2.9	1.3	1.3	0.26	0.57	0.67	0.70	0.74
16 142 Xã Tân Dân	12,275	32,103	42,858	48,791	55,546	11.3	2.9	1.3	1.3	0.18	0.40	0.47	0.49	0.52
17 154 Xã Xuân Thu	10,239	26,778	35,749	40,698	46,332	11.3	2.9	1.3	1.3	0.15	0.34	0.39	0.41	0.43
18 152 Xã Phú Minh	32,252	84,347	112,605	128,193	145,940	11.3	2.9	1.3	1.3	0.48	1.06	1.23	1.30	1.36
19 140 Xã Quang Tiến	14,721	38,498	51,396	58,511	66,611	11.3	2.9	1.3	1.3	0.22	0.48	0.56	0.59	0.62
20 270 Phường Ngô Quyền	31,630	72,685	48,992	51,917	55,016	9.7	-3.9	0.6	0.6	0.47	0.91	0.54	0.53	0.51
21 269 Phường Phú Thịnh	32,032	73,609	49,615	52,577	55,715	9.7	-3.9	0.6	0.6	0.47	0.93	0.54	0.53	0.52
22 139 Xã Tân Minh	29,041	62,463	83,389	94,933	108,076	8.9	2.9	1.3	1.3	0.43	0.79	0.91	0.96	1.01
23 223 Xã Tứ Hiệp	15,389	33,017	49,525	54,702	60,420	8.9	4.1	1.0	1.0	0.23	0.41	0.54	0.55	0.56
24 172 Xã Cổ Loa	8,447	17,817	24,829	25,752	26,709	8.6	3.4	0.4	0.4	0.12	0.22	0.27	0.26	0.25
25 164 Xã Vân Nội	16,952	35,756	49,828	51,680	53,601	8.6	3.4	0.4	0.4	0.25	0.45	0.55	0.52	0.50
26 181 Xã Yên Viên	11,521	24,301	33,864	35,122	36,428	8.6	3.4	0.4	0.4	0.17	0.31	0.37	0.36	0.34
27 166 Xã Việt Hùng	15,230	32,124	44,765	46,429	48,155	8.6	3.4	0.4	0.4	0.22	0.40	0.49	0.47	0.45
28 165 Xã Liên Hà	12,703	26,793	37,337	38,725	40,164	8.6	3.4	0.4	0.4	0.19	0.34	0.41	0.39	0.37
29 180 Xã Yên Thường	11,687	24,650	34,351	35,627	36,951	8.6	3.4	0.4	0.4	0.17	0.31	0.38	0.36	0.34
30 167 Xã Kim Nỗ	9,673	20,402	28,431	29,487	30,583	8.6	3.4	0.4	0.4	0.14	0.26	0.31	0.30	0.29
31 179 Thị trấn Yên Viên	4,517	9,527	13,276	13,770	14,281	8.6	3.4	0.4	0.4	0.07	0.12	0.15	0.14	0.13
32 300 Xã Cẩm Lĩnh	41,133	77,910	140,684	155,532	171,947	7.4	6.1	1.0	1.0	0.61	0.98	1.54	1.58	1.61
33 254 Phường Vạn Phúc	7,813	14,176	19,629	21,552	23,663	6.8	3.3	0.9	0.9	0.12	0.18	0.21	0.22	0.22
34 250 Xã Tráng Việt	7,146	12,966	17,953	19,712	21,643	6.8	3.3	0.9	0.9	0.11	0.16	0.20	0.20	0.20
35 271 Phường Quang Trung	52,599	94,331	145,205	159,951	176,194	6.7	4.4	1.0	1.0	0.78	1.19	1.59	1.62	1.64
36 272 Phường Sơn Lộc	29,138	51,059	70,188	77,047	84,575	6.4	3.2	0.9	0.9	0.43	0.64	0.77	0.78	0.79
37 217 Thị trấn Văn Điển	9,924	17,264	25,896	28,603	31,593	6.3	4.1	1.0	1.0	0.15	0.22	0.28	0.29	0.29
38 218 Xã Tân Triều	20,164	35,076	52,614	58,114	64,189	6.3	4.1	1.0	1.0	0.30	0.44	0.58	0.59	0.60
39 129 Thị trấn Sóc Sơn	20,308	35,192	88,771	107,168	129,378	6.3	9.7	1.9	1.9	0.30	0.44	0.97	1.09	1.21
40 316 Xã Văn Phúc	23,507	40,363	33,706	35,529	37,451	6.2	-1.8	0.5	0.5	0.35	0.51	0.37	0.36	0.35
41 311 Xã Văn Hòa	42,821	73,527	61,399	64,720	68,221	6.2	-1.8	0.5	0.5	0.63	0.92	0.67	0.66	0.64
42 315 Xã Văn Hà	20,476	35,159	29,359	30,947	32,622	6.2	-1.8	0.5	0.5	0.30	0.44	0.32	0.31	0.30
43 312 Xã Yên Bài	38,610	66,296	55,361	58,355	61,512	6.2	-1.8	0.5	0.5	0.57	0.83	0.61	0.59	0.57
44 313 Xã Khánh Thượng	32,098	55,114	46,023	48,513	51,137	6.2	-1.8	0.5	0.5	0.47	0.69	0.50	0.49	0.48
45 176 Xã Tâm Xã	26,198	44,559	62,094	64,402	66,796	6.1	3.4	0.4	0.4	0.39	0.56	0.68	0.65	0.62
46 163 Xã Uy Nỗ	15,917	27,072	37,726	39,128	40,582	6.1	3.4	0.4	0.4	0.23	0.34	0.41	0.40	0.38
47 305 Xã Cam Thượng	53,070	89,258	80,129	85,752	91,770	5.9	-1.1	0.7	0.7	0.78	1.12	0.88	0.87	0.86
48 318 Xã Xuân Phú	50,600	82,813	64,678	69,063	73,746	5.6	-2.4	0.7	0.7	0.75	1.04	0.71	0.70	0.69
49 320 Xã Sen Chiểu	47,567	77,849	60,802	64,924	69,325	5.6	-2.4	0.7	0.7	0.70	0.98	0.67	0.66	0.65
50 317 Xã Văn Nam	50,591	82,798	64,667	69,051	73,732	5.6	-2.4	0.7	0.7	0.75	1.04	0.71	0.70	0.69
51 290 Xã Phú Đông	31,781	51,038	96,263	111,024	128,048	5.4	6.6	1.4	1.4	0.47	0.64	1.05	1.12	1.20
52 309 Xã Minh Quang	25,735	40,699	34,299	36,469	38,776	5.2	-1.7	0.6	0.6	0.38	0.51	0.38	0.37	0.36
53 291 Xã Phú Phương	88,074	138,997	177,161	198,522	222,460	5.2	2.5	1.1	1.1	1.30	1.75	1.94	2.01	2.08

(Note) ◎ : Zone including HoaLac ○ : HoaLac's neighboring zones

Source: JICA Study Team based on TEDI's survey

Table 2.3.2 Rapid the employed population -increase zones considered that development projects are included.

Zone Name	Employed Population					Average Growth Rate (%)				Share (%)				
	2011	2020	2030	2040	2050	20/11	30/20	40/30	50/30	2011	2020	2030	2040	2050
Total in Hanoi	1,831,722	4,044,415	5,273,770	5,684,725	6,164,692	9.2	2.7	0.8	0.8	100.00	100.00	100.00	100.00	100.00
1 177 Xã Mai Lâm	50	2,201	2,873	2,882	2,891	52.3	2.7	0.0	0.0	0.00	0.05	0.05	0.05	0.05
2 252 Phường Mộ Lao	9	342	446	638	914	49.8	2.7	3.7	3.7	0.00	0.01	0.01	0.01	0.01
3 175 Xã Vòng La	106	3,444	4,495	4,510	4,524	47.2	2.7	0.0	0.0	0.01	0.09	0.09	0.08	0.07
4 184 Xã Dương Hà	69	2,163	2,824	2,833	2,842	46.6	2.7	0.0	0.0	0.00	0.05	0.05	0.05	0.05
5 168 Xã Kim Chung	73	1,952	2,548	2,556	2,564	44.1	2.7	0.0	0.0	0.00	0.05	0.05	0.04	0.04
6 179 Thị trấn Yên Viên	90	2,138	2,791	2,800	2,809	42.2	2.7	0.0	0.0	0.00	0.05	0.05	0.05	0.05
7 170 Xã Đại Mạch	53	1,256	1,639	1,644	1,650	42.1	2.7	0.0	0.0	0.00	0.03	0.03	0.03	0.03
8 169 Xã Đức Tú	186	4,177	5,453	5,470	5,488	41.3	2.7	0.0	0.0	0.01	0.10	0.10	0.10	0.09
9 172 Xã Cổ Loa	388	7,484	9,770	9,801	9,832	38.9	2.7	0.0	0.0	0.02	0.19	0.19	0.17	0.16
10 164 Xã Văn Nội	629	11,960	15,612	15,662	15,712	38.7	2.7	0.0	0.0	0.03	0.30	0.30	0.28	0.25
11 180 Xã Yên Thường	464	8,777	11,458	11,494	11,531	38.6	2.7	0.0	0.0	0.03	0.22	0.22	0.20	0.19
12 281 Xã Sơn Đông	1,098	20,296	26,494	28,549	30,764	38.3	2.7	0.7	0.7	0.06	0.50	0.50	0.50	0.50
13 280 Xã Kim Sơn	669	12,049	15,729	16,949	18,264	37.9	2.7	0.7	0.7	0.04	0.30	0.30	0.30	0.30
14 183 Xã Đình Xuyên	146	2,623	3,424	3,435	3,446	37.8	2.7	0.0	0.0	0.01	0.06	0.06	0.06	0.06
15 166 Xã Việt Hùng	408	7,261	9,478	9,508	9,538	37.7	2.7	0.0	0.0	0.02	0.18	0.18	0.17	0.15
16 176 Xã Tâm Xá	2,246	38,790	50,635	50,795	50,957	37.2	2.7	0.0	0.0	0.12	0.96	0.96	0.89	0.83
17 167 Xã Kim Nỗ	218	3,755	4,901	4,917	4,932	37.2	2.7	0.0	0.0	0.01	0.09	0.09	0.09	0.08
18 171 Xã Vinh Ngọc	970	16,635	21,715	21,783	21,853	37.1	2.7	0.0	0.0	0.05	0.41	0.41	0.38	0.35
19 133 Xã Nam Sơn	276	4,550	5,940	6,636	7,415	36.5	2.7	1.1	1.1	0.02	0.11	0.11	0.12	0.12
20 134 Xã Trung Giã	831	12,880	16,813	18,785	20,988	35.6	2.7	1.1	1.1	0.05	0.32	0.32	0.33	0.34
21 181 Xã Yên Viên	1,094	15,653	20,432	20,497	20,562	34.4	2.7	0.0	0.0	0.06	0.39	0.39	0.36	0.33
22 136 Xã Minh Phú	678	9,606	12,540	14,010	15,653	34.3	2.7	1.1	1.1	0.04	0.24	0.24	0.25	0.25
23 132 Xã Hồng Kỳ	497	6,987	9,121	10,190	11,385	34.1	2.7	1.1	1.1	0.03	0.17	0.17	0.18	0.18
24 173 Xã Hải Bối	837	11,724	15,304	15,353	15,401	34.1	2.7	0.0	0.0	0.05	0.29	0.29	0.27	0.25
25 163 Xã Uy Nỗ	4,030	55,636	72,625	72,856	73,087	33.9	2.7	0.0	0.0	0.22	1.38	1.38	1.28	1.19
26 130 Xã Bắc Sơn	1,284	17,414	22,732	25,397	28,375	33.6	2.7	1.1	1.1	0.07	0.43	0.43	0.45	0.46
27 182 Xã Ninh Hiệp	1,238	16,610	21,682	21,751	21,820	33.4	2.7	0.0	0.0	0.07	0.41	0.41	0.38	0.35
28 174 Xã Xuân Canh	1,221	16,361	21,357	21,425	21,493	33.4	2.7	0.0	0.0	0.07	0.40	0.40	0.38	0.35
29 178 Xã Đông Hội	5,905	77,480	101,140	101,461	101,783	33.1	2.7	0.0	0.0	0.32	1.92	1.92	1.78	1.65
30 208 Xã Minh Khai	62	803	1,048	1,129	1,217	32.9	2.7	0.7	0.7	0.00	0.02	0.02	0.02	0.02
31 279 Phường Trưng Sơn Trám	1,665	21,415	27,955	30,123	32,460	32.8	2.7	0.7	0.7	0.09	0.53	0.53	0.53	0.53
32 278 Xã Thanh Mỹ	1,649	21,187	27,657	29,803	32,115	32.8	2.7	0.7	0.7	0.09	0.52	0.52	0.52	0.52
33 160 Xã Nam Hồng	19	243	331	371	416	32.7	3.1	1.2	1.2	0.00	0.01	0.01	0.01	0.01
34 165 Xã Liên Hà	1,124	13,974	18,241	18,299	18,357	32.3	2.7	0.0	0.0	0.06	0.35	0.35	0.32	0.30
35 282 Xã Cổ Đông	1,881	23,166	30,240	32,586	35,114	32.2	2.7	0.7	0.7	0.10	0.57	0.57	0.57	0.57
36 261 Xã Yên Nghĩa	277	3,338	4,358	4,696	5,060	31.9	2.7	0.7	0.7	0.02	0.08	0.08	0.08	0.08
37 135 Xã Tân Hưng	2,715	29,092	37,976	42,429	47,404	30.2	2.7	1.1	1.1	0.15	0.72	0.72	0.75	0.77
38 129 Thị trấn Sóc Sơn	2,341	22,843	29,818	33,315	37,221	28.8	2.7	1.1	1.1	0.13	0.56	0.57	0.59	0.60
39 219 Xã Thanh Lịnh	282	2,640	3,446	3,713	4,001	28.2	2.7	0.7	0.7	0.02	0.07	0.07	0.07	0.06
40 146 Xã Mai Đình	130	1,211	1,649	1,849	2,074	28.1	3.1	1.2	1.2	0.01	0.03	0.03	0.03	0.03
41 137 Xã Phù Linh	7,095	65,884	86,003	96,088	107,355	28.1	2.7	1.1	1.1	0.39	1.63	1.63	1.69	1.74
42 310 Xã Ba Vì	465	4,285	8,390	10,440	12,990	28.0	7.0	2.2	2.2	0.03	0.11	0.11	0.16	0.21
43 213 Xã Tây Mộ	400	3,647	4,761	5,130	5,528	27.8	2.7	0.7	0.7	0.02	0.09	0.09	0.09	0.09
44 214 Xã Mê Trì	185	1,673	2,184	2,354	2,536	27.7	2.7	0.7	0.7	0.01	0.04	0.04	0.04	0.04
45 131 Xã Minh Trí	6,843	59,560	77,748	86,865	97,051	27.2	2.7	1.1	1.1	0.37	1.47	1.47	1.53	1.57
46 158 Xã Bắc Hồng	465	4,022	5,479	6,145	6,892	27.1	3.1	1.2	1.2	0.03	0.10	0.10	0.11	0.11
47 138 Xã Bắc Phú	13,069	111,180	145,131	162,149	181,163	26.9	2.7	1.1	1.1	0.71	2.75	2.75	2.85	2.94
48 263 Xã Phú Lâm	691	5,753	7,510	8,093	8,720	26.6	2.7	0.7	0.7	0.04	0.14	0.14	0.14	0.14
49 140 Xã Quang Tiến	209	1,725	2,350	2,636	2,956	26.4	3.1	1.2	1.2	0.01	0.04	0.04	0.05	0.05
50 308 Xã Ba Trai	786	6,051	11,847	14,741	18,342	25.5	7.0	2.2	2.2	0.04	0.15	0.22	0.26	0.30
51 220 Xã Tân Thanh Oai	385	2,951	3,852	4,151	4,473	25.4	2.7	0.7	0.7	0.02	0.07	0.07	0.07	0.07
52 162 Xã Văn Hà	397	2,993	4,077	4,572	5,128	25.2	3.1	1.2	1.2	0.02	0.07	0.08	0.08	0.08
53 154 Xã Xuân Thu	273	2,040	2,778	3,116	3,495	25.0	3.1	1.2	1.2	0.01	0.05	0.05	0.05	0.06
54 204 Xã Đông Ngạc	653	4,854	6,336	6,828	7,357	25.0	2.7	0.7	0.7	0.04	0.12	0.12	0.12	0.12
55 141 Xã Hiền Ninh	285	2,111	2,876	3,225	3,618	24.9	3.1	1.2	1.2	0.02	0.05	0.05	0.06	0.06
56 294 Xã Đông Thái	406	2,953	3,854	4,153	4,476	24.7	2.7	0.7	0.7	0.02	0.07	0.07	0.07	0.07
57 309 Xã Minh Quang	382	2,777	5,437	6,765	8,417	24.7	7.0	2.2	2.2	0.02	0.07	0.10	0.12	0.14
58 149 Xã Đông Xuân	738	5,338	7,271	8,155	9,146	24.6	3.1	1.2	1.2	0.04	0.13	0.14	0.14	0.15
59 305 Xã Cam Thưng	1,161	8,181	16,018	19,931	24,800	24.2	7.0	2.2	2.2	0.06	0.20	0.30	0.35	0.40
60 267 Xã Biên Giang	673	4,647	6,066	6,536	7,043	23.9	2.7	0.7	0.7	0.04	0.11	0.12	0.11	0.11
61 255 Phường Yên Kiều	139	955	1,246	1,784	2,553	23.9	2.7	3.7	3.7	0.01	0.02	0.02	0.03	0.04
62 297 Xã Vất Lai	581	3,980	5,195	5,599	6,033	23.8	2.7	0.7	0.7	0.03	0.10	0.10	0.10	0.10
63 225 Xã Vinh Quỳnh	518	3,506	4,577	4,932	5,314	23.7	2.7	0.7	0.7	0.03	0.09	0.09	0.09	0.09
64 283 Thị trấn Tây Đằng	235	1,588	5,529	6,661	8,025	23.7	13.3	1.9	1.9	0.01	0.04	0.10	0.12	0.13
65 298 Xã Chu Minh	287	1,877	2,450	2,640	2,845	23.2	2.7	0.7	0.7	0.02	0.05	0.05	0.05	0.05
66 221 Xã Hữu Hoà	353	2,188	2,856	3,078	3,317	22.5	2.7	0.7	0.7	0.02	0.05	0.05	0.05	0.05
67 210 Xã Phú Diễn	1,634	10,029	13,091	14,107	15,202	22.3	2.7	0.7	0.7	0.09	0.25	0.25	0.25	0.25
68 292 Xã Phú Châu	803	4,895	6,390	6,886	7,420	22.2	2.7	0.7	0.7	0.04	0.12	0.12	0.12	0.12
69 142 Xã Tân Dân	580	3,527	4,804	5,388	6,043	22.2	3.1	1.2	1.2	0.03	0.09	0.09	0.09	0.10
70 205 Xã Thụy Phương	223	1,342	1,751	1,887	2,034	22.1	2.7	0.7	0.7	0.01	0.03	0.03	0.03	0.03
71 306 Xã Thuận Mỹ	956	5,723	11,206	13,944	17,330	22.0	7.0	2.2	2.2	0.05	0.14	0.21	0.25	0.28
72 211 Xã Xuân Phương	625	3,740	4,882	5,261	5,669	22.0	2.7	0.7	0.7	0.03	0.09	0.09	0.09	0.09
73 156 Xã Xuân Nón	886	5,295	7,212	8,089	9,073	22.								

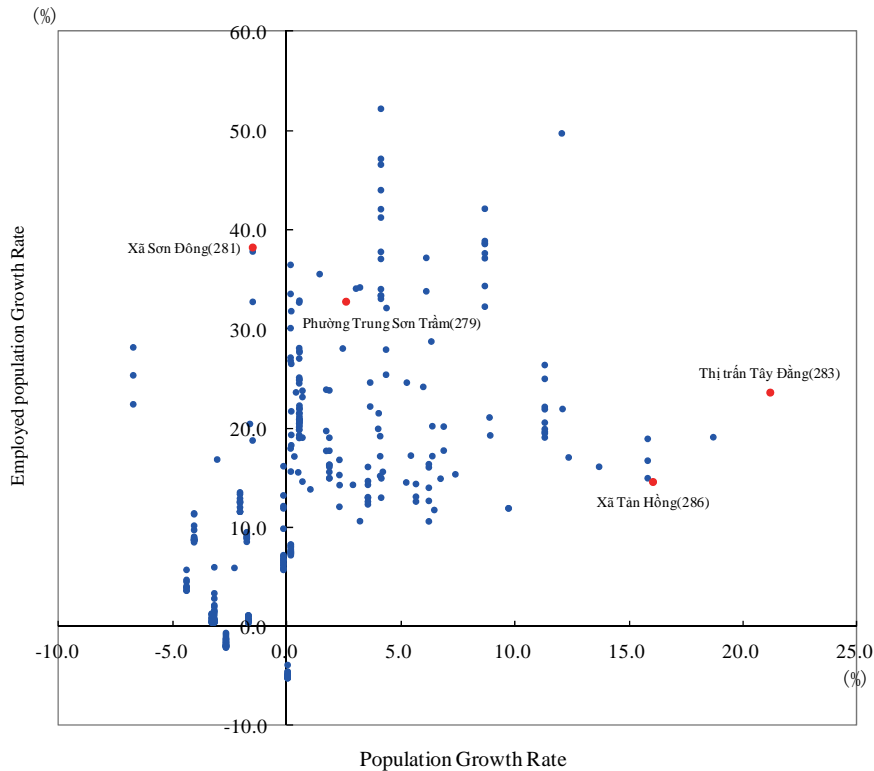
3) Development projects along the No.5 Line

About the HoaLac high-tech park in connection with this business, the population and the employed population are made into the precondition of the demand forecast as followings.

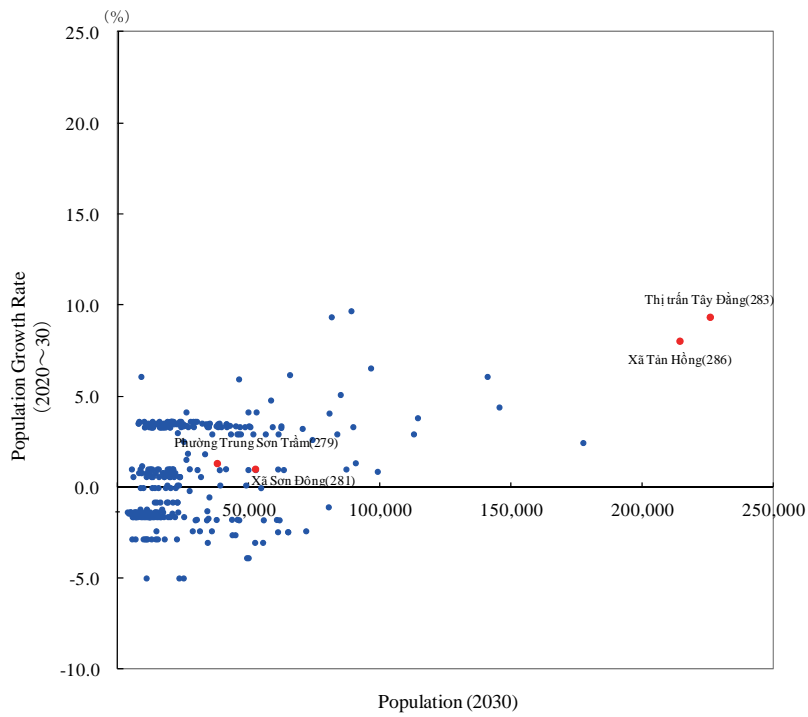
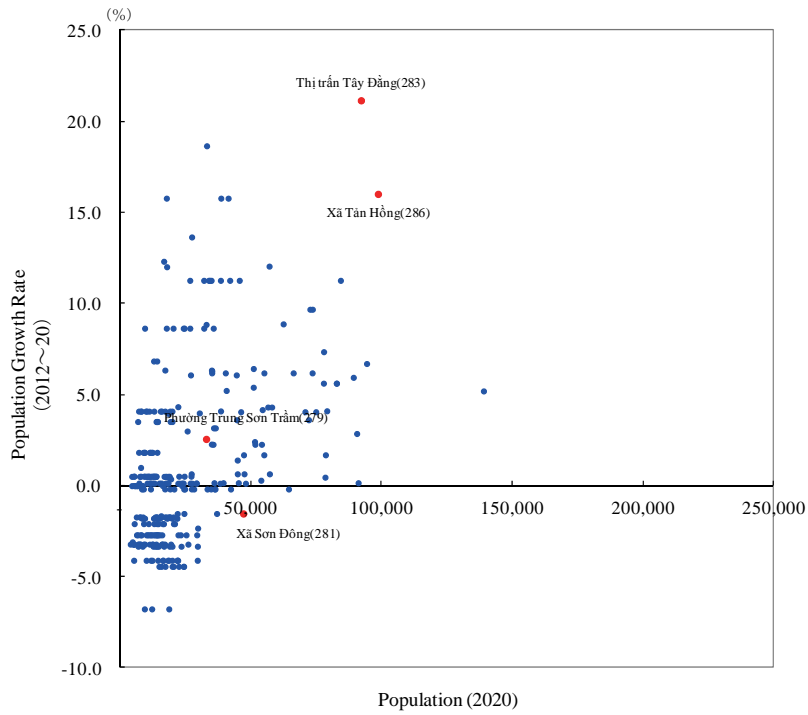
HoaLac is located near No.14 Station of No. 5 line, and Xã Tân Hồng (286) and Phường Trung Sơn Trầm (279) are corresponding as zones.

Though population of Xã Tân Hồng is 25,000 as of 2011, it will be expanded to about 100,000 by 2020 and also will reach the twice by 2030. The pace of expansion in this zone has far exceeded the average of the whole Hanoi region. In addition, although the growth becomes slow in 2030 and afterwards, a pace of expansion is higher than the average.

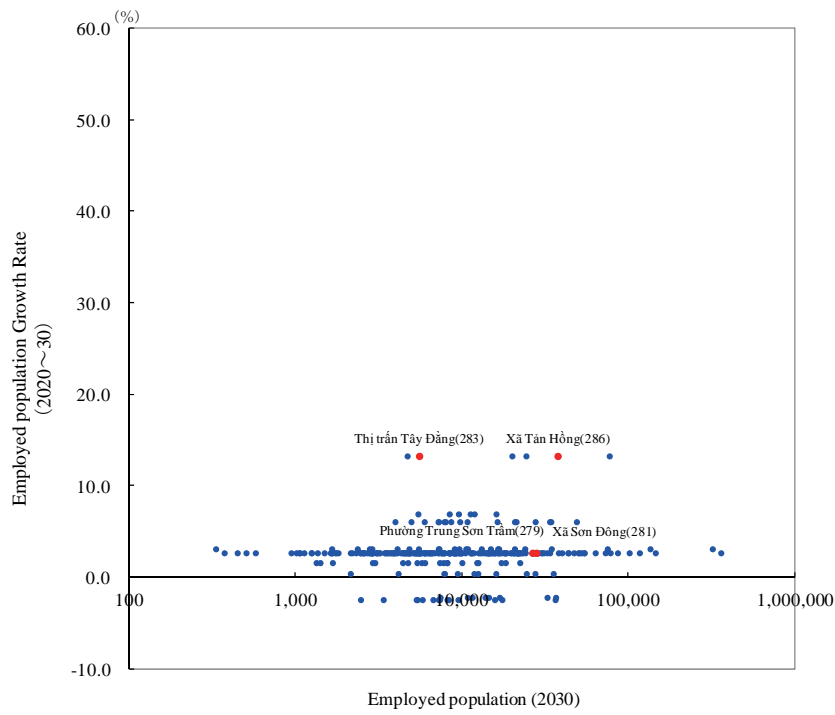
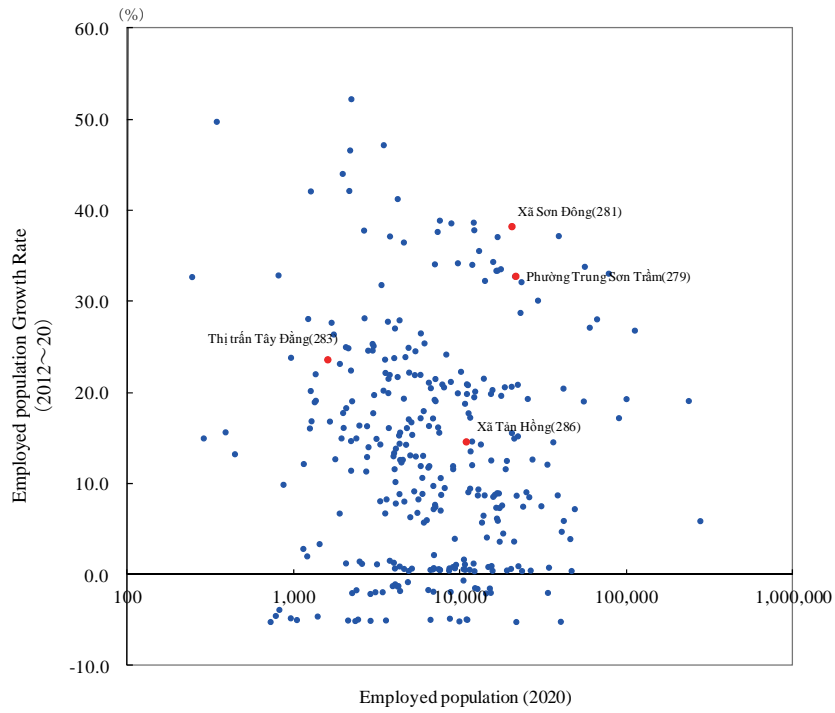
The employed population in this zone shows the same tendency and will increase more than 10% of an annual rate till 2030.



Source: JICA Study Team based on TEDI's survey
 Figure 2.3.4 Increase rates of the population and of the employed population in each zone in Hanoi(2011 to 2020)



Source: JICA Study Team based on TEDI's survey
 Figure 2.3.5 The population and the growth rate in each zone in Hanoi



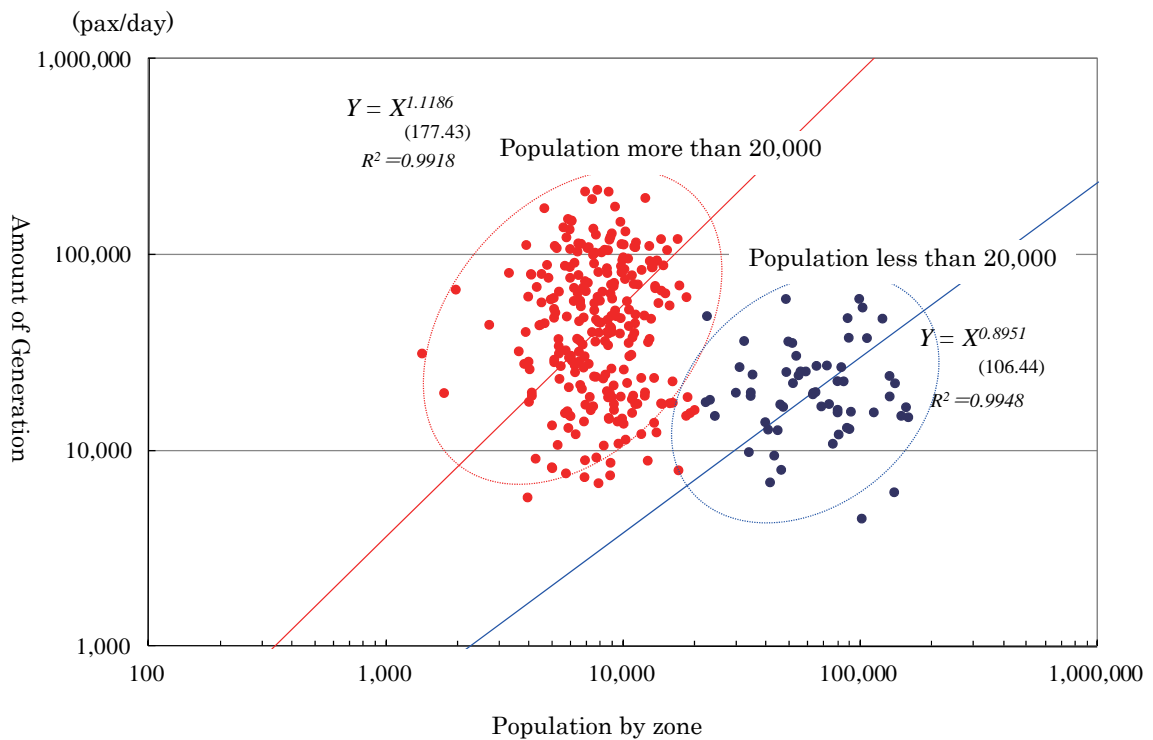
Source: JICA Study Team based on TEDI's survey
 Figure 2.3.6 The employed population and the growth rate in each zone in Hanoi

(2) Amount of Traffic Generation

The amount of generation and the amount of concentration by all the purposes and all the means of transportation between each zone are dependent on the size of the population and the employed population. Since both of them are equivalent to the round trip and basically the same in figure. For this, the amount of generation (Z), total amount of each OD from the zone, is expressed followings with the population (X) and the employed population(Y).

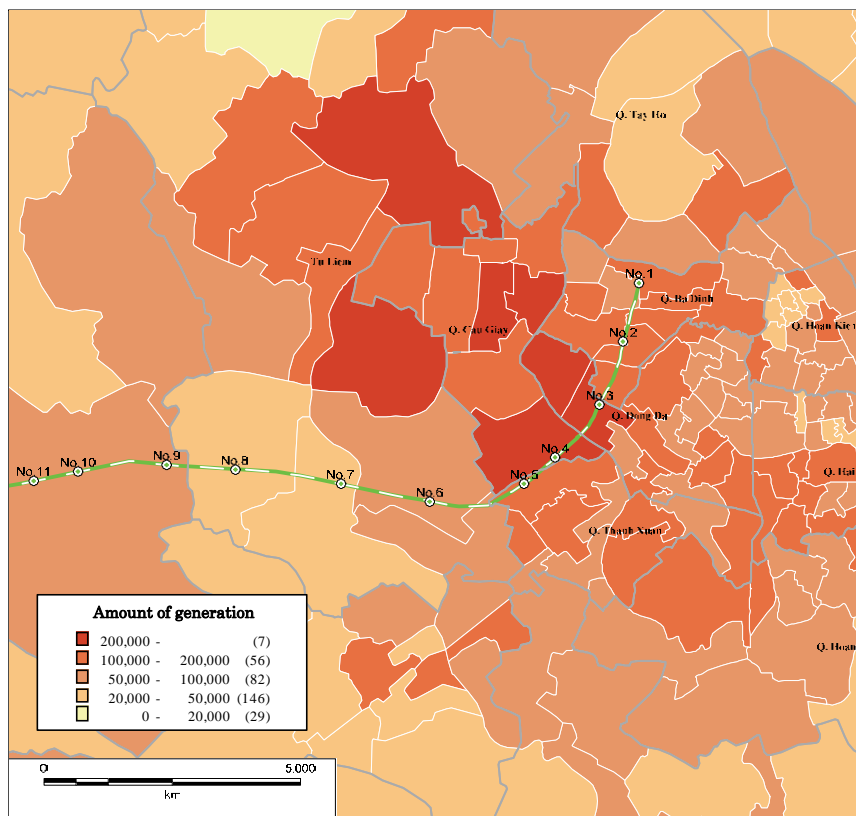
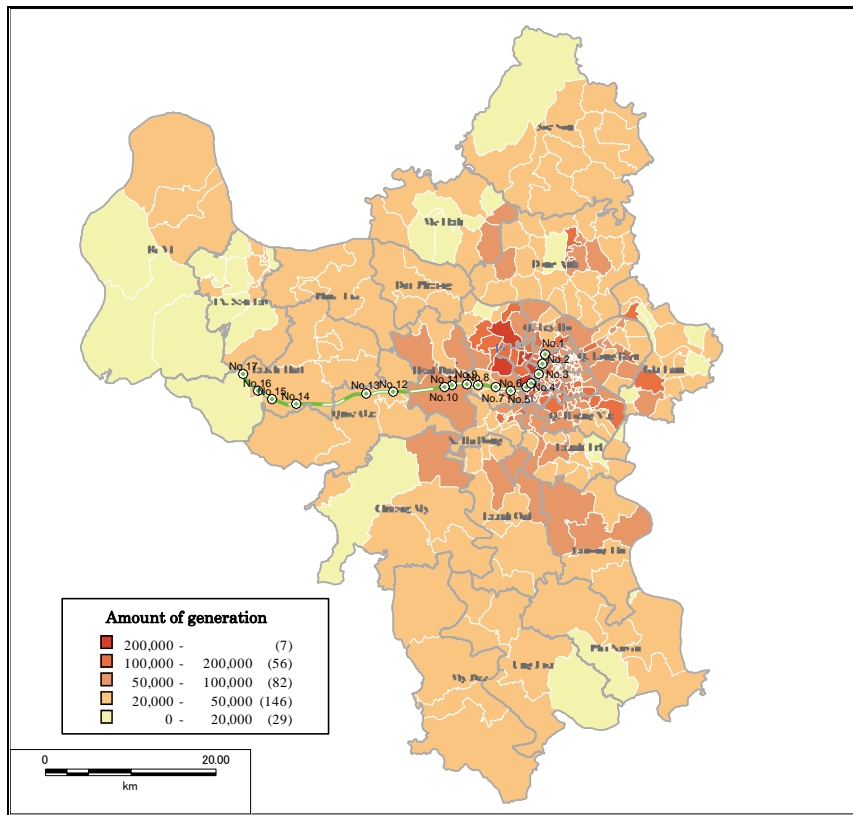
$$\begin{aligned}
 Z &= f(X,Y) \\
 \log(Z) &= a \cdot \log(X) + b \cdot \log(Y) + c \\
 Z &= c \cdot X^a Y^b
 \end{aligned}$$

The amount of generation (Z) from the latest person trip survey is explained by population (X) and employed population (Y) as followings. Explanatory and reappearant models are derived and statistically appropriate on t-value and a coefficient of determination (R^2).

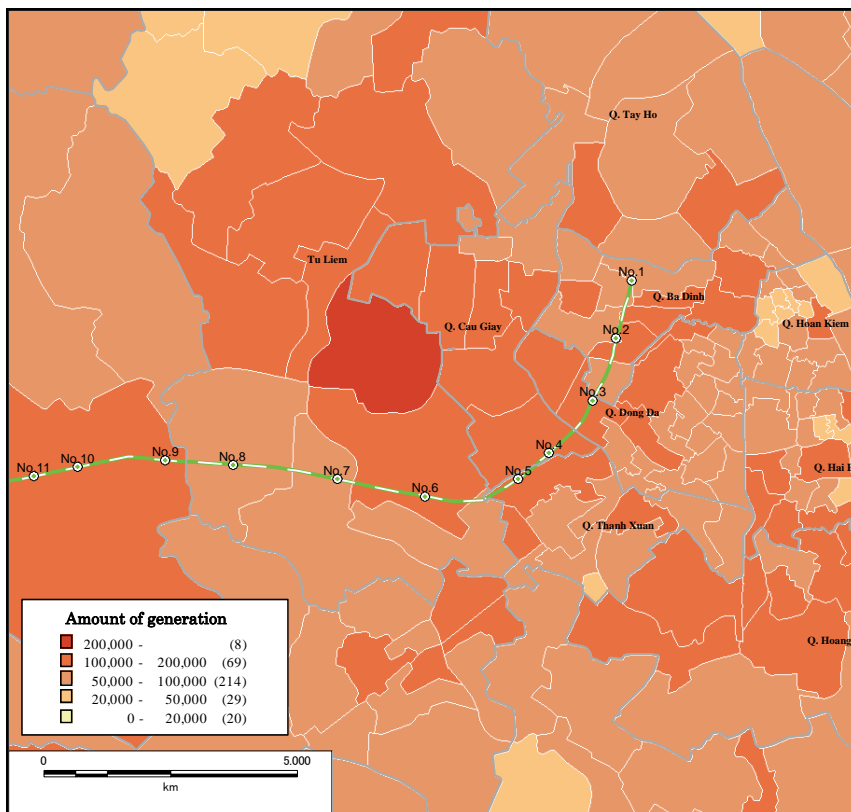
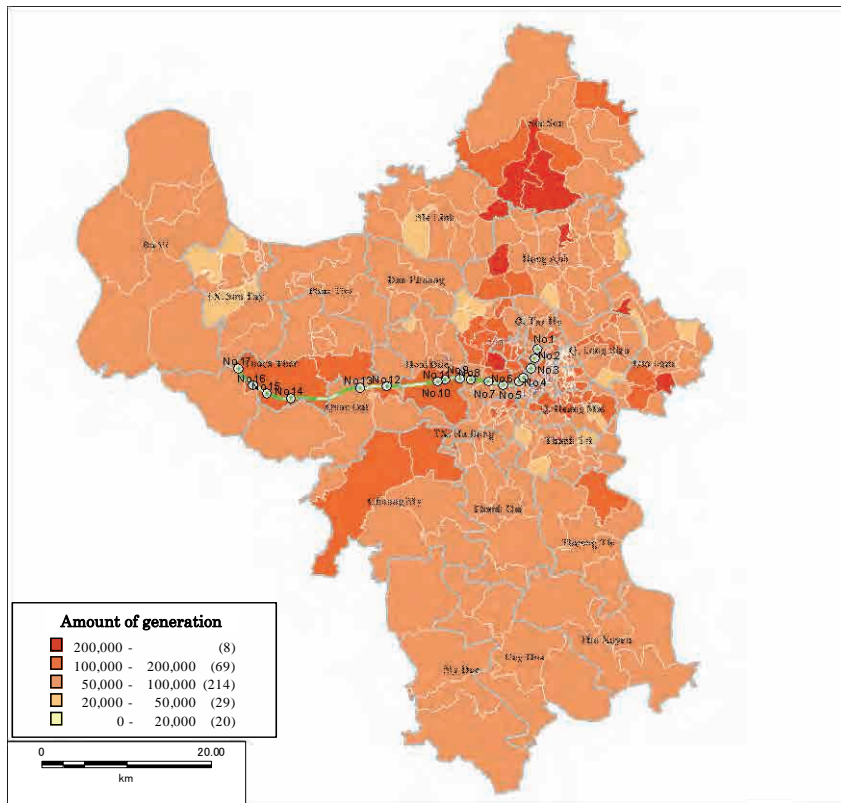


Source: JICA Study Team based on TEDI's survey
 Figure 2.3.7 Amount of generation according to population in each zone (2011)

The present and future figures of amount of generation in each zone are estimated based on the proposition of population and employed population with the forecasting models. They are followings.



Source: JICA Study Team based on TEDI's survey
Figure 2.3.8 Amount of generation in each zone in Hanoi (2011)



Source: JICA Study Team based on TEDI's survey
Figure 2.3.9 Amount of generation in each zone in Hanoi (2030)

On the amount of the generation in each zone, followings are pointed out with the comparison of the present (2012) and the future (2030).

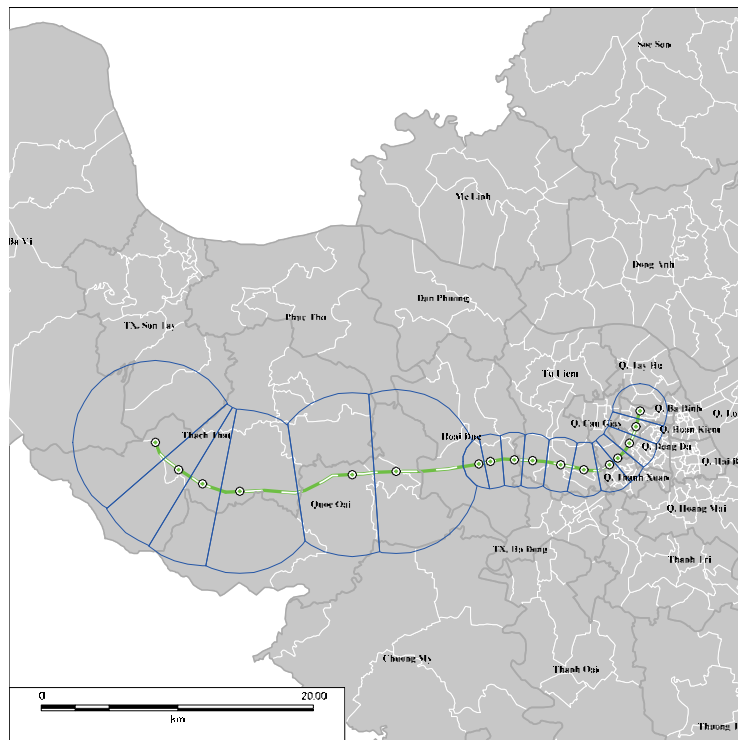
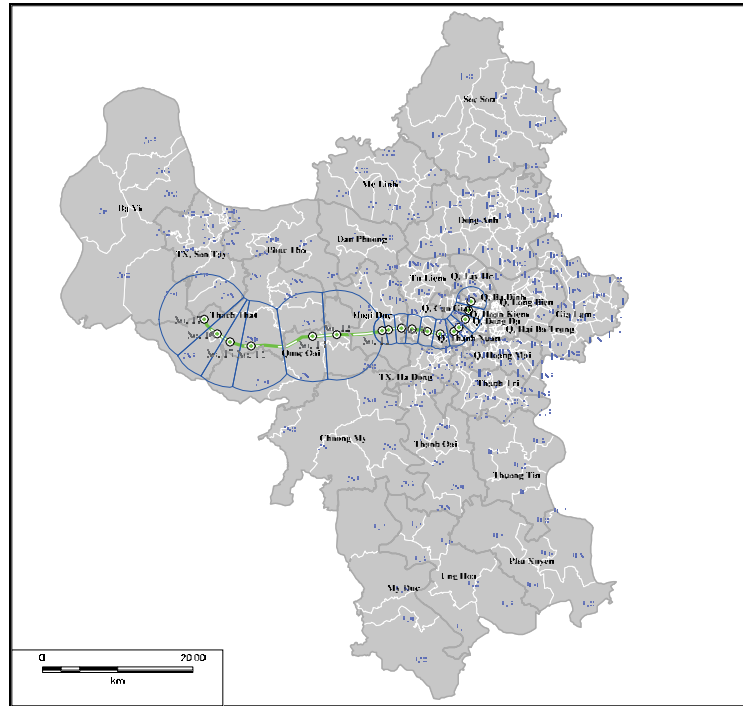
- Under the present condition (2012), zones with much amount of generation are concentrated in the central part of the city. Along the No. 5 line, many zones where No.3 to No.5 stations located have much amounts of generation.
- In the future (2030), zones with much amount of generation will expand in the suburban part. The zones with many amount of generation will be concentrating to the southwest part including Hoa Lac, northern part and southeast part.
- The amount of generation will expand with more than 10% increase rate in Xã Tân Hồng (286) where Hoa Lac is located and in its neighboring Phường Trung Sơn Trầm (279).
- In the future (2030), amount of generation are decreasing in some zones in central part s of the city rather than figures (2012).

Since the amount of generation in each zones depends on the size of the population and the employed population, the above-mentioned is considered reflecting the tendency of the suburbanization of population.

2.4 Preconditions of demand forecast

(1) Station converge area

The station coverage area for railway demand forecasting is based on the shape of 2km circle in radius centering on the No.1 to No.11 stations supposing the moveable area on foot in central part of the city. About No.12 to No.17 station, supposing the formation of the feeder transportation network connecting to the railway stations by a bus, considering the distance between stations, the station coverage area is based on the of 6km circle in radius.



Source: JICA Study Team

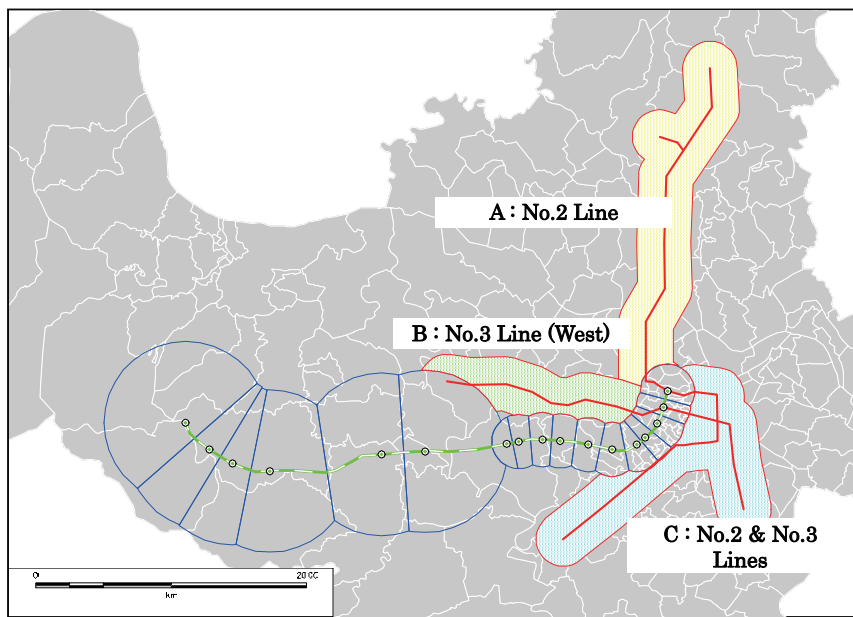
Figure 2.4.1 Station coverage area for demand forecasting
(Concentric circles divided by Voronoi method)

In order to predict the connection passengers with the Hanoi No. 2 line connecting at No.1 station of the Hanoi No. 5 line and No. 3 line connecting at No.2 station, station coverage area of these two lines are set the range 2 km in radius in the same way of Hanoi No.5 line.

The area along No. 2 line and No. 3 line are divided into "A:No. 2 line (a northern part)", "B:No. 3 line (a western part)" and "C:No. 2 line and a No. 3 line (an eastern part and a southern part)" and the relation with No.5 line is set as followings.

In the section between No.1 to No.11 station of No. 5 line, it is supposed that passengers will not generating because the section is parallel to sections B and C and stations of those sections are very close to each other. Then only the connection passengers between section of No.12 to No.17 station of No.5 line (the suburban section) and the sections B and C, the demand will be counted as a demand.

The demand between section A and No.5 line will be counted all because the section A and No.5 line extend toward different directions.



Source: JICA Study Team

Figure 2.4.2 Station coverage area for demand forecasting (No.2 line and No.3 line)

Table 2.4.1 Connecting passengers between No.5 line and other lines

	A:No.2 line (North)	B:No.3 line (West)	C: No.2 and No.3 line (East and South)
Central part along No.5 line (No.1 to No.11 Station)	○	No counts (movable on foot or by bus)	No counts (movable on foot or by bus)
Suburban part along No.5 line (No.12 to No.17 Station)	○	○	○

(note) ○: Count connecting passengers

Source: JICA Study Team

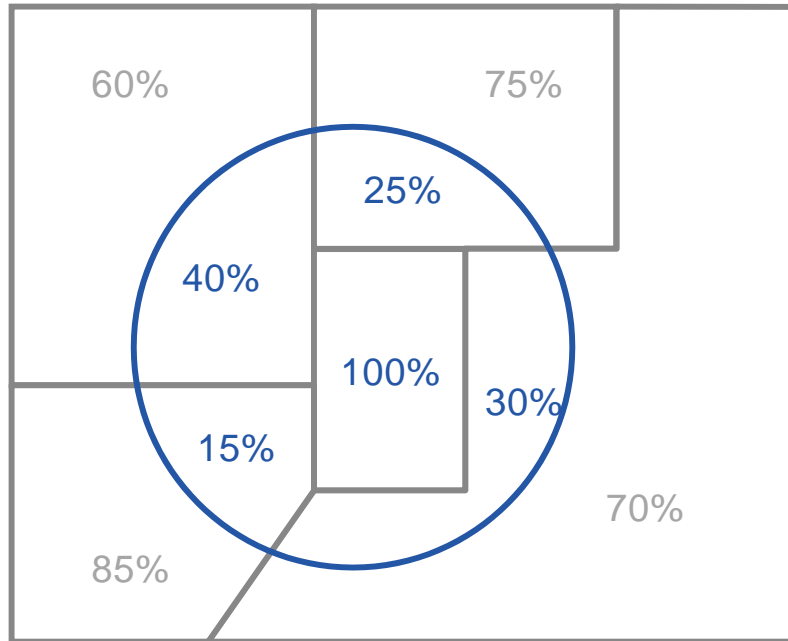
The area set by the above method overlap neighboring area each other without blank area along lines. Since the distance between stations is especially short in the central part, the parts of overlapping become large. Then it is assumed that the demand will be predicted excessively.

For this reason, the bases of the above-mentioned area are so divided that the demands of passengers in the overlapping area are contained the nearest station coverage area with Volonoi diagram. It is known as the method of the quantitative geography which divides area by the perpendicular bisector of the line segment connects between 2 points.

(2) Zone divided by station coverage area

Each station coverage area includes two or more zones divided administratively. In "Hanoi Urban Railway Construction Investment Project" by TEDI, amounts of generation in every OD between 320 zones are counted and predict the figures in the future.

In this survey, in order to convert ODs according to the zones into ODs according to each station coverage area, zones are divided on the boundary of each station coverage area. Then proportional share contained by station coverage area are calculated to multiple to ODs according to zones and derive ODs according to each station coverage area.



Source: JICA Study Team

Figure 2.4.3 Division of zone by each station coverage area (area proportional division)

(3) Transport shares

Transport share is a parameter for deriving the demand of railway passengers from the amount of generation OD estimated by each station coverage area.

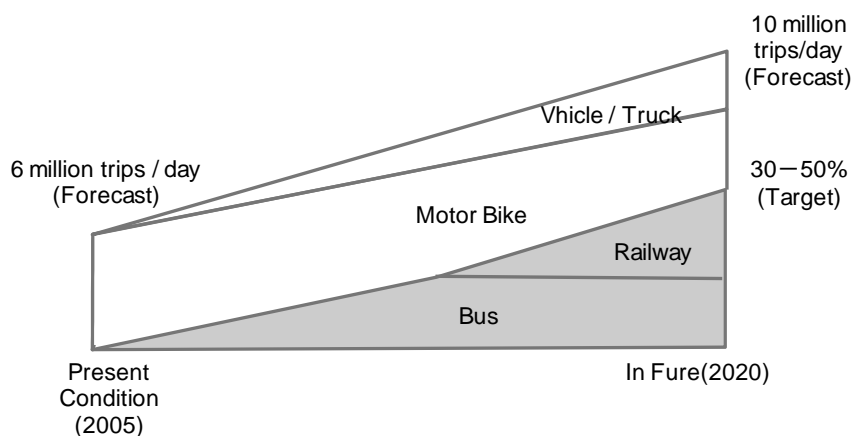
In cities where existing transportation, buses, railways, motor vehicles and bikes are already improved, it is possible to derive the change of transport shares mathematically if the conditions either a time or cost factor of them will be changed. For example, it is a method of figuring out the transport shares that using the function model estimated by present condition of total costs (defined "sacrifice") consists of time and costs (fare) and deriving the transport shares respond to the change of costs and time.

In this survey, it is not possibly to apply the method directly because of not being urban railway system in Hanoi. However the share of urban railway system is trying to be estimated based on the present share and conditions of buses, only one of the public transportation in Hanoi. From this, when an average fare is 0.5USD (2012 price), the share of urban railway system will become about 15%.

Moreover, in this survey, the target value (20.5%) of urban railway system (UMRT) in "HIDEP" and the cities in other Asian countries are taken into consideration.

Although the share of the urban railway system is exceeding 30% only in Japan, the share in Singapore where the urban transportation is highly sophisticated is 12%, the shares in Manila and in Jakarta are only 2%.

It is considered that the share of No. 5 line should be set more conservatively than the figure of HAIDEP.



Source: HAIDEP

Figure 2.4.4 The present shares and the future target figures in Hanoi

Table 2.4.2 The present shares and the future target figures in Hanoi

Mode		2005		2020			
		(1000 trips / day)	(%)	with UMRT		without UMRT	
				(1000 trips / day)	(%)	(1000 trips / day)	(%)
Private Mode	Bicycle	1,579	25.3	374	3.8	372	3.8
	Motor Bike	3,396	63.2	5,777	58.7	5,206	52.9
	Vehicle/Taxi	227	3.6	1,921	19.5	1,555	15.8
	Others	69	1.1	350	3.5	350	3.5
	Sub total	5,811	93.3	8,422	86.5	6,896	70.0
Public Mode	UMRT	—	—	—	—	2,012	20.5
	Bus	420	6.7	1,426	14.5	940	9.5
	Sub Total	420	6.7	1,426	14.5	2,364	30.0
Total		6,321	100.0	9,848	100.0	9,848	100.0

Source: HAIDEP

Table 2.4.3 The comparison of the transit shares in Asian countries

Mode \ City	Hanoi 2005	HCMC 2002	Manira 1996	Jakarta 2002	Singapore 1993	Tokyo 1998
Private Mode	93.3	94	22	42	34	64.1
Bicycle	25.3	17	—	4	—	—
Motor Bike	63.2	75	1	21	6	21.5
Vehicle/Taxi	3.6	1	25	15	19	42.6
Others	1.1	1	2	2	9	—
Public Mode	6.2	6	78	58	66	35.9
Bus	6.7	2	17	—	—	—
UMRT	—	—	2	—	—	—
Others	—	4	53	—	—	—
Road Ratio (km/km ²)	4.2	—	10.7	—	—	—
Urban Railway Length (km)	— (142)	— (29)	43.9 (30)	— (170)	109	300 (657)

(Notes) 1) Only in Urban areas.

2) Figures in parenthesis are referred to as a part of the length of some inter-city railways in the city

3) Only in Tokyo 23-wards. Total length in Tokyo Metropolitan Area is 2,100km.

4) Original Source : JICA(HCMC, Manira, Jakarta) / Tokyo Metropolitan Area's Person-Trip Survey, etc.

Source: HAIDEP

In addition, the fare level and per capita GDP of main countries in Asia are compared as one of the setting bases. In Singapore, where the total amount of motor traffic is regulated and use of public traffic is promoted, the fare of the urban railway is controlled politically low level to the

level of the Per capita GDP.

When setting a fare level, it will be also takes into consideration about the consumption of the purchase, maintenance and fuel cost of the motorbike as a daily means of transportation.

Table 2.4.4 The fare level of the urban transport of the Asian countries

	Hong Kong	South Korea (Seoul)	Singapore	Thailand (Bangkok)	Indonesia (Jakarta)	Vietnam (Settings)
①Average Fare Level (Mean)	1.95	1.05	1.04	0.75	0.37	0.50
②Per capita GDP	31,500	20,600	43,100	4,990	9,896	1,170
Index(①/②)	0.006 %	0.005 %	0.002 %	0.015 %	0.0037 %	0.042 %

Source: JICA Study Team