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The Study on Environmental Improvement for Hanoi City in The Socialist Republic of Vietnam

Final Report

Main Report

Volume 2

Environmental Master Plan
Methodologies for ENP

March 2000

Nippon Koei Co., Ltd.

EX Corporation

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THE STUDY
ON
ENVIRONMENTAL IMPROVEMENT FOR HANOI CITY
IN
THE SOCIALIST REPUBLIC OF VIETNAM

FINAL REPORT

MAIN REPORT

Volume 2

Environmental Master Plan: Methodologies for EMP

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ABBREVIATIONS

Government of Vietnam/Public Institutions

APNEH	:	Hanoi Association for Protection of Nature
CEETIA	:	Center for Environmental Engineering of Towns and Industrial Areas
CEST	:	Center for Environmental Science and Technology
DFP	:	Department of Finance and Pricing
DI	:	Department of Industry
DOC	:	Department of Construction
DOSTE	:	Hanoi Department of Science, Technology and Environment
EMD	:	Environmental Management Division
GOV	:	Government of Vietnam
HAPI	:	Hanoi Authority of Planning and Investment
HCAO	:	Hanoi Chief Architect's Office
HD	:	Healthcare Department
HPC	:	Hanoi People's Committee
HSDC	:	Hanoi Sewerage and Drainage Company
HT	:	Hanoi Television
MOC	:	Ministry of Construction
MOET	:	Ministry of Environment and Training
MOF	:	Ministry of Finance
MOI	:	Ministry of Industry
MOSTE	:	Ministry of Science, Technology and Environment
MPI	:	Ministry of Planning and Investment
NEA	:	National Environmental Agency
NIED	:	National Institute for Educational Development
PMB	:	Project Management Board
SC	:	Steering Committee
SCPE	:	Scientific Center for Population and Environment
TUPWS	:	Hanoi Transport and Urban Public Works Service
URENCO	:	Hanoi Urban Environment Company
VCCI	:	Vietnam Chamber of Commerce and Industry
VIWASE	:	Vietnam Consultant on Water Supply, Sanitation and Environment

International /Foreign Organizations

ADB	:	Asian Development Bank
ASEAN	:	Association of Southeast Asian Nations
CIDA	:	Canadian International Development Agency
EU	:	European Union
IBRD	:	International Bank for Reconstruction and Development (World Bank)
JBIC		Japan Bank for International Cooperation
JICA	:	Japan International Cooperation Agency
NGO	:	Non-Government Organization
OECD	:	Organization for Economic Cooperation and Development
SIDA	:	Swedish International Development Agency
The JICA Study Team	:	The JICA Team for the Study on Environmental Improvement for Hanoi City
UNDP	:	United Nations Development Program
UNICEF	:	United Nations International Children's Emergency Fund
UNIDO	:	United Nations Industrial Development Organization
WHO	:	World Health Organization

Others

BOD	:	Biochemical Oxygen Demand
C	:	Carbon
CECS	:	Center for Environmental Chemistry Studies
CEST	:	Center for Environmental Science and Technology
CH_4	:	Methane
CO_2	:	Carbon dioxide
COD	:	Chemical Oxygen Demand
CRES	:	Center for Regional and Environmental Studies
Cl	:	Chlorine
DID	:	Densely Inhabited District
DO	:	Dissolved Oxygen
EAR	:	Environmental Awareness-Raising
EARET	:	Environmental Awareness-Raising, Education and Training
EE	:	Environmental Education
EIA	:	Environmental Impact Assessment
EMP	:	Environmental Master Plan
ES	:	Executive Seminars
F/S	:	Feasibility Study
GDP	:	Gross Domestic Product

GRP	:	Gross Regional Product
H	:	Hydrogen
IUPM	:	Industrial and Urban Pollution Management
LEP	:	Law on Environmental Protection
LM	:	Laboratory and Monitoring
MEIP	:	Metropolitan Environmental Improvement Program
M/P	:	Master Plan
N	:	Nitrogen
O	:	Oxygen
ODA	:	Official Development Assistance
O&M	:	Operation & Management
SEDS	:	National Socio-Economic Development Strategy
P	:	Phosphorous
PVC	:	Polyvinyl chloride
SS	:	Suspended Solid
STW	:	Sewage Treatment Works
SWM	:	Solid Waste Management
SWS	:	Solid Waste Services
SWTC	:	Solid Waste Treatment Complex
The JICA Study	:	The Study on Environmental Improvement for Hanoi City
T-N	:	Total Nitrogen
T-P	:	Total Phosphorous
TCVN	:	Vietnam Standard
TMS	:	Time and Motion Survey
TSP	:	Total Suspended Particulate
VAT	:	Vietnam-Australia Training Project
VCEP	:	Vietnam Canada Environment Project
WSP	:	Waste Stabilization Pond

UNITS OF MEASUREMENT

T/Y	:	Tons per year
US$	:	United States Dollar
VND	:	Vietnamese Dong
dB	:	Decibel(s)
g/d	:	Grams per day
ha	:	Hectare
km^2	:	Square kilo meter
m^2	:	Square meter
m^3	:	Cubic meter
m^3/d	:	Cubic meter per day
mg/l	:	Milligram per liter
t/m^3	:	Tons per cubic meter
wt%	:	Weight percent

PART 3 PRELIMINARY ENVIRONMENTAL MASTER PLAN

Chapter 1 Objectives and Study Area for the Environmental Master Plan

1.1 Study Area and Target Years

Objective Area for the Study on the Environmental Improvement for Hanoi City comprises the whole of the Hanoi City with about 927 km^2, consisting of seven urban districts and five suburban districts.

1.2 Objectives of the Environmental Master Plan

Principle objectives of the JICA Environmental Master Plan (EMP) to be formulated in this JICA Study can be summarized as follows.

(1) Identification and proposal of urgent and priority projects for early implementation

For the short-term, in particular paying attention to the year of 2005, identify those projects which should be implemented at the earliest opportunity considering their urgent needs. Projects to be identified comprise both structural and non-structural or institutional/organizational ones. Due attention will be paid not only to their necessity but also their implementability from various viewpoints including financial affordability of the Government as well as the Hanoi citizens and comformity to the fundamental policy of the Government. Financing viability will also be considered with external aid included.

(2) Setting the basic orientation and strategic direction for environmental improvement

Make outline estimate of the future situation of environmental pollution in long-term, paying attention to the years of 2010 and 2020. Set desirous targets for environmental preservation and recommend the environmental management strategies and measures for mitigating the pollution to achieve the environmental targets. In the long time frame of 10 to 20 years until the years of 2010 and 2020, external conditions including socioeconomic framework and technology development may be different from the one we foresee now, resulting in different perspective of the environmental situation. The EMP in the long-term perspective should be understood as the basic orientation and strategic direction for the environmental improvement and management in the future rather than a proposal of detailed counter-measures and projects.

(3) Demonstration of the planning methodology for EMP formulation

To adapt the change of the external conditions including macro-frame for environmental management in the future, EMP should be regularly amended by the responsible organizations/Departments of HPC. Structure and methodologies adopted for the EMP will be clearly demonstrated so that HPC can do it by itself.

(4) Selection of priority fields considering the need and complementarity to other studies

With many ongoing and planned studies concerned with the management and improvement of environment in Hanoi, duplication should be avoided and complementarity should be sought. Emphases in this JICA Study, therefore, will be placed on:

a) Solid waste management
b) Improvement of water-related sanitary conditions and sewerage development, and
c) Reinforcement of institutional/organizational system for the environmental management in Hanoi, including the reinforcement of the environmental management organization, setting up of stronger coordination system as well as more effective environmental management at the district level.

It should be noted that achievement of recycle society or reduction of the generation and discharge of pollutants as well as proper land use to reduce the concentration of pollution in an area or reduce the number of people to be affected, are essential for achieving clean environment in the future. These preventive measures should be preconditions and should be rigorously implemented in parallel with the implementation of counter-measures and efforts to improve the polluted environment.

In this EMP, however, main focus will be placed on the recommendations for the institutional frame for the effective environmental management and projects and measures to improve the situation of the polluted environment. It is desirous and recommended that studies should be carried out for working out proper strategies and measures to reduce the environmental loads and achieving the recycle society together with this EMP.

Chapter 2 MACRO-FRAME

2.1 General

Macro-frame will be utilized as the pre-condition of estimation of future pollution load, including water quality, solid waste, air and noise for the Study.

Macro-frame is estimated for population frame and economic frame, which is set by considering the past trend and development plans for Hanoi City, including written documents such as Hanoi City Master Plan 2020 and information attained by interviews with various agencies both at the national level and at the city level.

The frame will be set for the year 2010 and 2020.

2.1.1 Population Frame

Population frame is investigated for the year 2010 and 2020.

(1) Methodology

The population frame is set by the following manner.

- Population frame covers the whole city of Hanoi, including the seven urban districts and five suburban districts.
- The base year for the population projection is 1997. The population data is attained from the Hanoi Statistics Office and the area data is attained from the Land Administration Office.
- Future population is estimated for the future urban area and for the suburban area. Population frame for the urban area is based on the Urban Master Plan for Hanoi 2020 in which planned population and area for 37 urban development units are specified. Subdistrict included each urban development unit is classified; however, since the urban development units ignore the administrative boundary, the present population and area don't match: some subdistricts are included in more than one urban development unit.
- Since the Urban Master Plan covers only the future urban area, the population and area for the suburban area are needed to be estimated.

(2) Urban Population

Population projection for the urban area is based on the Urban Master Plan for Hanoi 2020 in which 37 urban development units are designated, and they are categorized into three areas: Restricted Development Area, Outside Restricted Development Area (Red River South), and Northern Part of Red River. According to the Urban Master Plan, total urban population in 2020 is estimated to be 2.5 million and the urban area is 25,014ha. The future urban area is shown in Figure 2.1.1.

1) Restricted Development Area

Restricted Development Area is the area where development is restricted. Industry and residents will be removed from this area. The districts covered in the restricted zone are Ba Dinh District, Hoan Kiem District, Dong Da District, a part of Tay Ho District, and north of Hai Ba Trung District. According to the Master Plan, population in this area will be 800,000 in the area of 3,449ha by the year 2020.

Urban Development Units and Districts/Subdistricts Included in The Restricted Development Area

Urban development unit	Code	Population	Area (ha)	Pop. Density (pers./ha)
Ancient Quarter Area	1	50,000	100	500
Hoan Kiem	Hang Bac, Dong Xuan, Hang Dao, Hang Ma, Hang Bo, Cua Dong, Hang Gai			
Around Hoan Kiem Lake	2	25,000	102	245
Hoan Kiem	Hang Bong, Hang Trong, Trang Tien			
Old Street Quarter Area	3	35,000	163	215
Hoan Kiem	Cua Nam, Tran Hung §ao, Hang Bai Phan Chu Trinh, Ly Thai To			
9 Wards of Southern and Northern Hai Ba Trung	4	90,000	319	282
Hai Ba Trung	Nguyen Du, Le Dai Hanh, Bui Thi Xuan, Pho Hue, Ngo Thi Nham, Pham Dinh Ho, Dong Nhan, Dong Mac, Bach Dang			
Dai Co Viet - Minh Khai	5	105,000	449	234
Hai Ba Trung	Thanh Luong, Thanh Nhan, Cau Den, Bach Khoa, Bach Mai, Quynh Loi, Quynh Mai, Vinh Tuy			
Ba Dinh Area	6	17,000	140	121
Ba Dinh	Quan Thanh, Dien Bien			
Around Truc Bach Lake	7	25,000	109	229
Ba Dinh	Nguyen Trung Truc, Truc Bach			
Giang Vo - Thu Le Area	8	68,000	347	196
Ba Dinh	Kim Ma, Ngoc Khanh, Giang Vo			
Doi Can - Ngoc Ha Area	9	80,000	456	175
Ba Dinh	Doi Can, Cong Vi, Ngoc Ha			
Tay Ho	Buoi, Thuy Khue			
Van Chuong - Hao Nam Area	10	95,000	297	320
Dong Da	Van Mieu, Cat Linh, Quoc Tu Giam, Van Chuong, Hang Bot, Tho Quan, Kham Thien, Trung Phung, Phuong Lien			
Kim Lien - Trung Tu Area	11	126,000	534	236
Dong Da	O Cho Dua, Nam Dong, Quang Trung, Trung Liet, Kim Lien, Phuong Mai, Trung Tu, Khuong Thuong, Thinh Quang, Nga Tu So			
Thang Cong - Lang Thuong Area	12	34,000	178	191
Dong Da	Lang Ha, Lang Thuong			
Ba Dinh	Thanh Cong			
Outside Red River Dyke Area	14	50,000	305	164
Ba Dinh	Phuc Xa			
Tay Ho	Yen Phu			
Hoan Kiem	Hang Buom, Phuc Tan, Chuong Duong Do			

Note: Prepared by the JICA Study Team based on the Urban Master Plan for Hanoi 2020

2) Outside Restricted Development Area (Red River Right Bank)

Outside restricted development Area is located in the Red River right bank and surrounding the Restricted Development Area. The districts covered in the development zone are Tay Ho District, Cau Giay District, Thanh Xuan District, south of Hai Ba Trung District, Tu Liem District, and Thanh Tri District. According to the Master Plan, population in this area will be 700,000 in the area of 8,695ha by the year 2020.

Urban Development Units and Districts/Subdistricts Included in The Outside Restricted Development Area

Urban development unit	Code	Population	Area (ha)	Pop. Density (pers./ha)
North, West, East of West Lake Area	13	32,000	410	78
Tay Ho	Tu Lien, Nhat Tan, Quang An			
A Part of Tay Ho and South Thang Long Area	15	85,000	1,265	67
Tay Ho	Xuan La, Phu Thuong			
Tu Liem	Dong Ngac, Xuan Dinh , Co Nhue			
South Thang Long Area	16	55,000	680	81
Tu Liem	Dong Ngac, Co Nhue			
Cau Giay Area	17	75,000	620	121
Cau Giay	Nghia Do, Nghia Tan, Quan Hoa, Dich Vong			
Cau Giay and New Development Area	18	41,000	900	46
Cau Giay	Cau Giay			
Tu Liem	Cau Dien Town, My Dinh, Me Tri			
Cau Giay - Thanh Xuan Area	19	70,000	645	109
Than Xuan	Nhan Chinh, Thanh Xuan Trung			
Cau Giay	Yen Hoa, Trung Hoa			
Cau Giay - Thanh Xuan and New Development Area	20	42,000	745	56
Than Xuan	Thanh Xuan Bac			
Tu Liem	Trung Van, Me Tri			
Thanh Xuan and New Development Area	21	125,000	1,075	116
Than Xuan	Khuong Trung , Khuong Mai, Phuong Liet, Thuong Dinh, Khuong Dinh, Ha Dinh, Kim Giang			
Than Xuan	Van Dien Town, Dai Kim, Dinh Cong, Hoang Liet			
Than Xuan and New Development Area	22	25,000	400	63
Thanh Tri	Thanh Liet, Dai Kim, Tan Trieu			
Thanh Xuan	Thanh Xuan Nam			
Hai Ba Trung and New Development Area	23	135,000	1,220	111
Hai Ba Trung	Minh Khai, Truong Dinh, Dong Tam, Tuong Mai, Giap Bat, Mai Dong, Tan Mai, Hoang Van Thu			
Thanh Tri	Van Dien Town, Thanh Tri, Thinh Liet, Hoang Liet			
West of Nhue River	24	15,000	735	20
Tu Liem	Phu Dien, Minh Khai, Lien Mac, Co Nhue			

Note: Prepared by the JICA Study Team based on the Urban Master Plan for Hanoi 2020

3) Northern Part of Red River

Northern Part of Red River covers Dong Anh and Gia Lam. A large scale development is expected in the area. According to the Master Plan, population in this area will be 1,000,000 in the area of 12,820ha by the year 2020.

Urban Development Units and Districts/Subdistricts Included in the Northern Part of Red River Area

Urban development unit	Code	Population	Area (ha)	Pop. Density (pers./ha)
North of Road No.1 - Along Nguyen Van Cu Road	25	119,000	990	120
Gia Lam	Gia Lam Tow, Duc Giang Town, Thuong Thanh, Ngoc Thuy, Bo De			
East of Road No.1 - North of Road 5	26	103,000	1,475	70
Gia Lam	Sai Dong Town, Giang Bien, Viet Hung, Gia Thuy, Hoi Xa, Co Bi			
Gia Lam Airport - Cu Khoi	27	78,000	780	100
Gia Lam	Thach Ban , Gia Thuy, Long Bien			
Park, Agriculture University	28	11,000	850	13
Gia Lam	Trau Quy, Dong Du, Co Bi			
Yen Vien	29	17,000	200	85
Gia Lam				Yen Vien Town
West of Norht Thang Long Road	30	30,000	930	32
Dong Anh	Kim Chung, Dai Mach, Vong La			
East of Thang Long Road - South of Van Tri	31	108,000	1,180	92
Dong Anh	Kim No, Kim Chung, Hai Boi			
North of Van Tri Marsh	32	98,000	1,190	82
Dong Anh	Nam Hong, Van Noi			
Phuong Trach Center	33	75,000	550	136
Dong Anh	Vinh Ngoc			
Co Loa and South West of Co Loa	34	98,000	1,450	68
Dong Anh	Co Loa, Mai Lam, Dong Hoi, Xuan Canh, Vinh Ngoc			
Axe of Co Loa - Red River Center	35	75,000	660	114
Dong Anh	Dong Hoi, Xuan Canh			
Co Loa - Dong Tru Axe	36	83,000	1,135	73
Dong Anh	Mai Lam, Dong Hoi			
Dong Anh Townlet - Along Road No.3	37	105,000	1,430	73
Dong Anh	Dong Anh Town, Xuan Non, Tien Duong			

Note: Prepared by the JICA Study Team based on the Urban Master Plan for Hanoi 2020

4) Urban population for 2010

Population for the urban area for 2010 is derived from the population for 2020 by estimating the urbanization rate. Since clear urbanization for 2010 is not stated in the Urban Master Plan, the Study Team estimated the urbanization rate and the population for 2010 is calculated. It can be expected that the urbanization will accelerate in the early period then slow down between 2010

and 2020. Urban population densities in 2010 and 2020 are shown in Figure 2.1.2 and Figure 2.1.3, respectively.

Urban Population for 2010 and 2020

	2010		2020	
	Population	Pop. Density (pers./ha)	Population	Pop. Density (pers./ha)
Restricted Development Area	826,318	236	800,000	229
Outside Restricted Development Area	607,543	86	700,000	81
Northern Part of Red River	467,843	71	1,000,000	78
Total Urban Area	1,901,704	111	2,500,000	100

(3) Suburban Population

Suburban area is characterized as the area that is not covered by the urban development units in the Urban Master Plan. Suburban area is distributed in the 5 suburban districts. Population projection is done in the following manner.

- Natural population growth rate is applied for calculated the future population in the suburban area. The rate for the natural growth is decreasing in the past six years. Since the natural population change is growing by the decreasing rate, possible future trend is estimated for the year 2010 and 2020. The result is shown below.

Estimated Population Change

Population growth rate (estimate)	1998~2010	2011~2020
Soc Son District	1.35%	0.83%
Dong Anh District	1.54%	1.29%
Gia Lam District	1.21%	0.95%
Than Tri District	1.54%	1.41%
Tu Liem District	1.06%	0.70%

- Calculation of population growth rate

1998~2010: take the average increase rate of 1990/1997, 2005, and 2010

2010~2020: assuming that the natural increase rate will be constant after the year 2010. The increase rate for 2010 is applied for 2010/2020. (In many cases, the number of birth is constant and the number of death is increasing for 1990~1997. The number of death is expected to be

constant or decrease in the future due to the economic growth. Eventually the natural change is expected to be constant.)

The result shows that the total population in the suburban area in 2020 is 1,007,923 as shown below.

Population Distribution in the Suburban Districts

	2010		2020	
	Population	Pop. Density (pers./ha)	Population	Pop. Density (pers./ha)
Soc Son	277,571	9	301,489	10
Gia Lam	214,463	17	235,730	19
Tu Liem	80,787	21	86,623	23
Thanh Tri	188,942	24	217,338	27
Dong Anh	146,683	16	166,742	18
*Unclassified	10,629		2,769	
Total Suburban	908,446	14	1,007,923	15

Note : Since the border of urban development units ignores the administrative boundary, some areas can not be classified into the subdistricts. Also the 2010 population is derived from urbanization rate, so some discrepancy of urban area and sub-urban can be seen.

(4) Population Frame for the Year 2010 and 2020

The population for the year 2010 and 2020 is calculated and shown below and in Table 2.1.1. The result shows the population will be 2.8 million in 2010 and 3.5 million in 2020. The distribution of population density for 2010 and 2020 is shown in Figure 2.1.2 and Figure 2.1.3.

Estimated Population in 2010 and 2020

	2010		2020	
	Population	Pop. Density (pers./ha)	Population	Pop. Density (pers./ha)
Urban area	1,901,704	111	2,500,000	200
Su-urban area	908,446	12	1,007,923	15
Hanoi total	2,810,150	31	3,507,923	39

2.1.2 Economic Frame

(1) Methodology

The Vietnam's economic growth is influenced by the world economic trend, so uncertainty cannot be avoided for estimation of the economic growth. It is necessary to consider an alternative for the economic growth. The economic frame is set for a

high growth case and a low growth case. The final economic frame (one case) is set after discussing with the Vietnamese side during the second field survey.

The economic frame is set by the following manner.

- GRP is used for the economic growth indicator. Economic growth for agriculture/forestry/fishery sector, industry/construction sector, and service sector is estimated. GRP for 1997 (1994 price) is used as the base year for growth estimation.
- Review the GRP projection in the Hanoi City Master Plan, which is used as the base for the economic frame for the Study.
- Analyze the information obtained from other economic development plans, interviews with related agencies, as well as the trend of other Asian countries.
- Set the standard for the high growth case and the low growth case. Since the economic growth estimated in the Hanoi Master Plan is high, this rate will be applied as the high growth case. Some adjustment is needed for setting the low growth case by considering result of interviews from other agencies and the trend growth of the other Asian countries.

(2) High Growth Case

Hanoi City Master Plan, which has been approved by the Prime Minister, has the GRP economic growth projection for the year 2010 and 2020, and this projection is applied for the high case.

Since this projection is based on the maximum potential of Hanoi's economy and is not considering the effect of the Asian economic crisis, the growth rate is very high. Industrial growth is expected to be close to 18% and service sector is around 14%. Since rapid urbanization is expected to take place, the agricultural growth is low with 3%. Total GRP growth is expected to be relatively constant until the year 2020 of 15%.

The Growth Rate for High Case

	2001-2010	2011-2020	2001-2020
GRP Total	15.7%	14.5%	15.0%
Agriculture/Forestry	3.5%	3.0%	3.3%
Industry/Construction	17.5%	15.7%	16.6%
Service	14.6%	13.3%	14.0%

Based on the growth rate mentioned above, GRP for 2010 and 2020 is estimated. GRP in 2020 will be 25 times larger than that for 1997 level. By the year 2020, the share of agriculture will be less than 1% and the share of industry will grow to close to 50% of total GRP of Hanoi.

Per capita GRP will increase from 6,156,972 in 1997 level to 94,997,758 in 2020, which is 15 times larger than that for 1997 level. The result of estimation is summarized in the table below.

Estimated GRP

	1997		2010		2020	
	(million dongs)	(share)	(million dongs)	(share)	(million dongs)	(share)
GRP	15,272,886	100.0%	98,896,546	100.0%	381,920,058	100.0%
Agriculture/ Forestry	723,584	4.7%	1,131,654	1.1%	1,520,848	0.4%
Industry/ Construction	5,201,037	34.1%	42,794,221	43.3%	188,783,928	49.4%
Service	9,348,265	61.2%	54,970,672	55.6%	191,615,282	50.2%
GRP per capita	6,156,972 dongs		30,113,084 dongs		94,997,758 dongs	

Note : All the figures are in 1994 price

(3) Low Growth Case

It is desirable for Hanoi's economy to achieve high growth as mentioned above, but it is unrealistic: Asian economic crisis is not considered and the economic growth experienced by the other ASEAN countries shows less than 10% growth.

The low growth case is set as an alternative case by considering the other economic development plans, interviews with related agencies, as well as the trend of other Asian countries. Even though the Vietnam's economy started to grow in the 1990s and is still in the growing stage with the average annual rate of 10-15%, as economy matures, the rate of growth is expected to slow down and some adjustment is needed. Past economic growth trend of other countries, Asian economic crisis, and projections by other agencies are analyzed for estimating the economic growth of Hanoi. First, economic growth of Vietnam is analyzed based on the experience of other Asian countries and Asian economic crisis, then the economic growth of Hanoi is estimated based on the Vietnam's economic trend.

1) Economic growth of Vietnam

(a) Development trend of other developing countries in Asia

In order to observe the economic growth trend, four ASEAN countries (Thailand, Malaysia, Philippines, and Indonesia) and China are selected. AEAN countries are selected because Vietnam is a member of ASEAN. China is selected because Vietnam and China have a similar economic and political system (controlled economy and communist ruling politics), and shifting to

market oriented economy. The past economic growth trend of four Asian countries is observed to see the possibility of Vietnam's future economic growth. The year of GDP per capita level of other countries that is close to the present income level of Vietnam, which is approximately US$300 (World Bank), is set to be the base year for the estimation. The economic growth of these countries is observed from the base year, which will be utilized as a sample of economic growth in Vietnam.

Average annual growth rate for the period of 18 to 32 years (depending on the countries per capita income level) from the year in which per capita GDP of US$300 is summarized below. Continuous economic expansion with annual growth rate of more than 10% for 20 years is hardly achieved. The annual growth rate ranges from 3.3% to 9.9%.

Past Economic Growth Rate in the Asian Countries

Thailand	7.4% (max* 13.3%)
Malaysia	7.4% (max 11.6%)
Philippines	3.6% (max 9.2%)
Indonesia	6.5% (max 8.8%)
China	9.9% (max 14.6%)

Note: max: highest annual growth rate achieved

According to the past economic growth trend in East Asian countries, the average growth rate of 6 to 9% is considered as an appropriate level of economic growth for Vietnam.

(b) Impact of Asian economic crisis on Vietnam and Hanoi's economy

a) Brief description of Asian economic crisis

Asian crisis started Thailand in the middle of 1997 and spread to the other Asian countries. The crisis was caused mainly by the pressure of devaluing Thai Bahts against US dollar and eventually forcing to change the fixed exchange system to a floating exchange system. After the change in the system, Bahts against US dollar dropped as much as 50%. Devaluation of local currencies can be seen in Malaysia and Indonesia where Indonesia Rupiah against US$ dropped as much as 500%. Devaluation of local currencies has several effects on economy as follows.

- Rise in price of imported products, which will lead to the rise in the price consumer goods and lowers their demand.
- Shortage of foreign reserve to pay back the loan. Need to borrow more to payback the loan

- Increase competitiveness for the exported goods by lowering price

After the devaluation of local currencies, the economic system no longer functioned as it was supposed to function. The economic crisis lead to political instability in some countries such as Malaysia and Indonesia, and the economy was worsened.

b) Effect on Vietnam's economy

There are some effects of the Asian economic crisis on Vietnam's economy, but the effect was not too serious, and the economic stability was better maintained compared with the other countries. Vietnam achieved 6% economic growth in 1998 where the target growth for the year was 9%. There are several reasons for the stability.

- Vietnam still maintains a managed floating exchange system. Even though the rage of fluctuation allowed widened from 1% to 10%, the system is still functioning. Actual fluctuation in 1998 was estimated to be less than 9%, which prevented the rise in imported goods and shortage of foreign reserves. In early 1999, the range of fluctuation was changed in which daily fluctuation of 0.1% is allowed.
- Financial market system is still immature in Vietnam, so unlike the other countries, Vietnam was not considered as an attractive target for direct foreign investment.
- Political situation is stable in Vietnam. After the economic crisis, Malaysia and Indonesia faced political chaos. The Vietnam government, on the other hand, maintains the order and is able to control the economy.

(c) Projection conducted by other agencies

International organizations are conducting the GDP growth projection, which integrates the effect of the Asian economic crisis. It shows slow growth rate compared with the projection in Hanoi City Master Plan. The international organizations, such as World Bank and UNDP conducted the economic growth projection for Vietnam, which shows the growth rate ranges from 3.5% to 7.0%, where the growth rate in 1998-2000 is lower (3.5% to 4.5%) than the rate after 2001(5.5% to 7.0%). Presumably, this difference is caused by the Asian economic crisis.

2) Economic growth analysis of Hanoi

(a) Projection for Hanoi reviewed by institutions in Hanoi after the Asian economic crisis

Some research institutes in Hanoi also are conducting a GRP growth projection,

which integrates the effect of the Asian economic crisis. Although the result obtained from these organizations is still in a preliminary stage and will be finalized later on, it shows slow growth rate compared with the projection in Hanoi City Master Plan. The projection varies from 6% to 12% and the growth rate tends to be relatively constant for the years 1996~2020. By sector, the industrial growth is expected to be 8 to 12%, service sector growth is expected to be 6%, and agricultural sector is expected to be 3%.

(b) Projection based on the growth projection for Vietnam

The economic growth for 2010 and 2020 is estimated based on the condition mentioned above and some other factors influencing Hanoi's economy.

- The share of state owned enterprises is high in Hanoi, which means even when the state enterprises are not performing well, the government can subsidize to support the enterprises. Hanoi has a priority of receiving foreign investment, so a certain amount of capital will flow into Hanoi. Small businesses are still performing well and contributing the Hanoi's economy. For these reasons, the economy tends to be more stable than the other cities in Vietnam.
- Comparing the economic growth for Hanoi and Vietnam, Hanoi has always shown higher growth rate by 2 to 4% compared with the growth rate for Vietnam as a whole. Economic growth for Vietnam in 1996 was 9%. For the same period, Hanoi achieved 13% growth.
- The economic growth for 1998 to 2005 will be slow due to the Asian economic crisis, and recovery from the crisis can be expected after 2005 in which higher growth is expected.

(c) Adopted low growth case for Hanoi

Based on this analysis, economic growth for Hanoi is estimated.

Considering the Asian economic crisis and the potential of Hanoi's economy, the growth trend will be slow in the early stage and higher in the later stage. The estimation conducted by the institutions in Hanoi, which are known for research on economics, shows that the growth for 1996-2000 is 7.5%, 2001-2010 is 7.0%, and 2011-2020 is 6.5%. Since average economic growth of other ASEAN countries is 4 to 10%, international organizations are estimating the short term growth to be 3.5 to 7% for Vietnam, and Hanoi's economic growth is 2 to 4% higher than the growth for Vietnam as a whole, this estimation is considered feasible. By integrating this condition, the GRP growth for Hanoi is estimated.

Estimation of the Growth Rate for a Low Case

	1998-2005	2006-2010	2011-2020
GRP Total	7.2%	8.1%	7.3%

GRP in 2020 will be 5 times larger than that for 1997. Per capita GRP will increase from 6,156,972 in 1997 to 22,628,206 in 2020, which is 3.7 times larger than that for 1997. The result of estimation is summarized in the table below.

Estimated GRP

	1997	2010	2020
GRP	15,272,886 million dongs	39,439,028 million dongs	79,378,006 million dongs
GRP per capita	6,156,972 dongs	14,002,470 dongs	22,628,206 dongs

Table 2.1.1 Population Frame for Hanoi City in 2010 and 2020 (1/4)

Development area/sub-district	Code	2010			2020		
		Population	Total Area (ha)	Population Density	Population	Total Area (ha)	Population Density
Total Urban Area		1,901,704	25,014	76	2,500,000	25,014	100
A. South Part of Red River		1,433,861	12,194	118	1,500,000	12,194	123
I. Restricted Development Area		826,318	3,499	236	800,000	3,499	229
Ancient Quarter Area	1	51,645	100	516	50,000	100	500
Around Hoan Kiem Lake	2	25,822	102	253	25,000	102	245
Old Street Quarter Area	3	36,151	163	222	35,000	163	215
9 Wards of Southern and Northern Hai Ba Trung	4	92,961	319	291	90,000	319	282
Dai Co Viet - Minh Khai	5	108,454	449	242	105,000	449	234
Ba Dinh Area	6	17,559	140	125	17,000	140	121
Around Truc Bach Lake	7	25,822	109	237	25,000	109	229
Giang Vo - Thu Le Area	8	70,237	347	202	68,000	347	196
Doi Can - Ngoc Ha Area	9	82,632	456	181	80,000	456	175
Van Chuong - Hao Nam Area	10	98,125	297	330	95,000	297	320
Kim Lien - Trung Tu Area	11	130,145	534	244	126,000	534	236
Thang Cong - Lang Thuong Area	12	35,119	178	197	34,000	178	191
Outside Red River Dyke Area	14	51,645	305	169	50,000	305	164
II. Outside Restricted Area (Expansion Area)		607,543	8,695	70	700,000	8,695	81
North, West, East of West Lake Area	13	27,773	410	68	32,000	410	78
A Part of Tay Ho and South Thang Long Area	15	73,773	1,265	58	85,000	1,265	67
South Thang Long Area	16	47,736	680	70	55,000	680	81
Cau Giay Area	17	65,094	620	105	75,000	620	121
Cau Giay and New Development Area	18	35,585	900	40	41,000	900	46
Cau Giay - Thanh Xuan Area	19	60,754	645	94	70,000	645	109
Cau Giay - Thanh Xuan and New Development Area	20	36,453	745	49	42,000	745	56
Thanh Xuan and New Development Area	21	108,490	1,075	101	125,000	1,075	116
Than Xuan and New Development Area	22	21,698	400	54	25,000	400	63
Hai Ba Trung and New Development Area	23	117,169	1,220	96	135,000	1,220	111
West of Nhue River	24	13,019	735	18	15,000	735	20
B. Northern Part of Red River (New City)		467,843	12,820	36	1,000,000	12,820	78
North of Road No.1 - Along Nguyen Van Cu Road	25	55,673	990	56	119,000	990	120
East of Road No.1 - North of Road 5	26	48,188	1,475	33	103,000	1,475	70
Gia Lam Airport - Cu Khoi	27	36,492	780	47	78,000	780	100
Park, Agriculture University	28	5,146	850	6	11,000	850	13
Yen Vien	29	7,953	200	40	17,000	200	85
West of Norht Thang Long Road	30	14,035	930	15	30,000	930	32
East of Thang Long Road - South of Van Tri	31	50,527	1,180	43	108,000	1,180	92
North of Van Tri Marsh	32	45,849	1,190	39	98,000	1,190	82
Phuong Trach Center	33	35,088	550	64	75,000	550	136
Co Loa and South West of Co Loa	34	45,849	1,450	32	98,000	1,450	68
Axe of Co Loa - Red River Center	35	35,088	660	53	75,000	660	114
Co Loa - Dong Tru Axe	36	38,831	1,135	34	83,000	1,135	73
Dong Anh Townlet - Along Road No.3	37	49,123	1,430	34	105,000	1,430	73

Table 2.1.1 Population Frame for Hanoi City in 2010 and 2020 (2/4)

Development area/sub-district	Code	2010			2020		
		Population	Total Area (ha)	Population Density	Population	Total Area (ha)	Population Density
Total Sub Urban Area		**908,446**	**65,757**	**14**	**1,007,923**	**65,757**	**15**
*Sub-urban area not being able to be classified into sub-districts			2,769			2,769	
Soc Son		**277,571**	**29,521**	**9**	**301,489**	**29,521**	**10**
Soc Son Town	1	19,264	82	235	20,924	82	255
Tan Dan	2	10,795	884	12	11,725	884	13
Thanh Xuan	3	11,565	732	16	12,562	732	17
Minh Tri	4	10,845	2,435	4	11,779	2,435	5
Minh Phu	5	10,143	2,035	5	11,017	2,035	5
Hien Ninh	6	10,393	1,079	10	11,288	1,079	10
Quang Tien	7	7,895	1,133	7	8,575	1,133	8
Phu Cuong	8	9,182	890	10	9,973	890	11
Phu Minh	9	7,805	745	10	8,477	745	11
Mai Dinh	10	15,128	1,375	11	16,432	1,375	12
Phu Lo	11	13,279	603	22	14,424	603	24
Dong Xuan	12	9,091	646	14	9,875	646	15
Nam Son	13	8,489	2,935	3	9,221	2,935	3
Bac Son	14	13,934	3,631	4	15,135	3,631	4
Hong Ky	15	10,244	316	32	11,126	316	35
Trung Gia	16	11,356	821	14	12,334	821	15
Tan Hung	17	10,675	900	12	11,595	900	13
Bac Phu	18	9,928	1,080	9	10,784	1,080	10
Viet Long	19	7,903	694	11	8,584	694	12
Xuan Giang	20	9,554	857	11	10,378	857	12
Duc Hoa	21	7,874	717	11	8,552	717	12
Xuan Thu	22	8,900	571	16	9,667	571	17
Kim Lu	23	9,277	471	20	10,077	471	21
Phu Linh	24	8,739	1,442	6	9,492	1,442	7
Tan Minh	25	13,147	1,073	12	14,280	1,073	13
Tien Duoc	26	12,166	1,373	9	13,215	1,373	10
Gia Lam		**214,463**	**12,382**	**17**	**235,730**	**12,382**	**19**
Bat Trang	6	7,101	164	43	7,805	164	48
Le Chi	7	11,185	798	14	12,294	798	15
Dinh Xuyen	8	8,366	315	27	9,196	315	29
Ninh Hiep	9	14,665	489	30	16,119	489	33
Phu Dong	10	12,540	1,166	11	13,784	1,166	12
Trung Mau	11	5,263	424	12	5,785	424	14
Duong Ha	12	5,435	241	23	5,974	241	25
Yen Thuong	13	15,007	853	18	16,495	853	19
Yen Vien	14	12,035	98	123	13,228	98	135
Giang Bien	15	2,378	231	10	2,613	231	11
Thuong Thanh	16	3,202	160	20	3,519	160	22
Kim Lan	17	5,590	292	19	6,144	292	21
Ngoc Thuy	19	9,723	587	17	10,688	587	18
Bo De	21	4,092	198	21	4,498	198	23
Long Bien	22	4,329	357	12	4,758	357	13
Hoi Xa	23	2,511	202	12	2,761	202	14
Co Bi	24	2,759	164	17	3,032	164	19
Trau Quy	25	6,341	362	17	6,970	362	19
Da Ton	26	10,805	716	15	11,876	716	17
Duong Xa	27	9,190	488	19	10,102	488	21

Table 2.1.1 Population Frame for Hanoi City in 2010 and 2020 (3/4)

Development area/sub-district	Code	2010			2020		
		Population	Total Area (ha)	Population Density	Population	Total Area (ha)	Population Density
Kieu Ky	28	9,362	548	17	10,291	548	19
Van Duc	29	7,033	655	11	7,730	655	12
Dong Du	30	2,017	177	11	2,217	177	13
Cu Khoi	31	6,296	480	13	6,921	480	14
Duong Quang	32	10,211	529	19	11,224	529	21
Phu Thi	33	7,065	470	15	7,765	470	17
Dang Xa	34	8,498	591	14	9,341	591	16
Kim Son	35	11,463	630	18	12,600	630	20
Tu Liem		**80,787**	**3,786**	**21**	**86,623**	**3,786**	**23**
Tay Tuu	3	13,953	531	26	14,961	531	28
Phu Dien	4	5,892	198	30	6,318	198	32
Minh Khai	5	6,746	319	21	7,233	319	23
Thuong Cat	6	5,978	389	15	6,410	389	16
Lien Mac	7	4,577	415	11	4,903	415	12
Thuy Phuong	8	7,766	283	27	8,327	283	29
Tay Mo	14	11,126	611	18	11,930	611	20
Dai Mo	15	13,677	497	28	14,665	497	29
Xuan Phuong	16	11,071	544	20	11,871	544	22
Thanh Tri		**188,942**	**7,989**	**24**	**217,338**	**7,989**	**27**
Van Dien Town	1	4,251	30	142	4,890	30	163
Vinh Tuy	2	8,238	175	47	9,477	175	54
Thanh Tri	3	6,913	246	28	7,952	246	32
Tran Phu	4	5,998	378	16	6,899	378	18
Yen So	5	11,079	690	16	12,744	690	18
Ngu Hiep	6	10,594	320	33	12,186	320	38
Van Phuc	7	10,427	547	19	11,994	547	22
Tu Hiep	8	9,679	469	21	11,134	469	24
Thanh Liet	10	3,982	176	23	4,580	176	26
Linh Nam	12	13,177	557	24	15,158	557	27
Tam Hiep	13	10,127	318	32	11,649	318	37
Tan Trieu	14	8,741	197	44	10,054	197	51
Vinh Quynh	16	19,279	638	30	22,176	638	35
Lien Ninh	17	10,167	409	25	11,695	409	29
Ngoc Hoi	18	8,236	362	23	9,474	362	26
Ta Thanh Oai	19	14,075	780	18	16,190	780	21
Dong My	21	6,634	272	24	7,632	272	28
Yen My	22	4,780	360	13	5,499	360	15
Duyen Ha	23	5,229	266	20	6,015	266	23
Dai Ang	24	8,992	505	18	10,344	505	20
Huu Hoa	25	8,343	293	28	9,597	293	33
Dong Anh		**146,683**	**9,310**	**16**	**166,742**	**9,310**	**18**
Xuan Non	2	6,190	538	12	7,036	538	13
Nguyen Khe	3	12,165	745	16	13,828	745	19
Uy No	4	13,321	762	17	15,143	762	20
Co Loa	5	5,375	266	20	6,110	266	23
Tien Duong	6	5,236	330	16	5,953	330	18
Nam Hong	7	3,758	284	13	4,272	284	15
Bac Hong	8	12,022	710	17	13,666	710	19
Dai Mach	12	6,690	607	11	7,605	607	13
Vong La	13	2,302	226	10	2,617	226	12
Hai Boi	14	2,737	243	11	3,112	243	13

Table 2.1.1 Population Frame for Hanoi City in 2010 and 2020 (4/4)

Development area/sub-district	Code	2010			2020		
		Population	Total Area (ha)	Population Density	Population	Total Area (ha)	Population Density
Lien Ha	15	15,338	811	19	17,435	811	22
Van Ha	16	9,278	521	18	10,546	521	20
Duc Tu	17	15,617	848	18	17,753	848	21
Thuy Lam	18	17,600	1,071	16	20,007	1,071	19
Viet Hung	19	14,545	834	17	16,534	834	20
Tam Xa	23	4,510	513	9	5,126	513	10
Hanoi Total		**2,810,149**	**90,771**	**31**	**3,507,923**	**90,771**	**39**

Note: Since urban development units ignores the administrative boundary, total of urban area and sub-urban area does not match. That area is characterized as sub-urban area but does not specify the sub-district

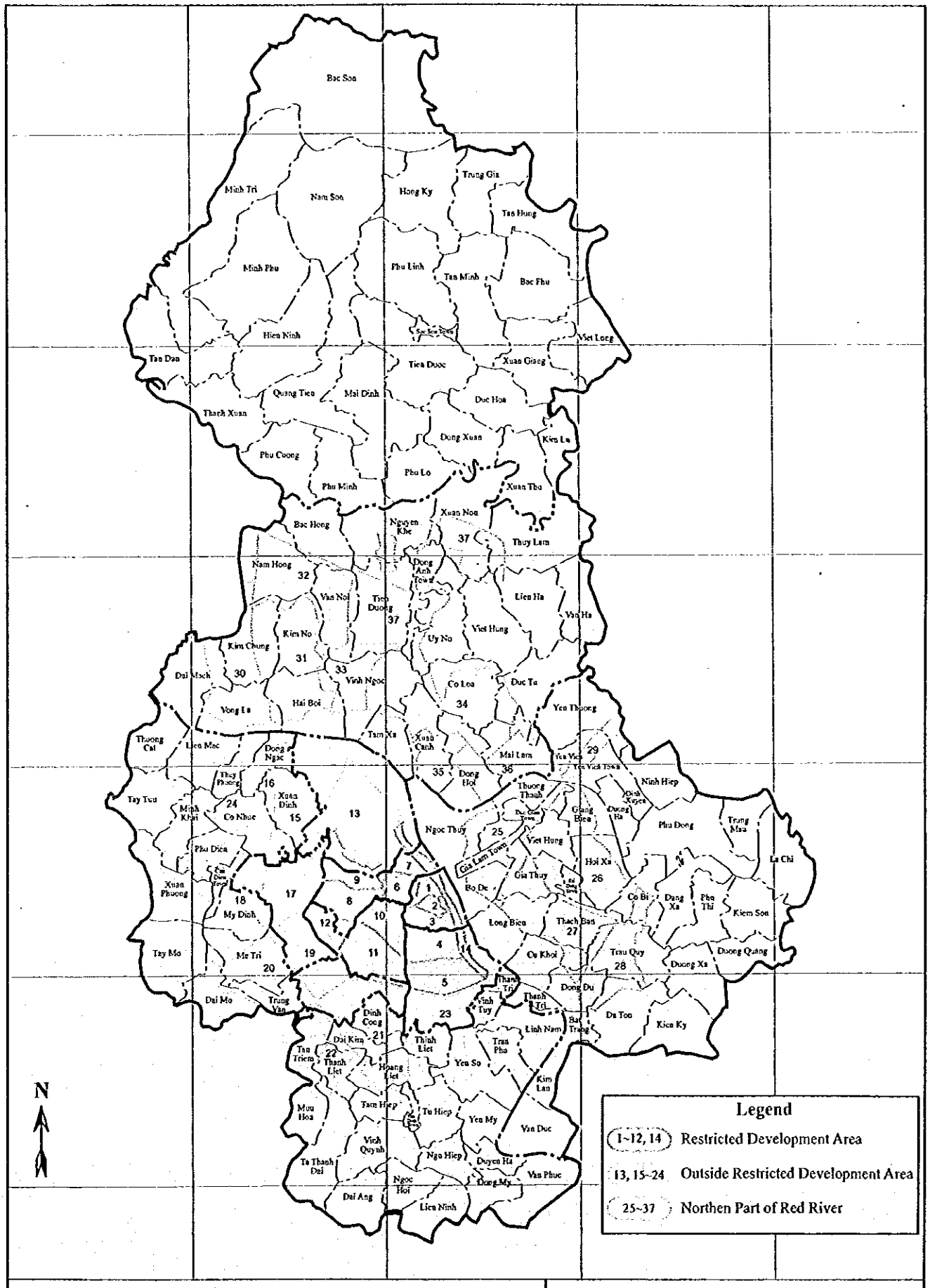

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Figure 2.1.1

37 Urban Development Units for 2020

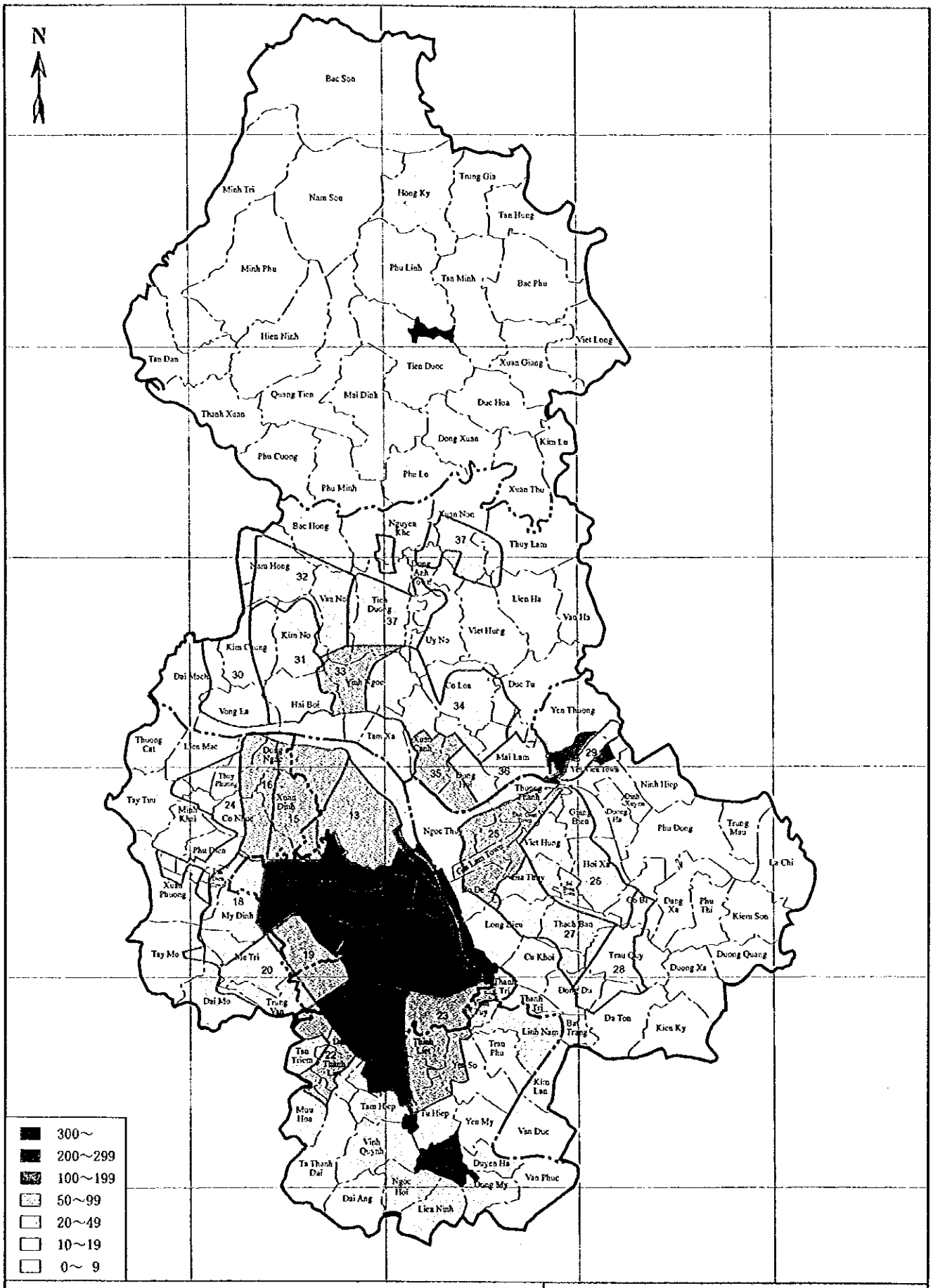

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Figure 2.1.2
Population Density (2010)

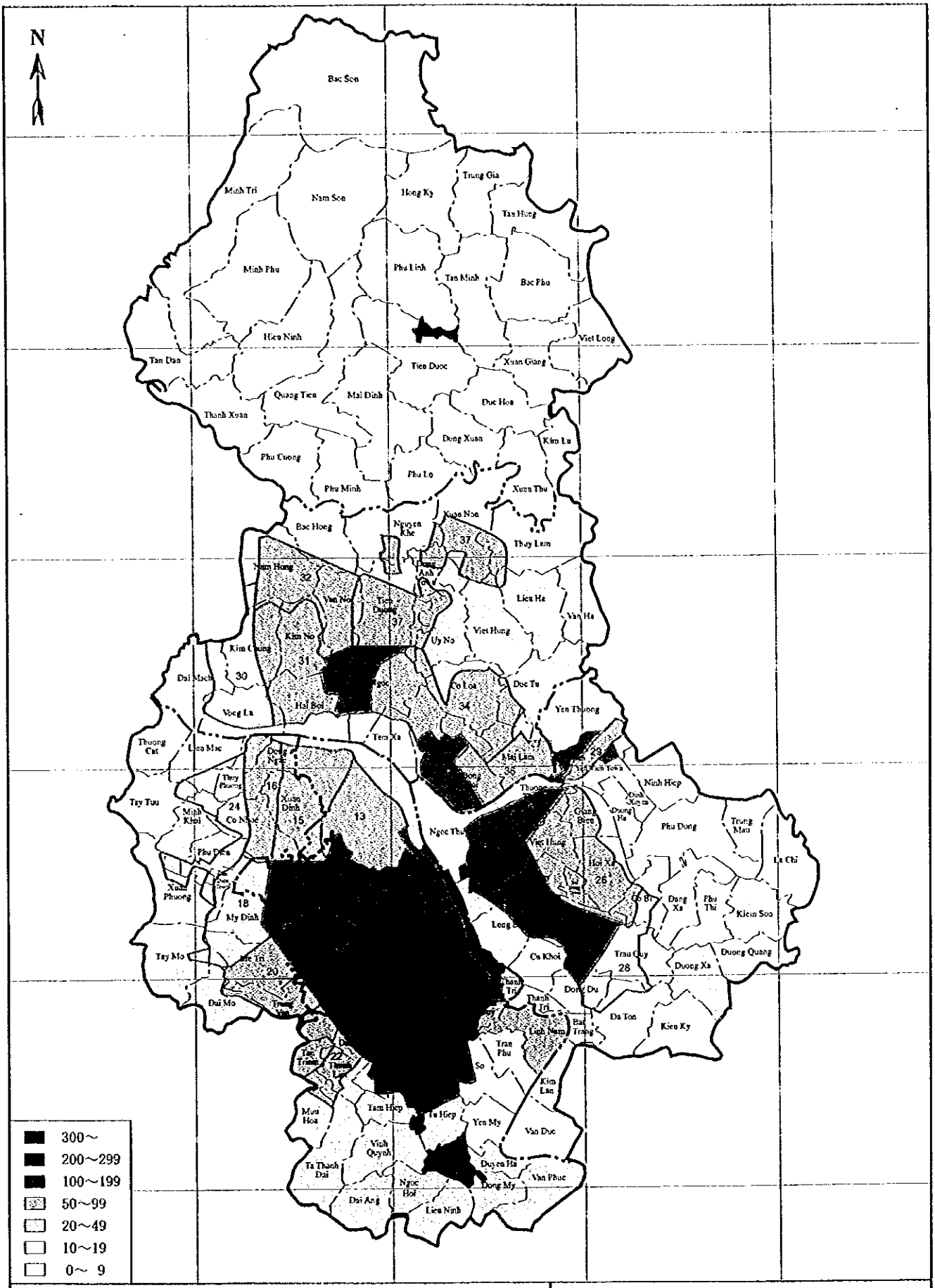

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Figure 2.1.3
Population Density (2020)

2.2 Future Land Use Plan

2.2.1 Future Land Use Frame

(1) Current Land Use

1) Characteristics as a Whole

The City of Hanoi spreads over the upper part of the Red River delta and has the flat lowland of alluvium formed by the river with elevation of some 10 m above sea level except Soc Son district belonging to the Tam Dao mountains of which elevation peak is around 500 m. Total area of Hanoi Jurisdiction is 907 km^2 (basis: summing up of the subdistricts and towns area data, the Land Administration Office, 1998).

The flat land is mostly used for agriculture, while only 84 km^2 (less than 10% of total area of the city) is for urban use at present. Waterways and water surfaces reach 127 km^2, of which a vast area are occupied by the Red River, the Duong River, and the West Lake.

Urban use of land is prominent in the districts such as Ba Dinh, Hoan Kiem, Hai Ba Trung, a part of Dong Da, Thanh Xuan, Tay Ho, and Gia Lam. So called "inner city" is formed by Hoan Kiem and the eastern part of Ba Dinh, where many governmental buildings, hotels, stations, hospitals, and shops locate. However, most shops have with living space in the same building which look far from the modern shape of a commercial town.

Urban expansion directs along Nguyen Trai Road (Route No.6), Route No.32, and Truong Chinh – Dai La – Minh Khai streets. Recently along Route No.5 in Gia Lam and Giai Phong Road (Route No.1) in Thanh Tri have grown up as well.

The number of subdistricts with high population density (more than 99/ha in inhabitable area) reaches 101, of which 13 districts have the density over 1,000/ha. The highest density is 1,598/ha of Bui Thi Xuan Sub-District belonging to Hai Ba Trung District. The remains 127 subdistricts have equal or less than 99/ha and the least density is 4/ha for Minh Tri, Nam Son and Bac Son Subdistricts belonging to Soc Son District.

Another characteristic of land use is that Hanoi lacks sufficient road area. Even in the urbanized area, the road area ratio is 9.4% and does not reach 10% of total land. At the moment motorcycles and bicycles are still the major forms of transportation, but problems will occur in a motorization process in near future with such poor road conditions.

More detailed land use information is illustrated in Figure 2.2.1.

2) Land Use by Category

The current land use categories are presented in Table 2.2.1.

Natural land use which includes "Agriculture", "Forest/Green", and "River/Lake", accounts for almost 70% of the total area of Hanoi City, while "Building" and "Residential" total no more than 20%. These figures imply that Hanoi is still a garden city as a whole, even if its urbanization is being more and more accelerated.

Each land use category is considered as follows.

(a) Agriculture

Agriculture use is overwhelmingly dominant in Hanoi and distributed everywhere evenly, occupying 48% of total area or 56% of the area without water surfaces. For the suburban districts, "residential use" includes a main house, a barn, a cattle shed and working yards, therefore the actual agriculture use will be much larger than the statistical figure. Even in the urban area, 23% of the land is still for agriculture use. But the agriculture land will be gradually replaced by urban use towards the year of 2010 and 2020, particularly in the Right Bank of the Red River there will not be agriculture land any more except the southern of Thanh Tri District. Around 50 to 70 km^2 of the agricultural use will be converted into urban use during coming two decades.

(b) Forestry

Forestry use is in a very limited area, namely in Soc Son District having 67 km^2 or 99.8% of Hanoi's forestry area. The green belts or parks are not indicated clearly in the statistic data because these kinds of use are lumped together in "public use". As a matter of fact, there are many excellently atmospheric parks in Hanoi which are publicly opened to people and tourists. Hanoi Authority seems to enlarge and to upgrade these assets together with some new parks development. By 2020 around 29 km^2 of parks and green areas will be arranged. The forestry use will be sustained by the target year because of a maldistribution of forest in Soc Son District.

(c) Buildings

"Buildings" means buildings except those for residential use as defined by in the statistics of the Hanoi authority. Accordingly it contains a factory, shop, business office, hotel, restaurant, school, hospital, R&D institute, religional facilities and governmental office. Exceptions are buildings such as for infrastructure and national defence and security. In addition, the statistic

classification has an item of "construction" which means manufacturing industry and infrastructure. This use occupies 17.6% or 15 km^2 of the urban area, and 6.2% or 56 km^2 of the Hanoi.

Commercial and Business use are centralized in both Ba Dinh and Hoan Kiem districts, and along the larger streets in the urban area where are large scale hospitals, hotels and schools as well. Governmental Offices are mostly located in Ba Dinh and Hoan Kiem also. By the year of 2010 and 2020, a part of these core facilities will move to the Extended Area or New Developed Area because of mainly traffic convenience and/or property costs per unit floor area.

School, Hospital and Hotel will not so quickly move because of their huge scale of buildings and location - oriented business.

Industrial use is distributed at the side of the Red River (right) in Hoan Kiem and Hai Ba Trung districts, Hoan Kiem and Hai Ba Trung districs for small scale industry, along Truong Chinh - Dai La - Minh Khai ring road, a part of Tu Liem, along the Route No.6 at Thanh Xuan District, along Route No.1 and Route No.5 at Gia Lam District, and Dong Anh along Route No.3, respectively. These existing industrial areas will not expand but will be renovated until 2020 according to Hanoi Urban Master Plan for 2020.

(d) Residential

Urban residential areas are spreaded all over the urban districts, while rural (agricultural) residential areas are dotted in vast agricultural land. In the near future these spots of rural residential area will be renovated or resettled into conurban residential area with a new method of real estate developments. At present this use occupies 28.8% or 24 km^2 of urban area and 12.7% of Hanoi.

(e) Transport

Mainly by roads and railways will take a role of mass transit measures. At present inner city commuters mainly use motorcycles and bicycles. But by 2010 or 2020, there will be drastic motorization in Hanoi as other ASEAN Countries have experienced. From this point of view, the road/street network in Hanoi is in a rather poor condition as mentioned in prior section. Width of the roads are insufficient for "rapid mass transit", even Route No.1 has only two lanes. The Thang Long Highway is somewhat modern because central reserves have two lanes on one side, and at least this grade of road will be needed throughout of the developments to solve the future traffic problem.

Needless to say, the railway will be a more economical mass - transit system. Therefore, Hanoi Urban Master Plan for 2020 plans railway network in

addition to road network in Hanoi and the surroundings. Long distance passengers use existing railways, not commuters. There is no ring line of railway, only a few radial lines in Hanoi.

At this moment this use occupies the urban land at 9.4% or 794 ha, and the whole Hanoi land at 5.6% or 51 km^2.

The city is now sprawling in a southwestern direction particularly along Route No.6. Even area outside of Hanoi in this direction has been urbanized. To decrease the trend and to realize a balanced development of the city, the new construction and upgrading of bridges over the Red River should be accelerated as much as possible.

(2) Future Land Use

In 1998, future land use planned for the present as well as the future urban areas mainly covering the existing seven urban districts and a part of Don Anh and Gia Lam districts, was approved and authorized the Government of Vietnam.

The principles of the Hanoi Urban Master Plan for 2020 (Hanoi Urban Master Plan) are:

a) The most densely populated area of the Old City Center should be restricted from further development and population density should be decreased from the viewpoint of preventing the over-concentration of economic activities and population which would result in aggravation of the environment, and thereby the central roles of the area for culture, political and administration functions, commercial activities, etc., should be maintained.

b) Urbanization should be extended toward the surrounding areas of the existing urbanized area of the seven urban districts toward Thanh Tri and Tu Liem districts, keeping pace with the adequate infrastructure development.

c) Toward the year 2020, urbanization should be expanded across the Red River, to the left bank districts of Don Anh and Gia Lam centering the towns of Don Anh and Gia Lam.

These principles are agreeable especially from the viewpoint of avoiding the concentration of pollution sources and pollutants, thereby reducing the environmental load on the natural environment while ensuring the sustainable growth of the economy of the Hanoi City. The future land use for this environmental master plan is assumed, therefore, in compliance with the one envisaged in the Hanoi Urban Master Plan.

It is noted that Hanoi Urban Master Plan is drawing the specific land use for:

a) the years of 2005 and 2020, and
b) the existing urban areas and future urbanized areas, excluding the suburban areas comprising Soc Son district and parts of the districts of Thanh Tri, Tu Liem, Don Anh and Gia Lam.

In the JICA Study, the future land use in the years of 2010, therefore, is assumed considering the change from the present land use to those planned in the Hanoi Urban Master Plan. Structural measures and projects are also mainly worked out for the urban areas in this context.

The planned land use in the year of 2020 is illustrated in Figure 2.2.2. The land use categories in the year 2020 are presented in Table 2.2.2. Considering the percentage of natural land use of almost 70%, Hanoi will still be a garden city with in abundance of greenery.

2.2.2 Restricted development area

This area mainly consists of five districts including a part of Ho Tay District, so called inner city, will be maintained as now except infrastructure improvement (street widening, setting parking lots, etc.). Therefore, no drastic change of land use will be realized. The major land use of the area is commercial & business. A lot of shops and small manufactures have residence in the same building. A part of them will move to the new city by 2020 because of new market anticipated there. While most large scale commercial facilities and governmental offices will remain here because this is the center of central city and the huge costs involved to move.

2.2.3 Extended development area

This area mainly consists of five districts including a part of Ho Tay District, and is partly already urbanized along Route No.32 (commercial), Hoang Quoc Viet Street (governmental use/ educational use), Route No.6 (industrial, educational, commercial and residential use), Route No.1 (industrial, commercial and residential use), etc. Other lands of currently agricultural use will rapidly change earlier than the Newly Development Area to urban use such as residential, industry, park, commercial & business by 2010 because of infrastructure development level and conurbation from the Restricted Area. Before 2020 this area will almost achieve the development target except for some huge parks.

New Developed Industrial Estates in This Area by the Hanoi Urban Master Plan for 2020

	2005 - 2010 area manpower	2010 - 2020 area manpower	Accumulation area manpower
a) South Thang Long:	50 ha 8,000	170 ha 24,800	220 ha 32,800
Total	50 ha 8,000	170 ha 24,800	220 ha 32,800

2.2.4 New development area

This area locates outward from the left bank of the Red River and includes two districts having the total planning area of 128 km^2 which is almost the same as the Restricted and Extended Areas (122 km^2). Basic characteristics of the area is "vast" on any kinds of land use and "balanced land uses" because the urban planning is drawn on a virgin land from urban point of view which mostly has mono-tone by agricultural uses. There will be rich residential areas, hi-tech oriented or cleaner production oriented industries with abundant sites, comfortable residential areas, abundant Even though a few part of the area has been urbanized already.

The earliest development will be done in the North Thang Long area for an industrial estate and its related facilities as a trigger project in the Dong Anh block. Another earlier development will be carried out along Route No.5 in the Gia Lam block where the basic infrastructure, in particular the road network, has existed. The following stage of development until the year of 2010 will be slow because infrastructure in the Dong Anh is lacking.

In case the basic infrastructure is developed by the year of 2010 and the expected investment is secured for long term, a momentum of development will be rapidly accelerated over the whole plan in the New Development Area.

New Developed Industrial Estates in This Area by The Hanoi Urban Master Plan for 2020

	2005 - 2010 area manpower	2010 - 2020 area manpower	Accumulation area manpower
a) North Thang Long:	350 ha 39,000	yet planned 6,000	350 ha 45,000
b) Dong Anh:	yet planned yet planned	70 ha 13,000	70 ha 13,000
c) Sai Dong:	166 ha 20,000	199 ha 40,000	365 ha 60,000
Total	516 ha 59,000	269 ha 59,000	785 ha 118,000

2.2.5 Soc Son industrial area

Regarding Soc Son District of Hanoi jurisdiction, the Urban Master Plan for Hanoi 2020 mentions only about an industrial development with numerical plan as below:

Numerical Plan in This Area by The Hanoi Urban Master Plan for 2020

	2005 - 2010 area manpower	2010 - 2020 area manpower	Accumulation area manpower
Soc Son:	50 ha 7,000	380 ha 58,000	430 ha 65,000

According to the Urban Master Plan for Hanoi 2020, a populational ripple effect by a new industrial development will be 3.7 to 4.4 persons/new manpower, which includes labor's family, public and private services sector's manpower. To apply the figure to Soc Son, its additional population will be approximately 28,000 by 2010 and 232,000 by 2020 respectively in migratory growth, while the current population of whole Soc Son District is 233,166 including 16,182 of Soc Son Town's population.

Further work for land use plan on Soc Son industrial area will be needed because the volume of people added 232,000, will form DID (densely inhabited district) with 2,320 ha (almost same area of existing Tay Ho District: 2,394 ha) of new urban area including 430 ha of industrial use around exiting Soc Son Town.

The same thing will be applied for Thang Tri District which is including one of the satellite towns in the Urban Master Plan for Hanoi 2020 having hundreds ha of area.

2.2.6 Urbanization toward 2010

Urbanization will rapidly progress toward the year 2020. According to the Hanoi Urban Master Plan for 2020, total area of the 37 urban units will reach 25,014 ha in 2020 from the current 8,413 ha, or about tripled within about two decades. The population density in the year 2010 is shown in Figure 2.1.2.

In this Study, urbanization as of the year 2010 is estimated based on the following data and assumptions.

a) Current population by subdistrict

b) Population for the years of 2005 and 2020 planned by the Hanoi Urban Master Plan for 2020 by subdistrict

c) Constant growth rate during the period of 2005 to 2020

d) Urbanized area is basically defined as the area with population density equal to or larger than 50 persons per ha.

According to the estimation, urbanization is expected to extend to the left bank of the Red river as well as to the surrounding areas of the existing urban area. Out of the 37 urban units planned for the year 2020, 24 units with 12,014 ha will be encompassed in the urbanized area in 2010 with the total population of 1,474,653 as shown below.

Estimated Urbanization toward 2020

Restricted Development Area	(13 urban units)	:	3,499 ha
Extended Development Area	(08 urban units)	:	6,315 ha
New Development Area	(03 urban units)	:	2,200 ha
Total	(24 urban units)	:	12,014 ha

The development of urban areas toward 2020 from now is illustrated in Figure 2.2.2. It should be noted that the urban unit boundaries do not always agree with the sub-district boundaries and, therefore, some of the present population of the urban units are based on the presumption by the Study Team and may not be accurate. The estimated population densities of the urban units in 2010, which is based on the present population, may not be accurate. The estimated urbanization of Hanoi City in 2010 is, therefore, subject to revision during the second study in Vietnam.

Table 2.2.1 Current Land Use

Land Use / District	a Agri-culture	b Forest/ Green	c Building	d Resi-dential	e Trans-port	f Defence/ Security	g River/ Lake	h Other	i Nature (a+b+g)	j Total (ha)	Demarcation by M/P2020	Geographycal Location
Ba Dinh	23	-	203	329	123	91	91	70	114	930	Development Restricted Area	Red River Right Bank
Hoan Kiem	-	-	114	215	120	23	36	21	36	529		
Hai Ba Trung*	110	-	352	588	167	19	203	26	313	1,465		
Dong Da*	34	12	285	476	97	20	49	14	95	987		
Tay Ho*	1,180	-	121	283	113	21	609	67	1,789	2,394		
Thanh Xuan	145	-	172	300	68	141	28	59	173	913	Development Extended Area	
Cau Giay	440	-	235	229	106	63	67	55	507	1,195		
Urban	**1,932**	**12**	**1,482**	**2,420**	**794**	**378**	**1,083**	**312**	**3,027**	**8,413**		
TOTAL ①	23.0%	0.1%	17.6%	28.8%	9.4%	4.5%	12.9%	3.7%	36.0%	100%		
Tu Liem	4,126	15	516	953	394	162	1,062	287	5,203	7,515		
Thanh Tri	5,386	-	615	1,203	480	130	1,466	516	6,852	9,796		
Gia Lam	9,192	59	902	1,707	1,142	403	3,190	690	12,441	17,285	New Development Area	Red River Left Bank
Dong Anh	9,856	5	911	2,082	1,027	59	3,421	811	13,282	18,172		
Soc Son	12,949	6,658	1,202	3,135	1,256	836	2,547	938	22,154	29,521		
Suburban	**41,509**	**6,737**	**4,146**	**9,080**	**4,299**	**1,590**	**11,686**	**3,242**	**59,932**	**82,289**		
TOTAL ②	50.4%	8.2%	5.0%	11.0%	5.2%	1.9%	14.2%	3.9%	72.8%	100.0%		
Hanoi	**43,441**	**6,749**	**5,628**	**11,500**	**5,093**	**1,968**	**12,769**	**3,554**	**62,959**	**90,702**		
GRAND TOTAL (①+②)	47.9%	7.4%	6.2%	12.7%	5.6%	2.2%	14.1%	3.9%	69.4%	100%		

Source: *Land Area Statistics by precinct/commune 1998*, Hanoi Department of Land Administration

Note: 1) Marked * Districts divided into Restricted area and Extended Area.

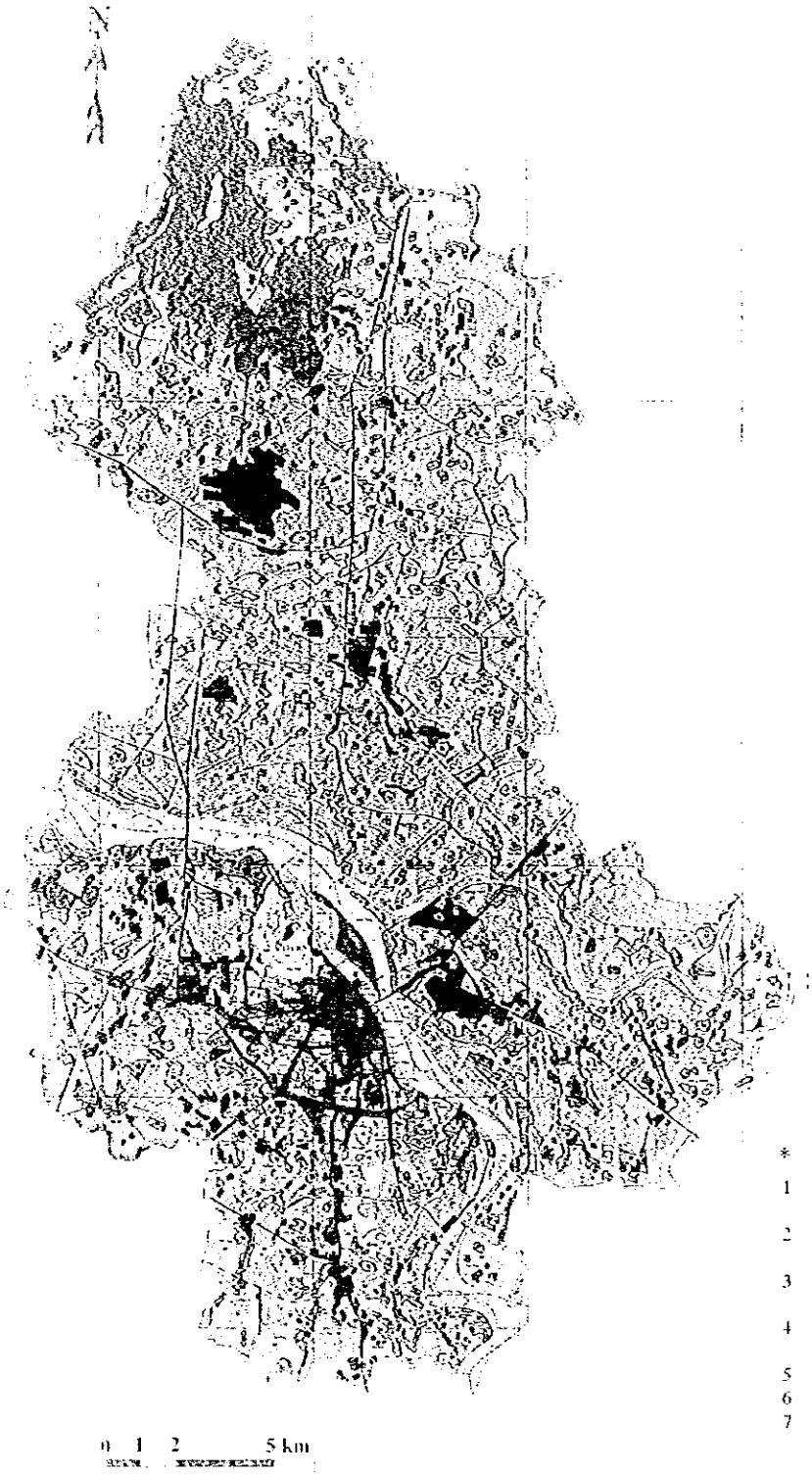
2) M/P2020: Hanoi People's Committee - Hanoi Chief Architect's Office, *The Urban Master Plan for Hanoi to 2020*, 1998

3) Glossary: Agri.(Agriculture), Frty.(Forestry and Park), Bldg.(Buildings including industry, commercial and public), Rsd.(Residential), Trnsp.(Transport including road and raiway), D&S(Natinal Defence and Security), Other(Infrastracture, Unused and Mountainous)

4) Suburban Districts partly stii remain the present positioning as suburban in the M/P2020.

Table 2.2.2 Future Land Use by Development Area of Hanoi Jurisdiction in 2020

Land Use / Area	a	b	c				d	e	f	g	h	i	j	
	Agri-culture	Forest/ Green	Building			Building Total	Resi-dential	Trans-port	Defence/ Security	River/ Lake	Other	Nature (a+b+g)	Total (ha)	Remarks (Planned pop.)
			Indry.	Cmml.	Public									
Development Restricted	0	160	32	640	560	1,232	1,120	490	114	379	4	539	3,499	800,000
	0%	4.6%	0.9%	18.3%	16.0%	35.2%	32.0%	14.0%	3.3%	10.8%	0.1%	15.4%	100.0%	
Development Extended	0	910	451	560	490	1,501	1,820	1,680	556	2,155	74	3,065	8,696	700,000
	0%	10.5%	5.2%	6.4%	5.6%	17.3%	20.9%	19.3%	6.4%	24.8%	0.9%	35.2%	100.0%	
New Development	250	1,800	985	1,000	900	2,885	2,800	2,400	462	2,204	19	4,254	12,820	1,000,000
	2.0%	14.0%	7.7%	7.8%	7.0%	22.5%	21.8%	18.7%	3.6%	17.2%	0.1%	33.2%	100.0%	
Central City TOTAL ①	**250**	**2,870**	**1,468**	**2,200**	**1,950**	**5,618**	**5,740**	**4,570**	**1,132**	**4,737**	**97**	**7,857**	**25,014**	2,500,000
	1.0%	11.5%	5.9%	8.8%	7.8%	22.5%	22.9%	18.3%	4.5%	18.9%	0.4%	31.4%	100.0%	
Soc Son Urban	234	117	430	187	163	780	606	443	6	112	21	463	2,319	233,166
Thanh Tri Urban	221	131	77	63	50	190	200	157	4	259	95	611	1,257	62,609
Other Urban TOTAL ②	**455**	**248**	**507**	**249**	**213**	**969**	**807**	**600**	**10**	**371**	**116**	**1,074**	**3,576**	295,775
	12.7%	6.9%	14.2%	7.0%	6.0%	27.1%	22.6%	16.8%	0.3%	10.4%	3.2%	30.0%	100.0%	
Sub-urban TOTAL ③	**38,303**	**6,737**	**10**	**425**	**30**	**465**	**4,420**	**1,360**	**826**	**7,661**	**2,290**	**52,701**	**62,062**	0.7 - 0.8 mil.
	61.7%	10.9%	0.0%	0.7%	0.0%	0.7%	7.1%	2.2%	1.3%	12.3%	3.7%	84.9%	100.0%	
Hanoi Jurisdiction GRAND TOTAL (①+②+③)	**39,008**	**9,855**	**1,985**	**2,874**	**2,193**	**7,052**	**10,967**	**6,530**	**1,968**	**12,769**	**2,503**	**61,632**	**90,652**	3.5 -3.6 mil.
	43.0%	10.9%	2.2%	3.2%	2.4%	7.8%	12.1%	7.2%	2.2%	14.1%	2.8%	68.0%	100.0%	



	Categories
1	CBD Area
2	Mixed Business
3	Public Use
4	Residential Use
5	Residential Use
6	Manufacturing Use
7	Infrastructure & Manufacturing Use
8	Trees
9	Agriculture
10	Forest
11	Other Use
12	Unusable
13	Water Surface

* **Instances**

1 : Business, Large Scale Commercial, Diplomatic Use, Hotel, Amusement
2 : Small Scale Business, Mixed with Residential Use, Road-Side Shops
3 : Government Office and Buildings, Hospital, School, Defence/Security
4 : Urban Use (Apartment, Town-House, Independent-House etc.)
5 : Rural Use (Independent, Collective)
6 : Consumer Goods
7 : Transport, Water Supply, Electricity, Waste Treatment, Ware House, Stock Yard, Material for construction, Petro-Chemical, Mining
8 : Plantation, Grave Yard, Other Plants
9 : Paddy Field, Vegetable Field
10 : Forest, Park
12 : Sand, Bare Mountain, etc.
13 : River, Lake Stream, Swamp, etc.

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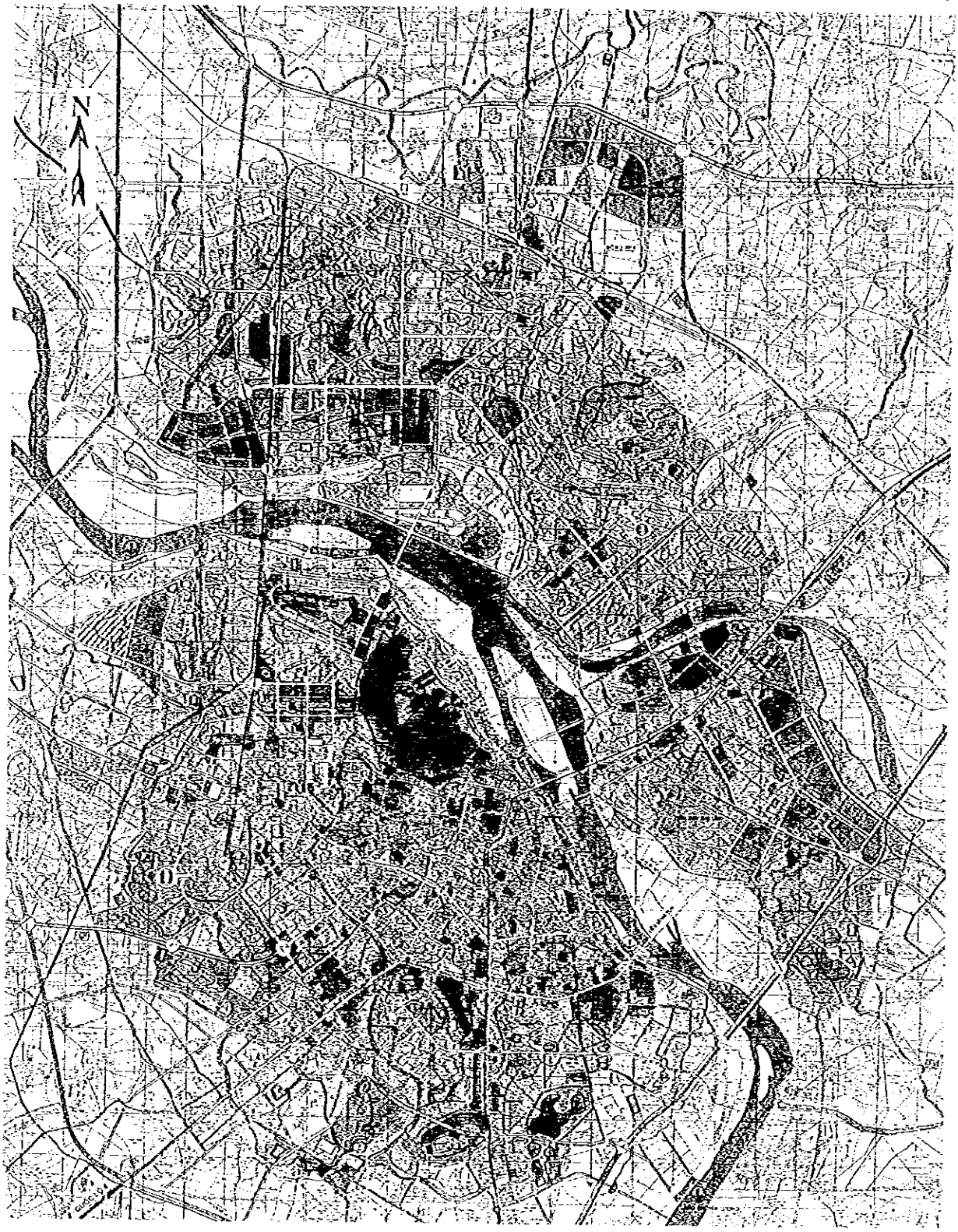
Figure 2.2.1

Current Land Use

Nippon Koei Co.,Ltd / EX Corporation



	Categories
	1 Residential Areas
	2 Public Works of City, Area and District Levels
	3 Villages Planned to be Existing
	4 Existing Villages
	5 Scientific and Technological Research Centres
	6 Research and Testing Areas
	7 Industrial Areas and Warehouses
	8 Green Parks, Relaxation, Entertainment, Sports, and Buffer Zones
	9 Land for National Defence Purposes and Airports
	10 Diplomatic Corps
	11 Offices, Training Schools, Research Institutes
	12 Rivers, Lakes, Ditches
	13 Floods Areas
	14 Land Reserved for Development

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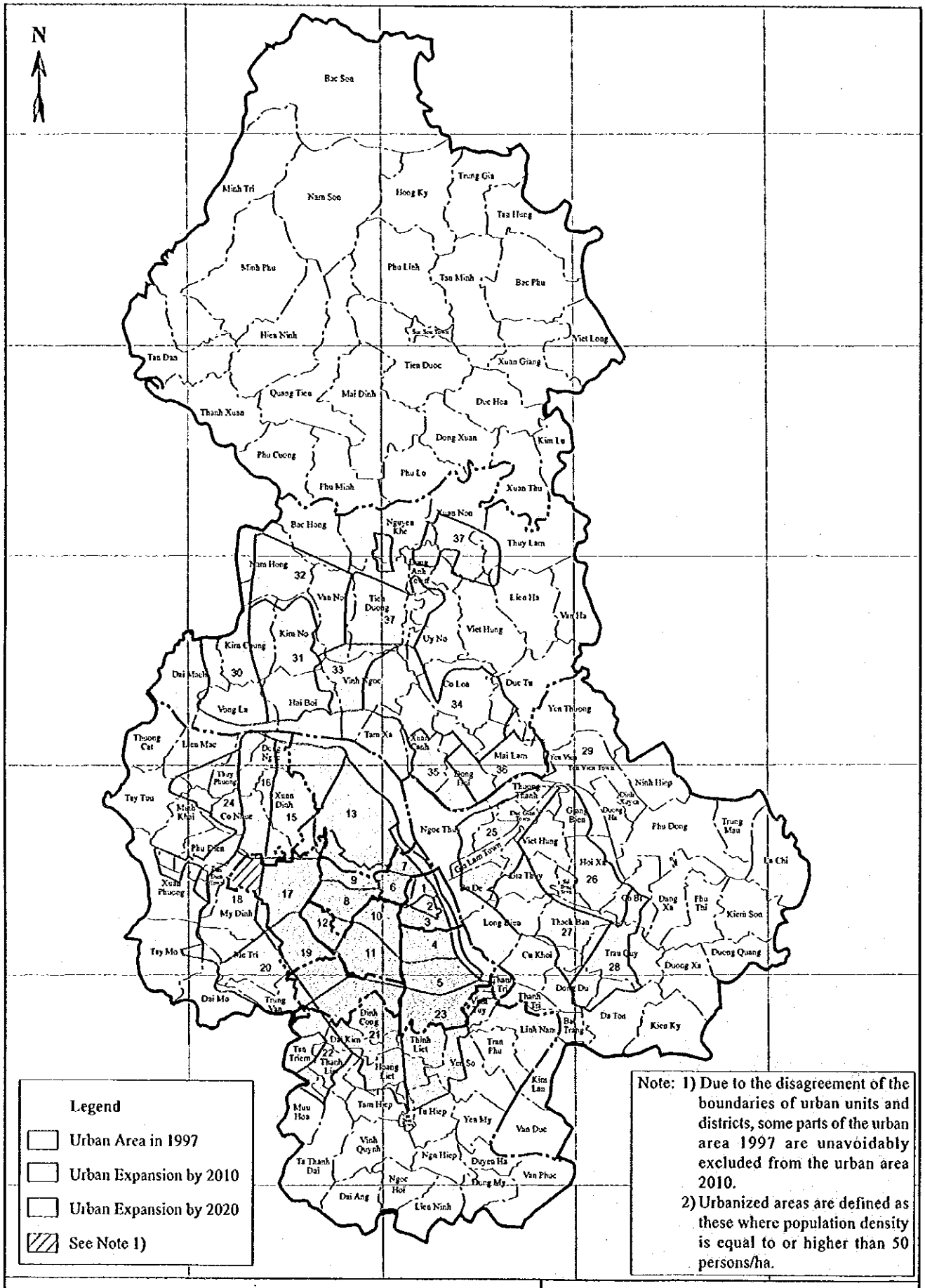
Figure 2.2.2
Future Land Use Plan (2020)
(Based on Urban Master Plan for Hanoi

Nippon Koei Co.,Ltd / EX Corporation



THE STUDY ON ENVIRONMENTAL IMPROVEMENT FOR HANOI CITY

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Figure 2.2.3

Urban Expansion by 2020