

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
MINISTRY OF SCIENCE, TECHNOLOGY AND ENVIRONMENT
SOCIALIST REPUBLIC OF VIETNAM

THE MASTER PLAN AND FEASIBILITY STUDY
ON
THE HOA LAC HIGH-TECH PARK PROJECT
IN
THE SOCIALIST REPUBLIC OF VIETNAM

FINAL REPORT

MAIN (VOLUME II)

MASTER PLAN ON THE HOA LAC HIGH-TECH PARK PROJECT

MARCH 1998

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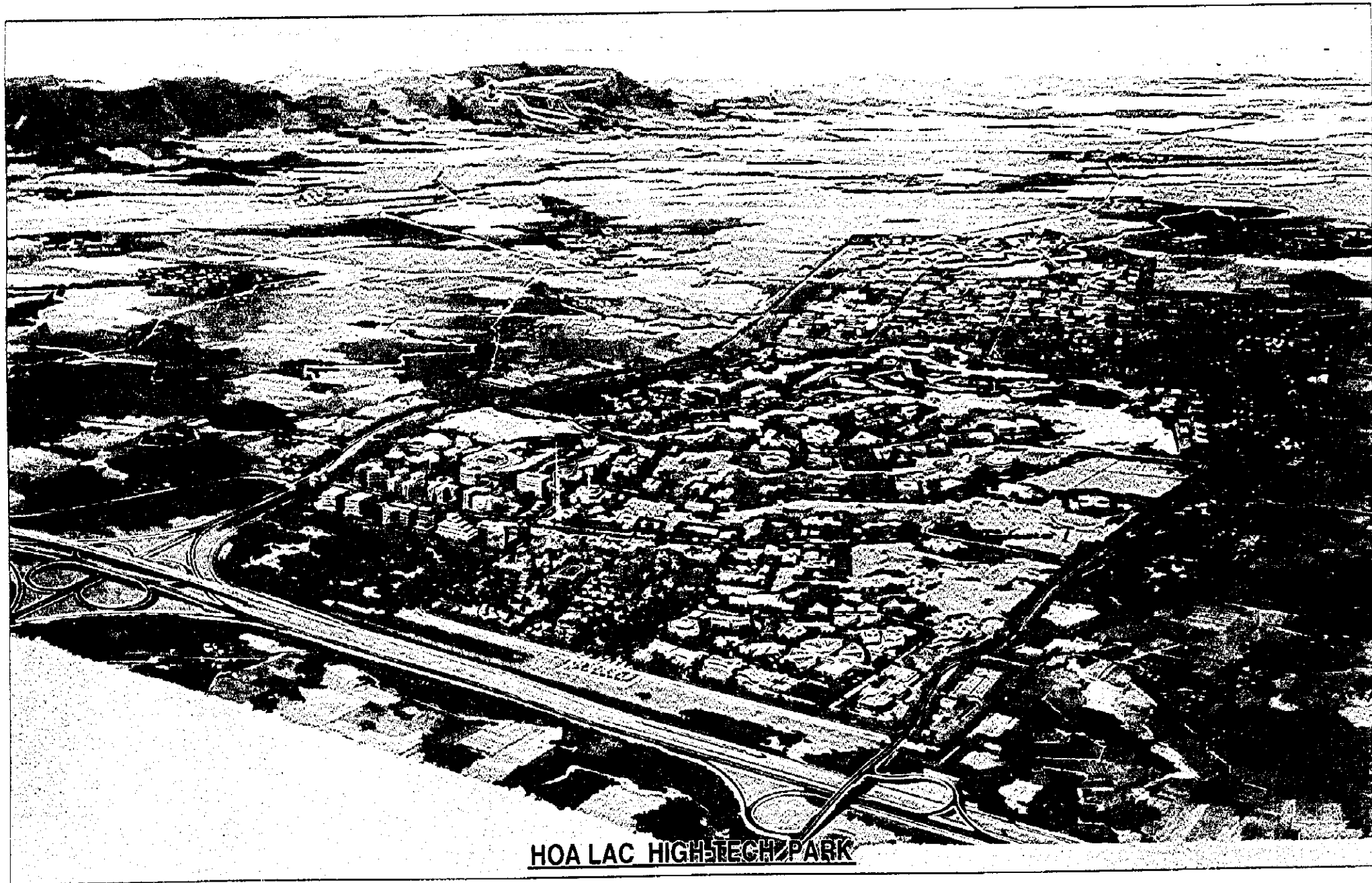


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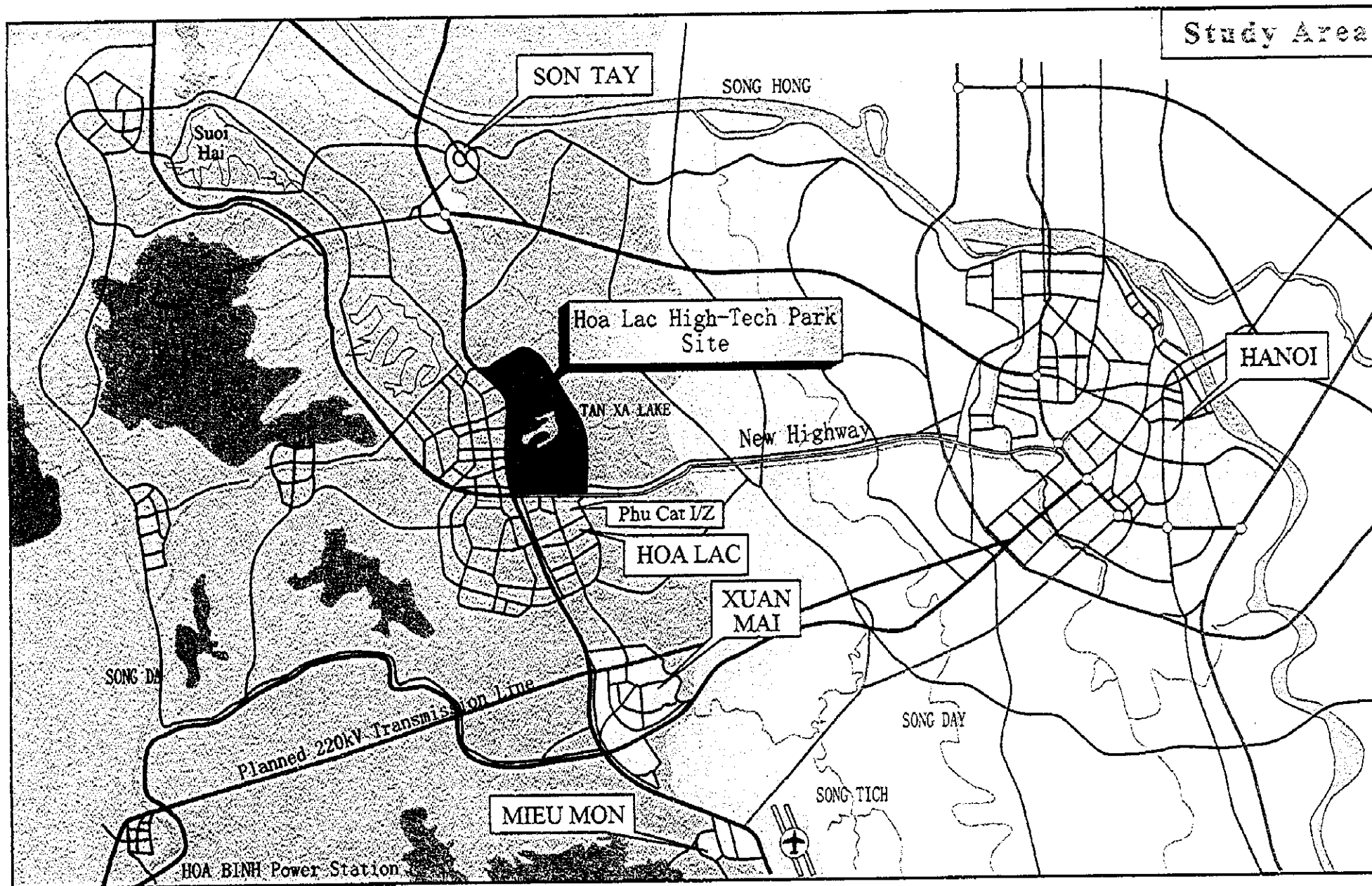
ESTIMATE OF PROJECT COST

Estimate of Base Cost : As of October 1997 Price Level

Currency Exchange Rate : USD1 = VND11,700 = Yen 120



HOA LAC HIGH TECH PARK



LOCATION MAP

PREFACE

In response to a request from the Government of the Socialist Republic of Vietnam, the Government of Japan decided to conduct a development study on the Master Plan and Feasibility Study on the Hoa Lac High-Tech Park Project in the Socialist Republic of Vietnam and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Vietnam a study team twice headed by Mr. Akagawa, Nippon Koei Co., Ltd. and constituted by members of Nippon Koei Co., Ltd., Japan Industrial Location Center and Pacific Consultants International from December 1996 to September 1997.

The team held discussions with the officials concerned of the Government of Vietnam, and conducted a field study. After the team returned to Japan, further studies were made. Then, a mission was sent to Vietnam in order to discuss a draft report and the present report was prepared.

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

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

Mar, 1998



Kimio Fujita

President

Japan International Cooperation Agency

March 1998

Mr. Kimio Fujita
President
Japan International Cooperation Agency
Tokyo, Japan

LETTER OF TRANSMITTAL

Dear Sir,

We have the pleasure of submitting to you the Final Report of "The Master Plan and Feasibility Study on the Hoa Lac High-Tech Park Project in the Socialist Republic of Vietnam".

This report presents the results of the study that was carried out for a total period of 16 months from December 1996 to March 1998, by the Study Team composed of Nippon Koei Co., Ltd., Japan Industrial Location Center and Pacific Consultants International in accordance with the contract concluded with your Agency.

The report consists of (1) a master plan for high-tech industry promotion policy, and (2) a master plan on the Hoa Lac High-Tech Park and a feasibility study focused on its initial development.

On this occasion, we would like to express our deep appreciation and sincere gratitude to all those who extended their kind assistance and cooperation to the Study Team, in particular the officials concerned from the Ministry of Science, Technology and Environment of the Government of Vietnam and Steering Committee. We also would like to extend our acknowledgements to the officials of your Agency, the Ministry of Foreign Affairs, the Ministry of International Trade and Industry, and the Embassy of Japan in Vietnam. We cordially appreciate the cooperation of Professor. T. Yoshimi (Kobe-Gakuin Univ.) and Professor. Y. Okamoto (Hosei Univ.).

We hope the report will realistically contribute to the future high-tech industrial development in Vietnam.

Sincerely yours,



Masatoshi AKAGAWA
Team Leader for
The Master Plan and Feasibility Study on
the Hoa Lac High-Tech Park Project in
the Socialist Republic of Vietnam

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ABBREVIATIONS

Government of Vietnam/Public Institutions

CD	: Customs Department
CEPD	: Committee for Economic Planning and Development
DGPT	: Department General of Posts and Telecommunications
DOSTE	: Department of Science, Technology and Environment
DUT	: Da Nang University of Technology
EPC	: Environmental Protection Center
EVN	: Electricity of Vietnam
FCC	: Field Clearance Committee
FPT	: Financing and Promoting Technology Corporation
FZ-IDC	: Functional Zone Infrastructure Development Company
GDLA	: General Department of Land Administration
HCM-HTP	: Ho Chi Minh High Tech Park
HCMPC	: Ho Chi Minh People's Committee
HCMPT	: Ho Chi Minh Posts and Telecommunications
HCMUT	: Ho Chi Minh University of Technology
HHTP	: Hoa Lac High-Tech Park
HHTP-BOM	: Hoa Lac High-Tech Park Board of Management
HHTP-IDC	: Hoa Lac High-Tech Park Infrastructure Development Company
HHTP-SC	: Hoa Lac High-Tech Park Steering Committee
HIU	: Hanoi International University
HN-PC	: Ha Noi People's Committee
HPT	: Hanoi Posts and Telecommunications
HT-P	: Ha Tay Province
HT-PC	: Ha Tay People's Committee
HTPC	: High-Tech Park Center
HUT	: Hanoi University of Technology
IMI	: Institute for Machinery and Industrial Instruments
IOE	: Institute of Energy
ITRI	: Industrial Technology Research Institute
MOC	: Ministry of Construction
MOET	: Ministry of Education and Training
MOF	: Ministry of Finance

MOFA	: Ministry of Foreign Affairs
MOI	: Ministry of Industry
MOLISA	: Ministry of Labor, Invalids and Social Affairs
MOSTE	: Ministry of Science, Technology and Environment
MOT	: Ministry of Trade
MOTC	: Ministry of Transport and Communications
MPI	: Ministry of Planning and Investment
NACENTEC	: National Center for Technical Progress
NCIA	: National Committee of Industrial Areas
NCSS	: National Center of Social Science
NCST	: National Center for Science and Technology
NEA	: National Environmental Agency
NISTPASS	: National Institute for Science and Technology Policy and Strategy Studies
NOIP	: National Office of Industrial Property
NUH	: National University Hanoi
NUHCM	: National University Ho Chi Minh
OOG	: Office of Government
PB	: Project Bureau
PC	: People's Committee
PM	: Prime Minister
PMU	: Project Management Unit
QUATEST	: Technical Centers for Quality Assurance-Testing-Measurement
RDC	: Regional Development Committee
SC	: Steering Committee
SCCI	: State Committee for Cooperation and Investment
SPC	: State Planning Committee
STAMEG	: Directorate for Standards and Quality
VDC	: Vietnam Data Company
VNPT	: Vietnam Posts and Telecommunications
VNUH	: Vietnam National University - Hanoi
VTI	: Vietnam Telecoms International
VTN	: Vietnam Telecoms National

International Organizations/Foreign Organizations

AFTA	: ASEAN Free Trade Area
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AIT-CV	: Asian Institute of Technology - Vietnam Campus
APEC	: Asia-Pacific Economic Caucus
ASEAN	: Association of Southeast Asian Nations
CEPD	: Committee for Economic Planning and Development (Taiwan)
IEAT	: Industrial Estate Authority of Thailand
IUCN	: International Union for the Conservation of Nature
JETRO	: Japan External Trade Organization
JICA	: Japan International Cooperation Agency
MBC	: Malaysia Business Council
MIDA	: Malaysian Industrial Development Authority
ODA	: Official Development Assistance
OECD	: Organization for Economic Cooperation and Development
OECD	: Overseas Economic Cooperation Fund (Japan)
SIDA	: Swedish International Development Program
UNDP	United Nations Development Program
UNIDO	: United Nations Industrial Development Organization
WTO	: World Trade Organization

Others

APITD	: Action Plan for Industrial Technology Development
ASIC	: Applied Specific Integrated Circuit
BAW	: Business/Administration Wing
BCC	: Business Cooperation Contract
BI	: Brain-Intensive Industry
BLT	: Build Lease Transfer
BOD	: Biological Oxygen Demand
BOT	: Build Operate Transfer
CAD	: Computer Aided Design
CAE	: Computer Aided Education
CAM	: Computer Aided Manufacturing
CBR	: California Bearing Ratio
CKD	: Complete Knock Down
CNC	: Computer Numerical Control
COD	: Chemical Oxygen Demand
COE	: Center of Excellence

CP	: Cleaner Production
CRTs	: Cathode-Ray Tubes
DAWD	: Daily Average Water Demand
DAWW	: Daily Average Wastewater
DMWW	: Daily Maximum Wastewater
EIA	: Environmental Impact Assessment
EIRR	: Economic Internal Rate of Return
EOP	: End-of-Pipe
EPE	: Export Processing Enterprise
EPZ	: Export Processing Zone
FC	: Foreign Companies
FDI	: Foreign Direct Investment
FIRR	: Fiscal Internal Rate of Return
F/S	: Feasibility Study
GDP	: Gross Domestic Product
GIS	: Geographic Information System
GRP	: Gross Regional Product
GVA	: Gross Value Added
HMWC	: Hourly Maximum Water Consumption
HMWW	: Hourly Maximum Wastewater
HTIZ	: High-Tech Industrial Zone
IAA	: Industrial Adjustment Allowance
ICA	: Industry Coordination Act
IKD	: Incomplete Knock Dawn
INTECH	: Initiative in New Technologies
IT	: Information Technology
ITA	: Investment Tax Allowance
ITRI	: Industrial Technology Research Institute
IZ	: Industrial Zone
JEIB	: Japan Export-Import Bank
JV	: Joint Venture
KLSE	: Kuala Lumpur Stock Exchange
LASER	: Light Amplification by Stimulated Emission of Radiation
LSI	: Large Scale Integration
MDAS	: Manpower Development Assistance Scheme
MPU	: Microprocessor Unit

MSL	: Mean Sea Level
NC	: Numeric Control
NH	: National Highway
NIC	: North Industrial Corridor
NIES	: Newly Industrialized Economies
NPESD	: National Plan for Environment and Sustainable Development
NRI	: National Research Institute
NSC	: National Software Center
NTP	: National Technology Plan
OCR	: Optical Character Recognition
OJT	: On the Job Training
PCB	: Printed Circuit Board
PCU	: Passenger Car Unit
PFI	: Productive Factor Intensiveness
R&D	: Research and Development
RDAS	: Research and Development Assistance Scheme
RDIL	: Research and Development Input Level
RISC	: Research Incentive Scheme for Companies
RIZ	: Red River Delta Industrial Development Zone
S&T	: Science and Technology
SDAS	: Software Development Assistance Scheme
SDF	: Skills Development Fund
SEP	: Strategic Economic Plan
SMEs	: Small and Medium-sized Enterprises
SOEs	: State-Owned Enterprises
SPM	: Suspended Particulate Matter
SS	: Suspended Solids
STC	: Science Technology Corridor
STP	: Scientific Technology Project
TPW	: Techno-Partnership Wing
TQM	: Total Quality Management
TW	: Township Wing
VA	: Value Added
VC	: Vietnamese Company
VCIE	: Venture Capital Investment Enterprises
VLSI	: Very Large Scale Integration

VOCs : Volatile Organic Compounds



I. BACKGROUND AND OBJECTIVES OF THE HOA LAC HIGH-TECH PARK (HHTP) DEVELOPMENT

1.1 Background of HHTP Development

(1) Necessity and Viability of High-Tech Industrialization in Vietnam

Vietnam is a late starter in industrialization. If Vietnam follows the conventional industrialization process already proven in many developing countries, the first priority would be placed on promoting labor-intensive industries or "low-tech industries" as well as local resource-based industries. However, the Government of Vietnam has put a great importance on promotion of high technology and high-tech industries, while addressing the conventional industrialization process. The necessity of such high-tech industrialization may be derived from the following factors and considerations:

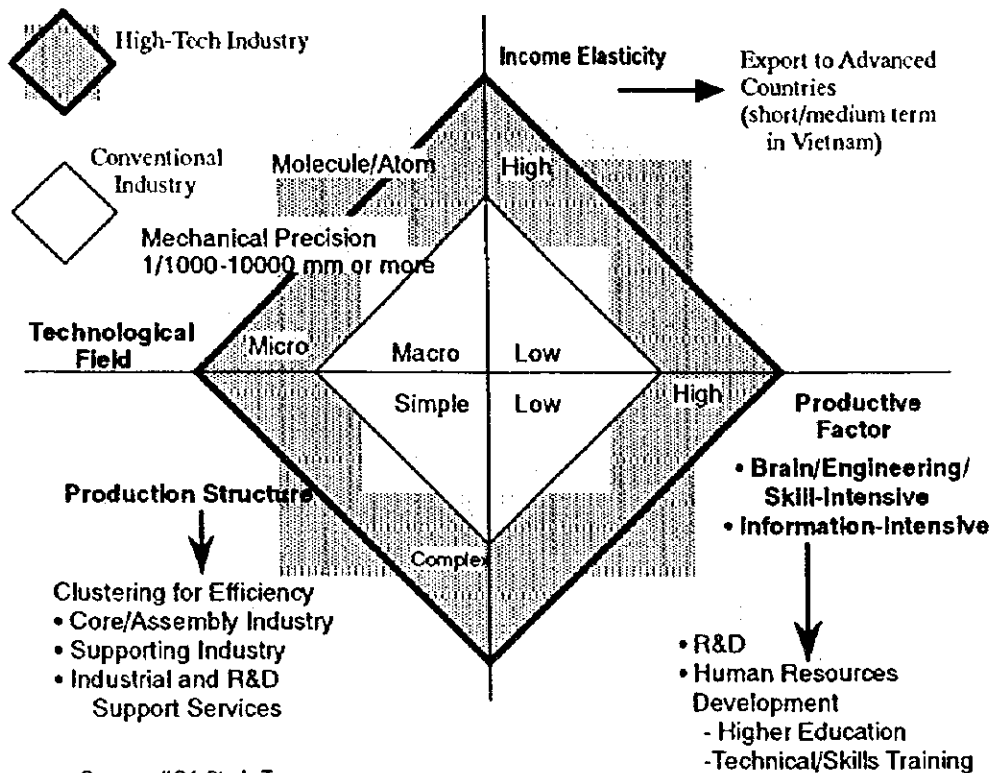
- It has been an urgent issue for Vietnam to catch up the forerunners such as ASEAN countries and Asian Newly Industrializing Economies (NIES) as fast as possible through effective industrialization;
- Vietnam is already a member of the ASEAN, and preparing for membership of the World Trade Organization (WTO) and Asia Pacific Economic Cooperation Conference (APEC). As such, Vietnam will be integrated into the "free trade regime", and will have to face a free competition with other countries under the ASEAN Free Trade Area (AFTA) and WTO agreements; and therefore
- Vietnam decided to adopt a multilateral development approach to industrialization including the high-tech industrialization in order to create, keep, and strengthen its competitiveness within the globalizing market economy.

The Study Report on "Master Plan for High-Tech Industrial Policy" (Volume I) has selected such high-tech fields as informatics/electronics, mechatronics, biotechnology, new materials, and new energy to be promoted in Vietnam. The Government of Vietnam might decide to adopt its high-tech industrialization policy by clearly recognizing the common attributes between high-tech industries as summarized below:

- 1) A large market potential based on the fact that high technology working in the field of molecule and atom as shown in the next figure could supply a limitless number of products to meet the needs of highly demanding consumers/markets through a diversified combination of technologies and matters/materials. As

such, just meeting the consumer's needs would be essential for survival and growth in severe competition.

Common Attributes between High-Tech Industries



- 2) A large contribution to income increase will be conducive to shortening the time for Vietnam to achieve the targeted income increase and per capita GDP, The 24 categories of high-tech industries (3 digit classification base) which were selected in the "Master Plan for High-Tech Industrial Policy" (Volume I) have 30 - 40% higher labor productivity (the gross value-added per worker) than other categories, according to the Census of Manufactures in Japan (1986 to 1995).
- 3) An accelerated production-inductive effect will be conducive to the development of other economic sectors on the condition that the above-mentioned faster income increase enable the domestic market to grow. In addition, high-tech industries with a complex production structure are expected to promote the supporting industries which produce their parts/components as shown in the above figure.

- 4) A multiplied effect of technology transfer will be conducive to a synergistic cycle of economy, increasing the value-added when the application and inducement of high technology in both manufacturing and other industries increase the value-added with a higher productivity and efficiency.

On the other hand, Vietnam's high-tech industrialization could be viable, since Vietnam can benefit from the external conditions summarized below, in combination with its internal conditions:

External conditions:

- 1) Shortening of duration of industrialization through technology transfer from advanced countries, which has been testified in some ASEAN countries such as Malaysia and Thailand, and the Asian NIES;
- 2) Shortening of lead time for application of scientific fruit to commercialization due mainly to the development of high technology;
- 3) Stagnation of scientific research capable of generating new technological seeds, even in the most advanced countries; and
- 4) Globalizing market economy capable of fully mobilizing capital, technology, information, and resources including human resources from all over the world, if a country opens the door to the world.

These external conditions will provide Vietnam with a good opportunity toward high-tech industrialization.

Internal conditions/Potentials:

The internal conditions of Vietnam summarized below should be well programmed into high-tech industrialization so that Vietnam can benefit from the external conditions mentioned above:

- 1) Strategic location of Vietnam in the central part of the Asian-Pacific region as well as the existence of the rich Mekong Delta region;
- 2) Relatively abundant natural resources such as agricultural and fishery resources, and mineral resources including petroleum oil, natural gas and coal;
- 3) High capability, diligence and understanding of Vietnamese including overseas ones, which have been testified not only in foreign companies in Vietnam, but also in advanced countries such as USA and France. Some Vietnamese received prizes in the Mathematical Olympics (these qualities are an advantage

of Vietnam in the development of high-tech industries with the attributes of intensiveness of brain, engineering/technology, and skills.);

- 4) Sizable stocks of scientists, researchers and engineers: over 800,000 scientific and technological university graduates, over 10,000 PhDs and master degree holders, over 45,000 workers in more than 300 research institutes, and over 20,000 scientists in 100 universities and colleges (according to the Vietnam Economic News, No. 31, 1997);
- 5) Large domestic market (more than 70 million people) with a strong potential to grow; and
- 6) The Government policy and Vietnam's economy already opened to the world to address market economy.

(2) Hoa Lac High-Tech Park (HHTP) Project

High-tech industrialization in Vietnam could be rational and timely to induce Vietnam's industrialization and modernization as described so far.

The Seventh Conference of the Central Committee of the Communist Party adopted a resolution to develop high-tech parks in both Hanoi and Ho Chi Minh city as the core projects for Vietnam's high-tech industrialization.

In January 1996, the Ministry of Science, Technology and Environment (MOSTE) was entrusted with the task of planning and developing high-tech parks by Decree 123/KTN. The Prime Minister approved a plan to establish the Hoa Lac High-Tech Park (HHTP) with an area of around 1,600 ha at Dong Mo-Ngai Son in Thach That district of Ha Tay province. The project site is situated about 30 km west of Hanoi city center, around the Tan Xa Lake at Hoa Lac, neighboring on such roads as Hanoi-Hoa Lac Highway to be completed within 1999 and the national road 21A.

To date, MOSTE has been mandated to undertake direct state management of the development of high-tech parks, as stipulated in Decree No. 36-CP of April 24, 1997. This mandate will further promote the implementation of high-tech park projects.

1.2 Objectives of HHTP Development

HHTP is a national project and a regional development project as well. Therefore the objectives of HHTP development could be summarized as follows:

National Level:

- HHTP to be an industrial core leading Vietnam's high-tech industrialization, strategically stimulating general industrialization and modernization through devising a mechanism to absorb, apply and transfer imported high technologies, and then to generate new high technologies, while integrating high-tech-related functions/industries by properly organizing linkages between science and technology;
- HHTP to break through the constraints and obstacles to high-tech-oriented industrialization by mobilizing internal and external resources to the full extent;
- HHTP to prepare a better infrastructure including business and living environment, and special incentives necessary to attract the foreign direct investment (FDI) in high-tech areas by intensively concentrating limited budget of the Government on the development of a designated pinpoint area; and then
- HHTP to contribute to a regionally balanced development of Vietnam, particularly between the Southern region and the Northern region.

Regional Level:

- HHTP to be an industrial core with research and development R&D and high-tech production functions leading the economic growth and high-tech-oriented industrialization in the Northern region through mobilizing a sizable agglomeration of national R&D institutes, scientists and researchers; and
- HHTP to contribute to a sound and sustainable development of the national capital of Hanoi through a balanced development between heavily and densely populated Hanoi city and its surrounding areas including Ha Tay province.

1.3 Scope of this Study Report

Vietnam has conditions advantageous to the development of HHTP as already mentioned, but there are not a few internal constraints and obstacles to materialize it. Besides, it should be noted that not all the high-tech industries will grow without innovation supported by continuous R&D activities. This Report compiles outputs of the study on the master plan for the HHTP Project formulated on the basis of studies on the strategy and concept for the HHTP development, incorporating policy measures and programs proposed in the Study Report on "Master Plan for High-Tech Industrial Policy" (Volume I). In addition, this Report brings together the outcomes of the feasibility study on the initial development (Phase 1) of HHTP.



II. PRESENT SITUATION AND FUTURE PROSPECTS OF HANOI/HA TAY AREA

Hanoi city, which is the national capital of Vietnam, and Ha Tay province are located in the Red River Delta region including the five other provinces, Hai Phong, Hai Hung, Thai Binh, Nam Ha, and Ninh Binh. This chapter describes the present situation of Hanoi/Ha Tay while referring to the Red River Delta region as a whole, and then maps out their future prospects toward the 21st century.

2.1 Present Situation

2.1.1 Topography, Population, and Land Use

Hanoi/Ha Tay: Situated in the center of the Red River Delta region, accounting for 0.9% of the total area of Vietnam

The Red River fed mainly by the three rivers of Da, Thao and Lo, flows through Hanoi city, borders the provinces of Ha Tay, Nam Ha, Hai Hung, Thai Binh and Ninh Binh, and then discharges its water into the Gulf of Tonkin. The Red River's tributary, the Duong River with its many branches flows into the gulf through Hai Phong province and other areas. This river system has carried a huge amount of sediment conducive to the formation of plains, i.e. the Red River Delta region with a total area of 12,512 km², accounting for 3.8% of whole Vietnam (330,991 km²).

Ha Tay meaning "west to the (Red) river" in Vietnamese neighbors on Hanoi (Ha Noi: within the river). Its area totals around 2,148 km², while Hanoi encompasses 921 km². Their combined area is around 3,069 km², accounting for only 0.9% of whole Vietnam.

Ha Tay has common borders with Hanoi on the east, Vinh Phu province on the north, Nam Ha province on the south, and Hoa Binh province on the west. Not only the Red River but also the geographical situation have affected Ha Tay's topography, which is diversified with mountains and hills in the west part, and plains in the east part.

Hanoi/Ha Tay: Densely populated area with a population of around 4.7 million

The combined population of Hanoi and Ha Tay province in 1996 was around 4.7 million or 6.25% of the national total (73.36 million), with Hanoi accounting for 3.15% (2.38 million), and Ha Tay province for 3.09% (2.33 million).

The area's population share of 6.25% is much higher than that of land, 0.9%. This means that the area's population density is equivalent to around seven times the national average (228 people/km²); Hanoi/Ha Tay 1,534 people/km² (Hanoi 2,562, and Ha Tay province 1,064). Hanoi's population density is the highest in Vietnam followed by Ho Chi Minh City.

Hanoi/Ha Tay: Agricultural land use is still dominant

Agricultural land amounts to 1,684 km² in Hanoi/Ha Tay (Hanoi 442, and Ha Tay province 1,242), accounting for around 55% of the total agricultural area, which corresponds to 2.5 times the national average (22%). This means a higher population density in the residential areas of Hanoi/Ha Tay, which accounts for 16% of the total area.

2.1.2 Urbanization

Urban area is the place for industrial production, trade/commerce, other business including services, and governance/public administration. In this context, urbanization could be an expression of industrialization within market economy. Industry in general is foot-loose compared to agriculture. Farmers are tied to the land, but industrial/service workers are free and moved to the "city" where they can find jobs. In the past two decades, international exchanges in various fields have been a crucial factor for urbanization, particularly for the formation of the "metropolis."

Data on migration between areas are not available in Vietnam. As an alternative, it could be said that if an area's population growth rate is over the national average (natural population growth), the area has been in the process of urbanization, since the exceeding rate might represent "social population increase/migration" from outside.

Hanoi: Still Over-concentrated

Vietnam's population growth annually averaged 2.14% from 1991 to 1996. During the same period, Hanoi's population grew from 2.10 million to 2.38 million at an annual average growth rate of 2.53%. As such, population was still concentrated in Hanoi.

Urban Sprawl: Progressing towards the west of Hanoi City Center

Figure 2-1-1 and Table 2-1-1 depict the population growth between 1991 and 1996, and population density in 1996 by district in Hanoi/Ha Tay, which could be featured as follows:

- Outstanding growth in over-populated districts: The population growth rate in Hoan Kiem, of which population density was the highest, was 1.63%, i.e. less than the national average. On the other hand, a rapid growth more than the national average was seen in the districts surrounding Hoan Kiem such as Ba Dinh (2.53%), Hai Ba Trung (2.58%), and Dong Da (3.25%).
- The population growth rate of the districts on the left bank of the Red River, of which population density was not so high, was smaller than the national average, except for Dong Anh (2.42%),
- The highest growth of population was seen in Tu Liem (3.69%) of Hanoi, which is situated in the west of the city center. Likewise, population of Ha Dong in Ha Tay to the west of Hanoi increased by 2.28%, more than the national average growth rate.
- It could be said on the whole that population growth was rapid in Hanoi's districts and its suburban districts (Ha Dong, Ha Tay), both of which are situated the west of Hanoi city center.

The Hoa Lac-Hanoi Highway connecting Hanoi city center and Hoa Lac in Thach That district of Ha Tay province, where the project site for Hoa Lac High-Tech Park is located, is now under construction. After it is completed by 1999 as scheduled, the above-mentioned recent trends of population growth will accelerate, and urban sprawl will rapidly progress towards suburban areas in the west of Hanoi.

2.1.3 Economy and Industrial Structure

The next table shows the present situation of economic activities in Hanoi/Ha Tay based on the available data.

Outline of Economic Activities in Hanoi/Ha Tay

	Year	Unit	Hanoi		Ha Tay	
			% Shares of VN Total		% Shares of VN Total	
01. Land Area	1996	km ²	927	0.28%	2,192	0.66%
02. Population	1996	1000	2,375.9	3.15%	2,331.3	3.09%
03. Population Density	1996	prs./km ²	2,562	(11.24)	1,064	(4.67)
04. Agricultural Sown Area	1995	km ²	894	0.85%	2,414	2.30%
- Gross Output Paddy Base *	1996	1,000 tons	233.7	0.80%	785.7	2.69%
05. Number of Industrial Establishments	1995		17,674	2.88%	57,758	9.42%
06. Number of State Industrial Enterprises	1995		288	14.71%	45	2.30%
07. Industrial Gross Output (in 1989 constant prices)	1995	bill. dong	1,891.7	7.12%	382.8	1.44%
by Central Industry			1,095.7	7.93%	102.4	0.74%
by Local Industry			796.0	6.24%	320.7	2.51%
08. Industry's Gross Output by Domestic Investment Outlays (in constant 1994 prices)*	1996		6,890	8.08%	1,520	1.78%
by State			5,871	10.11%	365	0.63%
by Non-State			1,019	3.74%	1,155	4.24%
09. Foreign Direct Investment (FDI)	88-96					
Number of Projects			299	16.29%	24	1.31%
Total Registered Capital		mill. USD	6,089.2	23.91%	430.0	1.69%
of which Legal Capital		mill. USD	2,387.1	22.05%	182.0	1.68%

Note 1: Agricultural sown area (Seeds are sown more than once a year.)

Note 2: () in Population density = Difference from the national average

Note 3: * 1996 (Estimated number by relevant authority)

Note 4: * Industry includes manufacturing, mining, electricity/gas/water supply, and construction.

Note 5: Central Industry (registered/licenced by the Central Government)

Note 6: FDI (Excluding oil and gas projects)

Source: Population (People's Committee), Others (Statistical Yearbook 1996, General Statistical Office)

(1) Outline of Economic Activities

The population of Hanoi and Ha Tay province accounted for 3.15% and 3.09% of the national total in 1996, respectively. Based on these population shares and the indicators shown in the table below, the economic activities in Hanoi and Ha Tay province could be outlined as follows:

1) Gross output of industry (mining, manufacturing, electricity/gas/water supply, construction) and foreign direct investment (FDI)

- Hanoi is an industrial center in the Northern region but has rather a small agglomeration of industries, of which gross output in 1995 was 1,891.7 billion dong (in 1989 constant prices) accounting for 7.9% of the national total, less than one-third of Ho Chi Minh City.

- SOEs carry weight with industrial production in Hanoi. Some 14.7% of SOEs are located in Hanoi. Hanoi's industrial gross output by domestic investment outlays of the State accounts for 10.1% of the national total. The shares of Hanoi are more than 7.9%, i.e. Hanoi's share of the total national industrial production.
- FDI amounted to around 6.1 billion USD (registration base) from 1988 to 1996, accounting for about 24% of the national total. As such, Hanoi is a center for FDI.
- Ha Tay contributes around 2% to the national economy as shown in Table the table above.

2) Past trends of industrial production

Industrial production has been less concentrated in Hanoi and Ha Tay than in the Northeast part of Southern region including Ho Chi Minh city. However, industrial production in Hanoi and Ha Tay increased from 1991 to 1995, at an annual average growth rate of 19.1% and 19.7%, respectively, both of which were more than 14.5 % of the national average as shown in Table 2-1-2.

A large increase in industrial gross output in 1993 contributed to such a rapid growth in Hanoi and Ha Tay, mainly because large factories located in both areas started full operation. In addition, the rapid industrial growth in Hanoi might be closely related to the sizable agglomeration of SOEs in Hanoi, since their production increased at an annual average growth rate of 15.8% in whole Vietnam, more than the rate of 11.4% of enterprises other than SOEs as shown in the above below.

Past Trends of Vietnam's Industrial Production by Sector						
	Gross Output (Bill. dong)		Average Growt Rate	Percent Shares		
	1991	1995		'91	'95	'95-'91
Total	15,471.1	26,584.1	14.5%	100.0	100.0	0.0
State	10,599.5	19,081.6	15.8%	68.5	71.8	3.3
Central	7,435.4	13,823.8	16.8%	48.1	52.0	3.9
Local	3,037.8	5,257.8	14.7%	19.6	19.8	0.1
Non-State	4,871.7	7,502.5	11.4%	31.5	28.2	-3.3
Collective Economy	746.8	216.3	-26.6%	4.8	0.8	-4.0
Individual/Mixture	228.5	1,782.5	67.1%	1.5	6.7	5.2
Household	3,896.3	5,503.7	9.0%	25.2	20.7	-4.5

Source: Statistical Yearbook 1996 (General Statistical Office)

(2) Major Industries and Past Trends of Industrial Location

SOEs in Vietnam have been strenuous in the process of transfer toward market economy, and accounted for 71.8% of the total industrial gross output in Vietnam, while the industrial production by individual/mixture grew rapidly as shown in the above.

The industries, of which production is highly shared by SOEs, are ones producing food including beverage, chemicals, machinery/equipment, and electric/electronic products as shown in Table 2-1-3. Major industries in Hanoi and Ha Tay are as follows based on a directory of enterprises:

Major industries and past trends of industrial location in Hanoi

- Food and beverage industries located in Hanoi have several large factories producing beer, soft drinks.
- The textile industry in Hanoi comprises mostly weaving nylon and the like. Industries producing pharmaceuticals and fertilizers are agglomerated among chemical industries. Factories of plastics are also not a few.
- Glass industry stands out in the Hanoi's non-metallic mineral industries. The steel and metal industries in Hanoi center on casting, construction materials, and mechanical parts.
- Industries producing diesel engines, compressors, industrial machinery are major among the general machinery industries in Hanoi, while industries manufacturing electric meters, printed circuit boards, electrical appliances such as refrigerator, TV, communication equipment, especially telecommunications equipment are major among the electric/electronic industries in Hanoi.
- Among the transport equipment industries in Hanoi, factories of motor vehicles including motorcycles are established by joint venture with well known Japanese companies. In addition, factories related to railway transport are agglomerated.
- Precision instruments industries producing medical equipment and measures are located in Hanoi.
- Among the major industries mentioned above, the general machinery and metal industries including steel are rather agglomerated in Hanoi as contrasted with the nationwide agglomeration of industries.

Major industries and past trends of industrial location in Ha Tay

- Among the beverage industries in Ha Tay, there are factories producing soft drinks and coffee owned by multinational companies. A state-owned beer brewery is also located. In the textile subsector, there is a factory for wool spinning.
- There are factories producing pharmaceuticals (chemicals), assembling motorcycles and producing their parts (transport equipment), and producing telecommunications equipment (electric/electronic products). In addition, there are two larger factories of agricultural machinery among the general machinery industries in Ha Tay.
- It is not only natural, but also outstanding that industries oriented to the market and industrial agglomeration of Hanoi have located their factories in Ha Tay.

The table below shows the structural comparison of manufacturing industry between Vietnam and Japan as one of the advanced countries. In Vietnam, the food industry including beverage was dominant, accounting for some 39.9% of the manufacturing total gross output, and non-metallic mineral/construction materials industry also accounted for 12.8% of the total. As such, industries to satisfy the basic needs such as eating and sheltering are dominant in Vietnam.

In contrast, the machinery/equipment and electric/electronic industries in Japan combinedly account for 43.4% of the total gross output (25.6% for machinery/equipment, 17.8% for electric/electronic industry), and the metal industry including steel also accounts for 12.5% of the total. This might signify that it will be very important how to increase the production of machinery and metal industries toward the Vietnam's industrialization and modernization. In this respect, Hanoi and Ha Tay are expected to play a crucial role, since they have a sizable agglomeration of these industries.

Structure of Manufacturing Industry in Vietnam and Japan					
(VN in 1989 constant prices)	Gross Output in 1995		Percent Shares		
	(1)	(2)	(1)	(2)	Difference
	Vietnam (bill. dong)	Japan (bill. USD)	Vietnam	Japan	(1-2)
Manufacturing Total	20,051.1	3,094.37	100.0%	100.0%	(0.0%)
Food and Foodstuffs	8,005.6	350.52	39.9%	11.3%	(28.6%)
Textiles	1,633.9	44.46	8.1%	1.4%	(6.7%)
Garments	726.4	53.77	3.6%	1.7%	(1.9%)
Wood and Wood Products	1,052.2	81.98	5.2%	2.6%	(2.6%)
Cellulose and Paper	566.1	85.57	2.8%	2.8%	(0.1%)
Printing and Publishing	322.8	133.46	1.6%	4.3%	(2.7%)
Tannery and Leather Goods	399.6	10.07	2.0%	0.3%	(1.7%)
Chemicals, Fertilizers and Rubst	2,291.6	373.78	11.4%	12.1%	(0.7%)
Non-Metallic Products	2,572.2	102.87	12.8%	3.3%	(9.5%)
Machinery/Equipment	970.9	791.99	4.8%	25.6%	(20.8%)
Electric/Electronic Products	532.3	549.63	2.7%	17.8%	(15.1%)
Other Metallic Products	583.3	387.61	2.9%	12.5%	(9.6%)
Others	394.2	128.66	2.0%	4.2%	(2.2%)

Note : Machinery/Equipment = general machinery, transport equipment and precision instrument

Source 1: Vietnam (Statistical Yearbook 1996, General Statistical Office)

Source 2: Japan (Census of Manufactures 1995, Ministry of International Trade and Industry)

(3) Software Industry

Software industry, as a subsector of informatics/ electronics, is expected to play a part in the high-tech industrialization in Vietnam. Exact data are not available, but there are at least 10 software companies operating in Hanoi, among which there is a powerful software company under the control of MOSTE, who exported a software of banking system to Laos and Cambodia. As such, Hanoi as well as Ho Chi Minh City is a center of software industry in Vietnam.

2.1.4 Manpower, R&D, and R&D Institute

Hanoi: S&T Capital in Vietnam

Some 35.7% of the total number of college/university professors in Vietnam are concentrated in Hanoi, while likewise a 37.6% of students are in Hanoi as shown in the next table. The Vietnam National University-Hanoi (VNUH) comprises five universities of general education, natural science, social science, pedagogy, and foreign languages. The university of natural science has ten departments specializing in mathematics, information, information technology and electronics, machinery, physics, chemistry, biology, environment etc., and recently has put an emphasis on education and R&D on informatics. The Hanoi University of Technology has educated many students to be engineers, and recently has undertaken manpower training for foreign enterprises who donate education facilities and the like to the university. The Asian Institute of Technology-Campus in Vietnam (AITCV), which is the sole foreign branch of AIT,

carries out post graduate education including one for industrial engineering, and many short-term seminars, while linking with its headquarters in Bangkok.

**Number of Professors and Students in Colleges/Universities
in Vietnam (1995)**

	Number of		Percent Shares		Students per Professor
	Professors	Students	Professors	Students	
National Total	22,750	173,080	100.0%	100.0%	7.6
Red River Delta	9,986	76,519	43.9%	44.2%	7.7
- Hanoi	8,118	65,121	35.7%	37.6%	8.0
- Ha Tay	371	4,167	1.6%	2.4%	11.2
Hanoi/Ha Tay	8,489	69,288	37.3%	40.0%	8.2
North-East South	5,086	43,262	22.4%	25.0%	8.5
- Ho Chi Minh	4,731	41,069	20.8%	23.7%	8.7
- Dong Nai	103	1,146	0.5%	0.7%	11.1

Source: Statistical Yearbook 1996 (General Statistical Office)

In addition, national R&D institutes in Hanoi amount to over 300 institutes, accounting for some 80% of the Vietnam's total. Of the 17 subinstitutes of NCST 13 institutes are located in Hanoi.

Not a few SOEs have their own laboratory or R&D functions. Such SOEs and the government ministries such as MOSTE are concentrated in Hanoi. As such, Hanoi is not only the national capital, but also the S&T capital of Vietnam.

2.1.5 Industrial Estates (IEs)

Development of industrial estate (IE) has two merits; one is to efficiently develop a good production environment for enterprises by an intensive investment in a pinpoint area or specific site, the other is to contribute to a planned/orderly land use. Industrial estate development in the Red River Delta region has progressed centering on Hanoi and Ha Tay as shown in the next table.

**Industrial Estates in the Red River Delta Region
(including ones at planning stage)**

	Location	Area (ha)	Developer /JV	Start of Operation	Note
Thang Long IZ	Hanoi	300	Japan	1999	130 ha in the first phase
Gia Lam IZ	Hanoi	400	Korea	1999	
Dai Tu IZ	Hanoi	40	Taiwan	1998	
Saidon B IZ	Hanoi	100	Korea	1995	100 ha in the first phase under feasibility study under planning
Soc Son EPZ	Hanoi	400	Malaysia	1998	
Phu Cat IE	Ha Tay	1,200	Korea	-	
Hoa Lac High-Tech Park (high-tech zone: HTZ)	Ha Tay	1,600	-	2005	
Nomura IZ	Hai Phong	153	Japan	1997	

Source: JICA Study Team

These IEs could be characterized according to their transport conditions as follows:

- IEs located nearby Noi Bai International Airport: the Thang Long Industrial Zone (IZ) and the Soc Son Export Processing Zone (EPZ). They have the advantage of location of airport-oriented industries.
- IEs located between Hanoi and Hai Phong: the Gia Lam IZ and the Saidu B IZ. They have a good access to Hai Phong, and have the advantage of location of industries heavily dependent on imported raw materials, and industries engaged in goods distribution/logistics.
- IEs located along the Hoa Lac-Hanoi Highway: the Phu Cat IE and the Hoa Lac High-Tech Park. They have the advantage of location of industries oriented to Hanoi's market and industrial/R&D-related agglomeration. In addition to such urban-oriented and R&D-oriented industries, goods distribution/logistics industries are prospective in line with the expressway development connecting Hanoi with the Central and Southern regions.
- IE located nearby Hai Phong Port: the Nomura IZ. It has the advantage of location of industries oriented to port functions and Hanoi's market/industrial agglomeration, and industries operating under international division of labor while utilizing sea transport.

The characteristics mentioned above are just only based on the transport conditions, and in practice the enterprise's factory site selection is heavily dependent on other factors such as investment promotion by IE's developer, IE's development concept/vision, land leasing prices, and the situation of infrastructure development in and around IE. In addition, industrial location in Vietnam is influenced by the Government's intervention, which has recently played a decisive role in the factory location in Hanoi. There exist complaints about such intervention among factories, especially those which market a sizable portion of their products to the Southern region, which accounts for around 70% of the domestic market in Vietnam, due particularly to the increased transportation cost. As a matter of fact, a balanced development between the Northern region, the Central region and the Southern region is very important. Compensations/incentives are necessary for such intervention, which has been an obstacle for business management.

2.2 Future Prospects

This section will firstly set out the future prospects toward the 21st century, and secondly will clarify the issues on high-tech industrialization.

2.2.1 Formation of the National Center for High-Tech Industrialization

Based on the analysis of the present situations as mentioned in Section 1.1 and others, comparative advantages of the Hanoi/Ha Tay area to put forward the industrialization and modernization of Vietnam are summarized below:

- The Hanoi/Ha Tay area is a research center of S&T (S&T Capital) in Vietnam as well as politics and government administration, with a big agglomeration of S&T manpower. In the area, some 80% of national R&D institutes are concentrated together with universities such as VNUH and AITCV, and S&T related government agencies including MOSTE.
- The Hanoi/Ha Tay area has an agglomeration of SOEs which have led a rapid growth of economy. Recently, FDI has been active, software industry has been developed, and industrial estate development has progressed in the Hanoi/Ha Tay area.
- The Hanoi/Ha Tay area is the center of the Northern region accounting for around 30% of the domestic market. The Northern region including the Red River Delta region is the center for exchange with the Asian-Pacific region, particularly China including Hongkong and Taiwan, Japan, Laos, and Cambodia.

The Hanoi/Ha Tay area has the potential to be the national center for high-tech industrialization in Vietnam, as shown in the decision of the Government of Vietnam to develop the Hoa Lac High-Tech Park (HHTP) in the area.

These potential and future prospects of the Hanoi/Ha Tay area are reflected in the Socioeconomic Development Plan of the Red River Delta Region, which was approved by the Prime Minister in August 1997, and sets up the target of high economic growth as follows:

**Targeted Economic Growth in the Socioeconomic Development Plan
of the Red River Delta Region**

	1996-2000	2001-2010
1) Annual average growth rate of GDP	11%	14%
2) GDP structure by sector	2000	2010
• Agriculture, etc	16%	7%
• Industry (mining, manufacturing, electricity/gas/ water supply, and construction)	33%	43%
• Service	51%	50%

The Plan has not specified the growth rate of industry. However, industry is assumed to grow rapidly during 2000 and 2010, as suggested by its forecast share of 43% of total GDP in 2010, which is 10% points higher than that in 2000. Such a rapid growth of industry or an industry-led high growth of the Red River Delta region might include high-tech industrialization. The Plan envisages to “develop the bases for industry, science and technology, culture, and tourism” in the west of Hanoi, which include HHTP Project in Ha Tay province.

2.2.2 Formation of the Red River Delta Region Growth Corridor

A rapid future growth of the Red River Delta region as mentioned before could be possible not only through high-tech industrialization, but also through expansion of international trade. To this end, the Government of Vietnam has strategically put forward the formation of the Growth Corridor as shown in Figure 2-2-1, which comprises the Key Economic Triangle of Hanoi-Hai Phong-Quang Ninh including a border trade center in Mong Cai, and the Satellite Cities in Hanoi’s suburban areas including Ha Tay. The Government of Vietnam plans to concentrate investment in the development of infrastructure facilities such as ports and roads for the Corridor formation.

A big expansion of export will substantially lead to a rapid economic growth of Vietnam for some time, since it will take a long time to expand its domestic market. Major exports from Vietnam are rice, rubber, fish and fish products, and crude petroleum oil, but these resources are not limitless, and therefore it is an emergent issue to expand export of industrial goods. In addition, import of raw materials for export goods production is also important.

Hanoi is situated in the inland area, and has no international port other than Noi Bai International Airport. As a contrast, Ho Chi Minh City, which could be called

"Industrial/Commercial Capital" of Vietnam, has Saigon Port, the largest port of Vietnam handling a total of 7.21 million tons of international cargoes in 1995. Accordingly, Hanoi's access to Hai Phong Port is essential for its development.

Hai Phong Port, which handled a total of 4.25 million tons of international cargoes in 1995, is the second largest port of Vietnam next to Saigon Port. A new deep-sea port is planned to be developed in Cai Lan nearby Hai Phong Port, since large vessels cannot enter Hai Phong Port. As such, access to Cai Lan Port from Hanoi will be also important in future.

The Growth Corridor development is a timely and reasonable strategy in terms of regional development aiming to appropriately response to internationalization or the globalizing economy through strengthening Hanoi's linkage with Hai Phong/Cai Lan as a sea gateway, and Mong Cai of Quang Ninh as a land gateway. If this Corridor is materialized and enhances the development potential of the Hanoi area including Ha Tay, the area will develop not only as the National Center for high-tech industrialization, but also as a regional center for industrial logistics. This is in other words the "formation of Hanoi Metropolitan Area" with centers not only for high-tech/science and technology, but also for export industries and distribution-processing/goods distribution industries.

2.2.3 Issues Toward High-Tech Industrialization

As a matter of fact, there are many issues other than the development of HHTP to put forward high-tech industrialization, or the formation of the National Center for high-tech industrialization in Hanoi/Ha Tay area. The "Master Plan for High-Tech Industrial Policy" (Volume I) has studied how to address the issues regarding Vietnam as a whole, and this section will focus on the issues in the regional context while referring to the attributes of high-tech industry.

Table 2-2-1 summarizes main attributes of high-tech industry as mentioned in section 3.2 of Volume I and the issues toward the high-tech industrialization in the Hanoi/Ha Tay area including the development of the Hoa Lac High-Tech Park (HHTP). The table presents only the attributes related to the regional issues.

- 1) Restructuring for high-tech industrialization, strengthening of R&D functions of national institutes, and strengthening of functions for manpower development and R&D in universities such as VNUH and the Hanoi University of Technology. An earlier implementation of VNUH and AITCV relocation project is also an issue on the development of HHTP.

- 2) SOEs to be high-tech and restructured: SOEs should enter the high-tech business not only individually, but also through joint ventures. Their entering supporting industries for high-tech industry should be also promoted.
- 3) Invitation of foreign enterprises with special incentives: Agglomeration of high-tech industries in the Hanoi/Ha Tay area is still very small and centering on factories of foreign enterprises. Export-oriented high-tech industries ought to be invited in the short and medium term, due to limited domestic market for high-tech products in Vietnam. In order to address such issues, some incentives should be prepared, e.g., the public support for R&D, double deduction of R&D expenditure, and accelerated depreciation of equipment for R&D in addition to the development of EPZs and giving high-tech production zones the EPZ function. As a regional incentive, disadvantage of industrial location in the Northern region including Hanoi and Ha Tay should be compensated for the enterprises of which products are mostly marketed to the Southern region.
- 4) A technical institute should be established to form a link in providing various hi-level manpower as well as education/manpower development by universities.
- 5) Strengthening of Hanoi's urban functions to be a metropolis/mother city: This is to strengthen high order urban functions, and should be carried out through an integrated and balanced development between Hanoi and its suburban areas in parallel with urban renewal of Hanoi city center so that the various over-concentrations in Hanoi could be rectified. Regarding this, the Hanoi-Hoa Lac Highway should be completed as fast as possible.
- 6) Improvement of access conditions in response to the globalizing business activities, e.g. expansion and improvement of Noi Bai Airport, development of Hai Phong/Cai Lan Port, improvement and widening of access roads to and from Hanoi such as the national road 5 and 18, and improvement of access conditions including low cost to information and telecommunications network.
- 7) Development of HHTP as a core leading to the National Center for high-tech industrialization in the Hanoi/Ha Tay area: HHTP should be developed so as to integrate high-tech R&D and production functions, related and supporting industries, and R&D and industrial services, while being facilitated with good infrastructure. In addition, it is an issue to develop good living and urban

environments for researchers and engineers. Other than these, the basic issues on the development of HHTP are as follows:

- Reasonable and competitive land leasing prices: In the severe races to attract high-tech industry, HHTP should offer competitive land prices not only to industrial estates around Hanoi, but also to other countries.
- Harmonized development of HHTP with its surrounding environment and agriculture as the main economic sector in and around the HHTP project site.
- An integrated and coordinated development between HHTP and relevant projects: It is indispensable to coordinate with relevant projects including relocation of VNUH and AITCV so as to economically and efficiently put forward the development of relevant infrastructure, which is foreseen to need a huge amount of investment.
- An appropriate functional sharing and linkage between HHTP site and other industrial estates: HHTP cannot work and function independently. HHTP should be linked with IZs and EPZs around its site so that it can effectively be working and feasible as a project.

The Government of Vietnam has appropriately addressed the issues mentioned above, and relevant plans will be reviewed in Chapter 3.

Table 2-1-1 Population Density by District in Hanoi/Ha Tay (1996)

(Unit: Persons per km²)

HANOI	2,562	HA TAY	1,064
Ba Dinh	17,177	Ha Dong	5,375
Hoan Kiem	40,626	Son Tay	716
Hai Ba Trung	24,516	Ba Vi	550
Dong Da	22,343	Phu Tho	1,304
Tu Liem	2,712	Thach That	1,130
Soc Son	736	Dan Phuong	1,572
Dong Anh	1,334	Hoai Duc	1,938
Gia Lam	1,726	Quoc Qai	1,112
		Chuong My	1,101
		Thanh Oai	1,367
		Thuong Tin	1,483
		Ung Hoa	1,071
		Phu Xuyen	1,074
		My Duc	732

Table 2-1-2 Past Trends of Vietnam's Industrial Production by Region

Amounts (in constant 1989 prices: bill. dong)					
	1991	1992	1993	1994	1995
National Total	15,471.1	18,116.9	20,412.0	23,214.2	26,584.1
North	3,812.3	4,337.6	4,869.1	5,960.0	6,924.2
South	10,560.2	12,621.0	14,264.5	15,779.8	17,903.5
NEC	1,098.6	1,158.3	1,278.4	1,474.4	1,756.4
Red River Delta	2,108.2	2,376.5	2,753.8	3,539.8	4,077.8
- Hanoi	940.4	1,077.9	1,290.4	1,706.7	1,891.7
- Ha Tay	186.4	203.6	221.7	335.7	382.8
Hanoi/Ha Tay	1,126.8	1,281.5	1,512.1	2,042.4	2,274.5
North-East South	6,987.8	8,711.8	9,942.0	11,269.1	12,862.7
- Ho Chi Minh	4,298.6	4,953.8	5,722.1	6,539.3	7,544.4
- Dong Nai	365.5	557.3	619.2	711.4	818.6
- Ba Ria-Vung Tau	2,135.1	2,953.0	3,341.0	3,679.0	4,022.3
Percent Shares (%)					
	1991	1992	1993	1994	1995
National Total	100.0	100.0	100.0	100.0	100.0
North	24.6	23.9	23.9	25.7	26.0
South	68.3	69.7	69.9	68.0	67.3
NEC	7.1	6.4	6.3	6.4	6.6
Red River Delta	13.6	13.1	13.5	15.2	15.3
- Hanoi	6.1	5.9	6.3	7.4	7.1
- Ha Tay	1.2	1.1	1.1	1.4	1.4
- Hanoi/Ha Tay	7.3	7.1	7.4	8.8	8.6
North-East South	45.2	48.1	48.7	48.5	48.4
- Ho Chi Minh	27.8	27.3	28.0	28.2	28.4
- Dong Nai	2.4	3.1	3.0	3.1	3.1
- Ba Ria-Vung Tau	13.8	16.3	16.4	15.8	15.1
Growth Rate					
	1991-92	1992-93	1993-94	1994-95	1991-95 (Average)
National Total	17.1%	12.7%	13.7%	14.5%	14.5%
North	13.8%	12.3%	22.4%	16.2%	16.1%
South	19.5%	13.0%	10.6%	13.5%	14.1%
NEC	5.4%	10.4%	15.3%	19.1%	12.4%
Red River Delta	12.7%	15.9%	28.5%	15.2%	17.9%
- Hanoi	14.6%	19.7%	32.3%	10.8%	19.1%
- Ha Tay	9.2%	8.9%	51.4%	14.0%	19.7%
- Hanoi/Ha Tay	13.7%	18.0%	35.1%	11.4%	19.2%
North-East South	24.7%	14.1%	13.3%	14.1%	16.5%
- Ho Chi Minh	15.2%	15.5%	14.3%	15.4%	15.1%
- Dong Nai	52.5%	11.1%	14.9%	15.1%	22.3%
- Ba Ria-Vung Tau	38.3%	13.1%	10.1%	9.3%	17.2%

Note 1: NEC (mainly gross output of the electricity corporation)

Note 2: Red River Delta (Hanoi, Hai Phong, Ha Tay, Hai Hung, Thai Binh, Nam Ha, Ninh Binh)

Note 3: North-East South (Ho Chi Minh, Song Be, Tay Ninh, Dong Nai, Ba Ria-Vung Tau)

Source: Statistical Yearbook 1996 (General Statistical Office)

Table 2-1-3 Past Trends of Industrial Production by Economic Sector

(in 1989 constant prices)	Gross Output Grand Total (Billion dong)		Annual Average Growth Rate (91-95)				
	1991	1995	Grand Total	State Total	Non-State		
					Total	Indivi- dual/ Mixture	House- hold
Total	15,471.1	26,584.1	14.5%	15.8%	11.4%	67.1%	9.0%
Electricity	1,100.8	1,759.7	12.4%	12.4%	41.4%	-	-
Fuels	2,141.0	4,190.4	18.3%	18.3%	2.2%	-	2.3%
Ferrous Mining	187.8	398.3	20.7%	20.4%	23.7%	180.6%	20.2%
Non-Ferrous Mining	131.5	184.6	8.8%	10.6%	3.0%	171.1%	1.2%
Manufacturing Subtotal	11,910.0	20,051.1	13.9%	15.5%	11.1%	66.7%	9.0%
Food	512.5	879.0	14.4%	13.1%	14.9%	62.3%	10.0%
Foodstuffs	4,865.9	7,126.6	10.0%	13.4%	2.7%	96.4%	-2.1%
Textiles	1,276.4	1,633.9	6.4%	6.2%	6.6%	56.5%	11.7%
Garments	219.1	726.4	34.9%	33.2%	35.0%	78.4%	36.8%
Wood and Wood Products	595.7	1,052.2	15.3%	3.6%	16.4%	69.7%	18.0%
Cellulose and Paper	292.0	566.1	18.0%	14.8%	25.7%	104.5%	48.6%
Printing	108.4	322.8	31.4%	31.6%	27.2%	-	24.6%
Tannery and Leather Goods	56.3	399.6	63.2%	67.8%	60.8%	258.1%	51.6%
Chemicals, Fertilizers and Rubber	1,114.0	2,291.6	19.8%	19.8%	19.7%	128.3%	14.9%
Construction Materials	1,165.1	2,279.5	18.3%	19.0%	16.9%	42.9%	20.7%
Glass, Earthenware and Porcelain	178.3	292.7	13.2%	17.9%	8.7%	47.6%	6.7%
Machinery/Equipment	588.0	970.9	13.4%	19.9%	4.3%	54.2%	2.1%
Electric/Electronic Products	277.6	532.3	17.7%	21.4%	7.2%	45.8%	5.2%
Other Metallic Products	316.5	583.3	16.5%	20.4%	15.3%	53.8%	17.4%
Others	344.2	394.2	3.4%	7.2%	1.0%	11.8%	-1.0%

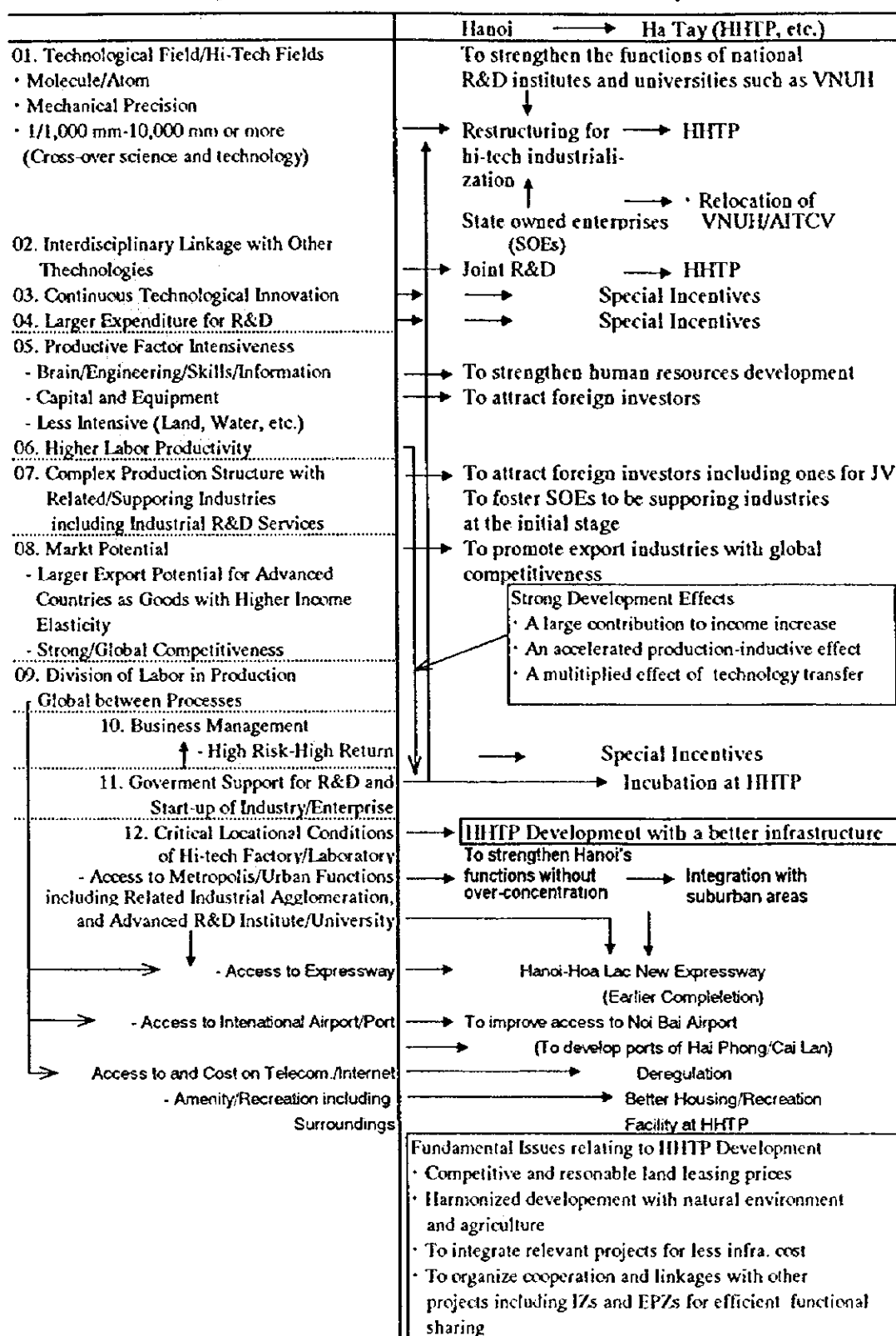
	Percent Shares Gross Output Grand Total		Percent Shares by Sector (1995)				
	1991	1995	State Total	Non-State			
				Total	Indivi- dual/ Mixture	House- hold	Collec- tive Economy
Total	100.0%	100.0%	71.8	28.2	6.7	20.7	0.8
Electricity	7.1%	6.6%	99.9	0.1	0.0	0.0	0.1
Fuels	13.8%	15.8%	99.8	0.2	0.0	0.1	0.0
Ferrous Mining	1.2%	1.5%	90.7	9.3	3.1	5.8	0.4
Non-Ferrous Mining	0.8%	0.7%	80.1	19.9	2.9	16.8	0.2
Manufacturing Subtotal	77.0%	75.4%	63.0	36.6	8.8	27.2	1.1
Food	(4.3%)	(4.4%)	24.4	75.6	19.4	56.2	0.0
Foodstuffs	(40.9%)	(35.5%)	73.2	26.8	6.7	19.9	0.2
Textiles	(10.7%)	(8.1%)	66.0	34.0	3.9	27.3	2.8
Garments	(1.8%)	(3.6%)	54.4	42.8	18.4	26.5	0.7
Wood and Wood Products	(5.0%)	(5.2%)	16.1	78.2	17.3	64.6	2.1
Cellulose and Paper	(2.5%)	(2.8%)	65.6	34.4	16.1	15.2	3.1
Printing	(0.9%)	(1.6%)	94.3	5.7	1.0	4.4	0.3
Tannery and Leather Goods	(0.5%)	(2.0%)	36.5	63.5	24.7	35.9	2.8
Chemicals, Fertilizers and Rubber	(9.4%)	(11.4%)	74.4	25.6	8.7	16.2	0.7
Construction Materials	(9.8%)	(11.4%)	65.2	34.8	4.6	28.9	1.3
Glass, Earthenware and Porcelain	(1.5%)	(1.5%)	54.2	45.8	10.4	33.5	1.9
Machinery/Equipment	(4.9%)	(4.8%)	66.3	33.7	6.5	24.8	2.5
Electric/Electronic Products	(2.3%)	(2.7%)	79.4	20.6	4.9	15.3	0.4
Other Metallic Products	(2.7%)	(2.9%)	24.8	75.2	5.2	67.4	2.7
Others	(2.9%)	(2.0%)	43.6	56.4	23.3	32.4	0.7

Note 1: Percent Share in (): within "Manufacturing"

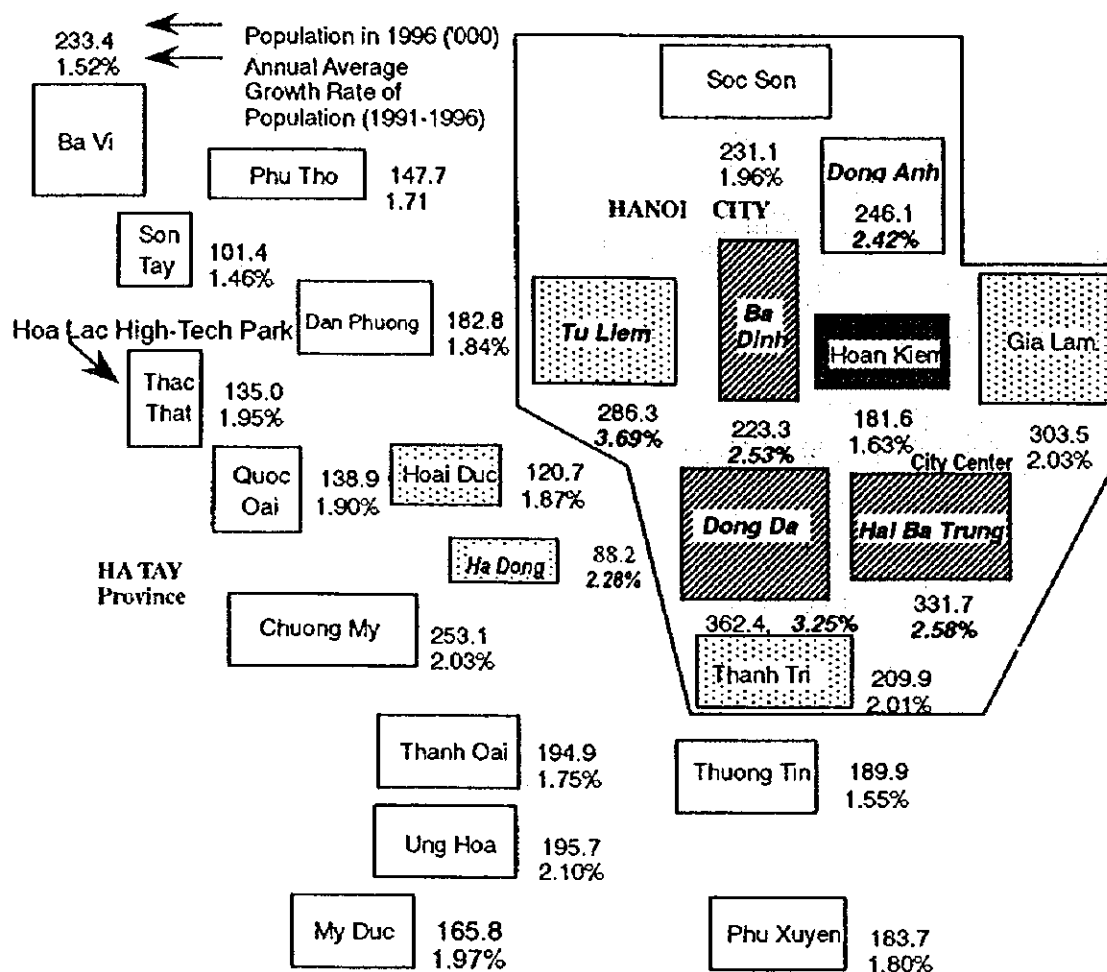
Note 2: Machinery/Equipment = general machinery, transport equipment and precision instruments

Source: Statistical Yearbook 1996 (General Statistical Office)

Table 2-2-1 Main Attributes of High-Tech Industry and Issues Toward the High-Tech Industrialization in the Hanoi/Ha Tay Area



Source: JICA Study Team



Note 1: This "italic" signifies the districts, of which population increase rate was more than the national average (2.14%: annual average rate between 1991 and 1996).

Note 2: Size of square roughly represents the population size.

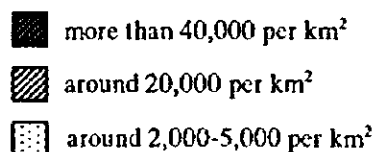


Figure 2-1-1 Population, Population Growth by District of Hanoi/Ha Tay

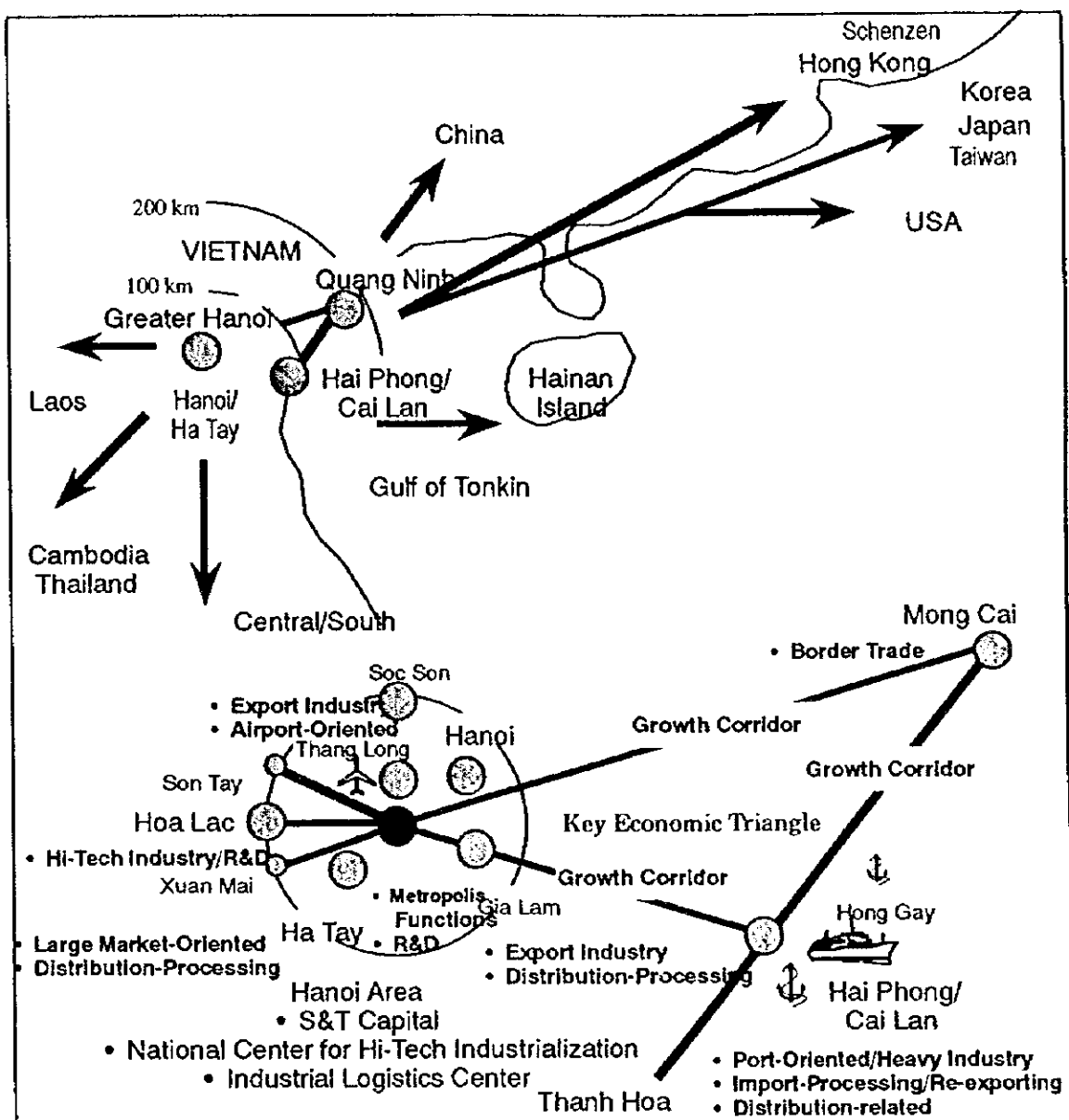


Figure 2-2-1 Formation of the Red River Delta Region-Growth Corridor



III. CONDITIONS FOR THE DEVELOPMENT OF THE HOA LAC HIGH-TECH PARK

HHTP is expected to be developed in line with relevant projects in order to efficiently develop infrastructure and increase development effects, as mentioned in Sub-section 2.2.3. Probably based on such considerations, master plans for Hanoi city and the Mieu Mon-Xuan Mai-Hoa Lac-Son Tay area were formulated. HHTP is a component of the integrated project in the Hoa Lac area, Ha Tay province, which includes land development for university, housing, and IZ.

This chapter outlines the present situation of the HHTP project site, reviews the current status of relevant plans and infrastructure development, and estimates the site demands which is a critical condition for the HHTP development.

3.1 Present Situation of the HHTP Project Site

HHTP is planned to be developed at the site with an area of around 1,600 ha situated in Hoa Lac, Thach That district, Ha Tay province; about 30 km west of Hanoi city, along national road 21A in the west and the highway under construction in the south.

The site, which extends over the five communes of Ha Bang, Thach Hoa, Tan Xa, Binh Yen, and Co Dong, is mostly hilly land. The Tan Xa Lake is the largest among the lakes with the same water system used for agricultural and domestic purposes. Households and inhabitants in the site including a part of its surroundings numbered 2,583 and 10,853, respectively. The main stay is agriculture as shown in the land use presented in the table below. Public use accounts for a sizable portion of the total land use. Conditions of the HHTP site for industrial location are summarized below:

Outline of the HHTP Project Site as of April 1997
(including a part of its surroundings)

	House- hold	Popu- lation	Land and Land Use (ha)						
			Total	Agricul- ture	Forestry	Resi- dence	Public Use	Military Use	Others
Total	2,583	10,853	1,908	915	296	175	252	111	156
Ha Bang	381	1,409	242	170	0	25	30	0	16
Thach Hoa	453	1,459	458	226	66	32	19	73	73
Tan Xa	638	2,924	582	216	126	39	171	0	18
Binh Yen	951	4,361	458	246	64	53	31	4	4
Co Dong	160	700	167	57	40	25	0	34	45

(Percent Shares)

	House- hold	Popu- lation	Land Use Structure (%)						
			Total	Agricul- ture	Forestry	Resi- dence	Public Use	Military Use	Others
Total	100.0%	100.0%	100.0%	(48.0)	(15.5)	(9.2)	(13.2)	(5.8)	(8.2)
Ha Bang	14.8%	13.0%	12.7%	(70.2)	(0.0)	(10.3)	(12.4)	(0.0)	(6.6)
Thach Hoa	17.5%	13.4%	24.0%	(49.3)	(14.4)	(7.0)	(4.1)	(15.9)	(15.9)
Tan Xa	24.7%	26.9%	30.5%	(37.1)	(21.6)	(6.7)	(29.4)	(0.0)	(3.1)
Binh Yen	36.8%	40.2%	24.0%	(53.7)	(14.0)	(11.6)	(6.8)	(0.9)	(0.9)
Co Dong	6.2%	6.4%	8.8%	(34.1)	(24.0)	(15.0)	(0.0)	(20.4)	(26.9)

Note: Details may not add up to totals due to rounding.

Source: JICA Study Team

- The ground is solid with N standard of 12 to 20 according to a boring survey conducted in July/August, 1997 under this Study, and the project site has no problem for factory construction. Solid ground is one of the advantages for location of high-tech industries such as precision processing which is highly sensitive to vibration and industries using highly precise equipment.
- Tapped water is not available. Groundwater is available but not abundant, being estimated to be around 3,000 m³ per day based on the boring survey conducted in February/March, 1997 as a portion of the Study. Tapping of surface water of the Tan Xa Lake is possible but it has problems such as seasonal fluctuation, usage for irrigation and necessity to maintain the water level within some limits to keep a good landscape. Accordingly, water supply should be facilitated from other sources for the HHTP development.
- Roads within the site are poor due to spontaneous origin. In addition to improvement and pavement of existing roads, new road development is essential for the HHTP development.

- Telephone is not popular and just installed at limited places such as office of the People's Committee of communes. Telecommunications facilities and network should be established for the HHTP development.
- Power transmission lines (6 kV and 10 kV) of EVN run through the site but a substation should be constructed for the HHTP development.

The site has no problem for location of high-tech industry in terms of linkage with Hanoi, of which mother city functions will be easily utilized by HHTP through its integration with Hanoi, since Hanoi city center and the site will be connected by 30 minutes with a minimum traveling speed of 100 km per hour, after the completion of the highway now under construction. On the other hand, the site abounds in good natural environment, and is also surrounded by a scenery landscape worth seeing. The site of HHTP is expected to be developed to be more attractive by adding some artificiality.

It should be noted that around 10,000 people are living in the HHTP site in clusters. HHTP should be developed in such a way that the land to be developed will exclude the existing clusters of living people as much as possible. Additionally, relocators should be not only compensated based on relevant regulations, but also be provided with housing and measures for restructuring their livelihood.

3.2 Review of Relevant Plans

3.2.1 Hanoi Master Plan

The Hanoi Master Plan is outlined in Table 3-2-1. The population of Hanoi increased at an annual rate of 2.53% from 1991 to 1996, largely exceeding the national average of 2.14% (refer to Sub-section 2.1.2.). Assumed to increase annually at the past rate of 2.5%, the population of Hanoi will amount to 4.28 million in 2020 from 2.38 million in 1996. In the case of a 2.0% growth rate, it will be 3.82 million in 2020.

The Hanoi city center is already demographically saturated. Further concentration of people will aggravate negative effects concomitant to overconcentration. On the other hand, increasing population is a symbol of economic vitality of the city. Conclusively speaking, the issue on Hanoi's development is to rectify negative effects caused by the overpopulation while strengthening its urban functions and keeping its economic growth. Within this context, a balanced development between the city center and its suburban areas is essential. The Hanoi Master Plan, which is a sort of guideline or grand design, was formulated to address the said issue. Spatial population distribution and development of functions in the Plan are summarized below:

- The Hanoi city center: It will accommodate a limited number of people, 800,000 in 2020 from 910,000 in 1994, and will specialize in functions related to government administration and business.
- The right and left banks of the Red River: Both are situated in suburban areas of the city center, and will functionally play the role of a part of the city center. The areas on the right bank will accommodate a total of 1.7 million people in 2020, and will be developed as new urban areas with good living conditions including facilities for education, recreation, sports, culture, and urban resort, among others.

The South Thang Long New City Center is planned to be developed in the South Thang Long Bridge area and is a big project with investments worth a total of USD 2.1 billion for 50 years by a joint venture of an Indonesian company and the Hanoi Infrastructure Investment Company under the Hanoi Construction Committee.

The left bank of the Red river connected to the Hanoi city center by a bridge is planned to be "New Hanoi" with a total population of 0.7 million in 2020 through the development of an urban center integrating an industrial zone, a goods distribution center, and other functions in the North Thang Long Bridge area.

- Balancing urban groups: These groups comprise two series of cities. One is the urban center along the national road 18, and the other is the urban corridor along national road 21A, Mieu Mon-Xuan Mai-Hoa Lac-Son Tay. The urban center along the national road 18 is planned to consist of the four cities of Soc Son, Xuan Hoa, Dai Lai, and Phuc Yen, of which population will be 0.5 million in 2020. Along with Gia Lam and Sai Dong in the northern part of the left bank area, this center will absorb sizable industrial investments, since it has a good access to Hanoi city, Hanoi (Noi Bai) International Airport, and Hai Phong port. The national road 21A urban corridor is included in a plan to develop new cores including the HHTP site. It is outlined in the next Sub-section 3.2.2 below.

Figure 3-2-1 illustrates the spatial distribution of urban population in and around Hanoi City, and the location of HHTP, which is based on the master plan.

3.2.2 Master Plan of Mieu Mon-Xuan Mai-Hoa Lac-Son Tay (National Road 21A Urban Corridor)

This Master Plan was approved by the Prime Minister in June 1997, and a ceremony for official announcement of the Plan was held in August 1997. The plan is

titled "The Corridor of Towns for the 21st Century," and also could be called "21/21 Urban Corridor," mainly because the Corridor with towns along national road 21A is an urban development project toward the 21st century. In the meantime, this project is hereinafter called "National Road 21A Urban Corridor."

The National Road 21A Urban Corridor is outlined in the table below. It is a big project to build a center pole for socioeconomic development of Vietnam in the 21st century, and to develop a new urban center with a targeted total population of 1 million in 2020 by properly absorbing and directing the increased population to the west of Hanoi (refer to Sub-section 2.1.2.). The Hoa Lac area, where HHTP is planned to be developed, is a core of the corridor with a targeted population of 670,000. This is to create a "New City" to the west of Hanoi.

Outline of Master Plan of Mieu Mon-Xuan Mai-Hoa Lac-Son Tay
(National Road 21A Urban Corridor)

	Existing Population (1,000) 1996	Population (1,000)			Required Land Area (ha)		
		Short term 2005	Medium term 2010	Long term 2020	Short term 2005	Medium term 2010	Long term 2020
Framework (Total)	100	285	620	1,000	6,000	11,000	17,500
1. Son Tay Town (Industrial, tourism, and service center)	40	60	80	100	700	800	900
2. Hoa Lac New City (National center of industry, tourism, culture, science and hi-tech R&D, and training)	44	150	420	670	3,900	8,000	12,200
2-1 Dong Xuan Residential Area		68	280	400	800	2,700	3,600
2-2 Hanoi International University		5	10	20	100	200	300
2-3 VN National University-Hanoi		30	60	110	500	1,000	1,200
2-4 Hoa Lac High-Tech Park (area of the Tan Xa lake)		22	35	45	800 (300)	1,200 (300)	1,800 (300)
2-5 Phu Cat Industrial Zone (IZ)		5	10	15	600	850	1,200
2-6 Dong Mo Resort - Binh Yen Residential area (tourism, sport, and entertainment) (area of the Dong Mo lake to be developed)		20	25	80	900 200	1,750 300	3,500 600
3. Xuan Mai Town (Economic, industrial and commercial service center)	15	60	100	170	1,000	1,500	2,500
4. Mieu Mon Town (International airport/aviation service center)	1	5	10	30	400	700	1,600
Du Phong (Mieu Mon airport)		10	20	30	 (300)	 (300)	 (1,000)

Source: Master Plan of Mieu Mon-Xuan Mai-Hoa Lac-Son Tay
(Ha Tay People's Committee and Ministry of Construction, August 1997)

According to the Plan, each area will be developed as follows: (population as of the year 2020)

- Micu Mon area: With a total population of 30,000, it will be a center of aviation service, tourism, and resort. Aviation service is expected to grow linked with an international airport, which will be developed after 2010. Resort facilities such as villas and the like are expected to be developed around the Dong Xuan Lake.
- Xuan Mai area: With a total population of 170,000, it will be an economic, industrial, commercial, and service center. The Tui Xuan Tienh area is planned to accommodate such industries as mechanical engineering, construction materials industry, consumer goods manufacturing, and goods distribution (warehouse) business.
- Hoa Lac area/New City: With a total population of 670,000, it will be a national center for industry, tourism, culture, science and high-tech R&D, and training. Its components are the HHTP site and five sites for the university area, Phu Cat IZ, Dong Xuan residential area, and Dong Mo Lake resort. In the university area, relocation of VNUH and AITCV is planned. The establishment of a cultural village in the Dong Mo resort area was already approved by the Prime Minister for implementation. The Phu Cat IZ, which is to be developed by a joint venture with a Korean company, is under feasibility study, but the Ha Tay Planning and Investment Service was already established, and started its investment promotion.
- Son Tay: With a total population of 100,000, it will be an industrial, tourism, and service center. There is the site of an ancient castle, and it is expected to be developed as a historical and cultural tourism center.

Relocation of VNUH and AITCV as well as HHTP is a main component in the development of Hoa Lac New City. This relocation project is outlined in the following sub-section.

3.2.3 Relocation Plan of VNUH and AITCV

VNUH is a distinguished university in Vietnam ranking with the Vietnam National University-Ho Chi Minh, and comprising the five universities of general education, natural science, social science and humanity, pedagogy, and foreign languages. Additionally, five new universities are planned to be established; law, economics/business, technology, agriculture/forestry, and pharmaceuticals/medical science. Consequently, VNUH will have 100,000 students in 2020. VNUH has a plan to strengthen its R&D functions as shown in the next table.

Outline of VNUH's Future Plan

			Number of students			
			1996	2005	2010	2020
Univer-	Existing	Total	15,000	27,000	66,000	100,000
sities						
		General Education	8,000	15,000	30,000	
		Natural Science	1,500	1,800	4,000	
		Social Science and Humanity	2,000	2,000	4,000	
		Teacher Education/Pedagogy	2,000	3,000	5,000	
		Foreign Languages	1,500	2,000	4,000	
	Newly	Law			3,000	100,000
	Estab-	Economics/Business			4,000	
	lished	Technology including Geology/Mining		3,200	5,000	
		Agriculture/Forestry			4,000	
		Pharmaceutics/Medical Science			3,000	
Research Institutes						
• Basic Research/Science, Technology, Environment/ Resources, R&D, and Pedagogy			→	2,500	5,000	8,000

Source: Vietnam National University Hanoi (VNUH)

Such strengthening is a big project involving 100,000 students in 2020, i.e. more than six times the number of existing students, and its cost is estimated to be USD 10 billion. VNUH has planned to relocate in the university area in Hoa Lac New City, since there is no room in its three campuses scattered in Hanoi, of which area totals 37 ha. This relocation will contribute not only to rectifying the overconcentration in Hanoi, but also to rationalizing the operation of VNUH through the integration of ten universities. In addition, it should be noted that the New City has been targeted to be a national center for science, R&D, and manpower training could not be materialized without an organic/complimentary linkage between HHTP and VNUH; the latter is to be relocated in the university area neighboring on the HHTP site.

In addition to VNUH, AITCV has also a plan to relocate in the university area, and to open a master degree course for 120 students as well as 50 short courses and seminars in 2000. It will cost USD 6 million according to AITCV. After 2000, a total of USD 11 million will be invested in expansion of buildings for research and dormitory, and in construction of facilities including library, computer center, and sports facilities. The site will be free of charge, and its final area will be 148 ha.

It is reported that the Prime Minister issued the decision to approve the Master Plan of VNUH with an area of 1,000 ha in Hoa Lac New City in January 1998. The Master Plan incorporates the cooperation/linkages between HHTP and VNUH through networking of R&D, prototype fabrication, manufacturing as well as manpower training and the joint use of relevant equipment/facilities. In this respect, VNUH is to focus its activities on the hi-tech fields such as informatics/electronics/telecommunications,

biotechnology, new materials, mechatronics and so on, while other universities will be in charge of conventional fields like chemicals, mechanics, metallurgy, etc.

3.2.4 Infrastructure Development Plans Relevant to HHTP

(1) Transportation

It is necessary to develop the various infrastructures to realize the urban plans, accumulate population, and attract high-tech industries to Hoa Lac and its suburbs. Particularly the most important development is a high-speed transportation network and a telecommunications network. The city planning includes the development of the following transportation systems. It would be desirable to construct these systems and put into service as soon as possible.

Among road development/improvement projects, the most important one is the highway project among Hanoi City – Hoa Lac – Bavi that is the largest transportation project to realize a commuting system between the capital and Hoa Lac. Other road development/improvement projects are: the construction of the national road 18 of 130 km long between Bac Ninh and Com Pha; the widening of the section of the national road 5 between Hanoi – Hai Phong of 105 km long; the widening of the section of the national road 6 between Hanoi – Hoa Binh of 40 km long to 33 m wide; the widening the section of the national road 21A between Son Tay and Mieu Mon as well as the construction of bridges in this section.

For railroad improvement, a new railroad construction project to link Bavi tourism area and Hoa Lac with Hanoi has surfaced. This will enable commutes between Hoa Lac and Hanoi. Early commencement of the project are desired.

As for airport/heliport projects, there is a plan to build the second international airport at an appropriate location near Mieu Mon where the former airport once existed. Time required from Hoa Lac, where HHTP will locate, to the site of the airport is only 20 to 30 minutes. Early construction of the second airport is desired to attract high-tech industries to HHTP. Besides, a new heliport has been planned in the Hoa Lac area for civilian use by converting the Hoa Lac military heliport. Short-distance high-speed transportation system would support the production and R&D activities of high-tech industries. Early realization of this infrastructure plan is desired.

(2) Water Supply

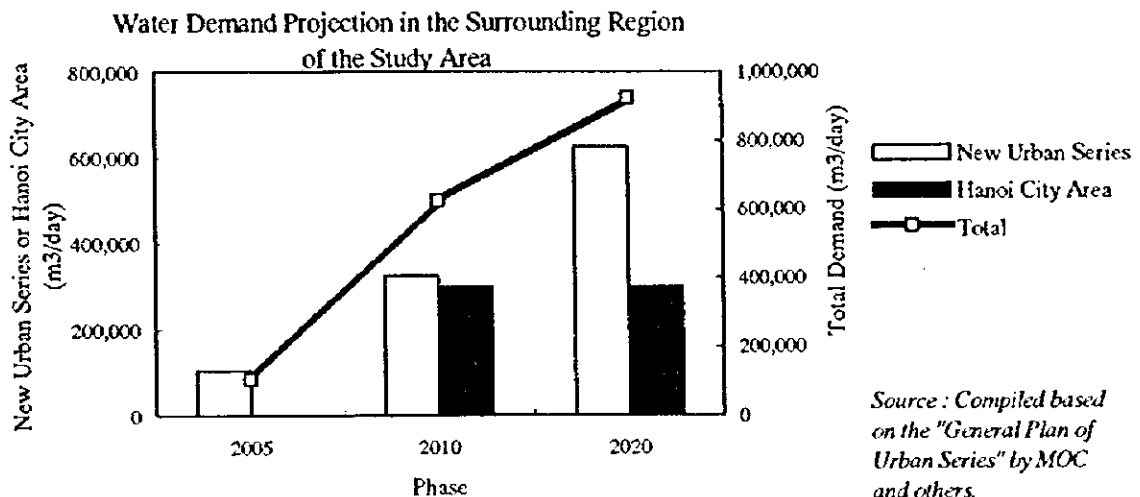
1) Present situation and related projects

In Ha Tay province, Ha Dong town and Son Tay town are equipped with a piped water supply system. However, the majority of other areas in the Study Area

are relying on unprotected individual water provision which uses groundwater extracted by shallow wells and surface water from streams and ponds, like other rural areas in Viet Nam.

The "General Plan for the Development of the New Urban Series including Son Tay, Hoa Lac, Xuan Mai and Mieu Mon" has been formulated by the Ministry of Construction (MOC). Water supply for the new urban series in 2020 is required for about one million people in total according the General Plan. Besides this, the "Hanoi Master Plan to the Year 2020" proposed by MOC calls for the development of the Da River water resources in order to replenish the present groundwater reserve for water supply to the Hanoi City Area for the period of 2010 and afterwards.

Based on the urban development plans mentioned above, the water demand for the region surrounding the Study Area containing the new urban series and the Hanoi City Area is foreseen to reach 925,000 m³/day in 2020 as shown below and detailed in Table 3-2-2.



2) Water resources and reserves

Groundwater

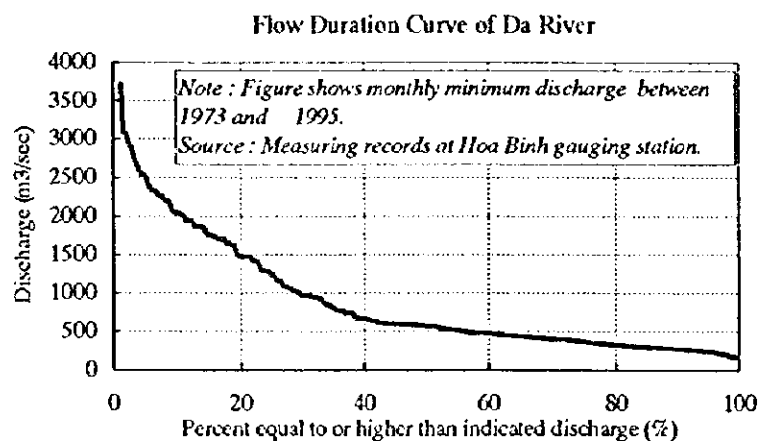
According to previous surveys, a large water-bearing formation layer called "Vinh Phuc-Hanoi aquifer" is encountered in the Red River delta region. This aquifer presently contributes to major water sources for such large centers in this region as Hanoi City, Ha Dong town, etc. According to the results of previous

pumping tests conducted in the vicinity of the Study Area, the underground water reserve around the Study Area appears to be limited, if ever it is available. This is because Hoa Lac is located at the border of the Vinh Phuc-Hanoi aquifer. In terms of groundwater quality, it has been known that the Vinh Phuc-Hanoi aquifer often produces saline water and water with high iron and/or high manganese concentration beyond drinking water standards, depending on the region. In order to sound the groundwater reserve and water quality in the Study Area, a series of groundwater exploitation tests were carried out during the Study, as detailed in Appendix IX.

Surface Water

Apart from groundwater, a number of candidate surface water resources including rivers and lakes exist in the vicinity of the Study Area. As for lake water, the Suoi Hai Lake and the Dong Mo Lake lying outside the Study Area and the Tan Xa Lake inside are endowed with a large storage volume. Constraint is, however, existing in utilization for water supply purpose, since these lakes are functioning at present as major reservoirs for irrigation of nearby paddy fields and for flood prevention in the region. With respect to river water, the Red River should be placed at a lower priority due to the wide fluctuation of water stage, high turbidity resulting in heavy silting and the concerns on high concentration of iron and manganese. On the other hand, the discharge of the Tich River is likely to be insufficient to cover the foreseeable water demand in the region.

The Da River lying some 20 km west of the Study Area is regarded as the most promising water source with a huge minimum discharge of about 150 m³/s which is enough to satisfy water demand of the region, as shown below.



The Da River is endowed with relatively stable water level and low suspended solid concentration as referred to Table 3-2-3, resulting from the function of the Hoa Binh Reservoir located upstream. The Da River provides several candidate sites of water intake near cities along it, running almost parallel to the planned development areas in the new urban series as shown in Figure 3-2-2. Generally, of the construction cost required for water supply system, a large portion is occupied by water conveyance pipes for water transportation from the intake site to the water service area. Thus, the construction of a number of water intakes and water plants along the Da River, which is proximate to the respective towns, is considered to be advantageous, taking into consideration the economical effect on the water supply work in the region.

(3) Sewerage and Drainage

1) Sewerage

In Vietnam, there is presently no wastewater treatment system for either urban wastewater or industrial wastewater except rare special cases. It is widely known that direct discharge of wastewater results in serious environmental degradation of surface water and groundwater which is regarded as the most serious environment pollution in this country. Almost all domestic wastewater in Ha Tay Province is discharged into public waterways without treatment, thus there is a risk that domestic water extracted from shallow wells in densely populated areas in the Study Area is polluted by wastewater infiltration.

Wastewater will be generated in the HHTP area through industrial and research activities, living activities of the people concerned, etc. Sewerage facilities accompanied by wastewater treatment equipment should be developed in order to preserve the water environment of the Tan Xa Lake in the Study Area and the Tich River flowing along the Study Area and also to conserve the hygienic conditions of research and industrial activities and living environment of the people.

2) Drainage

The HHTP area is located at an elevation of 10 m to 20 m + MSL (Mean Sea Level), except for lowlying paddy fields. Stormwater in the HHTP area is drained to the Tich River running some 2 km east of the HHTP area through its tributary streams. Based on the records of water stage measured at the gauging station on the Tich River, there is a few possibility that the Study Area suffers from flooding.

The Tan Xa Lake is functioning as a water reservoir for rainwater and a water source for irrigation of the surrounding paddy fields at present. These roles will continue even after the Study Area has been developed. Considering that the rainwater runoff coefficient will be increased by the development, a number of retention ponds will be constructed to maintain the peak flow within the same level as the present.

(4) Electricity

At present, the Hanoi area is supplied with electricity from EVN's power system of the Northern region. The Hoa Binh hydropower plant (1,920 MW) and Pha Lai coal thermal power plant (440 MW) are main supply sources. Since the Hoa Binh power plant's 8 generating units with a capacity of 240 MW each have been put into full operation in 1994, the capacity of the electric power system of the Northern region has been strengthened and the system meets the growth of demand. Additionally, the Pha Lai 2 thermal power plant with a capacity of 600 MW is expected to be commissioned by 2000. Other potential hydropower resources include the Son La power station (3,600 MW) on the Da River, Ban Mai power station (600 MW), etc. Consequently, there would be no shortage on the power generation side, though the future power balance of EVN should be considered, including the energy supplied to the Central and Southern regions through the 500 kV transmission line.

Power consumers in Hanoi can receive electricity from the three major 220 kV substations of Ha Dong (2 x 125 MVA), Chem (2 x 125 MVA), and Mai Dong (2 x 125 MVA). Ha Tay province receives energy from the power system via the Ha Dong and Mai Dong 220 kV substations. There are four 110 kV substations in the province at present. The Son Tay 110 kV substation (2 x 16 MVA), located at Son Tay, is fed with electric power from the Ha Dong substation by a 110 kV single line transmission line (AC120). The Son Tay and Hoa Lac areas are being supplied with electricity from the Son Tay substation via a 35/10/0.4 kV distribution system. The Xuan Mai area receives electricity from the 35 kV main bus of the Ha Dong substation. 220 kV transmission lines of single circuit (1 x AC 500) and of double circuit (2 x AC500) are running across the Xuan Mai area. One is the Hoa Binh - Chem line, and the other is Hoa Binh - Ha Dong line. The Institute of Energy (IOE), which is an agency of EVN, has a plan to develop an additional power system for energy supply to the projected areas as follows:

- Increase capacity of Ha Dong 220 kV substation to 2 x 250 MVA: by the year 2000.

- Construction of an additional 220 kV transmission line (1 x AC500) between Hoa Binh and Ha Dong: 2000.
- Increasing the capacity of Son Tay 110 kV substation to 56 MVA: 1998.
- Construction of new 110 kV substations at Xuan Mai (1 x 40 MVA), Hoa Lac (1 x 40 MVA) and Dan Phuong (1 x 25 MVA), connected with the Ha Dong substation: (2000).

It would be required, however, to construct new major 220 kV substations at the site and additional 110 kV substations, considering energy supply to the whole development area of Hanoi National University, new urban, industrial zone and High-Tech Park. The 220 kV substations will be connected to the 220 kV grid in the Northern region, and supply power to the 110 kV substations in the development area.

(5) Telecommunications

The Department General of Posts and Telecommunications (DGPT) is the government administration in charge of nationwide policy formulation of postal services, telecommunications and radio frequency management. Vietnam Posts and Telecommunications Corporation (VNPT) is a state-owned enterprise responsible for the development, management and operation of the telecommunications network under the control of DGPT. Actual operation of the telecommunications network is mainly done by the following financially dependent subsidiaries.

- Vietnam Telecoms International (VTI): international telephone services.
- Vietnam Telecoms National (VTN): long distance telephone switching systems, transmission systems.
- Vietnam Data Company (VDC): Data communication services.
- Hanoi P&T (HPT), HCM P&T and Provincial P&T: telephone and postal services.

As of 1996, VNPT operated about 1,186,000 telephone subscribing lines nationwide, with a telephone density of 1.56 sets per 100 population. The DGPT's targeted density by the year 2000 and 2010 is 6 sets and 20-25 sets per 100 population, respectively. In the Northern region telecommunications network, each province is linked with a regional telecommunications centre in Hanoi city by long distance transmission lines.

The Ha Tay provincial telecommunications centre is located in Ha Dong city and connected with the Hanoi telecommunication centre by 34 Mb/s optical fibre cables.

There are remote exchange stations near the development area: Son Tay (2,000 lines), Thach That (500 lines), Xuan Mai (500 lines). These remote stations are controlled from the Ha Dong telecommunications centre through 2 Mb/s microwave at present.

Considering the telecommunications demand of the whole development area, it is recommended to install some local switches, connected with the Ha Dong telecommunications centre by optical fibre cables. In order to meet requirement of high-speed international data communication in future, installation of optical fibre cable lines for the exclusive use of HHTP/Hoa Lac city to connect the site with Hanoi city seems necessary.

3.2.5 Issues toward Implementation of Relevant Plans

Plans reviewed so far could be classified as follows:

- Plans for comprehensive regional development: the Hanoi Master Plan, and the Master Plan of Mieu Mon-Xuan Mai-Hoa Lac-Son Tay including the Hoa Lac New City
- Component projects of the above plans; relocation of VNUH and AITCV, and development of HHTP
- Infrastructure development to frame the above plans or to support the above component projects
- Among issues to be addressed for the implementation of these plans and projects, the main issues will be as follows:

(1) Consistency between Planning and Individual Projects in the Hoa Lac New City Development

A project to develop a 18-course golf course in the planned Dong Xuan residential area was already approved by the Ha Tay People's Committee in July 1997, and is now under feasibility study.

The Dong Xuan area is a new town in the Hoa Lac New City, and is planned to accommodate 68,000 people within the site of 800 ha up to 2005. The golf course under feasibility study is planned to be developed in an area of 150 ha, which accounts for 15% of the total area of Dong Xuan. If it is developed, it will result in a change in planning of the Dong Xuan residential area, and will affect the development plan of the Hoa Lac New City as a whole.

It is not a focal point whether development of golf course is good or not. A focus should be put on consistency between planning and individual projects against it. It is

pointed out that such inconsistent projects have been prioritized among many plans in Vietnam, not limited only to the case of Dong Xuan. As a matter of fact, flexibility is sometimes necessary for implementation of plans. However, it should be noted that if individual projects inconsistent with the plan are continuously prioritized, planning is meaningless.

(2) Utilization of Various Sources for Funds and Mobilization of Various Methods for Project Implementation

The plans already reviewed contain many projects for infrastructure development. However, the most critical issue on infrastructure development in Vietnam is shortage of implementation funds. Investment outlays of the Government of Vietnam totaled USD 20.9 billion in 1995 as shown in the next table, which is equivalent to 28 USD per capita/year. This is not so small in percentage, as it accounted for more than 5% of per capita GDP. The investment outlays were allocated as follows: 42% for industry, 18.6% for transport, and 13.0% for post and telecommunications. In terms of per capita outlays, around 5 USD/year and 4 USD/year were allocated for transport, and post and telecommunications, respectively. Such an amount is absolutely small to develop good infrastructure in both quality and quantity, even taking in account the cheap construction cost in Vietnam. The Hanoi-Hoa Lac Highway is now under construction with the national budget, and would be completed within 1999, two years later than the initial target due to the lack of budget. On the other hand, there are projects deadlocked among big joint venture projects with foreign capital, since both sides could not reach a solution on who should bear the cost for relevant infrastructure development.

Investment Outlays of the Government of Vietnam (1995)

(in current prices)	Investment Outlays		Percent Shares	By Government	
	(bill. dong)	(bill. USD)		Central	Local
Total	22,963.0	2,087.5	100.0	61.6%	38.4%
Agriculture/Forestry	2,650.2	240.9	11.5		100.0%
Industry	7,022.2	638.4	30.6	68.8%	31.2%
Construction	549.9	50.0	2.4	49.6%	50.4%
Transport	4,276.7	388.8	18.6	52.9%	47.1%
Postal Service and Telecommunications	3,180.8	289.2	13.9	94.7%	5.3%
Trade/Material Supply	510.1	46.4	2.2	48.0%	52.0%
Other Products	103.5	9.4	0.5		100.0%
Housing/Public Service/Tourism	274.7	25.0	1.2	3.2%	96.8%
Science	166.7	15.2	0.7	90.4%	9.6%
Education/Training	1,043.1	94.8	4.5	25.5%	74.5%
Culture/Art	728.2	66.2	3.2	41.8%	58.2%
Health/Social Insurance/Sports	559.0	50.8	2.4	31.4%	68.6%
Finance/Banking/Insurance	26.8	2.4	0.1		100.0%
State management	1,707.1	155.2	7.4	70.2%	29.8%
Other Non-Material Products	163.9	14.9	0.7	47.0%	53.0%

Note 1: 1 USD = 11,000 dong

Note 2: Industry includes manufacturing, mining, and electricity/gas/water supply.

Source: Statistical Yearbook 1996 (General Statistical Office)

In order to address the difficulties, the Government of Vietnam has been active in the establishment of infrastructure development companies, adoption of business corporation contract (BCC) and build, operate, transfer (BOT), mobilization of ODA funds, but there are the following problems:

- BCC is highly effective to mitigate Vietnam's budget constraints, since projects under BCC are hardly invested by the Vietnamese side, to which invested facilities belong, and by which the project is operated. BCC is accordingly limited to highly profitable projects such as telecommunications development. A high rate of telephone charge has also contributed to such high profitability.
- Some BOT projects could not be implemented on schedule. As an example, a planned seaport development under BOT system in the Southern region could not progress. Among many reasons, it is considered that the BOT investor is reluctant to invest before the market conditions are matured.

As such, while addressing budget constraints as well as the situations mentioned above, the measures below should be adopted so as to effectively put forward the plans and infrastructure development relevant to HHTP:

- Full utilization of ODA Funds: Timing is the most important factor in infrastructure development. Investors decide to construct factories on the condition that infrastructure development progress on schedule. If it is delayed the cost for factory operation will increase and depress the factory management. When such delay becomes popular and continued, investment in Vietnam as a whole might decrease, since investors will be discouraged in further investment, partly based on exchange of information among them. ODA for infrastructure development is centered on loan, but is effective for on-schedule implementation of projects. Accordingly, ODA should be mobilized for the projects such as expressway and water supply projects.
- Integrated or combined development of several projects: This aims to ensure economic feasibility of the component projects as a whole through absorbing profit from some projects, and returning it to the developer. To this end, several projects are combined together as follows:
 - Railway and housing: A railway project is in general less profitable,

since it is a public service. However, if it is developed in combination with a housing project in the areas along the railway and the terminal, its profitability will be improved. Such railway development may be combined not only with housing, but also with amusement facilities and a big shopping center in and around the station so as to increase passenger demand during daytime.

- International seaport/airport and goods distribution center, industrial estate: This combined development is well exemplified by development projects in coastal areas of Japan, Singapore, and the Clark Field in the Philippines. Singapore has developed an integrated sea and air transport system many years ago, with a management body in charge of both airports and seaports. The system has been successful.
- Golf course and hi-grade residence: This is already very popular across the world, and has a merit to decrease loans for the project by utilizing funds from and deposit for membership. In addition to hi-grade residence, combined development with an industrial estate may be effective also in view of investment promotion, if the golf course is near the estate site.
- Combined development of international exhibition hall, conference hall and hotel: This is targeted at generating guest demand for the hotel, and is popular across the world, particularly in USA, Europe, and Japan.
- Research & resort: This is targeted at increasing the value-added and profitability of the "Research Park" project through the combined development with resort, which mitigates "technostress" stemmed from R&D activities. This idea might be borrowed from Nice-Sophia Antipolis in France.
- Combined development of industrial estate and university: Mutual benefit is one of the objectives; locators can easily use functions provided by the university such as manpower development and R&D, and the estate is a place of business for the university. This is a sort of synergy effects. An example in the Silicon Valley (Stanford University and its industrial park) is quite well known as the original of this type of development. It is not rare in USA that developers provide the university with free land in and around the site of the industrial estate with an aim to increase its value, and then succeed in inviting enterprises in it.

Such an integrated/combined development of several projects is also applied to the development of the Hoa Lac New City and HHTP in national road 21A Urban Corridor, and is considered to be applicable to other projects, e.g., the Hanoi-Hoa Lac railway combined with housing development, and an international airport combined with an airport-oriented industrial estate in Mieu Mon.

(3) Consensus between People Concerned for Relocation Projects

VNUH will relocate to the Hoa Lac New City, but to date there seems to be still no positive response among teachers and students, probably because the relocation has been put forward in a top-down way. Teachers have yet worried about moving from existing living places, even though they are provided free land for their house as already proposed. It is questionable whether students will move there from Hanoi that is attractive for them, even if new dormitories are provided.

Relocation of national R&D institutes has been also considered, but has the same problems as VNUH. Relocation of AITCV depends on consensus between the donor countries which mostly bear its budget. Accordingly, such relocation plans should get consensus so as to satisfy the people concerned toward their implementation. To this end, an attractive and reasonable incentive or measure should be prepared for them; teachers and students in VNUH, and R&D staff in national institutes.

(4) Detailed Planning and Substantially Effective Coordination

Comprehensive regional development mostly comprises several projects under the control of different government agencies, e.g., in the case of the Hoa Lac New City, HHTP under the direct state management by MOSTE and VNUH under MOET, road development under MOT, water supply and drainage under MOC or otherwise under the People's Committee, and the like. As such, coordination is essential between the government agencies toward the planned development of the Hoa Lac New City; coordination for reasonable functional sharing between projects, including coordination between their components and scales, and coordination for implementation schedules to be timely synchronized.

In the meantime, some government agencies in Vietnam constitutionally lack the budget for project implementation. If budgeted, the project is highly dependent on loans from abroad due to insufficiency of own budget. It has happened sometimes in putting forward comprehensive regional development plans in Vietnam that coordination between the component projects just results in exchange of comments.