

Japan International Cooperation Agency (JICA)

**Haiphong People's Committee
Socialist Republic of Vietnam**

**The Study
on
Sanitation Improvement Plan for Haiphong City
in
The Socialist Republic of Vietnam**

FINAL REPORT

MAIN REPORT

VOLUME 1: SANITATION MASTER PLAN

July 2001

Nippon Koei Co., Ltd.

EX Corporation

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LIST OF REPORTS

SUMMARY

MAIN REPORT

Volume 1 Sanitation Master Plan

Volume 2 Feasibility Studies for the Priority
Projects

SUPPORTING REPORT

DATA BOOK

Note: All the figures shown in the tables of the reports were set or estimated by the JICA Study Team in case data sources are not written.

EXCHANGE RATE FOR COST ESTIMATION

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PREFACE

In response to a request from the Government of the Socialist Republic of Vietnam, the Government of Japan decided to conduct the master plan and feasibility study on Sanitation Improvement for Haiphong City and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team headed by Mr. Masatoshi Akagawa, Nippon Koei Co., Ltd., consisted of Nippon Koei Co., Ltd and EX Corporation to the Socialist Republic of Vietnam, three times between March 2000 and July 2001. In addition, JICA set up an advisory committee headed by Mr. Masami Mizuguchi, Environmental Administration Specialist of Institute for International Cooperation, between March 2000 and July 2001, which examined the study from technical point of view.

The team held discussions with the officials concerned of the Government of the Socialist Republic of Vietnam, and conducted field surveys at the study area. Upon returning to Japan, the team conducted further studies and prepared this final report.

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

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

July, 2001



Kunihiko Saito
President

Japan International Cooperation Agency

July, 2001

Mr. Kunihiko Saito
President
Japan International Cooperation Agency
Tokyo, Japan

Dear Sir,

LETTER OF TRANSMITTAL

It is a great pleasure that we submit to you the Final Report of the Study on Sanitation Improvement Plan for Haiphong City completed by the Study Team with cooperative efforts of Haiphong People's Committee (HPPC) and other parties concerned. The report has been prepared for the Government of the Socialist Republic of Vietnam to contribute to the implementation of the effective sanitation improvement plan in the HPPC area.

The report consists of four volumes of the Summary, Main Report, Supporting Report and the Data Book. The Summary presents the outline of the study results and the Main Report gives all the study results regarding sanitation improvement. The Supporting Report describes the results of field surveys conducted during the study period, implementation of pilot projects, environmental impact assessment and detailed data for cost estimation. The Data Book presents the useful reference data relevant to the Study.

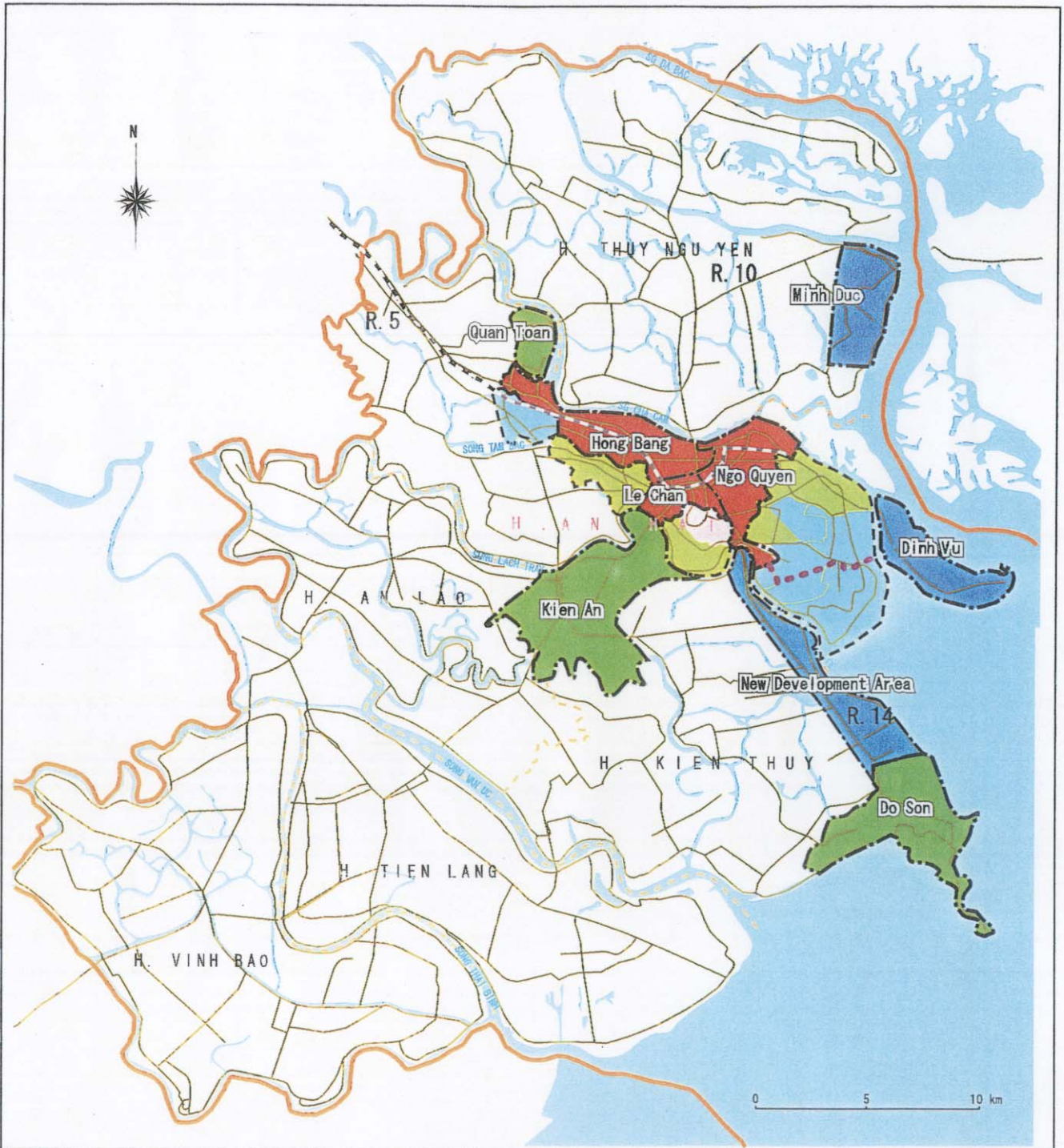
Taking this opportunity, on behalf of the Study Team, I would like to express my heartfelt gratitude to the personnel from JICA, Advisory Committee, Ministry of Foreign Affairs, Ministry of Environment, Ministry of Health, Labour and Welfare, Embassy of Japan in Vietnam and JICA Vietnam Office and Steering Committee / Project Management Unit and other Vietnamese officials concerned who extended the kind assistance and cooperation to the Study Team for the entire study period.

The Study Team hopes that the results of this study will contribute to the implementation of sanitation improvement project in Haiphong City, Vietnam.

Yours faithfully,



Masatoshi Akagawa
Team Leader
The Study on Sanitation Improvement Plan
for Haiphong City



Legend



Study Area



Effective Study Area



To the south of this boundary line
i.e., Trang Cat commune, only for
solid waste management study

Study Area Expanded Area

Zone A



Zone B



Zone C



Study Area and Effective Study Area

**THE STUDY ON SANITATION IMPROVEMENT PLAN FOR HAIPHONG CITY
IN THE SOCIALIST REPUBLIC OF VIETNAM**

FINAL REPORT

MAIN REPORT

VOLUME 1: SANITATION MASTER PLAN

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Abbreviations

Government of Vietnam/Public Institutions

DI	:	Department of Industry
DARD	:	Department of Agriculture and Rural Development
DOC	:	Department of Construction
DOF	:	Department of Finance
DOH	:	Department of Health
DOSTE	:	Department of Science, Technology and Environment
EMD	:	Environmental Management Division
GOV	:	Government of Vietnam
HP	:	Haiphong
HPPC	:	Haiphong People's Committee
MOC	:	Ministry of Construction
MOF	:	Ministry of Finance
MOI	:	Ministry of Industry
MOSTE	:	Ministry of Science, Technology and Environment
MPI	:	Ministry of Planning and Investment
NEA	:	National Environmental Agency
NIED	:	National Institute for Educational Development
NIURP	:	National Institute for Urban and Rural Planning
PMU	:	Project Management Unit
SADCO	:	Sewerage And Drainage Company
SC	:	Steering Committee
SCPE	:	Scientific Center for Population and Environment
TEDI	:	Transportation Engineering Design Institute
TUPWS	:	Transport and Urban Public Works Service
URENCO	:	Urban Environment Company
VIWASE	:	Vietnam Institute for Water and Sanitation Engineering
WSCO	:	Water Supply Company

International / Foreign Organizations

ADB	:	Asian Development Bank
AIT	:	Asian Institute of Technology
ASEAN	:	Association of Southeast Asian Nations
AusAID	:	Australian Agency for International Development
CIDA	:	Canadian International Development Agency
DIDC	:	Department for International Development Cooperation of the Ministry for Foreign Affairs of Finland
EU	:	European Union
FINNIDA	:	Finnish International Development Agency
IBRD (WB)	:	International Bank for Reconstruction and Development (World Bank)

IFC	:	International Finance Agency
JBIC	:	Japan Bank for International Cooperation
JICA	:	Japan International Cooperation Agency
NGO	:	Non-Government Organization
OECD	:	Organization for Economic Cooperation and Development
SIDA	:	Swedish International Development Agency
UNDP	:	United Nations Development Program
UNICEF	:	United Nations Children's Fund
UNIDO	:	United Nations Industrial Development Organization
WB	:	World Bank
WHO	:	World Health Organization

Peculiar Abbreviations for this Study

City MP	:	Haiphong City Master Plan
DVEZ	:	Dinh Vu Economic zone
NDA	:	New Development Area
NUA	:	New Urban Area
OCC	:	Old City Center
SA	:	Study Area
SMP	:	Sanitation Master Plan
The Study	:	The Study on Sanitation Improvement Plan for Haiphong City
The JICA Study Team	:	The JICA Team for the Study on Sanitation Improvement Plan for Haiphong City

Others

ADWF	:	Average Dry Weather Flow
AIDS	:	Acquired Immuno- Deficiency Syndrome
AJ	:	Aerated Jokaso
AL	:	Aerated Lagoon
AnA	:	Anaerobic Aerobic Process
ARI	:	Average Recurrence Interval
AS	:	Activated Sludge
ASP	:	Activated Sludge Process
BOD	:	Biochemical Oxygen Demand
BOT	:	Built, Operate, Transfer
C	:	Carbon
CAS	:	Conventional Activated Sludge
CCTV	:	Closed Circuit Television
CECS	:	Center for Environmental Chemistry Studies
CEST	:	Center for Environmental Science and Technology
CH ₄	:	Methane
Cl	:	Chlorine
CNMS	:	Customer Network Management System

CO ₂	:	Carbon dioxide
COD	:	Chemical Oxygen Demand
CPP	:	Contact Purification Process
CRES	:	Center for Regional and Environmental Studies
CSO	:	Combined Sewer Overflow
CW	:	Constructed Wetlands
DID	:	Densely Inhabited District
DO	:	Dissolved Oxygen
EAR	:	Environmental Awareness-Raising
EARET	:	Environmental Awareness-Raising, Education and Training
EE	:	Environmental Education
EIA	:	Environmental Impact Assessment
EMP	:	Environmental Master Plan
ES	:	Executive Seminars
F/S	:	Feasibility Study
FC	:	Fecal Coliform
GDP	:	Gross Domestic Product
GRP	:	Gross Regional Product
H	:	Hydrogen
HCMC	:	Ho Chi Minh City
HDPE	:	High Density Poly-Ethylene
HIV	:	Human Immunodeficiency Virus
HPWSSP	:	Haiphong Water Supply & Sanitation Program
IDF	:	Intensity-Duration-Frequency
IEE	:	Initial Environmental Examinations
IUPM	:	Industrial and Urban Pollution Management
LEP	:	Law on Environmental Protection
LM	:	Laboratory and Monitoring
M/P	:	Master Plan
MEIP	:	Metropolitan Environmental Improvement Program
MT	:	Membrane Technology
MWSP	:	Modified Waste Stabilization Pond
N	:	Nitrogen
NE	:	North East
NH ₄	:	Ammonium
NRW	:	Non-Revenue Water
O	:	Oxygen
O&M	:	Operation & Maintenance
OD	:	Oxidation Ditch
ODA	:	Official Development Assistance
P	:	Phosphorous
PDWF	:	Peak Dry Weather Flow
PP	:	Poly Propylene

PS	:	Pumping Station
PVC	:	Poly Vinyl Chloride
RBC	:	Rotating Biological Contactor
SEDS	:	National Socio-Economic Development Strategy
SOE	:	State Owned Enterprises
SOP	:	Standard Operation Procedure
SP	:	Stabilization Pond
SPP	:	Sewerage Priority Project
SS	:	Suspended Solids
STW	:	Sewage Treatment Works
SW	:	South West
SWM	:	Solid Waste Management
SWS	:	Solid Waste Services
SWTC	:	Solid Waste Treatment Complex
TC	:	Total Coliform
TCVN	:	Vietnam Standard
TEQ	:	Toxic Equivalents
TMS	:	Time and Motion Survey
T-N	:	Total Nitrogen
T-P	:	Total Phosphorous
TSP	:	Total Suspended Particulate
TWAP	:	Treated water from Aeration Pond
TWPP	:	Treated water from Precipitation Pond
UASB	:	Up-flow Anaerobic Sludge Bed (Reactor)
UFW	:	Unaccounted For Water
VAT	:	Vietnam-Australia Training Project
VCEP	:	Vietnam Canada Environment Project
VIP	:	Ventilated Improved Pit (Latrine)
WSP	:	Waste Stabilization Pond
WTP	:	Water Treatment Plant
WWTP	:	Waste Water Treatment Plant
1A	:	Vietnam Three Cities Sanitation Program: Haiphong Component (Water Supply Phase 1)
2A	:	Vietnam Three Cities Sanitation Program: Haiphong Component (Water Supply Phase 2)
1B	:	Vietnam Three Cities Sanitation Program: Haiphong Component (Drainage & Sewerage)

Units of Measurement

T/Y	:	tonnes per year
°C	:	degrees Celsius
g/d	:	grams per day
Gm	:	Gram
ha	:	Hectare
kg	:	kilo gram
km	:	kilo meter
km ²	:	Square kilo meter
lpcd	:	liter per capita per day
m	:	Meter
m ²	:	square meter
m ³	:	cubic meter
m ³ /d	:	cubic meter per day
mg/l	:	milligram per liter
Nm ³	:	Normal cubic meter
pg	:	Picogram
t/m ³	:	tonnes per cubic meter
US\$:	United States Dollar
VND	:	Vietnamese Dong
wt%	:	weight percent

PART 1 INTRODUCTION

CHAPTER 1 INTRODUCTION

1.1 Background of the Study

To improve the environmental condition in Haiphong City, the Government of Vietnam requested the Japanese Government to prepare a sanitation improvement plan for Haiphong in September 1997. In March 1999, the Japanese Government sent the project finding team to Vietnam to grasp the background for the request and to have discussions on possible responses to the request. As a result, the Japanese Government decided to implement a study on Haiphong City sanitation improvement plan in Vietnam including water supply system, drainage improvement, sewerage development and solid waste management. Accordingly, the Japanese Government dispatched a Preparatory Study Team in November 1999, to discuss the Scope of Work (S/W) for the Study on Sanitation Improvement Plan for Haiphong City in the Socialist Republic of Vietnam. Both parties discussed the S/W and reached an agreement. Accordingly, S/W for the Study on Sanitation Improvement Plan for Haiphong City in the Socialist Republic of Vietnam was signed on December 2, 1999 in Haiphong, Vietnam. the field work for the Study commenced in March, 2000.

1.2 Objectives of the Study

The objectives of the “Study on Sanitation Improvement Plan for Haiphong City in the Socialist Republic of Vietnam” (herein referred to as the “Study”) comprises the following three main components:

- To formulate a sanitation improvement plan for Haiphong City (Sanitation Master Plan: SMP) covering water supply, drainage, sewerage and solid waste management system
- To conduct a feasibility study of priority projects related to drainage and sewerage and/or solid waste management
- To transfer technology to the counterpart personnel in the course of the Study

It should be noted that a pilot project was carried out comprising a) small size contact purification facility and b) small size activated sludge plant with a view to transferring the appropriate technology for water purification and raise environmental awareness of the citizens and people concerned with the environment in Haiphong City.

1.3 Definitions of the Study Area

Basic concept to set up the Study Area and its definition are as follows.

1.3.1 Study Area

The Study Area (SA) for the Study agreed in the Scope of Works covers the area of the four urban districts, Do Son town, new development area and newly planned industrial area comprising Quan Toan, Minh Duc, and Dinh Vu as shown in figure below.

1.3.2 The Effective Study Area

However, the Vietnamese side and the Japanese side agreed that some areas located outside of the Study Area would also be considered for certain aspects by means of the data provided by HPPC, taking the following into account:

- Secure continuity of sanitation improvement plan worked out for the SA
- Take into account the demand generated in the area whose facility plan should be an integral part of the overall plan for the SA

To be specific, under category (i) above, certain areas adjacent to the existing three urban districts of Hong Bang, Ngo Qyen and Le Chan, which are growing fast and likely to be integrated into three urban districts in the future, are considered for sanitation improvement planning. Namely;

-South of Hong Bang

Nam Son Commune., An Dong Commune.

-South of Le Chan

Du Hang Kenh Commune., Vinh Niem Commue.

-Southeast of Ngo Quyen

Dong Hai Commune., Dang Lam Commune., Dang Hai Commune., Nam Hai Commune.

Under category (ii), Trang Cat commune in An Hai district was considered for solid waste management planning from the view point of solid waste generation volume which should be considered in to determine the capacity of the Trang Cat landfill located in the same commune.

These areas are as shown in following figure together with SA and called the Augmented Study Area (ASA). The SA and ASA is called the Effective Study Area (ESA). The total area of ESA is 209.21 km² and the Study was carried out, in principle, for ESA. For convenience, Effective Study Area (ESA) is hereafter called as Study Area (SA).

1.4 Target Year

Considering coordination with the relevant plans and programs, in particular the Haiphong City Master Plan for the year 2020, and practical time range for the future projection, the target year for the Study was set at 2020. As a mid-term target, the year 2010 was selected. For short-term plans, the year 2005 was adopted.

1.5 Cooperation Extended by the Vietnamese Government

As agreed in the Scope of Works, counterpart personnel and office space as well as office assistants are duly provided through the Project Management Unit (PMU). Data and information requested during the first work in Vietnam were also provided.

1.6 Preparation of Donor Map

1.6.1 Activities of International Donors

Several projects and studies related to water supply, sanitation and solid waste as well as environment and institutional improvement have been carried out in Haiphong under the assistance of the international and bilateral donors such as the World Bank, WHO, UNDP, IFC, DIDC (formerly called FINNIDA; hereafter the name of FINNIDA is used in the JICA Study reports for convenience), CIDA and AusAID. Activities of these donors are explained hereunder.

Projects Conducted by International Donors

Sector	Donor	Activities	Imp. Period
Water supply, sanitation and solid waste	DIDC (= FINNIDA)	Haiphong Water Supply and Sanitation Programme (HPWSSP) (Phase I – III, IV)	1990 - 2000, 2001 – 2004
	DIDC / WB	Haiphong Water Supply and Environment Project Feasibility Study	1994 - 1995
	DIDC / WB	Haiphong Water Supply and Environment Project (1A Water Supply Project) Detailed Design	1996 - 1998
	WB	Haiphong Water Supply and Environment Project (1A Water Supply Project) Construction	1999 – 2002
	DIDC	Haiphong 2A Water Supply Project Feasibility Study	1999 - 2000
	DIDC / WB	Vietnam Three Cities Sanitation Project – Haiphong Component (1B Project) Feasibility Study	1997 - 1998
	DIDC / WB	Vietnam Three Cities Sanitation Project – Haiphong Component (1B Project) Detailed Design	1998 - 2000
	WB	Vietnam Three Cities Sanitation Project – Haiphong Component (1B Project) Construction	2001 – 2005
	WB	Strategic Municipal Solid Waste Management Planning Project	1999 – 2000
Environment	CIDA	Vietnam – Canada Environment Project (VCEP)	1996 2005
	ADB	Coastal and Marine Environmental Management in the South China Sea	1998 –
	Netherlands / AusAID/ WB	Metropolitan Environmental Improvement Program (MEIP)	2000 – 2001
	WHO	Pilot Project for Environmental Health in Ngo Quyen District	1998 – 2000
Institutions, management	UNDB	Pilot Public Administrative Reform Project in Haiphong	1999 –
	AusAID / IFC	Haiphong Pilot SOE Equalization Project	1999 – 2001
Others	JICA/JBIC	Improvement Project of Haiphong Port	1993 –
	JICA/JBIC	Improvement Project of National Road No.5	1994 – 1999
	JICA/JBIC	Improvement Project of National Road No.10	1997 –

The programs and projects can be classified into three sectors: water supply, sanitation and solid waste projects, environmental projects and institutional projects. Besides international projects, environmental surveys e.g. pollution source investigation and air and water quality monitoring are conducted by DOSTE or through DOSTE.

1.6.2 Donor Map

Status of the above projects and studies is presented in Table 1.6.1. The projects and studies carried out by international donors are summarized as shown in donor map (Figure 1.6.1).

1.6.3 Outline of Water Supply, Sanitation and Solid Waste Projects

The Finnish Government has conducted through Department for International Development Cooperation of the Ministry for Foreign Affairs of Finland (DIDC, former FINNIDA) several water supply, sanitation and solid waste related projects starting from 1990.

(1) Haiphong Water Supply and Sanitation Programme (HPWSSP)

Haiphong Water Supply and Sanitation Programme (HPWSSP) has been proceeding since 1990. HPWSSP includes water supply, sanitation and solid waste components. During Phase I 1990 – 1992 the main tasks were preparation of a Water Master Plan, and preparation and implementation of a crash rehabilitation program. During Phase II 1993 – 1997 the main tasks have been further improvement of the service level and organizational and institutional development of HPWSCO and construction and rehabilitation of a water supply network implementing the phuong model. Phase III 1997 – 2000 has focused on strengthening HPWSCO in parallel with the implementation of Haiphong Water Supply and Environment Project (1A Water Supply Project) financed by the World Bank. Sanitation component has concentrated on improvement of urban sanitation through flood protection, rehabilitation of sewerage and drainage system and development of solid waste management. About 3,000 bucket latrines have been converted into septic tanks in the city center. Phase IV 2001 – 2004 will concentrate on further strengthening of institutional capacity of SADCO to implement the “Three Cities Sanitation Project Haiphong Component (1B Project)” financed by the World Bank.

(2) Haiphong Water Supply and Environment Project (1A Water Supply Project)

The World Bank financed Haiphong Water Supply and Environment Project (1A Project) started by preparation of a feasibility study in 1994 – 1995. Detailed design was done in 1996 – 1998 and construction started in 1999 and will continue until the end of 2002. The project comprises upgrading An Duong water treatment plant, construction of a new raw main and new transmission lines, improvement of distribution network, rehabilitation of service network.

(3) Haiphong 2A Water Supply Project

The next phase of water supply project, 2A Water Supply Project, is in feasibility study phase. The proposed project will improve the water supply services in those urban areas, which are not included in the previous projects including construction of new water treatment plant and aim at extending the service area of HPWSCO.

(4) Vietnam Three Cities Sanitation Project – Haiphong Component (1B Project)

The feasibility study of 1997 – 1998 identified priority of investment projects, assessed the institutional and financial feasibility, and examined environmental impacts of the project. The design phase during 1998 – 2000 included necessary investigations and analysis, detailed design, preparation of technical specifications and bills of quantities and bidding documents. The construction phase financed by the World Bank will be 2001 – 2005. The project includes cleaning and inspection of sewers, construction of interceptor sewers, and dredging of channels of lakes including construction of sludge treatment facilities.

(5) Strategic Municipal Solid Waste Management Planning Project

A pilot project for solid waste management guidelines funded by the World Bank.

1.6.4 Outline of Environmental Projects

Several nation-wide and provincial environmental projects have been conducted in cooperation with Haiphong DOSTE.

(1) Vietnam – Canada Environment Project (VCEP)

The CIDA-funded Vietnam Canada Environment Project (VCEP) Haiphong Component includes three main components: environmental monitoring including Demonstration Project on Air Quality; industrial and urban pollution management; and environmental impact assessment training. Phase I was carried out in 1996 – 2000 and Phase II will be in 2000 – 2005.

(2) Metropolitan Environmental Improvement Program (MEIP)

The objectives of the Metropolitan Environmental Improvement Program are: assist HPPC to develop environmental management strategies and action plans (in the context of urban and industrial development); strengthen the institutional and legislative framework for environmental planning, monitoring and enforcement; identify and prepare high priority investment projects; promote community-led efforts; develop training programs on environmental protection for various concerned offices; and initiate cross-country exchange of lessons and information. The three components of the project are: 1) develop Environmental Strategy and

Action Plan for Environmental Protection, 2) implement community based projects in four phuongs at a budget for each phuong if US\$15,000, and 3) community participation and education. The governments of the Netherlands and Australia are jointly funding the program. The World Bank is the executor of the program.

(3) Pilot Project for Environmental Health in Ngo Quyen District

In cooperation with WHO, Ministry of Health and Haiphong Health Service, a pilot project was carried out in Ngo Quyen district. The target of the pilot project is to increase public awareness in markets, schools, hospitals etc. concerning the cleanness of the city.

1.6.5 Outline of the Institutional Projects

(1) The Pilot Public Administration Reform Project in Haiphong

The UNDP project includes the improvement of the following key areas: private sector involvement in the provision of urban services; legal requirements for the introduction of socialization into public service provision; public-private-community relationship in the provision of public services in Haiphong and prospects for socialization; efficiency of public service contracts and overview of the economic and policy issues; financial requirements to be met in the socialization process; experiences in the contracting out of government services, and introduction of the organizational manual on socialization.

(2) Haiphong Pilot SOE Equitization Project

Financed by a grant from the Government of Australia through AusAID, the project is being implemented by HPPC with technical assistance from the International Finance Corporation (IFC) of the World Bank Group.

The project aims to establish an auction method of SOE equitization and divestiture that could accelerate the ownership transfer program in Haiphong and be considered for replication throughout the country.

The key components of the project are: creation of a pipeline of state-owned enterprises subject to ownership transfer; introduction of mechanisms and procedures of SOE divestiture through open auctions; capacity-building efforts for government officers involved in SOE divestiture; provision of business management training for the management of targeted SOEs; and conducting public relations and awareness campaign.

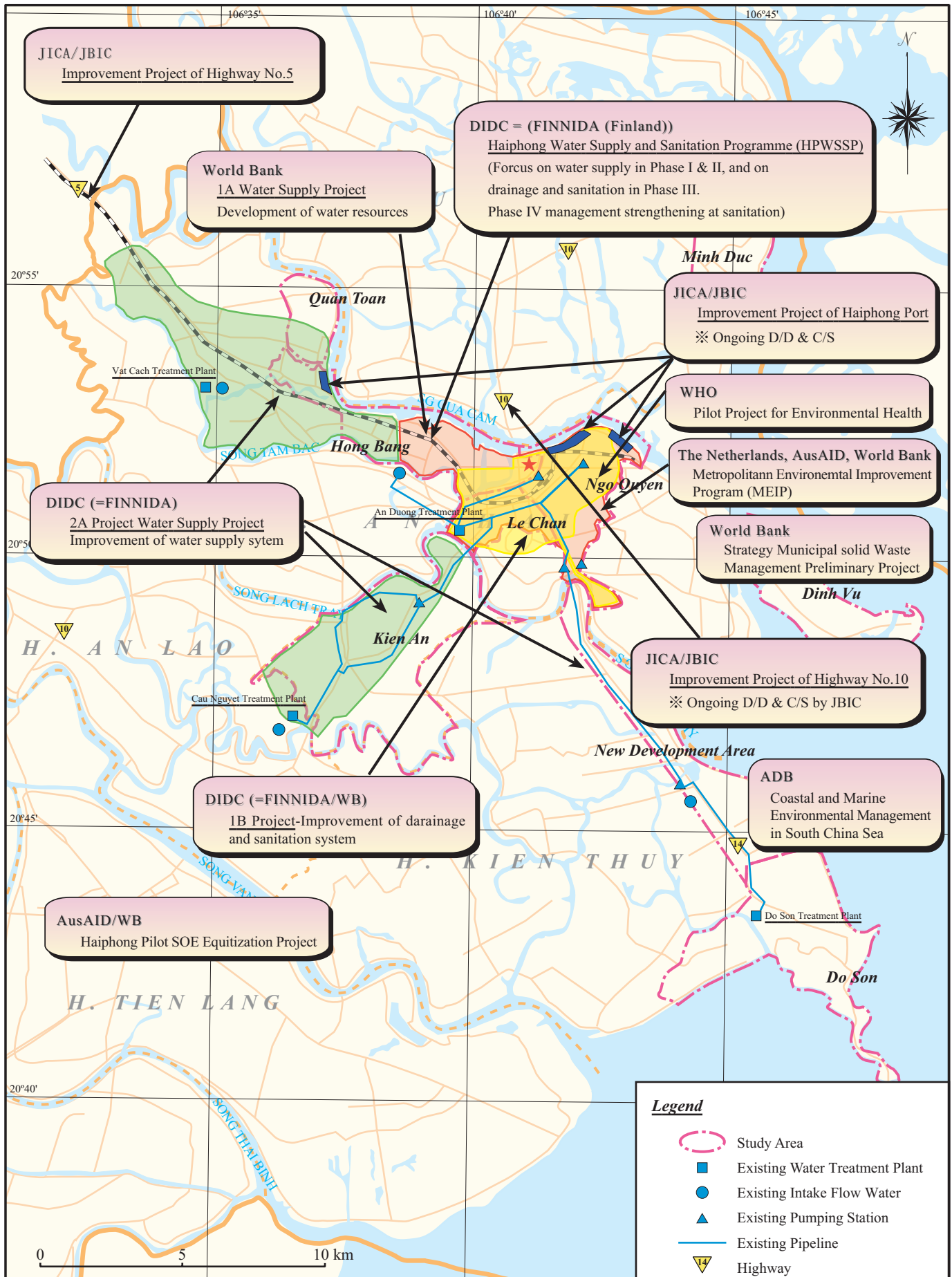
1.7 Required Efforts by the Vietnamese Government/Haiphong People's Committee

If SMP together with the priority projects is materialized as proposed in the Study, current sanitation problems would be solved and future environmental degradation would be avoided. In order to bring SMP into reality, however, it is noted that rigorous efforts of the Haiphong People's Committee and the Government of Vietnam are essentially required to implement the recommendations made in the Study, including:

- To re-organize and reinforce the relevant organizations
- To augment the staffing and provide adequate manpower training for the personnel of the relevant organizations in order to meet the new and increasing needs
- To set up clear policies for the sanitation improvement in the coming years including socialization, cost-recovery and appropriate tariff setting
- To make necessary financing arrangement including these of the Government, HPPC and external aids
- To carry out detailed social and environmental impact assessment and prepare resettlement action plans for the priority projects
- To raise awareness of the citizens, organizations, both public and private, for the improvement of the sanitation and environment of the Haiphong City

Table 1.6.1 Summary of Projects and Studies Conducted by International Donors

Donor	Projects and Studies	Cost (Million USD)	Type of Cooperation	Counterpart Key Agency	Implementation Period	Status
DIDC (=FINNIDA)	Haiphong Water Supply and Sanitation Programme Phase I	4.0	Grant Aid	WSCO	1990 – 1992	Completed
	Phase II	9.0		SADCO	1993 – 1997	Completed
	Phase III	13.0		URENCO	1997 – 2000	On-going
	Phase IV				2001 - 2004	Agreed
DIDC / WB	Haiphong Water Supply and Environment Project Feasibility Study	0.3	Grant Aid	WSCO,SADCO URENCO	1994 - 1995	Completed
DIDC / WB	Haiphong Water Supply and Environment Project (1A Water Supply Project) Detailed Design	0.7	Grant Aid	WSCO	1996 - 1998	Completed
WB	Haiphong Water Supply and Environment Project (1A Water Supply Project) Construction	27.0	Loan	WSCO	1999 – 2002	On-going
DIDC	Haiphong 2A Water Supply Project Feasibility Study	0.3	Grant Aid	WSCO	1999 – 2000	On-going
DIDC / WB	Vietnam Three Cities Sanitation Project – Haiphong Component (1B Project) Feasibility Study	1.6	Grant Aid	SADCO	1997 – 1998	Completed
DIDC / WB	Vietnam Three Cities Sanitation Project – Haiphong Component (1B Project) Detailed Design	0.1	Grant Aid	SADCO	1998 – 2000	Completed
WB	Vietnam Three Cities Sanitation Project – Haiphong Component (1B Project) Construction	40.0	Loan	SADCO	2001 – 2005	Agreed
WB	Strategic Municipal Solid Waste Management Planning Project		Grant Aid	DOSTE	1999 – 2000	Completed
CIDA	Vietnam – Canada Environment Project (VCEP) Phase I Phase II	7.0	Grant Aid	DOSTE	1996 – 2000 2000 – 2005	On-going Planned
		8.0				
ADB	Coastal and Marine Environmental Management in the South China Sea, Feasibility Study	Total 2.8	Grant Aid	DOSTE	1998 -	On-going
The Netherlands / AusAID / WB	Metropolitan Environmental Improvement Program (MEIP)	0.62	Grant Aid	DOSTE	1999 – 2000	On-going
WHO	Pilot Project for Environmental Health in Ngo Quyen District		Grant Aid	Health Service	1998 – 2000	On-going
UNDP	Pilot Public Administration Reform Project		Grant Aid	HPPC	1999 -	On-going
AusAID / IFC	Haiphong Pilot SOE Equitization Project	0.73	Grant Aid	HPPC	1999 - 2001	On-going



The Study on Sanitation Improvement Plan for Haiphong City in The Socialist Republic of Vietnam

Figure 1.6.1

Donor Map

CHAPTER 2 SURVEY WORKS CARRIED OUT IN VIETNAM

2.1 Surveys for Master Plan

2.1.1 Surveys for Environmental Conditions

(1) Interview Survey of 500 Households

Five-hundred (500) households were interviewed in order to gain an understanding of Haiphong citizens' opinion about environmental problems and grasp waste discharge habits. The survey was conducted during the period from 29 May to 13 June 2000. The 500 households subjected to the interview were composed as follows:

- Government house 110
- Private houses in residential areas 130
- Private houses in commercial streets 135
- Houses in polluted area 70
- Houses in rural area 55
- Total (1+2+3+4+5+6) 500

The 500 households selected were from the four (4) urban districts: Hong Bang, Le Chan and Ngo Quyen and one rural district of An Hai.

Forty (40) percent of the interviewees answered that serious pollution existed in their neighboring environment, and 52 % of interviewees answered that pollution exists but it was not so serious. Air pollution, odor, noise and vibration were the major environmental problems according to half of the interviewees.

Concerning the living environment in Haiphong, 18 % of the interviewees answered it was dirty and 70 % answered that it was not so clean, while only 12 % answered that it was clean.

Eighty-six (86) percent of the interviewees were served with URENCO's waste collection service but 46 % of the service recipients were not satisfied with the service. 51 % said they would pay the collection fee if it rises to VND2,000/month, though they feel it is high, and 27 % were willing to pay this fee as they did not think it was too high.

(2) Interview Survey of 100 Factories

One hundred (100) factories were interviewed to identify the type and quantity of industrial solid waste, and to collect information on water supply and wastewater management of the factories. These factories were selected to cover all type of industries existing in Haiphong. The factories subject to the survey are located in Hong Bang, Le Chan, Ngo Quyen, Kien An, industrial areas in Quan Toan and along Do Son road.

A questionnaire was prepared including the following main categories. Interviews were conducted over six weeks in June and July, 2000.

Content of Questionnaire

	Type of question	Number of question
A	Questions concerning factory	8
B	Questions concerning business	3
C	Questions concerning solid waste management	6
D	Questions concerning water supply	6
E	Questions concerning sanitation	4
	Total	27

The total amount of solid industrial waste from the factories subjected to the survey was 11,119 ton/year (30.5 ton/day), of which non-hazardous industrial waste was 9,122 ton/year (25.0 ton/day) accounting for 82 % of the total amount. The amount of hazardous industrial waste was 107 ton/year (0.29 ton/day). Only 7 factories responded that they were producing hazardous industrial waste. The amount of household type waste was 1,890 ton/year (5.1 ton/day).

Thirty-eight (38) factories are producing 100 to 500 m³/month of wastewater. Twenty-four (24) of the factories produce less than 50 m³/month, while 18 factories produce more than 1000 m³/month. Forty-four (44) percent of the factories have one or two septic tanks for wastewater while 7 factories do not.

(3) Survey of Current Environmental Conditions

A survey of current environmental conditions of the study Area was contracted out to the Institute of Chemistry.

To investigate the present environmental conditions, forty (40) water samples and ten (10) sediment samples were collected and analyzed in May – June 2000. The sampling points were selected based on the distribution of pollution sources, the availability of existing data, land use and other factors. The samples were analyzed with the methods designated by Vietnamese Environmental Standard (TCVN 5942-1995) or other international standards, such as ISO and JIS.

Water Sampling and Analysis

Category	Items/Remarks
Sampling	20 locations in 4-5th May, 2000 (dry season) 20 locations in 15-16th June, 2000 (wet season)
Analysis	On-site: temp., DO (mg/l), pH, EC, turbidity, smell, color Laboratory: BOD ₅ , COD, SS, T-N, NH ₄ -N, NO ₃ -N, T-P, PO ₄ -N, SO ₄ , total coliform, fecal coliform, Cd, CN, Pb, Zn, Total Cr, Cr(VI), As, total Hg, Cu, Fe, and oil (n-Hexane extract)

Sludge Sampling and Analysis

Category	Items/Remarks
Sampling	10 locations on 4-5th May, 2000 sampling: grab method, surface
Analysis	Sludge depth, pH, moisture content, volatile solid, total solid, apparent density, BOD _{SED} , COD _{SED} , T-N, T-P, Cd, CN, Pb, Zn, total Cr, and Cr(VI)

Water bodies in the urbanized area (Tien Nga Lake, Sen Lake, Lam Tuong Lake, Du Hang Lake, Dong Khe (NE) Channel, SW Channel and An Kim Hai Channel) are heavily polluted by inflow of untreated sewage, where BOD and COD values exceeded the Environmental Standard (TCVN5942-1995). The coliform level in these water bodies is also high, and exceeds the standard (10,000 MPN) in many places. Nutrients such as nitrogen and phosphorous are also at high level. Ammonia concentration exceeds the Standard TCVN5942-1995 (1 mg-N/L). Eutrophication is observed in An Kim Hai Channel and Tien Nga Lake where water hyacinth is growing uncontrollably and algae bloom was noted.

In less urbanized areas of Kien An, Do Son and other areas, the situation is considerably better, and the pollution problems are localized.

The concentrations of heavy metals and other toxic substances in both water and sediment are generally low and within the Standard.

(4) Source-wise Unit Pollution Load Study

The unit pollution loads from the sources of domestic, commercial, industrial, hospital, office/institutional, tourism, and infiltrated water of sewer were investigated.

In total, 144 water samples were taken from 11 pollution sources at intervals of 2 hours over the duration of 1 day. The flow rates were also measured at the time of sampling. In addition, twelve (12) flow rate measurements were carried out at 3 locations in order to estimate the amount of infiltrated water in sewer lines before and after a large rain event in July, 2000.

Number of Samples and Flow Measurements

Pollution Source	Locations	Samples	Flow Meas.
Domestic	3	36	36
Commercial	2	24	24
Industrial	4	48	48
Hospital	1	12	12
Office/institutional	1	12	12
Tourism/resort	1	12	12
Infiltrated water	3	-	12
Total	14	144	154

Water quality parameters were classified into 3 groups; Group1 for basic water quality, Group 2 for heavy metals and other indicators, and Group 3 for nutrients. All 144 samples were analyzed for Group 1 parameters. In addition, selected

samples were analyzed for Group 2 and Group 3 parameters. All chemical analyses were carried out at the Institute of Chemistry in Hanoi with the methods designated by Vietnamese Environmental Standard (TCVN 5942-1995) or other international standards, such as ISO and JIS.

Analytical Items

Category	Items/Remarks	
Sampling	total 144 samples for water quality analysis sampling : May-June, 2000	
Analysis	Group 1: BOD, COD, SS	144 samples
	Group 2: Fe, Mn, As, Cd, Cr, Cr(VI), Cu, CN, Pb, Hg, F, Cl	4 samples
	Group 3: NH ₄ -N, T-N, T-P	6 samples

1) Domestic Source

The following table summarizes the estimated unit pollution loads from domestic sources.

Calculated Unit Pollution Loads from Domestic Sources

Name	Wastewater	BOD	COD	SS	Remark
	l/c/d	g/c/d	g/c/d	g/c/d	
Multi-Story Apt. 1	128	176	304	401	raw wastewater
Multi-Story Apt. 2	90	30	62	24	after septic tank
Private House	100	15	75	12	gray water only

The pollution loads from the Multi-Story Apt.1 were consistently higher than the expected ranges (BOD 30-50 g/c/d, SS 25-50 g/c/d) for unknown reason. The per capita pollution loads from Multi-Story Apt.2 and Private House were closer to the expected ranges considering the facts that these represented samples after treatment by septic tank or gray water only.

2) Commercial and Institutional Sources

BOD, COD and SS were generally lower than the typical values, partially because the wastewater were pretreated at each institution before discharge.

3) Industrial Sources

Samples were taken from the wastewater of a seafood processing factory, paper mill, an enamel products factory and a brewery.

It was noted that the effluent quality was highly variable from factory to factory. Also it depended strongly on the operating condition of the factory. The wastewater of the seafood processing factory and the paper mill were pretreated before discharge. Factors specific to the factories had to be taken into account to interpret the results.

4) Nutrient Levels

The concentrations of nutrients were generally within the expected pollution load ranges.

5) Toxic Substances

The concentrations of heavy metals in the wastewater from factories and a hospital were generally lower than the discharge standard, TCVN 5945-1995 except for iron and manganese of which the concentration was slightly higher than the TCVN 5945-1995. However, these substances are not as toxic as other heavy metals and they did meet the Japanese discharge standard. Hence, immediate health threat was not anticipated.

2.1.2 Surveys for Drainage and Sewerage

(1) Sewer Line and Drainage Channel Profile Study

The survey was conducted to supplement existing data on sewer line and drainage channel configurations.

Existing data were available for 70 km of main combined sewers and 100 km of branch and tertiary combined sewers in Hong Bang District, Ngo Quyen District, and Le Chan District, including 22 wards.

For drainage channels, existing data were available for 3 km of channels in Le Chan District and 3 km of channels in Ngo Quyen District.

The sewer surveys comprised 394 survey locations in the following areas:

- Main combined sewers on Da Nang Street, Le Lai Street, Le Loi Street, and Lach Tray Street in Ngo Quyen District, and on To Hieu Street and Tran Nguyen Han Street in Le Chan District
- Branch and tertiary combined sewers in 2 wards in Hong Bang District, 2 wards in Ngo Quyen District, 3 wards in Le Chan District, and 4 wards in Kien An District
- Main sewers in Do Son Town

The sewer surveys in Ngo Quyen and Hong Bang Districts were done to supplement existing data. The surveys in the wards in the 4 urban districts and Do Son Town were done because data were not available for these areas.

The channel surveys comprised 106 survey locations in the following channels:

- An Kim Hai Channel
- Channel connecting Northeast (NE) Channel to An Kim Hai Channel
- Channel connecting Southwest (SW) Channel to An Kim Hai Channel
- Phu Luu drainage channel in Kien An District

The drainage channel surveys were done because data were not available for these channels.

Average depth of the sewer inverts and crowns from ground level ranged from 0.88 to 1.68 m and 0.67 to 1.04 m, respectively. Gradient of the sewer lines seems to be small, as the surveyed area is fairly flat.

A large amount of sediment were observed in all of the channels surveyed. The sediments reduces the hydraulic capacity of the channels

2.1.3 Surveys for Solid Waste Management

(1) Study of Leachate from Solid Waste Disposal Site

The survey was conducted in order to evaluate the state of an existing landfill site and the effect on the surrounding environment of the site. The work was contracted to the Institute of Oceanology in Haiphong.

The leachate and ground water were sampled in and around Trang Cat landfill site and the Samples were analyzed at a laboratory

Samples of the groundwater were taken from a well of 10 m depth. The samples were taken in dry season and rainy season.

Number of Samples taken

Season	Leachate	Gutter	Groundwater
Dry	3	None	2
Rainy	3	2	2

Samples of dry season were taken on 22 May 2000, while samples of rainy season were taken in July.

Parameters of water analysis are shown in below.

Parameter of water analysis for leachate and another

Items	Parameter	Unit
1	pH	-
2	Colour	TCU
3	Turbidity	NTU
4	Alkalinity as CaCO ₃	mg/L
5	SO ₄ ²⁻	mg/L
6	BOD ₅	mg/L
7	COD	mg/L
8	TSS	mg/L
9	Oil	mg/L
10	NO ₂ ⁻	mg/L
11	NO ₃ ⁻	mg/L
12	NH ₄ ⁺	mg/L
13	Total-N	mg/L
14	Total-P	mg/L
15	CN ⁻	mg/L
16	Cd	mg/L
17	Pb	mg/L
18	Cu	mg/L
19	Total-Cr	mg/L
20	Cr (VI)	mg/L
21	Zn	mg/L
22	As	mg/L
23	Total-Hg	mg/L
24	Fe	mg/L
25	Coliform	colonies/100mL
26	Fecal Coliform	colonies/100mL

Leachate

BOD, COD, nutrients such as nitrogen and phosphorus, total suspended solid (TSS) and coliforms are high in the leachate of both the Pond 1 and 2.

BOD and COD of Pond 1 did not differ much from those of Pond 2. This suggests that organic matter was not effectively degraded in Pond 1. The ratio of BOD/COD indicates the contents of biodegradable matter. The result suggests that most of the organic matter contained in the leachate may be biodegradable.

Groundwater

Water from the wells and a prawn pond near the landfill site was contaminated with organic matter, ammonia and coliform. A high concentration of chloride and nitrate/nitrite may indicate an influence of river or brackish water or leachate, but the exact source cannot be specified.

(2) Household Waste Generation Survey

The objective of the survey was to estimate the quantity of generation of household waste in Haiphong. The generation quantity is estimated from the following two factors:

- Unit generation rate per person per day by area/house category
- Population by area/house category

The procedure of the survey is as follows:

- Classifying areas and houses
- Selecting houses by category and collecting population data
- Sampling and weighing collected waste
- Estimating the generation quantity for the city

In general, household waste generation depends significantly on the income level of households. The higher the income, the greater the amount of waste generated. However, in Haiphong, as result of a preliminary survey, a different correlation between the two factors was found. The lower the income of household, the larger the quantity of household waste generation. This is mainly because of use of charcoal briquette for cooking in lower income houses.

Furthermore, we also found that there is no reliable data on population by income category in Haiphong. In view of this situation, and considering that the household waste generation quantity differs by types of house/housing area, we categorized houses/area as follows:

- Individual houses in residential area
- Individual houses in residential/commercial area
- Individual houses located on main streets
- Individual state-owned terraced houses
- Multi-storied state-owned apartments
- Farmer's houses

We selected 20 households from each of the 6 categories. A total of 120 households were selected.

The unit generation rates of the two major categories are as follows:

- Non-Farmers' Houses: 523 gram/person/day
- Farmers' Houses: 128 gram/person/day

Total generation amount of household waste in Haiphong City was estimated to be 489 ton/day, of which 217 ton/day was generated in the three urban districts, Hong Bang, Le Chan and Ngo Quyen. An estimated 31 ton/day was generated in Kien An urban district, and 9 ton/day in Do Son Town.

(3) Solid Waste Collection Quantity Survey

A solid waste collection quantity survey was conducted to know waste quantity (weight in terms of ton) collected by the following three companies:

- URENCO (collects waste from Hong Bang, Le Chan and Ngo Quyen urban districts)
- Kien An Urban Works Company
- Do Son Public Works Company

A truck scale was used for measurement. It was a half-scale truck scale rented from the police. The measurement was done during the following periods:

15-21 May for URENCO and Kien An Urban Works Company

23-29 May for Do Son Public Works Company

During the measurement period, URENCO and Kien An Urban Works Company transported all collected waste to Trang Cat landfill site, and Do Son Public Works Company transported collected waste to Do So landfill site.

During the above measurement period, we measured the weight of all vehicles that carried solid waste into the landfill sites. Weight of solid waste carried by a vehicle in one trip was measured by subtracting A from B, where A is weight of vehicle without waste load, and B is weight of the same vehicle with waste load. Weights of vehicle without waste load were measured once for each vehicle.

The aggregate waste amount collected by the three companies is 477 ton/day on average. URENCO collects 367 ton/day; while Kien An Urban Works Company and Do Son Public Works Company collect 61 ton/day and 50 ton/day, respectively.

The survey was conducted in a high season for tourism in Do Son town, the amount of waste generated in Do Son might be higher than average. Average amount throughout the year was estimated to be 44 ton/day, based on the information given by Do Son Public Works Company.

(4) Solid Waste Composition Analysis

The objectives of the survey was to clarify the waste composition carried into the land fill site. The work was contracted out to Haiphong Institute of Oceanology.

About 100 to 150 kg of waste was sampled each time from the compactor of URENCO. The waste was unloaded on to a plastic sheet spread on the ground, then a pile of the waste was divided by a crossing line into 4 smaller piles. Diagonal 2 small piles of 4 were selected and mixed again, and then divided into 4 smaller piles again. This process was repeated until the waste amount of each pile became less than 50 kg. Then one of the pile was selected as a sample. The following parameters were measured and recorded:

- Bulk density on wet base
- Physical composition on wet base
- Physical composition on dry base
- Chemical composition, i.e., water, ash and combustible content

After the measurement of bulk density, the sample was sorted into 12 types of the material following the environmental quality analysis guidelines issued by the MOSTE. The sorted samples were dried at a temperature of 105 °C for 2 days to determine the weight of water. The weight of each component was measured and

a small part of each component was taken to measure ash content. A small sample was put into a crucible and placed in the oven at 800 °C for 3 hours or more to incinerate it. The weight was determined as ash weight.

Bulk density of the samples ranged 0.44 to 0.47 and the average was 0.45. It was remarkable that particles more than 5 mm had a share of 41.16 % on wet basis and 42.97 % on dry basis. The particles larger than 5 mm contained residue of briquettes used for cooking which may contribute to such a large share in weight.

In a chemical composition, water content was about 40 % on average, which could be attributed to the moist garbage.

(5) Recycling Materials Market Survey

The objective of the survey was to estimate the quantity and value of recyclable materials traded in Haiphong. The Kinds of materials surveyed include the following:

- Paper
- Plastics
- Metals
- Glasses
- Food and others

There are some industrial waste materials that are reused or recycled within the factory that generates them, or exchanged/traded between factories without going through intermediary traders. These types of industrial waste materials are out of the scope of the current survey. The survey was conducted in October and November 2000 in Haiphong. The survey contains the following studies:

- Study the structure of the recycle materials market
- Visit and interview with traders of all levels as well as end users of recyclable materials (manufacturers)
- Analysis of the data collected, and make assumptions
- Estimation of quantity and value of recyclable materials collected in Haiphong based on the data and assumptions

Total quantity of recyclable materials collected and traded in Haiphong was estimated to be 13,272 ton/year or 36.4 ton/day on average. This corresponds to about 8.3 % of the waste collected by the URENCO (367 ton/day). Total value of the recyclable materials collected and traded in Haiphong was estimated to be about VND30 billion (approximately US\$2.1 million) per year.

Quantity and Value of Recyclable Materials Collected and Traded in Haiphong

Kinds of Materials	Quantity of Materials (Ton/year)		Value of Materials (VND million/year)	
1. Paper	6,768	(51%)	9,964	(33%)
2. Plastics	3,120	(24%)	11,012	(37%)
3. Metals	2,580	(19%)	8,543	(28%)
4. Glasses	384	(3%)	154	(1%)
5. Others	420	(3%)	479	(2%)
6. Total	13,272	(100%)	30,153	(100%)
7. Total on Daily Base	36.4 ton/day		VND83 million/day	

Note: Major items of "Others" are food, shoes, and duck's feather.

(6) Hazardous Industrial Waste Survey

The objective of the survey was to prepare an inventory of hazardous industrial waste generated in Haiphong City area. The Vietnamese Hazardous Waste Regulation 155/1999 is used for definition and categorization of hazardous waste. The survey was conducted in October and November 2000.

Methods and main procedures of the survey were as follows:

- Identification of all factories in Haiphong that generate hazardous industrial waste
- Based on the following information and procedure, we identified 28 factories together that are listed in Table 1 hereto attached to this section
 - A survey conducted by the JICA Study Team in June 2000 identified 8 factories from 100 surveyed that were generating hazardous waste
 - Information of Haiphong DOSTE, 20 identified additional factories as generating hazardous industrial waste. According to DOSTE's data, no other factories in Haiphong generate hazardous waste
- Visit and interview all the 28 factories identified, and recorded necessary data in the recording sheets
- Analyze data obtained, and compile the inventory

In Haiphong, there are 17 factories which generate hazardous industrial waste. They generate 2.13 ton/ day or 778 ton/year of the hazardous waste. The table below shows the quantity and percentage of recycled or disposed waste.

Quantity and Percentage of Recycled or Disposed Hazardous Industrial Waste

	Generation Quantity		Percentage (%)
	(ton/day)	(ton/year)	
1. Recycled or sold	1.14	415	54
2. Disposed as waste	0.99	363	47
Total (1+2)	2.13	778	100

The three types, with respect to the amount generated, are:

- Leather, rubber, sponge with glue attached , generated at footwear companies (31.6 %)
- Waste oil or cloth containing waste oil (26.7 %)
- Cement fibro board containing asbestos (25.7 %)

2.2 Surveys for Feasibility Study

2.2.1 Drainage Feasibility Study

(1) Topographic Survey

The survey was conducted to prepare maps and cross-section drawings of the existing and planned drainage system in Haiphong.

Survey Area

Name	Area
An Kim Hai Channel	11 km x 50 m both sides Cross Section: 50 m interval
Proposed Phuong Luu Lake	about 100 ha

The survey was carried out in November-December 2000 by a team of local consultants. The survey was done in 2 steps. In the first step, existing maps and other data from local institutes were obtained, and representative cross-sections along the channel were surveyed in order to determine requirements for the detailed survey. Then, the detailed survey was designed and carried out.

The specifications for the topographical survey were made by the Geotechnical and Survey Expert of the JICA Study Team. Field works and collection of existing topographical data were carried out by local staff under supervision of Sewerage and Drainage Planner and Geotechnical and Survey Expert.

Summary of Topographic Survey

Survey Method	Tachymetric method
Instrument	<ul style="list-style-type: none"> • Digital Total Station SET 5E and SET 3100 (JAPAN) • Site Data Input: DR48
Reference Document	<ul style="list-style-type: none"> • Code of setting up topographic map, 96TCN-90 issued by State Topographic Map Measurement Department • Code of setting up land map issued by Land Map Measurement Department

The results of topographical and land use surveys were presented on maps in scale 1:500, which show data of elevations and existing buildings and other structures.

In total, 209 cross-sections were investigated at an average interval of about 50 m. The drawings of channel cross-sections are at scale H: 1:200, V: 1:100. The cross-sectional drawings include the data of water and bottom levels, ground levels on the channel banks, thickness of sediments and locations of existing houses and other structures.

(2) Environmental Impact Assessment

The survey was conducted in order to gather information necessary to assess environmental impact of the proposed project. The survey also included preliminary assessment of the environmental impacts as well as proposal of mitigation measures and monitoring programs.

The survey covers An Kim Hai Channel (about 10 km), proposed Phuong Luu Lake area (about 42 ha), as well as the area benefiting from the project, i.e., the urban center. The survey was designed by the JICA Study Team based on the results of the Initial Environmental Evaluation (IEE) and the results of the discussions with DOSTE and other relevant organizations. The EIA survey was carried out in Nov.-Dec. 2000 by a team of local consultants in accordance with relevant laws and regulations, under the supervision of the JICA Study Team.

Considerable environmental impacts are:

- Resettlement of affected residents along An Kim Hai Channel which is approximately 1,044 households
- Pollution caused by dredging, transportation and disposal of sludge taken from the Channel

To minimize environmental impacts, a number of mitigation measures were proposed including a resettlement plan, air pollution, noise and water pollution control measures and so on. Monitoring programs were also developed so that the environmental impacts during the pre-construction, construction and operation stages of the project can be monitored.

2.2.2 Sewerage Feasibility Study

(1) Topographic Survey

The main objectives of the survey were:

- to identify the locations of existing sewerage and drainage systems
- to know the main directions of water flows
- to produce base maps for the Feasibility Study

The survey areas covered the proposed Vinh Niem WWTP area, 3 alternative locations for a pumping station and sewer lines in urban area (Phase 1 area).

Survey Area

Name	Area
Proposed Vinh Niem WWTP Area	70 ha + surrounding area
Alternative Locations for Pumping Station	3 locations, about 3,000 m ² each
Sewer Lines	Trunk and branch sewers in Phase 1 area (13 phuongs, 11 km ²)

The survey was carried out in November-December 2000 by a team of local consultants. The survey was done in 2 steps. In the first step, existing maps and other data from local institutes were obtained, and representative cross-sections along the channel were surveyed in order to determine the requirements of the detailed survey. Then, the detailed survey was designed and carried out. The specification of the topographical survey has been made by the Geotechnical and Survey Expert of JICA Study Team. Field works and collection of existing data have been carried out by a local staff under supervision of Sewerage and Drainage Planner and Geotechnical and Survey Expert.

Summary of Topographic Survey

Survey Method	Tachymetric method
Instrument	<ul style="list-style-type: none">• Digital Total Station SET 5E and SET 3100 (JAPAN)• Site Data Input: DR48
Reference Document	<ul style="list-style-type: none">• Code of setting up topographic map, 96TCN-90 issued by State Topographic Map Measurement Department• Code of setting up land map issued by Land Map Measurement Department

The total amount of work consisted of 30 km main sewers along 20 main streets in City Center and branch sewers in 13 wards (phuong). Detailed survey of branch sewers was carried out in the following wards: Cau Tre, Du Hang, Dong Hai, Gia Vien, Hang Kenh, Ho Nam, Lac Vien, Lac Tray, Le Loi, Luong Khanh Thien, May To, Trai Cau and Tran Nguyen Han. Base maps (plan drawings) of the main and branch sewer locations were proposed at a scale of 1:500. Longitudinal drawings of the main sewers are also presented in scale H: 1:500, V: 1:100 on the base maps.

The results of topographical and land use surveys for the Wastewater Treatment Plant and alternative sites of the pumping station were presented on maps at a scale of 1:500. The maps included elevations and the locations of existing buildings and other structures.

(2) Geological Survey

The main objective of the survey was to identify the soil conditions and geotechnical design parameters of soil strata at the selected sites of the planned Waste Water Treatment Plant and the main pumping station. The results were used for the preliminary design of foundations and earth works in the Feasibility Study.

The survey was carried out in November-December 2000 by a team of local consultants. In total 8 bore holes were made for the survey.

Number of Bore Holes

Name	Number of Bore Holes	Depth
Vinh Niem WWTP Site	6	About 30 m
Proposed Pumping Station Sites	2	
Total	8	

The location of the Treatment Plant is in Vinh Niem area on the northern side of Lach Tray River and the survey area was about 50 ha. Two alternative sites of a main pumping station were also investigated. Both sites are located along National Highway No 5 at Dong Khe and An Bien Wards.

Soil conditions have been investigated with rotary drillings, with soil sampling and standard penetration tests (SPT) at 3.0 m intervals.

Disturbed soil samples were taken during SPT and undisturbed samples obtained by thin-wall sampling tube. Selected soil samples were tested in soil laboratory and the following physical properties determined:

- specific gravity (G_s)
- particle size distribution
- water content (w , %)
- degree of saturation
- Atterberg limits (w_L , w_P , %)
- Plasticity index (I_P)
- angle of internal friction (ϕ°)
- cohesion (c)
- natural and dry density ($\gamma_{w,c}$)
- void ratio (e_o)
- coefficient of permeability (k , cm/s)
- Compressibility (E , kN/m^2 , C_c)

Angle of internal friction (ϕ) and cohesion (c) were determined with direct shear box test and with tri-axial test and compressibility with two-dimensional compression test (oedometer test).

In addition the following chemical analyses were carried out.

- Ignition loss (% of dry solids)
- Total organic matter (% of dry solids)
- Cation exchange capacity (meq/100 g soil)

The specification of the geological survey has been made by the Geotechnical and Survey Expert of JICA Study Team. Investigation methods and the specification are based on site visits, general geology of the area and on the international and local codes of practice for site investigations. Field work and laboratory tests as well as reporting have been carried out by a local company under the supervision of JICA Study Team.

Character and thickness of each layer can be summarized as in the table below

Layer	Soil Character	Thickness
Layer 1	Backfill, organic clay	0.5 m – 0.9 m
Layer 2	Very soft high plastic clay with some organic	2.3 m – 6.3 m
Layer 3	Very soft low plastic clay with some organic	4.7 m – 6.0 m
Layer 4	Very soft high plastic clay with some organic	1.3 m – 8.5 m
Layer 5	Stiff low plastic clay	2.0 m – 7.6 m
Layer 6	Firm low plastic clay	> 7 m
Layer 7	Stiff low plastic clay	Only in Bore hole No.6

(3) Environmental Impact Assessment

A survey was conducted in order to gather information needed to assess environmental impact of the proposed project. The survey also included preliminary assessment of the environmental impacts as well as proposed a mitigation measures and monitoring programs.

The survey covered the proposed Vinh Niem WWTP area, proposed pumping station area (3 alternative locations in Dang Gian ward), and urban center where sewer lines will be constructed. The survey was designed by the JICA Study Team and based on the results of the Initial Environmental Evaluation (IEE) and discussions with DOSTE and other relevant organizations. The survey was carried out in Nov.-Dec. 2000 by a team of local consultants in accordance with relevant laws and regulations, under the supervision of the JICA Study Team.

Considerable environmental impacts of the project would be:

- Land acquisition (42 ha) and resettlement (23 households)
- Pollution caused by disposal of sludge generated at the WWTP and the sewer lines

To minimize environmental impacts, a number of mitigation measures were proposed including resettlement plan, air pollution, noise and water pollution control measures and so on. Monitoring programs were also developed so that the environmental impacts during the pre-construction, construction and operation stages of the project can be monitored.

2.2.3 Solid Waste Management

(1) Topographic Survey for Trang Cat Landfill

The main objective of the survey was to supplement and up-date the existing maps of the Tran Cat Landfill area. The results of the survey were used in the Feasibility Study.

The survey area covered the proposed Trang Cat Landfill (33 ha) and surrounding area.

Survey Area

Name	Area
Trang Cat Landfill Phase 3 Area	total 150 ha including surrounding area

The survey was carried out in November-December 2000 by a team of local consultants. The survey was done in 2 steps. Firstly, existing maps and other data from local institutes were obtained and representative cross-sections along the channel were surveyed in order to determine the requirements for detailed survey. The detailed survey was then designed and carried out.

The specifications of the topographical survey were made by the Geotechnical and Survey Expert of JICA Study Team. Field works and collection of data were carried out by local staff under the supervision of the Sewerage and Drainage Planner and Geotechnical and Survey Expert.

Summary of Topographic Survey

Survey Method	Tachymetric method
Instrument	<ul style="list-style-type: none"> • Digital Total Station SET 5E and SET 3100 (JAPAN) • Site Data Input: DR48
Reference Document	<ul style="list-style-type: none"> • Code of setting up topographic map, 96TCN-90 issued by State Topographic Map Measurement Department • Code of setting up land map issued by Land Map Measurement Department

The results of topographical surveys for the Tran Cat Landfill area are presented at a scale of 1:500 including data of elevations, dykes, roads, channels and existing structures.

(2) Geological Survey for Trang Cat Landfill

The main objective of the survey was to identify the soil conditions and geotechnical design parameters of soil strata within the planned extension area of the Tran Cat Landfill. The results were used for the preliminary design of the landfill in the Feasibility Study.

In total, 10 bore holes and 2 observation wells were made in and around the proposed Trang Cat Phase III area.

Number of Bore Holes

Name	Number	Depth
Boreholes	10	30-32 m
Observation Wells	2	9 and 43 m
Total	12	-

Soil conditions were investigated by rotary drilling, soil sampling and standard penetration tests (SPT) at 3.0 m intervals. In addition, observation wells were installed for observations of ground water levels and for water sampling.

Disturbed soil samples were taken during SPT and undisturbed samples obtained by thin-wall sampling tube. Selected soil samples were tested in a soil laboratory and the following physical properties were determined:

- specific gravity (Gs)
- particle size distribution
- water content (w, %)
- degree of saturation
- Atterberg limits (wL, wP, %)
- Plasticity index (IP)
- angle of internal friction (ϕ)
- cohesion (c)
- natural and dry density (γ_w , c)
- void ratio (eo)
- coefficient of permeability (k , cm/s)
- Compressibility (E , kN/m² , Cc)

Angle of internal friction (ϕ) and cohesion (c) were determined by direct shear box test and tri-axial test. Compressibility was by the determined two-dimensional compression test (oedometer test).

In addition, the following chemical analyses were carried out.

- Ignition loss (% of dry solids)
- Total organic matter (% of dry solids)
- Cation exchange capacity (meq/100 g soil)

The specifications for the geological survey were made by the Geotechnical and Survey Expert of JICA Study Team. The Investigation methods and specifications were based on site visits, general geology of the area and on international and local codes of practice for site investigations. Field works and laboratory tests as well as reporting were carried out by a local company under the supervision of JICA Study Team.

The character and depth of each layer are summarized in the hollowing table. Water content of the very soft sandy clay was 27-30 %, while that of the soft plastic silt was 50-67 %.

Layer	Character	Under the western dyke	Under the middle part	Under the eastern dyke
Layer 1	Very soft sandy clay	13-19 m depth	23-28 m depth	18-24 m depth
Layer 2	Soft plastic silt			
Layer 3	Soft plastic silt			

(3) Environmental Impact Assessment

The survey was conducted in order to gather information needed to assess environmental impact of the proposed project. The survey also included a

preliminary assessment of the environmental impacts as well as proposed mitigation measures and monitoring programs.

The survey covered the proposed Trang Cat Phase 3 Project area and its vicinities. The survey was designed by the JICA Study Team based on the results of the Initial Environmental Evaluation (IEE) as well as the results of the discussions with DOSTE and other relevant organizations. The survey was carried out in Nov.-Dec. 2000 by a team of local consultants in accordance with relevant laws and regulations, under the supervision of the JICA Study Team.

Considerable environmental impacts during construction would be:

- Landscape change from fishponds to landfill
- Temporary increase of turbidity in the Cam River by drying up the fish ponds
- Increase of traffic, noise and dust temporarily in the area during dredging of the bottom and construction of the dykes

Considerable environmental impacts or risks during operation would be:

- Burning and exploding of methane gas
- Leakage of leachate from the treatment ponds
- Diseases for the community
- Local protesters preventing collections from accessing the landfill

To minimize environmental impacts, a number of mitigation measures were proposed including resettlement plan, air pollution, noise and water pollution control measures and so on. Monitoring programs were also developed so that the environmental impacts during the pre-construction, construction and operation stages of the project can be monitored.

CHAPTER 3 IMPLEMENTATION OF PILOT PROJECT

3.1 Objectives and Outline of Pilot Project

(1) Objectives

The objectives of the Pilot Project were to:

- transfer technology for the operation and maintenance of wastewater treatment
- demonstrate treatment technologies and thereby raise the environmental awareness of the citizens
- investigate appropriate technologies for water purification and treatment

There were two components to the pilot project. The first was to treat polluted ambient water using the contact purification process (CPP). The other was to treat wastewater by the activated sludge process (ASP). The locations of the pilot project plants are shown in Figure 3.1.1.

(2) Outline of CPP

As an example of appropriate technologies to treat polluted ambient water, such as water from channels and lakes, the Contact Purification Process (CPP) was selected because it requires little or no energy to operate, has low investment cost, requires little maintenance, can be made from locally available materials, and has a low land requirement.

Figure 3.1.2 shows the design of the plant. The plant was designed to treat polluted water from the Southeast channel at the design capacity of 12 m³ per day. The plant is installed near Vinh Niem Tidal Gate (Figure 3.1.3). Oyster shell, which was collected from Bac Dang River in Ha Nam Island, was used for the contact media.

(3) Outline of ASP

Treatment technologies representing eight broad classes were considered for the pilot project. The activated sludge method was adopted mainly due to the following reasons:

- The Appropriateness for the pilot project scale
- The suitability to meet the objectives of the pilot project

Figure 3.1.4 shows the design of the plant. The plant was designed to treat sewage from a residential area at a design capacity of 6 m³/day. The plant is installed at Dong Quoc Binh Pumping Station in Ngo Quyen District (Figure 3.1.5).

3.2 Implementation and Demonstration of Pilot Project

Installation of both plants was completed in June 2000 and the test operations were made in July 2000. In the second phase, during October 2000 to January 2001, the following tasks were carried out:

- optimization of systems
- regular operation and samplings
- assessment of performance
- technology transfer

The operation was started in October 2000 when the Study Team sublet daily operation work to a Vietnamese contractor with the cooperation of HPPC, in particular SADCO, and continued until late January 2001.

(1) Optimization of Systems

1) Contact Purification Unit

- Power supply: Although a new electric line was installed, operation was hampered due to frequent power failures. One electric generator was installed to prevent operation stoppage.
- Standby motor: There was also a motor failure. Hence, a standby motor was installed.

2) Activated Sludge Unit

- Seed sludge: The first startup with seed sludge failed. Presumed reason was the variance of microorganism species in the seed sludge. Because of low amount of influent and long sludge retention time (SRT) and hydraulic retention time (HRT), the microorganism species were not typical of the activated sludge process. Hence, seed sludge from another activated sludge plant was introduced after checking that the source plant was operating under conventional activated sludge condition. The startup went successfully.
- Plate in sedimentation tank: It was observed that sludge decreasing was occurring, which is typical of a small scale plant. The major reason was presumed to be insufficient settlement in the secondary sedimentation tank due to short-circuiting. A plate was installed in the secondary sedimentation tank to prevent short-circuiting and to ensure required retention.
- Plate in aeration tank: To ensure the required hydraulic retention time (HRT), another plate was installed in the aeration tank.
- Oxygen transfer: It was observed that the MLSS (mixed liquor suspended solid) increase was slow. The reason was presumed to be the poor distribution of oxygen in the MLSS. In order to maintain required dissolved oxygen level throughout the aeration tank, two new branch pipes were connected to the air supply pipe with each branch pipe being

capable of providing to two diffusers. Branch pipes were supplying air to four diffusers at the same time before the optimization work.

- Power supply: To prevent operation stoppage, one generator was installed in this plant.

(2) Regular Operation and Samplings

The regular operation of the units started in late October 2000, and continued until January 2001. The following water quality parameters were monitored during the operation of the units.

Sampling Points, Frequency and Items

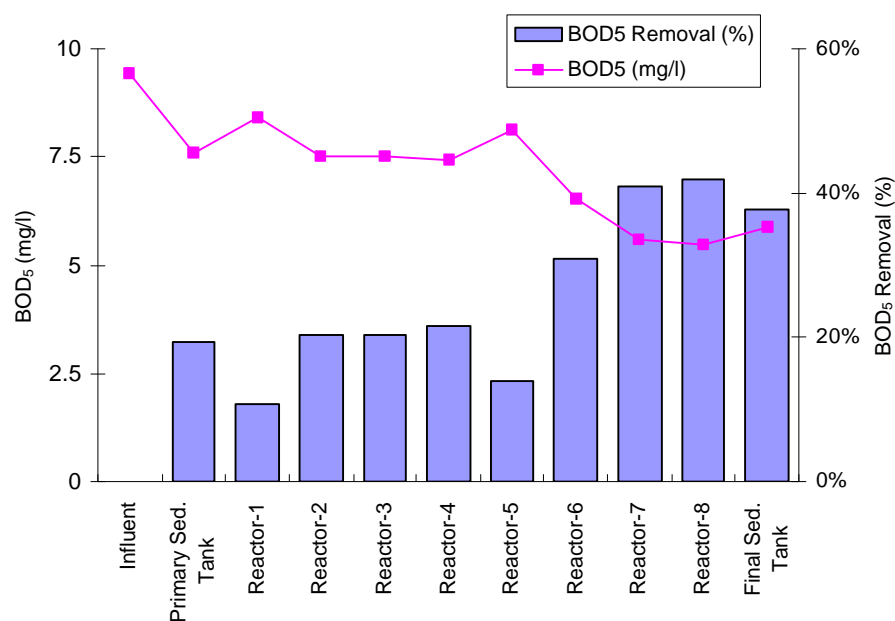
Unit	Contact Purification	Activated Sludge
Sampling Point	11 points (inlet, outlet, and between reactors)	Inlet and Outlet
Sampling Frequency	10 times (approx. 1 time/week)	20 times (approx. 2 times/week)
Items	Temperature, BOD ₅ , COD, SS, NH ₄ -N, NO ₂ -N, NO ₃ -N, T-N, T-P, DO, pH	

In addition daily monitoring of several parameters (pH, DO, COD, transparency) was carried out by SADCO.

(3) Assessment of Performance

1) Contact Purification Unit

The figure below shows a snapshot of BOD₅ concentrations in the contact purification unit, which consists of a primary sedimentation tank, 8 contact purification reactors (sub-unit) and a final sedimentation tank in series.



Removal of BOD₅ by Contact Purification Unit (Oct. 30)

In this case, the influent BOD₅ concentration (i.e., canal water) was about 9 mg/l, and the effluent BOD₅ concentration from the final sedimentation tank was 5.5 mg/l. Namely, the overall BOD₅ removal efficiency was about 40 %. Table below summarizes the results from the operation during October 30-December 18, 2000 (8 samples).

Average Performance of Contact Purification Unit

	Unit	BOD ₅	COD	SS	T-N	T-P
Influent	mg/L	5.46	40.43	75.63	13.72	1.29
Effluent	mg/L	3.07	34.45	41.63	6.69	1.05
Reduction	%	44%	13%	36%	47%	5%
Standard*	mg/L	25	35	80	15**	-

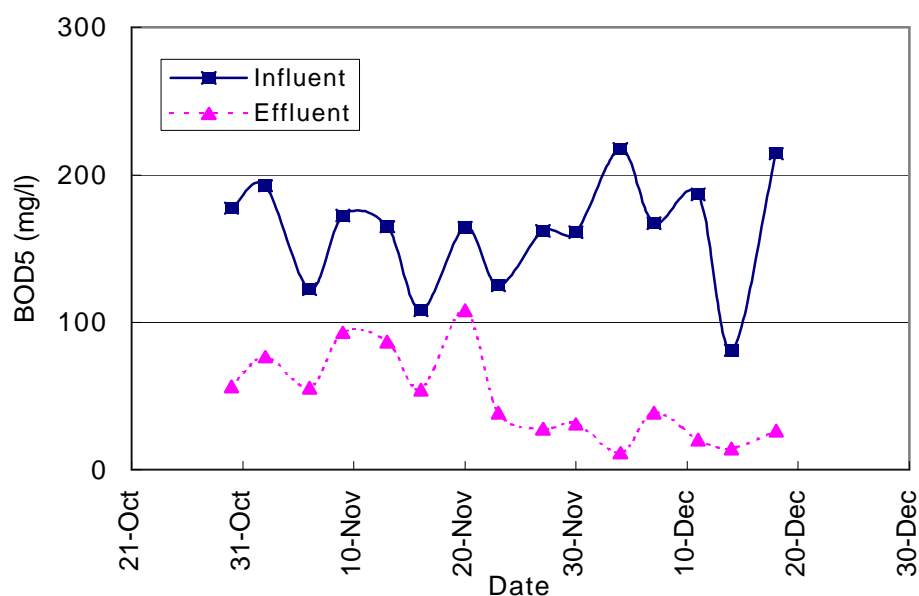
* : Environmental Standard TCVN5942-1995 (column B)

** : as NO₃-N

About 40 % removals of BOD, SS and T-N were achieved. It was also demonstrated that the system was relatively stable even if the quality of influent fluctuated significantly (e.g., 1.01 – 12.8 mg/l in BOD₅) due to tidal fluctuations and operation of the tidal gate.

2) Activated Sludge Unit

Figure below shows the BOD₅ concentrations of influent and effluent to/from the activated sludge unit.



Removal of BOD₅ by Activated Sludge Unit (Oct.-Dec., 2000)

Initially, the system was not stable, and the efficiency of the system was low (50 – 60 % for BOD₅ removal). However, as the unit was optimized, and the system became stable, it was demonstrated that nearly 80 – 90 % removal of the BOD₅ load could be achieved constantly. The following table summarizes the results from the measurements in December, 2000 (5 samples).

Average Performance of Activated Sludge Unit in December 2000

	Unit	BOD ₅	COD	SS	T-N	T-P
Influent	mg/L	173.3	405.4	83.8	111.4	10.7
Effluent	mg/L	22.4	91.6	45.0	76.0	9.6
Reduction	%	86%	77%	40%	30%	10%
Standard*	mg/L	50	100	100	60	6

* : Discharge Standard TCVN5945-1995 (column B)

The effluent from the unit satisfied the Discharge Standard (TCVN 5945-1995) for BOD, COD and SS.

(3) Construction and Operation Cost

The procurement cost of the ASP was US\$59,545. The collection of oyster shells and procurement of drums for the CPP was US\$3,250. The installation and test operation cost for ASP was US\$37,000 while for the CPP it was US\$15,500. The regular operation and evaluation cost for ASP was US\$16,610 while that for CPP was US\$26,890.

3.3 Technology Transfer

(1) On the Job Technology Transfer

Under the supervision of the JICA Study Team, SADCO participated in the operation of the contact purification unit and the activated sludge plant. This provided SADCO with unique and invaluable opportunities to learn how to:

- operate and maintain water purification systems
- optimize system performance
- trouble-shoo for problems

(2) Plant Handover

After successful demonstration, both pilot plants were handed over to the Project Management Unit (PMU) of with the approval of JICA Head Office. The PMU decided to donate the plants to Haiphong Private University's Department of Environmental Engineering. This will give the students a valuable opportunity to learn the system mechanism and operation technique. This will also provide access to such processes by all relevant agencies in Haiphong, namely, SADCO and DOSTE. Moreover, it will promote environmental awareness among the general public of Haiphong.

An operation manual was also prepared by the Study Team and handed over to PMU. This includes process description, operating procedures, trouble shooting and suggested remedial methods. This will ensure smooth operation of the plants in future.

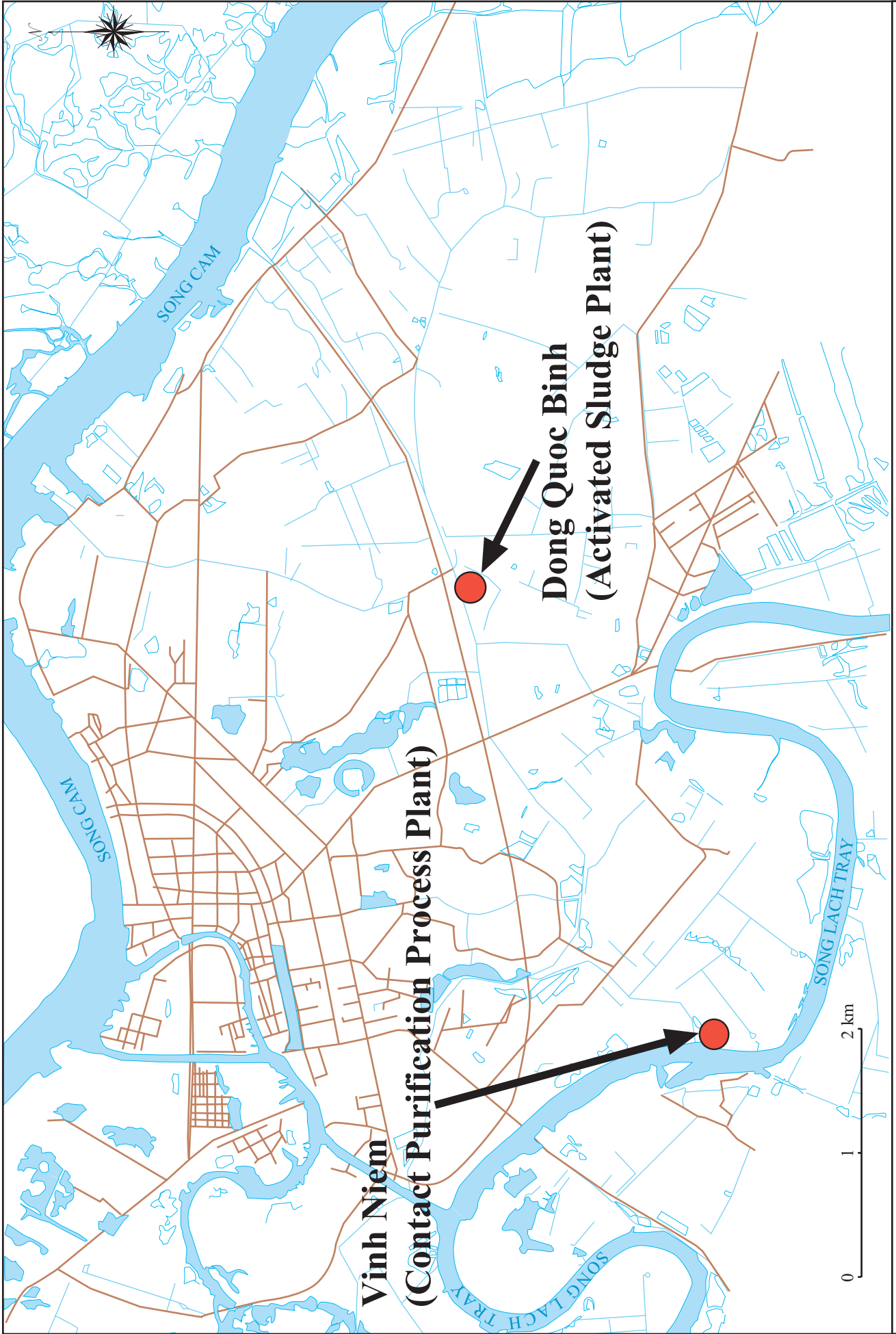


Figure 1.1.1.1 Location Map of Pilot Project Plant

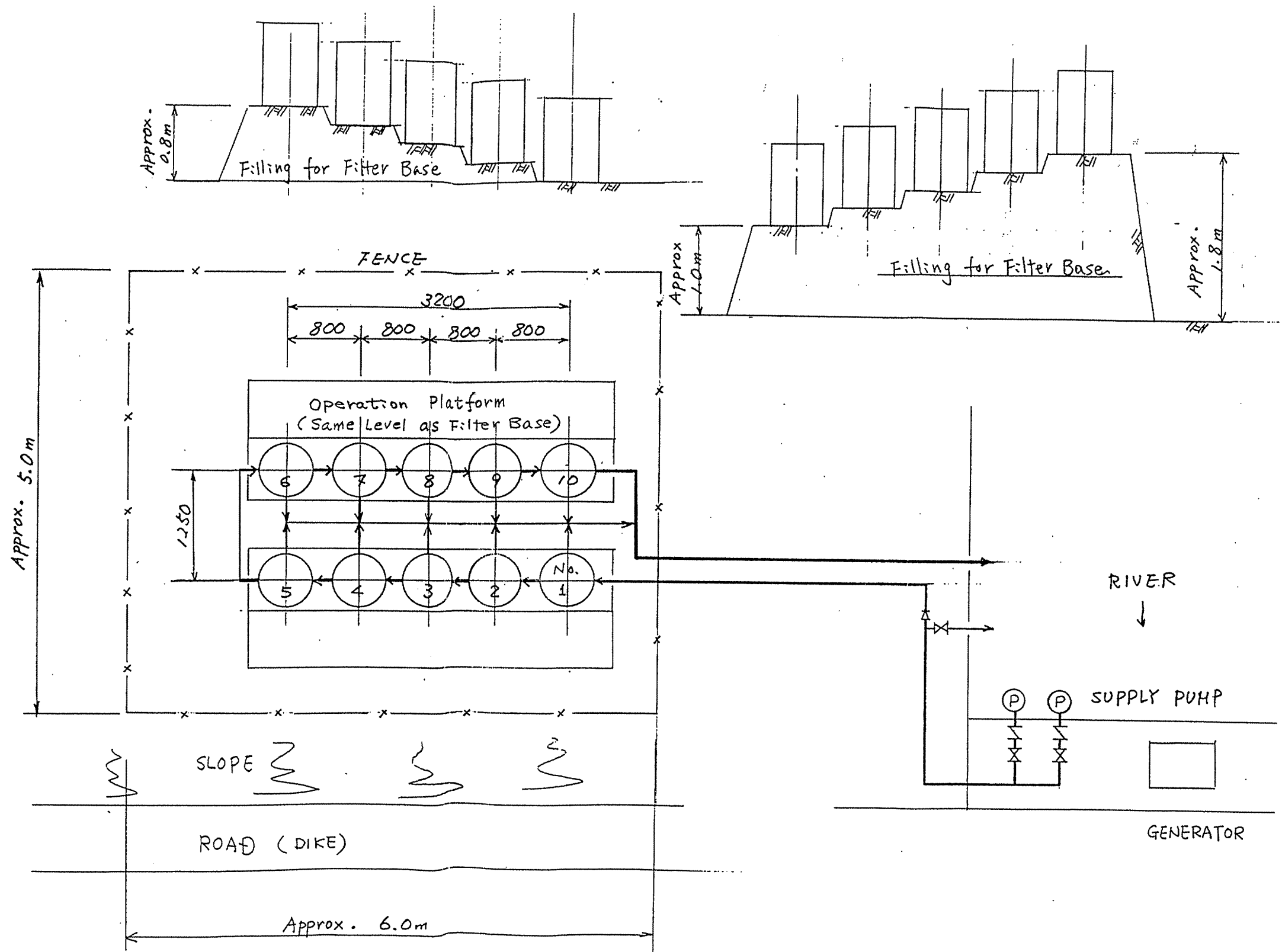


Figure 3.1.2 Layout of Contact Purification Plant



Figure 3.1.3 Picture of Contact Purification Process Plant

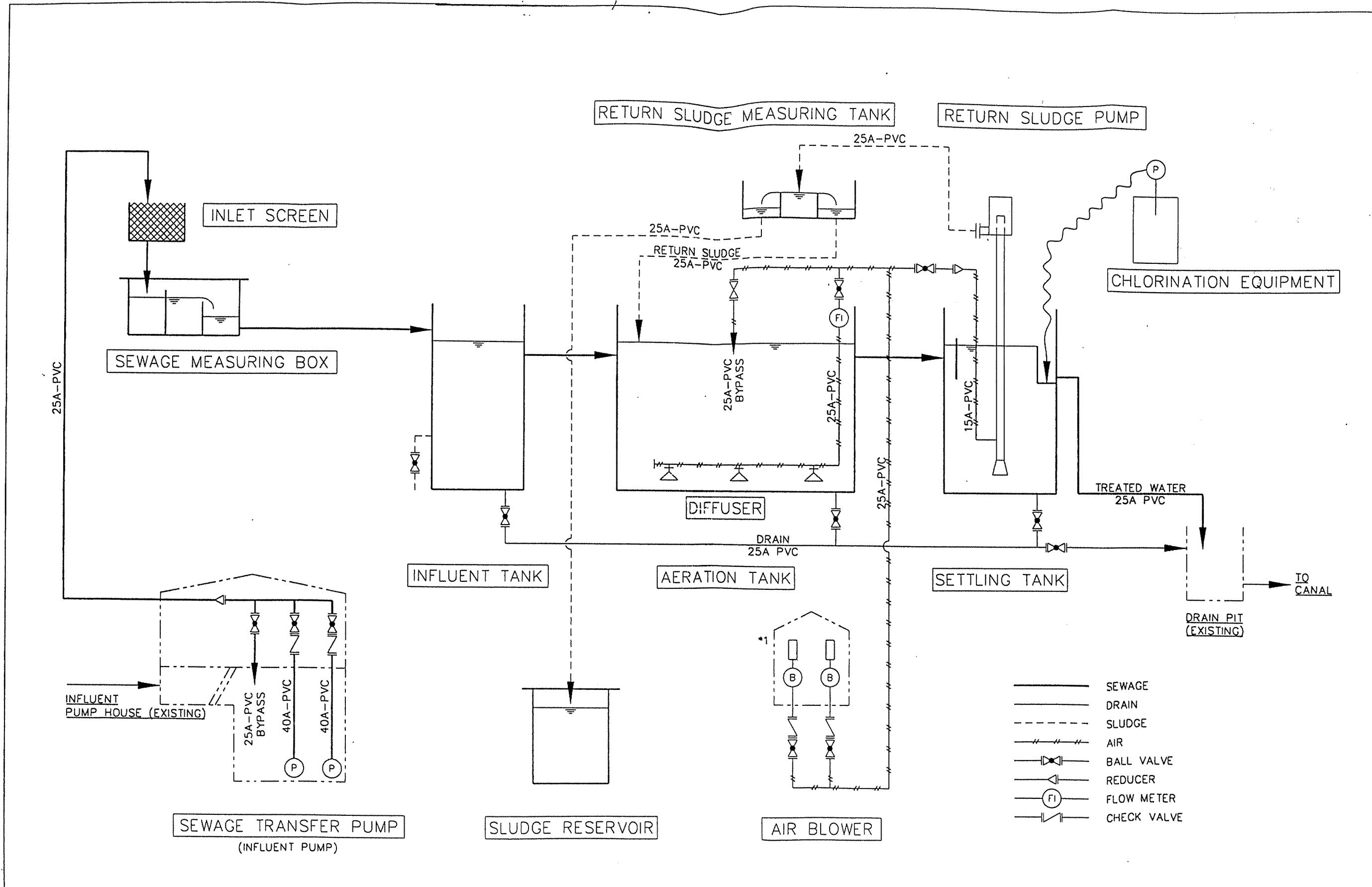


Figure 3.1.4 Layout of Activated Sludge Plant

*1. SOUND PROOFING COVER MAY BE PROVIDED DEPEND ON THE BLOWER OPERATING NOISE LEVEL.



Figure 3.1.5 Picture of Activated Sludge Plant

PART 2 MASTER PLAN FOR SANITATION IMPROVEMENT FOR THE STUDY AREA

CHAPTER 1 NECESSITY AND FRAMEWORK FOR SANITATION MASTER PLAN

1.1 Current Conditions of Haiphong City and the Study Area

1.1.1 Administrative Division and Population

(1) Administrative Division

Haiphong City has four urban districts namely, Hong Bang, Le Chan, Ngo Quyen, Kien An, and eight suburban districts namely, Thuy Nguyen, An Hai, Kien Thuy, An Lao, Tien Lang, Vinh Bao, Cat Hai, Bach Long Vi and one town, that is Do Son.

The total area of Haiphong City is 1,507 km².

Administrative Division

Districts	Area (km ²)	Administrative Unit Precincts, Communes
Urban districts		
Hong Bang Dist.	15.20	11
Ngo Quyen Dist.	12.24	14
Le Chan Dist.	4.42	12
Kien An Dist.	26.70	9
Town		
Do Son Town	39.50	5
Suburban Districts		
Thuy Nguyen Dist.	242.70	36
An Hai Dist.	220.70	23
An Lao Dist.	110.80	17
Kien Thuy Dist.	159.50	24
Tien Lang Dist.	168.00	23
Vinh Bao Dist.	181.10	30
Cat Hai Dist.	322.30	13
Bach Long Vi Dist.	4.50	
Total	1,507.66	217

Source: Statistical Year Book, Department of Land Administration

(2) Population Trend and Distribution

The total population of Haiphong City was 1.7 million in 1999.

The population concentration of the four urban districts is high. Twenty nine percent (488,393) of the population is inhabits just 4 % (58.56 km²) of the total area. The population density is 83.4 persons/ha in the urban areas; ten times larger than in the suburban districts (8.22 persons/ha).

The annual population growth rate in Haiphong City for the period of 1994-1999 was 1.07 %; this is less than it was from 1989-1994. The general information is summarized in the table below. Distribution of population densities for 1989 and 1999, and population growth for 1989-1999 are shown in figures on the following pages.

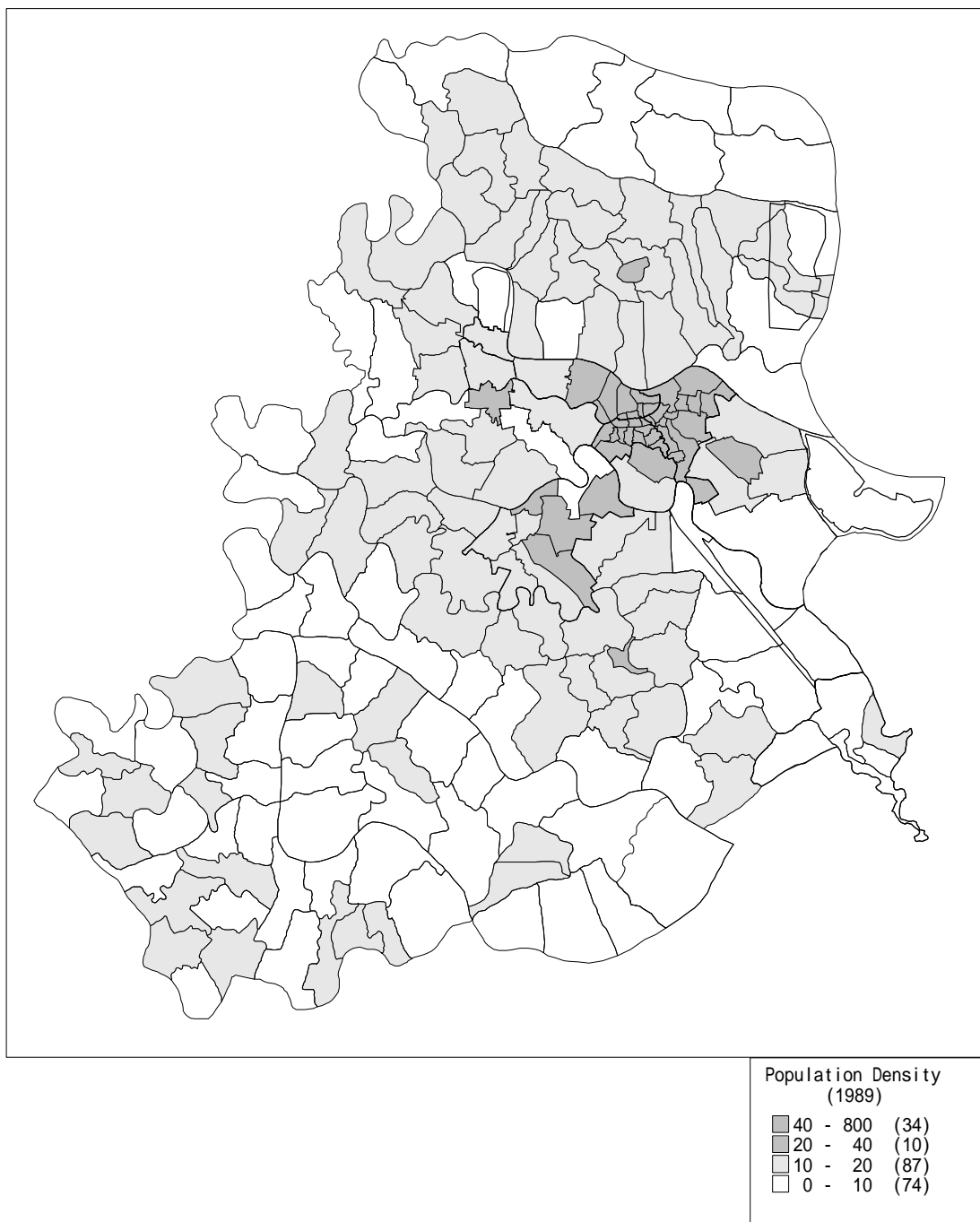
The population in the Study Area was 659,000 in 1998. The Study Area covers 40 % of the total population of Haiphong City and 13 % of the total area.

Population Characteristics of Haiphong City

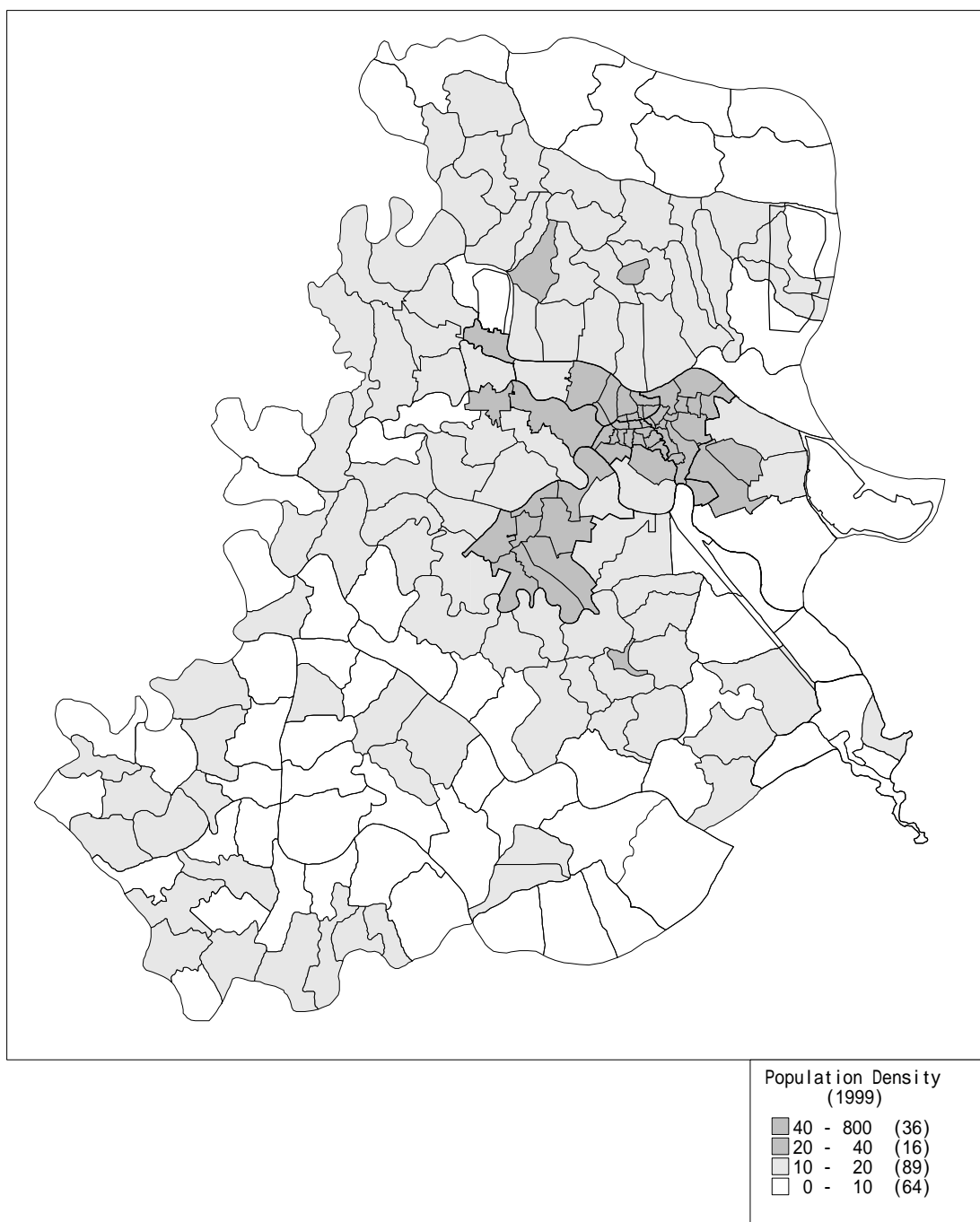
	Population (persons)			Population Density (pers/ha)	Population Growth Rate	
	1989	1994	1999		1994/1989	1999/1994
Haiphong City	1,461,968	1,590,297	1,677,465	11.13	1.70%	1.07%
Urban district	424,185	461,469	488,393	83.40	1.70%	1.14%
Hong Bang	89,070	89,849	97,565	64.19	0.17%	1.66%
Ngo Quyen	150,474	166,224	171,623	140.21	2.01%	0.64%
Le Chan	126,546	140,631	146,204	330.78	2.13%	0.78%
Kien An	58,095	64,765	73,001	27.34	2.20%	2.42%
Town	25,966	28,610	30,560	7.74	1.96%	1.33%
Do Son	25,966	28,610	30,560	7.74	1.96%	1.33%
Rural district	1,011,817	1,100,218	1,158,512	8.22	1.69%	1.04%
Thuy Nguyen	242,048	262,437	284,525	11.72	1.63%	1.63%
An Hai	176,134	197,135	215,656	9.77	2.28%	1.81%
An Lao	110,089	121,738	121,978	11.01	2.03%	0.04%
Kien Thuy	151,891	163,649	172,907	10.84	1.50%	1.11%
Tien Lang	134,350	145,072	149,277	8.89	1.55%	0.57%
Vinh Bao	172,250	185,710	186,594	10.30	1.52%	0.10%
Cat Hai	25,055	24,477	27,336	0.85	-0.47%	2.23%
B.L.. Vi			239	0.53		
S.A.	557,787	620,336	658,721	31.49	2.15%	1.21%

Source: Population Census, Department of Statistics

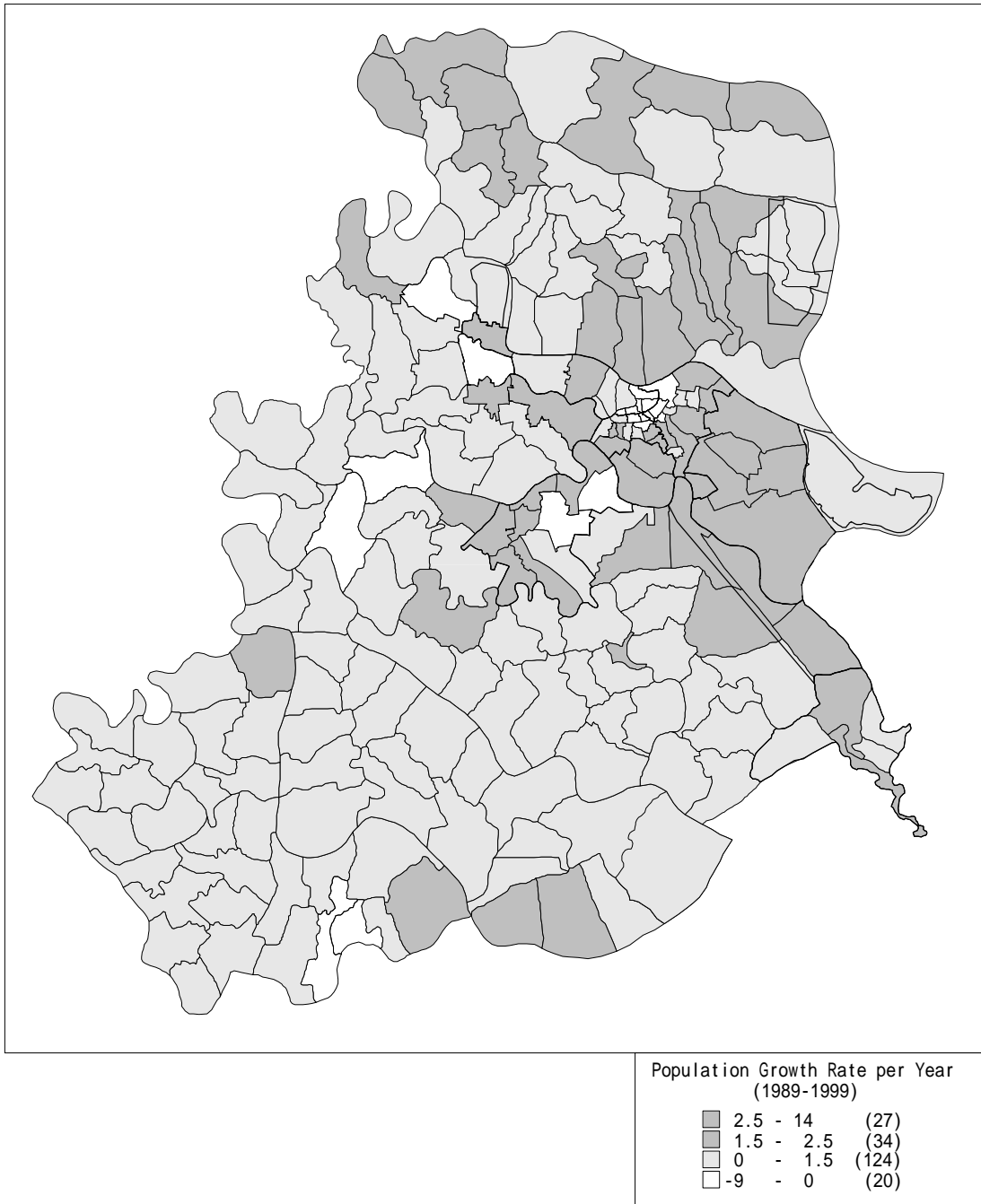
Population Density in 1989



Population Density in 1999



Population Growth Rate per Year (1989-1999)



1.1.2 Natural Conditions

(1) Meteorology

Haiphong City is located in a tropical area near the Northern tropic and therefore the climate is hot and humid. However, due to the impact from Southeast Asian monsoon, the climate in Haiphong City is divided into two distinctive seasons: a cold winter with little rain from November to March and a hot and humid summer with lots of rain from May to September. April and October are transitional months.

1) Temperature and Humidity

The mean temperature of Haiphong from December to February is about 18 °C. The mean temperature in July is 28.2 °C. The seasonal variation in temperature is about 10 °C. The minimum and maximum temperatures in the past were 4.5 °C and 37.8 °C.

Humidity is high through the year, and the average is 85%.

2) Annual Rainfall

Annual rainfall is from 1600-1800 mm. In the rainy season from May to October the rainfall is between 1500-1600 mm, accounting for about 80-90 % of total annual rainfall.

3) Wind Velocity and Direction

The wind velocity varies between 2.3 m/s and 3.1 m/s, averaging 2.6 m/s. The average maximum wind velocities are 20 – 24 m/s in monsoon and 10 – 16 m/s in other periods. There are two main wind directions in the Study Area, north-eastern wind in winter and south-eastern wind in summer.

(2) Topography and Geology

1) Geology

Most of the Haiphong area is young land consisting of alluvium and ancient clay layers. The thickness of this layer is about 25-30 m and it is covered by a loam layer about 2 m from the surface. The bottom of the clay layer serves as a diluvium, and consists of a gravel layer.

Organic clay has accumulated and N value of the soil is low and has low permeability. The groundwater level is 0-1 m in the rainy season and about 2-3 m in the dry season.

2) Geography and Topography

The geographical feature of Haiphong is that it is a delta region and the three urban districts are flat. Most of the area of the three urban districts is less than 5 m above sea level.

The mean slope inclines towards the southeast from the northwest at 0.002 %. One geographical feature do note is an area of hills and plateau located in Do Son and Kien An.

1.1.3 Economic Structure

(1) GRP by Sector and Past Growth Rate

Haiphong has been one of the fastest growing areas in Vietnam in recent years, owing largely to its location and role as a major port for Hanoi and the Red River Delta area, and in view of the gradual opening up of the Vietnamese economy to international trade.

The following table shows that Haiphong's GRP increased by 30 % in real terms over the 4 year period 1995-1998. Services continue to be the most important general sector, but only grew at a rate of 23 % over the period. Within the services sector, the most important in 1998 were transport and communications (32 % of all services); commerce, land development and consulting, 31 %; public administration 12 % and education and training 8 %.

GRP by Economic Sector 1995-98 (1994 Prices)

VND Billion, 1994 prices

Economic Group	Year				% of 1998 Total	% change 1995-1998
	1995	1996	1997	1998		
Agriculture, Forestry, Aquaculture	957.1	1027.8	1083.1	1129.0	16.4	17.9
Agriculture	799.3	848.1	894.7	932.5		
Forestry	24.3	25.8	26.7	26.0		
Aquaculture	133.5	153.9	161.7	170.5		
Industry	1526.9	1698.7	2126.7	2414.4	34.97	58.12
Exploitation, Mining	32.3	40.1	43.6	42.5		
Manufacturing	929.8	1028.2	1441.9	1730.0		
Power and Water Supply	95.3	95.2	125.3	107.0		
Construction	469.5	535.2	515.9	534.9		
Services	2542.7	2837.1	2961.2	3129.7	45.33	23.1
Commerce, land development, consulting	864.0	941.6	972.1	975.6		
Hotels, restaurants	154.5	160.7	152.4	154.0		
Transport, warehouses, communications	710.0	843.9	866.2	1000.4		
Finance, credit	126.2	129.7	94.0	80.1		
Scientific Research	8.0	11.3	12.8	14.1		
Public administration	333.2	345.1	395.6	394.4		
Education, training	173.1	193.5	237.0	258.3		
Health and social services	82.6	92.0	104.6	108.4		
Culture, sports	20.3	43.5	38.1	51.9		
Associations	5.5	5.6	8.7	9.5		
Individual and community services	61.8	64.9	73.3	74.8		
Household services	3.5	5.3	6.4	8.2		
Import taxes	284.7	257.9	215.2	230.7	3.3	-19.0
TOTAL	5311.4	5821.5	6386.2	6903.8	100	30.0

Source: Statistical Abstract Haiphong City 1995-1998, 1999

The fastest growing sector was industry, which increased by 58 % over the period, and which accounted for 35 % of GRP in 1998. By far the most important of this general sector was manufacturing, some indicators of which are presented below. The agriculture sector grew by about 18 % over the period, accounting for 16 % of GRP in 1998.

Of major policy interest is the fact that the contribution of import taxes fell from 5 per cent to about 3 % of the total, representing a reduction in revenues of 19 % over the period. This is explained by trade liberalization policies that are being gradually introduced by the Vietnamese government.

(2) Per Capita GRP

Basic demographic data for Haiphong City, showing trends in male/female; urban/rural and agricultural/non-agricultural population 1995-1998 are shown in the next table. This shows that the population of Haiphong classified as belonging to rural communities increased in number, but remained a constant proportion (two-thirds) of the population in between 1995 and 1998.

However, over the four-year period there was a noticeable trend in the substitution of non-agricultural for agricultural employment; populations classified as directly dependent upon industrial and service employment rose from 39 % of the total in 1995 to 44 % in 1998. There was a corresponding percentage reduction in the agricultural population.

Basic Demographic Data, Haiphong City 1995-1998

Population Group	Year			
	1995	1996	1997	1998
Male	782.7	791.2	799.6	808.2
Female	824.6	833.4	842.4	854.4
Urban	542.4	548.7	555.5	562.1
Rural	1064.9	1075.9	1086.5	1097.5
Agricultural	976.2	940.9	940.7	929.7
Non-Agricultural	631.1	683.7	701.3	729.9
TOTAL POP.	1607.3	1624.6	1642.0	1659.6

Source: 1999 Census, Statistical Abstract Haiphong City 1995-1998, 1999 (for approximate distribution of population among various categories)

As shown earlier, although by far the most important occupation in terms of numbers, agriculture (along with forestry and aquaculture) contributes a relatively small proportion of Haiphong's GRP. While accounting for 56 % of total employment, this economic sector only accounts for about 16 % of Haiphong's GRP, with industry and construction contributing about 35 % and services 45%.

In terms of value added (or GRP), per capita, there is therefore a substantial difference between agricultural and non-agricultural employment in the Haiphong area, as indeed, in other parts of Vietnam. This is illustrated in the following t, which shows that in 1998 the GRP per capita of the industrial/services population

was about 5.5 times as great as that for the agricultural population. Average per capita income in 1998 was thus about US\$365, with employment in industrial and services yielding US\$673, and agriculture about US\$122. To put this in perspective, World Bank estimated that the GDP per capita for Vietnam as a whole in 1998 was US\$330. (Source, World Bank Country Assistance Strategy, 1998).

Value Added by Agricultural and Non-Agricultural Populations, Haiphong 1998

values in 1998 constant price

Sector	Population (thousands)	GRP (Value Added) (VND billion)	GRP (Value Added) per capita	
			VND thousand	US\$
Agriculture	929.7	1589.3	1709.5	122
Industry/Services	729.9	6880.5	9426.6	673
Total	1659.6	8469.8	5103.5	365

Source: Statistical Abstract Haiphong City 1995-1998, 1999

(3) Industrial Sector in Haiphong

Details of value added by industrial sub-sector are unavailable, but an indicator of the relative importance of different industrial groups is provided by information on gross production values, as shown in the following table.

Gross Production Value, Industrial Sector 1995-1998

VND Million, 1994 prices

Industry	1995	1996	1997	1998	% of 1998 total
Mining	32,828	51,027	58,876	57,731	
Manufacturing	2,910,411	3,664,823	5,277,610	6,063,058	98
Food, drink	246,180	243,420	291,024	287,357	
Tobacco	175,314	213,161	245,015	271,177	
Textiles	67,956	91,464	88,242	124,217	
Garments	62,793	54,277	61,831	74,307	
Footwear	710,966	910,463	1,314,317	1,351,206	22
Wood processing	17,312	16,440	12,920	17,188	
Paper	50,784	87,087	113,989	110,296	
Publication, printing	16,419	5,183	5,894	7,239	
Chemicals	81,084	144,142	258,721	231,844	
Plastics and rubber	127,327	116,325	156,274	210,465	
Other non-metal products	527,271	499,131	1,185,888	1,518,253	25
Metals	218,114	710,860	920,140	1,134,565	18
Metal products	149,597	186,771	214,540	163,168	
Machinery, equipment	42,732	45,618	58,115	47,461	
Electrical	75,830	63,883	87,454	163,279	
Radio, TV	73,148	31,571	6,855	8,595	
Motor vehicles	17,313	7,262	9,982	26,075	
Shipbuilding, other transp	226,631	204,895	212,708	276,657	
Furniture	23,037	32,415	28,988	39,081	
Recycling	603	455	4,713	628	
Water and Power Supply	69,834	64,091	58,709	70,510	
TOTAL	3,013,073	3,779,941	5,395,195	6,191,299	

Source: Statistical Abstract Haiphong City 1995-1998, 1999

The above table shows that the gross value of output in the industrial sector roughly doubled during the four-year period; notable is the growth in the footwear industry, which accounted for 22 % of total industrial output in 1998. Shipbuilding on the other hand, a more traditional industry, changed little over the period.

(4) GRP by Ownership in Haiphong

Trends in the contribution to Haiphong's GRP by ownership are given in the following table. Consistent with the policy of decentralization, a slight reduction within the State sector of centrally owned enterprises, and a corresponding increase in local enterprises, is observed. Domestic non-state enterprises contributed roughly the same proportions of GRP throughout the period, while the foreign sector grew from 2 % to 11 % over the period. As noted earlier, import taxes fell from 5 to 3 % of the total.

GRP by Ownership, Haiphong 1995-98

VND Billion, current prices. (Percentage to total)

	Year			
	1995	1996	1997	1998
Domestic Sector:				
State				
Central	1834.6 (30)	1978.3 (29)	2077.1 (28)	2284.5 (27)
Local	1034.9 (17)	1117.1 (16)	1184.3 (16)	1269 (15)
Non State				
Collective	1237.1 (20)	1362.2 (20)	1392.2 (19)	1581.6 (19)
Private	32 (1)	28.1 (0)	52.1 (1)	69.5 (1)
Individual	1416.3 (23)	1632.5 (24)	1703.6 (23)	1833.8 (22)
Combined	163.6 (3)	235.8 (3)	200.7 (3)	229.6 (3)
Foreign sector:	95.5 (2)	189.8 (3)	617.3 (8)	945 (11)
Import Taxes:	324.6 (5)	294.8 (4)	242.80 (3)	256.8 (3)
TOTAL	6138.6	6838.6	7470.1	8469.8

Source: Statistical Abstract Haiphong City 1995-1998, 1999

(5) Employment in the State-Owned Sector

Data on employment in Haiphong are only available for the State-Owned sector, and show that manufacturing is the dominant state employer, followed by education and training; transport and communications; construction; commerce; public administration; and social and health care. Details are presented below.

Employment in Haiphong (State-Owned Sector only)

	1995	1996	1997	1998	1995	1996	1997	1998
	Number of Persons				Proportion (%)			
Agriculture/forestry	1725	1727	1737	1804	1	1	1	1
Aquaculture	850	702	692	659	1	1	1	1
Mining	500	1081	818	743	0	1	1	1
Manufacturing	41667	42114	40764	39645	35	35	33	32
Water supply/power	2446	2539	2492	2598	2	2	2	2
Construction	12869	13622	15151	15344	11	11	12	12
Commerce	8194	7494	7460	6714	7	6	6	5
Hotel/restaurant	1758	1439	1340	1551	1	1	1	1
Transport/comms	15022	14728	14490	14744	12	12	12	12
Finance/credit	2009	2059	2081	1811	2	2	2	2
Scientific research	683	711	670	693	1	1	1	1
Prop.dev/consulting	1355	1695	1436	1685	1	1	1	1
Public administration	5124	5210	5637	6136	4	4	5	5
Education/training	17517	17809	19151	19906	15	15	15	16
Health care/social	5164	5290	5387	5548	4	4	4	5
Culture/sports	1176	1085	1118	1160	1	1	1	1
Party/unions, assns	1171	1211	1195	1233	1	1	1	1
Community services	1168	1147	1318	1359	1	1	1	1
TOTAL	120398	121663	122945	123333	100	100	100	100

Source: Statistical Abstract 1995-1998, Haiphong City, 1999

(6) Price Indices

In the early 1990s the rapid growth of the Vietnam economy, paralleling that of East Asia as a whole, was reflected in a high inflation rate. Slower growth in the region has subsequently been accompanied by moderate inflationary trends, which are also projected for the near future by the World Bank.

Price Indices, Vietnam 1993-2005

	Actual				Estimated			Projected		
	1993	1994	1995	1996	1997	1998	1999	2000	2001	2005
Merchandise export price index	99	102	112	113	117	119	122	125	128	142
Merchandise import price index	113	111	115	111	106	107	110	113	116	130
Consumer price index (% growth rate)	8.3	9.3	16.8	5.6	3.2	8.0	6.0	6.0	5.0	5.0
GDP deflator (% growth rate)	14.3	14.5	19.5	6.1	5.5	6.0	6.0	6.0	5.0	5.0

Source: World Bank, Vietnam: Country Assistance Strategy of the World Bank Group 1999-2002, August, 1998

1.1.4 Haiphong Government Finance

Recent trends in revenues collected by Haiphong City; the amounts actually retained and spent by the city, and revenues passed on to the national government, are shown below.

Haiphong City Budget 1995-1998

VND Billion, Current Prices

	1995	1996	1997	1998
Total Revenue Collected*	3009	2744	2341	2332
Revenue Retained by Haiphong City	577	662	735	769
Revenue transferred to National Government*	2432	2082	1606	1563
Total Expenditure by Haiphong City	562	659	733	763

Source: Statistical Abstract 1995-1998, Haiphong City, 1999

As shown above, one of the most important aspects of the inter-governmental fiscal situation is the large difference between the revenues collected by Haiphong City, and the amount actually retained by the city itself and used for its own purposes. To a large extent, therefore, the city acts as a tax collection agency for the national government. Revenues retained by the city in 1998 amounted to about one third of the total collected, the excess being transferred to the national government.

In particular, as shown in the next table, import duties, most of which are transferred to the national government, accounted for over 50 % of gross revenues in 1998, although, as noted below, they have sharply declined as a proportion of total collections, having been almost 70 % of the total in 1995. This is the primary explanation for why total revenues collected, and revenues transferred to the national government showed a decline in current prices over the period.

Sources of Revenue: Haiphong City 1995-1998

VND million, current prices: Proportion of totals in parentheses

	1995	1996	1997	1998
From the country	2960160 (98.37)	2671170 (97.35)	2302129 (98.33)	2256193 (96.74)
Taxes from SOEs (State Owned Enterprises)	412239 (13.70)	459934 (16.76)	437938 (18.71)	480415 (20.60)
Taxes from foreign companies	33651 (1.12)	64267 (2.34)	132838	129218
Taxes on industry, commerce, and non-state services	78198 (2.60)	91554 (3.34)	99510	90477
Agricultural land use tax	27586 (0.92)	33406 (1.22)	28589	33677
Export tax	10538 (0.35)	8655 (0.32)	8234	2958
Import tax	2052331 (68.20)	1552043 (56.56)	1183024	1247002
Income tax	18700 (0.62)	17424 (0.64)	22993	30939
House and land tax	14530 (0.48)	16840 (0.61)	11533	8980
Taxes for right of land use	87230 (2.90)	59236 (2.16)	11949	12118
From sales of State-owned housing	1014 (0.03)	5810 (0.21)	6215	2873
Collections from non- economic activities	16365 (0.54)	562 (0.02)	95338 (4.07)	156 (0.00)
Communication fees	32938 (1.09)	39252 (1.43)	22154 (0.95)	3827 (0.00)
Lottery	10547 (0.35)	10214 (0.37)	10040 (0.43)	7877 (0.34)
Other charges and fees	56831 (1.89)	41086 (1.50)	37920 (1.62)	37731 (1.62)
Others	107462 (3.58)	270887 (9.87)	193854 (8.28)	167945 (7.37)
From Other Countries	10167 (0.34)	-	6978 (0.30)	8565 (0.37)
Subsidy from Central Budget	38981 (1.30)	72672 (2.65)	32060 (1.37)	67351 (2.89)
Construction subsidies	-	42935 (1.56)	-	6000 (0.00)
Budget balance subsidies		29737 (1.08)	32060 (1.37)	61351 (2.89)
	3009308	2743842	2341167	2332109

Source: Statistical Abstract 1995-1998, Haiphong City, 1999

In real terms, of course, the decline in total revenues collected by Haiphong City, and the amounts transferred to the national government, have been even more marked than those shown in the above tables. Based upon the GDP price deflators presented earlier, the rates of change in revenues and expenditures over the 1995-1998 period were as follows:

Rates of Change in the Haiphong City Budget 1995-1998 (Constant Prices)

	Percentage Change
Total Revenue Collected	-35%
Revenue Retained by Haiphong City	12%
Revenue transferred to National Government	-45%
Total Expenditure by Haiphong City	14%

Source: Statistical Abstract 1995-1998, Haiphong City, 1999, Country Assistance Strategy of the World Bank Group 1999-2002, August 1998

The sharp decline in revenues collected on behalf of the national government illustrates the process of decentralization and trade liberalization that has been taking place in Vietnam. A further illustration of this process, and in particular of the impact of increased privatization, is that while expenditures by Haiphong City increased by about 14 % in real terms between 1995 and 1998, this was only about half the rate of increase in GRP over the same period.

Haiphong City expenditures by broad category are shown below.

Expenditures, Haiphong City, 1995-1998

VND million, current prices

Year	1995	1996	1997	1998
Capital investment	128577 (22.90)	156060 (23.67)	157919 (21.54)	145900 (19.13)
Recurrent costs – economic activities	69713 (12.40)	68803 (10.44)	76036 (10.37)	83188 (10.91)
Recurrent costs – cultural and social activities	189801 (33.77)	226262 (34.32)	267858 (36.54)	301227 (39.49)
Public administration	51240 (9.12)	51250 (7.78)	60952 (8.31)	60525 (7.93)
Others	122749 (21.84)	156818 (23.79)	170320 (23.23)	171923 (22.54)
TOTAL	562080	659193	733085	762763

Source: Statistical Abstract 1995-1998, Haiphong City, 1999

Re-lending conditions for external loans have been developed to address the specific objectives and circumstances of the Vietnamese water supply and sanitation sectors. As expressed by the World Bank, relevant aspects of the Vietnamese government's strategy include (a) decentralization of activities to the local level and, where appropriate, outsourcing service functions such as septage and solid waste collection, maintenance of equipment, etc. to the private sector. (b) Commercialization of the public utilities whereby they will be given sufficient autonomy by their parent governments to efficiently administer the services for which they are responsible and to generate and retain adequate revenues to achieve this; and (c) establishing a financial strategy whereby investment costs, as well as recurrent costs, would eventually be met by local governments and the SADCs through a mix of revenues, grants, and borrowing.

However, progress in these areas in Vietnam is still at a relatively early stage. Therefore the government, the World Bank, and other donors, in particular the Finnish and Danish governments, have agreed that a gradual approach is required. In particular, and presumably as an interim policy measure in light of the fact that Vietnam is still in the early stages of market liberalization and decentralization of economic decision-making, the World Bank has relaxed its normal conditions for on-lending.

Thus with respect to the recent 40 year IDA credit for water supply (Vietnam water Supply project 1997), the borrower was the Socialist Republic of Vietnam. The credit included a 10-year grace period, and, in parallel with a Danish grant, was to be on-lent to the Haiphong and two other water companies from the Government in VND at a fixed interest rate of 6.5 % per annum. This loan is repayable over 20 years with a 5-year grace period. The national government would thus bear the exchange rate risk, and interest during the grace period would be waived by the national government. These favorable terms took into account the fact that the water supply companies concerned required subsidy at this initial stage of their restructuring.

For similar reasons, the World Bank-financed Three Cities Sanitation Project (1999) is consistent with the Government's current policy for social infrastructure, so that the credit is passed on by the Central Government (Ministry of Finance) to the project implementing agencies (SADCOs) in the concerned cities (Danang, Haiphong and Quang Ninh) in the form of grants. In the case of Haiphong, counterpart funding amounting to 16 % of total project costs is to be provided by the City Government. It is expected that this counterpart contribution will be financed from local/provincial government revenues together with existing government grants.

A feature of the externally supported sanitation program has been to introduce revolving funds to provide sub-loans to low-income households to construct or improve on-site sanitation facilities such as septic tanks, or to enable them to make connections to main sewerage or drainage. Loans to individual households, or groups of households will be up to \$150 equivalent to cover up to 90 % of the cost and, based on experience with similar micro-credit schemes in Vietnam, would be repaid over 2 years at an interest rate of about 1 % per month.

1.1.5 Land Use

(1) Characteristics as a Whole

The total area of Haiphong City is about 1,500 km². Land for agriculture accounts for 55.5 %, forestry and hill 10.2 %, water surface 15.3 % (the area of undeveloped land accounts for 81 % of the total). Developed land such as

residential, building, industrial, roads transport and national defence accounts for 9.4 %.

Urban use of land is prominent in the districts such as Hong Bang, Le Chan, Ngo Quyen. The so-called “inner city” is formed by these three urban districts, where many governmental buildings, hotels hospitals, offices, restaurants and shops are located. However, most restaurants and shops include living spaces in the same building, which look far from the modern shape of a commercial town.

Urban expansion is directed towards the outskirts to the south and southeast (south of Le Chan districts, southeast of Ngo Quyen districts and along road No 14), to the southwest (Kien An districts), to the northwest (Vat Cach in An Hai districts).

The high population density sub-districts are concentrated in the 3 urban districts (more than 40 persons/ha). Besides the three urban districts, the areas where population density is high are only Tran Thanh Ngo Ward in Kien An district and Du Hang Kenh Commune in An Hai district. The highest density is 662 persons/ha in Luong Khanh Thien Ward in Ngo Quyen district. However, the population density of Le Chan district is the highest of any district.

Another characteristic of land use is that Haiphong City lacks sufficient road area. Even in the 3 urban districts the road area ratio is 6.9 % and does not reach 10 % of total land. At the moment, motorbikes and bicycles are still the major form of transport and the road No. 5 bypass was recently opened for traffic. However problems such as traffic jams and atmospheric pollution will occur with the motorization process in the near future.

Current Land Use

(Unit: ha)

	Agriculture	Aquaculture	Forest/Hill	Building	Residential	Industries
Haiphong City (%)	83,413 55.5 %	4,138 2.8%	15,344 10.2 %	340 0.2 %	11,555 7.7 %	1,325 0.9 %
Urban district (%)	1,778 30.4 %	0 0.0 %	182 3.1 %	175 3.0 %	1,664 28.4 %	682 11.7 %
Hong Bang	221			51	353	296
Le Chan				44	315	37
Ngo Quyen	72			43	546	272
Kien An	1,485		182	37	450	77
Rural district (%)	81,635 56.5 %	4,138 2.9 %	15,162 10.5 %	165 0.1%	9,891 6.9 %	643 0.4 %
Do Son	200	871	201	14	244	7
Thuy Nguyen	18,431	450	1,432	37	598	138
An Hai	14,447	1,750		38	2,661	371
An Lao	8,242	13	129	18	1,135	53
Kien Thuy	11,980	604	20	24	1,990	64
Tien Lang	13,745			11	1,144	3
Vinh Bao	14,590			10	1,845	2
Cat Hai		450	13,380	13	274	5

	Traffic	National Defence	Water Surface	Others	Total
Haiphong City	889 0.6 %	699 0.5 %	23,048 15.3 %	9,490 6.3 %	150,241
Urban district	402 6.9 %	231 3.9 %	527 9.0 %	209 3.6 %	5,850
Hong Bang	232	32	207	128	1,520
Le Chan	27	1	16	0	440
Ngo Quyen	110		144	33	1,220
Kien An	33	198	160	48	2,670
Rural district	487 0.3 %	468 0.3 %	22,521 15.6 %	9,281 6.4 %	144,391
Do Son	57	180	1,065	1,111	3,950
Thuy Nguyen	61	3	1,200	1,850	24,200
An Hai	154	277	442	1,930	22,070
An Lao	40	5	933	512	11,080
Kien Thuy	35	3	580	650	15,950
Tien Lang	45		770	1,082	16,800
Vinh Bao	60		957	646	18,110
Cat Hai	35		16,574	1,500	32,231

(2) Land Use by Category

The land use by commune is presented in the following table.

1) Agriculture

Agriculture use is overwhelmingly dominant in Haiphong City and distributed ever where, occupying 55.5 % of the total area. In the urban districts, 30.4 %

of the land is for agriculture. However, most agricultural land is situated in Kien An district, and there is very little remaining agricultural land in the 3 urban districts and in Le Chan district there is no agricultural land.

In Hong Bang district, although agricultural land is situated in the sub-districts (Quan Toan Ward and Hung Vuong Ward) included in 1993, it is gradually being converted into urban use and there will be little agricultural land by 2020. Also there will be little agricultural land in Ngo Quyen district by 2010.

2) Aquaculture

Aquaculture is performed briskly in Haiphong City and is distributed along the seashore of the City, especially in An Hai district and the Road No. 14.

3) Forestry

Forestry is mostly found in Cat Hai island and north of Thuy Nguyen district. There are hills in Kien An district and Do Son town. The hills serve as a precious source of remnant nature in urban land.

4) Specialized (Commerce, Office, Public Facilities etc.)

Specialized use includes governmental building, school hospital, office, hotel, restaurant and shop except residential use.

Commercial and business use is concentrated in Hong Bang and Le Chan districts. Governmental offices are also concentrated in Hong Bang district. Along Lach Tray street in Ngo Quyen district, sports and cultural facilities are located.

Many small shops are located along the larger streets in the urban districts .

In the rural districts public facilities are concentrate in the district town.

5) Residential

Urban residential areas are spread all over the urban districts. However in Ngo Quyen district residential area is expanding into agricultural land in a disorderly fashion without sufficient roads. In Kien An district and beside the Cat Be airport a planned residential area has been developed.

In the rural districts residential areas are dotted amongst vast areas of agricultural land.

Land Use by Commune

Unit : ha

	total	1.Agri culture	2.Aqua culture	3.Forestry Land	4.Specialized Land	5.Residential land	6.Unused land
Hong Bang Dist.	1,441.74	403.82	55.43	0.00	637.71	164.16	236.04
Quan Toan Ward	244.00	93.66			97.97	27.04	25.33
Hung Vuong Ward	434.26	222.86	9.82		110.50	25.25	75.65
So Dau Ward	328.28	87.30	45.61		150.84	31.82	58.32
Thuong Ly Ward	158.10				100.94	31.71	25.45
Trai Chuoi Ward	44.28				20.74	12.54	11.00
Ha Ly Ward	97.11				56.35	13.71	27.05
Minh Khai Ward	62.53				49.50	5.03	8.00
Quang Trung Ward	13.86				8.14	4.32	1.40
Hoang Van Thu Ward	28.82				25.01	3.81	
Phan Boi Chau Ward	15.90				8.64	5.62	1.65
Pham Hong Thai Ward	14.60				9.09	3.32	2.20
Ngo Quyen Dist.	1,241.01	111.03	43.48	0.00	556.83	455.12	118.03
May To Ward	148.34				77.67	31.27	39.40
May Chai Ward	231.80				148.08	25.17	58.55
Van My Ward	108.98	2.34			68.55	32.09	6.00
Lac Vien Ward	37.96				12.55	22.90	2.52
Cau Tre Ward	44.84				9.87	34.97	
Luong Khanh Thien Ward	26.75				17.32	9.43	
Gia Vien Ward	25.50				7.48	18.02	
Cau Dat Ward	14.84				5.19	9.65	
Le Loi Ward	22.90				12.58	10.32	
Lach Tray Ward	67.48				49.17	18.31	
Dang Giang Ward	178.12	38.29	20.98		73.28	63.05	3.50
Dong Khe Ward	181.78	70.40	22.50		27.79	83.59	
Dong Quoc Binh Ward	22.88				12.97	9.58	0.33
Cat Bi Ward	128.84				34.34	86.77	7.73
Le Chan Dist.	424.21	0.00	0.00	0.00	178.89	223.79	14.53
Cat Dai Ward	33.00				18.30	12.54	2.16
An Bien Ward	19.10				8.94	10.16	
Me Linh Ward	11.44				5.51	5.93	
Lam Son Ward	48.61				24.55	17.06	
An Duong Ward	20.56				5.94	14.62	
Tran Nguyen Han Ward	28.10				8.55	19.55	
Ho Nam Ward	23.16				7.51	14.83	0.82
Ward Trai Cau	29.96				11.89	18.07	
Du Hang Ward	27.90				10.30	17.60	
Hang Kenh Ward	36.42				13.94	22.48	
Dong Hai Ward	35.86				7.44	26.07	2.35
Niem Nghia Ward	110.10				56.02	44.88	9.20

	total	1.Agri culture	2.Aqua culture	3.Forestry Land	4.Specialized Land	5.Residential land	6.Unused land
Kien An Dist.	2,955.45	1,323.20	140.83	202.44	805.86	353.14	270.81
Quan Tru Ward	333.62	60.90	16.17		95.00	72.15	105.57
Dong Hoa Ward	357.44	256.80	39.44		47.46	19.43	33.75
Bac Son Ward	228.99	52.17	6.95	25.43	111.62	19.05	20.72
Nam Son Ward	371.10	208.86	17.56	41.07	93.34	26.98	0.85
Ngoc Son Ward	349.63	27.87	3.25	37.85	258.99	22.06	2.86
Tran Thanh Ngo Ward	118.32	6.19		45.07	27.26	39.80	
Van Dau Ward	462.88	259.96	16.89	9.55	67.67	93.64	32.06
Phu Lien Ward	347.59	242.82	17.97		50.73	26.83	27.21
Trang Minh Ward	385.88	207.63	22.60	43.47	53.79	33.20	47.79
Do Son Town	3,094.91	1,075.35	734.32	564.34	540.43	187.97	726.82
Ngoc Xuyen Ward	1,196.29	730.16	468.51		94.86	48.05	323.22
Ngoc Hai Ward	349.49	41.19	41.19	70.04	97.09	31.46	109.70
Van Huong Ward	363.76	13.08	7.23	93.21	81.34	15.51	160.62
Van Son Ward	218.64	69.05		46.67	45.96	25.36	31.60
Bang La Commune	966.73	221.87	217.39	354.42	221.17	67.59	101.68

Figure Current Land Use

1.1.6 Current Sanitation and Environmental Situation

(1) Current Sanitation Condition

At present, there is no proper sewerage system in Haiphong. Most of the households in the urban area have septic tanks, though septic tank maintenance is inappropriate and inadequate. These septic tanks only receive black water while all gray water is discharged either into surface drains or the ambient environment. Some households in urban area and most households in semi-urban area have bucket latrine, which is not hygienic at all. The rest use some sort of pit latrines.

In the urban areas, there are combined sewer network. In the three urban districts, this network is extensive, approximate total is around 200 km. This collects overflows from septic tanks, all gray water and also storm water. These combined sewers then discharge into surface water bodies causing extreme surface water pollution.

(2) Current Environmental Situation

1) Lakes

Most lakes in the urban area of Haiphong are heavily polluted by the inflow of untreated sewage. The levels of BOD are as high as 150 mg/l or higher, and exceed the environmental standard for surface water (TCVN 5942-1995, 25 mg/l for BOD) by several times. Large fluctuations in water quality due to tidal mixing were also noted. Some lakes (e.g., Tien Nga Lake) are densely covered by water hyacinth, and exhibiting the characteristics of eutrophication. The levels of nutrients are in the order of 30-50 mg/l for T-N and 1-5 mg/l for T-P. Water pollution of these lakes in the urban area must be controlled urgently. Water quality of lakes in less densely populated area, such as Do Son (e.g., Dan Tu Lake) and Kien An (e.g., Ngoc Son Lake), are better, although localized pollution is progressing.

2) Channels

Most channels in the urban area are heavily polluted by sewage, and the water quality is exceeding the Vietnamese surface water standard with respect to BOD, COD and ammonia. DO level is generally low, and sediment is exhibiting anaerobic condition. Large sections of these channels are densely covered by water hyacinth. Channels in urbanized area of Do Son and Kien An are also polluted by sewage. However, the water quality of irrigation channels in agricultural area is still relatively good.

1.1.7 Current Institutional Setting for Sanitation and Environmental Management

(1) Organization for Overall Sanitation Improvement and for environmental management

1) Department of Planning and Investment (DPI)

DPI was established in 1996 by merging two departments: Foreign Economic Relations and the Haiphong Planning Committee. It is a professional organization under the administrative control of HPPC and the professional guidance of MPI. It has its own bank account and seal.

(a) Functions

The main functions of DPI are:

- to advise the HPPC on master planning and socioeconomic development (long term, medium term, and annual)
- to recommend strategy, measures, and act as the liaison in the management of investment projects for all (domestic and international) financial sources
- coordinate with other Haiphong government agencies in implementing their projects and plans

(b) Responsibilities

The main responsibilities of DPI are:

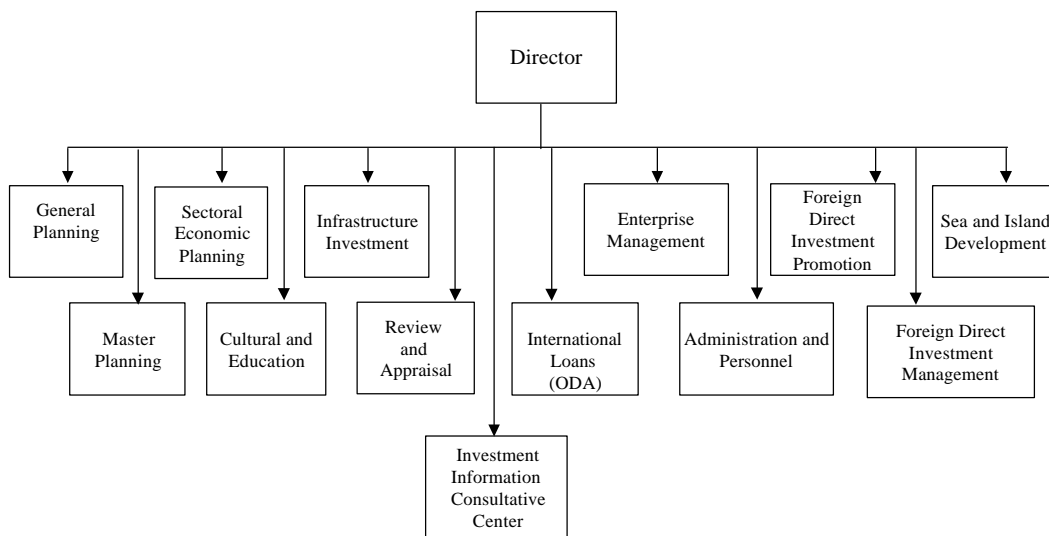
- organizing, analyzing, and gathering information on investment projects for short and medium term planning
- prioritizing socioeconomic development programs and projects
- governing financial sources for infrastructure, grant aid, and international joint ventures
- selecting counterparts for cooperation and negotiation
- contracting and planning for local imports and exports
- cooperating with the Department of Finance (DOF) to monitor the implementation of plans and projects of companies and State Owned Enterprises (SOEs)
- providing guidance and advice to Haiphong City agencies in the preparation of their plans
- providing guidance to agencies and sectors, urban and suburban districts and towns under the HPPC's administration in formulation of plans and projects relating to municipal socioeconomic development
- dissemination of regulations and policies of the State to the local level
- monitoring the implementation of development plans, projects and programs- and proposing to the HPPC measures for strict enforcement of objectives and targets and directly supervising projects assigned by the HPPC

- studying and preparing plans for socioeconomic development and submission to the HPPC for approval
- review and appraisal of investment projects
- management and control of enterprises through issuance of investment licenses
- preparation of periodic (semi-annual) reports on socioeconomic development in Haiphong
- organizing the training of staff on socioeconomic development planning in Haiphong

(c) Organizational Structure

The organizational chart of DPI is presented below.

Organization Chart for the Department of Planning and Investment



The HPPC decision that originally established DPI mandated the following divisions:

- general planning
- master planning
- sectoral economic planning
- cultural and education planning
- infrastructure and investment planning
- review and appraisal
- international investment (promotion, enforcement, and monitoring after licensing)
- enterprise management
- international loans and grants planning
- administration and personnel

Changes have become necessary, including the creation of divisions for:

- foreign direct investment promotion
- managing foreign direct investment projects
- sea and island economic development

Also an information center has been set up to provide information and consulting services to foreign investors.

DPI has three deputy directors:

- one with responsibilities for: planning and the general office, infrastructure investment, the information and investment consultative center, foreign direct investment promotion, review and appraisal, international loans (ODA), foreign direct investment management, and administration and personnel
- one with responsibilities for sectoral economic planning, master planning, sea and island development, and culture and education
- one with responsibilities for enterprise management including SOE equitization

The key divisions for sanitation improvement projects are:

- International Loan Division – which handles all ODA (e.g. JICA/JIBC, FINNIDA, World Bank financing)
- General Planning which handles the local financial contributions from the HPPC

Advice and approvals from both divisions are necessary to get a project financed and implemented.

2) Urban Planning Institute (UPI)

UPI is the main agency responsible for spatial planning within the city of Haiphong. It organizes almost all of the physical planning work in Haiphong. The UPI is the key agency for planning the location of facilities in Haiphong. UPI is the lead agency with respect to preparation and management of the Haiphong Master Plan to 2020.

UPI also undertakes detailed planning work for water supply and sanitation facilities in Haiphong. For example UPI is currently being considered by URENCO for contractual work on the next phase of Trang Cat Landfill.

(a) Functions

The main functions of UPI are:

- government administration in the construction sector
- planning, review and analysis of project proposals

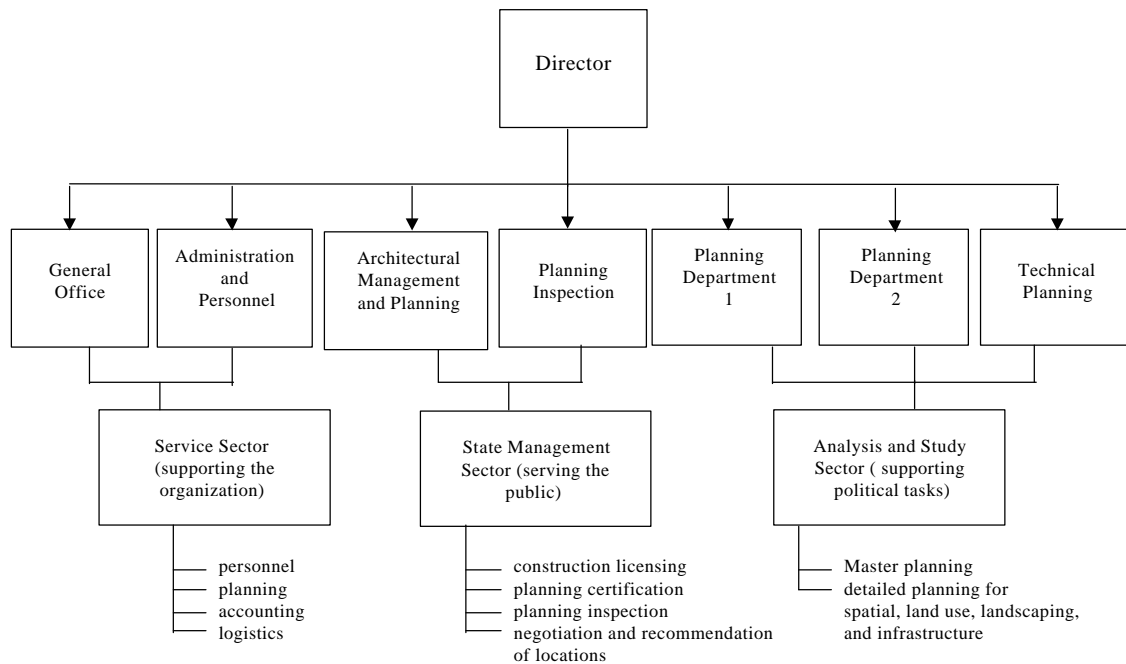
(b) Structure

UPI has a director, one vice director and seven divisions (see organization chart):

- Administration and Personnel: which is responsible for payroll, personnel records, logistics, accounting and budgeting
- General Office: which advises how to participate in projects, prepare monthly and annual reports on UPI activities, and together with Administration prepares the budget
- Architectural Management and Planning: which issues construction licenses and approves the location of facilities
- Planning Inspection: which works together with local authorities to ensure that planning laws are obeyed
- Planning Division 1 which is primarily concerned with planning in the urban area
- Planning Division 2 which is primarily responsible for planning in the suburban areas
- Technical Planning Division which is primarily responsible for infrastructure

The key departments for sanitation improvement planning are 1) Technical Planning Division; and 2) Architectural Management and Planning Division.

Organizational Chart for the Institute of Urban Planning



3) Transport and Urban Public Work Service (TUPWS)

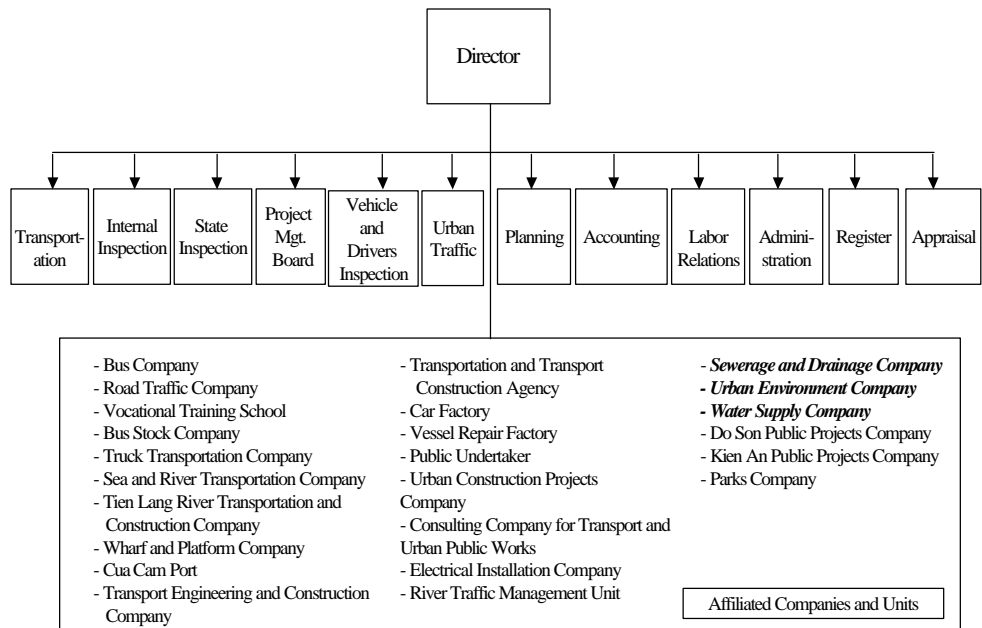
(a) Responsibilities

The Transport and Urban Public Works Service (TUPWS) has overall responsibility for transport and public works in Haiphong City. TUPWS has responsibility for 36 companies.

(b) Organizational Structure

The organization chart for TUPWS is presented below.

Organizational Chart for the Transport and Urban Public Works Service



TUPWS has three deputy directors. One is for construction infrastructure, one is for transportation and one is for Public Utilities (also has responsibility for Green Tree and Parks and Street Lighting).

The organizations within TUPWS that are most important to sanitation improvement are:

- Haiphong Sewerage and Drainage Company
- Haiphong Water Supply Company
- Haiphong Urban Environment Company

TUPWS exercises supervisory and coordination responsibilities over its companies in a number of ways:

- Each company prepares an annual plan and budget for approval by TUPWS and then the HPPC
- For large capital projects, companies will prepare their own proposals. However, TUPWS provides review, advice and comment then submits

draft plans to the HPPC for approval. The HPPC then applies to Ministry of Finance (MOF) for financing

- Project Management Units (PMUs) are established within the individual companies for major projects. Multi-agency Project Steering Committees are established to supervise the PMUs. A vice-chairman of the HPPC chairs these Project Steering Committees. However, there are usually two deputy chairmen. One deputy chairman is from TUPWS and one from DPI. This exact structure has been used in setting up the Steering Committee for this Study

4) Water Supply Company (WSCO)

(a) Objectives

The main objectives of the corporate plan (2000- 2005) for WSCO are:

- to produce at all times, and as economically as possible, clear potable drinking water to meet the needs of the whole city in terms of quantity and the WHO standards in terms of quality
- to keep and conserve water resources
- to expand the capacity of waterworks so that supply is always more than sufficient to meet demand
- to ensure that the quality of water delivered to the consumers meets drinking water quality standards and to achieve quality standards with a minimum amount of loss and waste
- to sell water at the lowest possible cost consistent with the need to obtain sufficient income to cover all operation, maintenance, and investment costs
- to regulate and control the use of water in the best interests of the public in the view of health, economy, and convenience
- to provide speedy, efficient, and sympathetic communication between the public and services units of WSCO
- to maintain proper morale within staff so as to provide efficient consistent and courteous service to the public

(b) Responsibilities

WSCO main responsibilities are:

- extracting water from sources allocated to WSCO, treating it and pumping it to supply
- operation and maintenance of water treatment plants
- distribution of water to consumers and managing customer relations
- management or direct implementation of minor construction works undertaken by WSCO
- organize and keep comprehensive records on all components of the water system

(c) Authorities

WSCO needs authority to:

- set conditions on property owners for house connection arrangements
- control land use within the area allocated for water supply easements for existing water transmission and distribution lines
- collect water utilization fees from customers
- make arrangements with phuongs for revenue collection and financing capital investments at a tertiary level

(d) Facilities

WSCO has the following facilities:

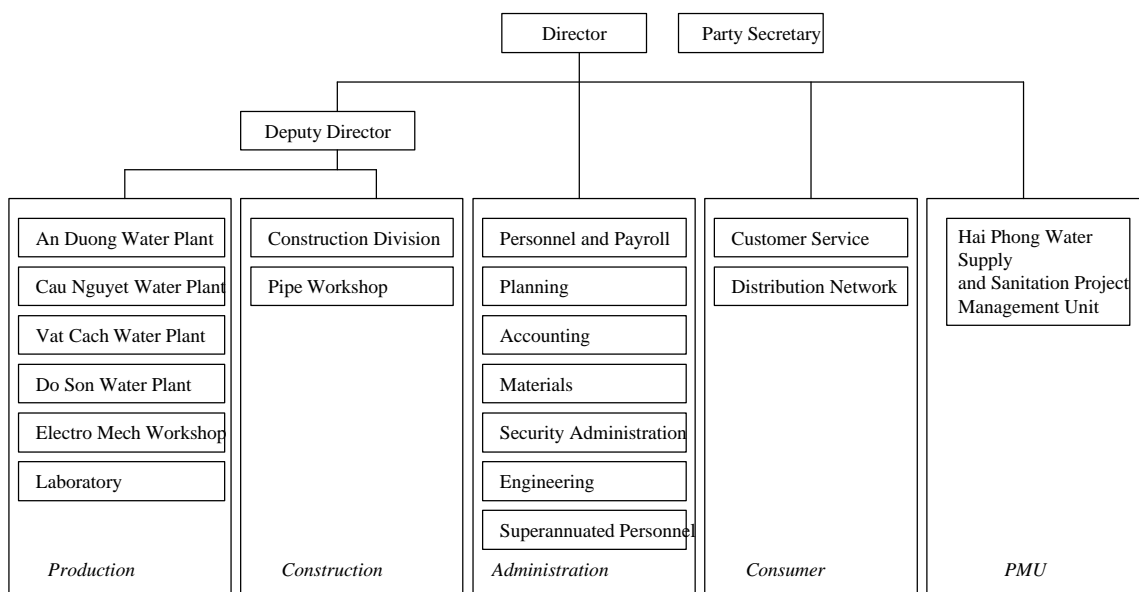
- Water treatment plants at An Duong, Cao Nguyet, Vat Cach, and Do Son
- Water distribution network
- Offices
- Information systems

(e) Organization Structure

The WSCO is organized into four major groups: 1) production, 2) construction, 3) administration; and 4) consumer. There is also a separate PMU for the Haiphong Water Supply and Sanitation Project (HPWSSP).

At present there is only one deputy director (with responsibilities for the production sector). In practice, the General Director is involved in almost all decisions. The duties and responsibilities and authorities of the managers below the General Director need to be further clarified and a more formal delegation of responsibility should be considered. In 1998, a HWSSP workshop recommended the establishment of two additional deputy directors (one for water distribution and customer services; and one responsible for administration). As yet, WSCO has not appointed these new directors. It is believed that there have been difficulties recruiting qualified staff from outside WSCO.

Organization Chart for Water Supply Company



(f) Functions

The main functions discharged by WSCO are:

- operations and maintenance of water treatment plants
- operations of water distribution network
- customers billings and customer services
- finance and administration – budgeting, cash flow management, accounting, personnel management
- planning
- project management for HPWSSP

5) Sewerage and Drainage Company (SADCO)

(a) Mission

The mission of SADCO is to operate and maintain the sewerage and drainage system in an environmentally sound manner to eliminate health risks associated with sewage discharges and flooding.

(b) Major Responsibilities

The major responsibilities of SADCO are to:

- organize access to public sewers within a reasonable distance from property
- organize and keep comprehensive records on all components of the system
- control and regulate hydraulic performance of the system in accordance with tidal and weather conditions

- maintain the system and keep it fully operational by removing garbage, grit, sediment, and sludge continuously and by repairing identified defects
- desludge septic tanks at frequent intervals and take care of septic treatment
- control and consult property owners on proper use of sanitary facilities
- promote public health and sanitation

(c) Authorities

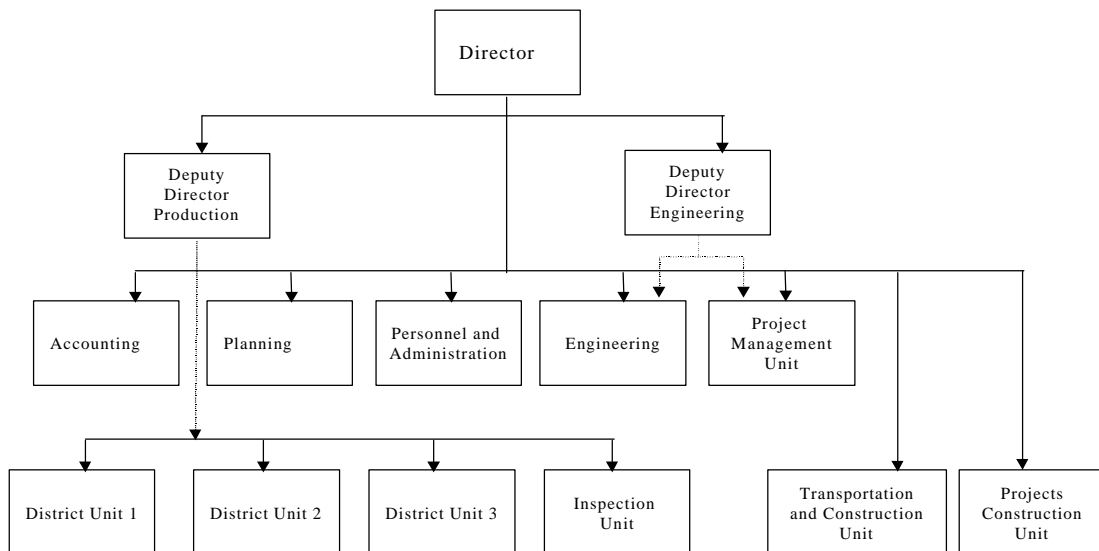
SADCO needs authority to:

- set conditions on property owners for house connection arrangements
- control land use within the area allocated for utility and secondary uses of lakes and channels (aquaculture, recreation, shore zone occupation) and give instructions
- collect fees for system utilization from customers
- make arrangements with phuongs for revenue collection and financing capital investments on a tertiary level
- impose fines and penalties for violation

(d) Organizational Structure

The current organizational structure for SADCO is presented below.

Organizational Chart for Sewerage and Drainage Company



(e) Functions

The main functions discharged by SADCO's Headquarters are:

- Finance and Administration – budgeting, cash flow management, accounting, personnel management
- Inspection – internal audit, contract compliance, compliance with environmental regulations

- Technical Services – technical planning and design, system operational planning and control
- Economic Planning – economic studies, provision of management information
- Project Management

The main functions discharged by SADCO's three district field operational units are:

a) Technical Functions

- desludging of septic tanks and sludge transportation to treatment facilities
- cleaning and repair of combined sewage and drainage system
- hydraulic control of the system (tidal regulation gates, flap valves, penstocks)

b) Administrative Functions

- record keeping on facilities and customers
- collection of fees for specified services
- planning of own operations
- accounting for own operations
- administration of own operations
- reporting on own operations

6) Urban Environmental Company (URENCO)

(a) Mission

To keep Haiphong City clean through efficient operation and maintenance of the solid waste management system in an environmentally sound manner to eliminate health risks.

(b) Major Responsibilities

The major responsibilities of URENCO are:

- organize the separation, collection, transport of all forms of solid waste (domestic, industrial, hazard and hospital)
- organize treatment and disposal of solid waste (domestic, industrial, hazard and hospital)
- street sweeping and street washing
- operation and maintenance of public toilets and other sanitation services
- sanitation management of sea, rivers, and ports in Haiphong Area including collection and transport of solid waste and liquid waste from ships and boats in the river and sea ports
- organize and keep comprehensive records on all components of the solid waste management system

- provide household sanitation services such as bucket latrine management (the emptying of buckets and disposal of nightsoil) and implementation of the bucket latrine conversion program
- promote public health and sanitation
- organize a pilot model on socialization of solid waste collection in Phuong areas

(c) Authorities

The authorities of URENCO are to:

- collect fees from users
- impose fines and penalties for violations

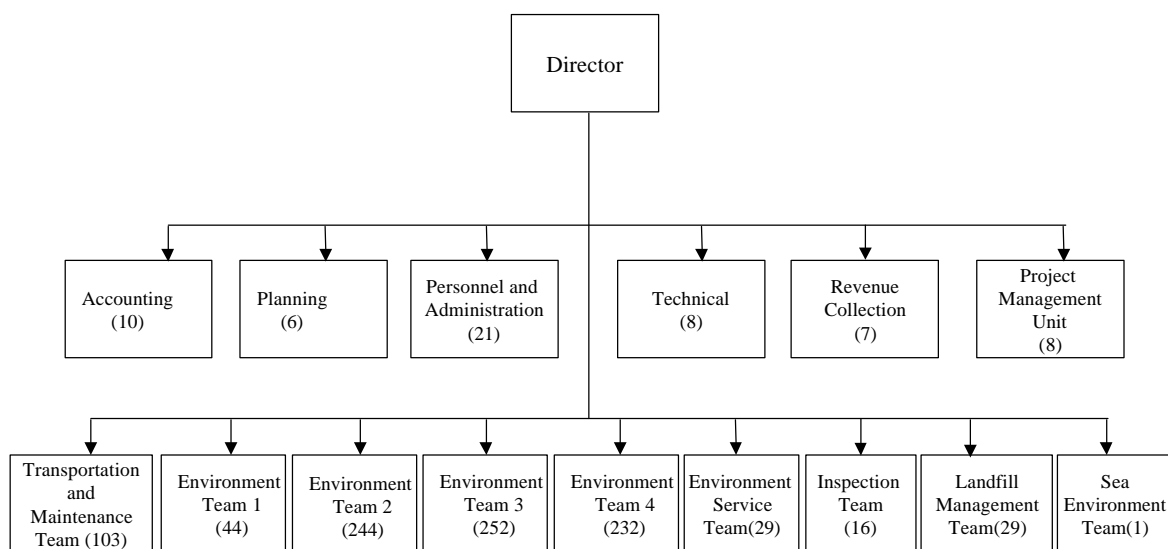
(d) Facilities

URENCO operates the 5 ha Trang Cat Landfill site.

(e) Organizational Structure

The organization chart of URENCO is presented below.

Organizational Chart for the Urban Environmental Company



(f) Functions

The main functions discharged by URENCO’s Headquarters are:

- Finance and Administration – budgeting, cash flow management, accounting, personnel management
- Planning
- Technical Services – technical planning and design, operational planning and control
- Project Management Unit for JICA study
- Revenue Collection

The main function of the three district environment teams (teams 2, 3, and 4) is solid waste collection by handcarts and loading it into trucks.

Environment Team Number 1 is responsible for nightsoil collection.

The main function of the environmental service team is the cleaning and maintenance of public toilets.

The main function of the transport and maintenance team is the transport of solid waste to the landfill.

The main function discharged by the landfill team is operation of the Trang Cat landfill site.

The main functions discharged by the inspection team are: 1) inspection of the activities of URENCO personnel and 2) reporting violations and issuing fines for illegal dumping.

The Sea Environment Team has been recently set up to manage solid waste activities on the sea, rivers, and ports in Haiphong area, including collection and transport of solid waste and liquid waste from ships and boats in the river and sea ports. This team is likely to be receiving more staff soon.

7) Department of Science Technology and Environment (DOSTE)

Government Decree 175/CP provides guidance on the implementation of Environmental Protection Law. It delegates to and assigns the responsibilities for environmental protection to the Ministry of Science Technology and Environment (MOSTE), other ministries, People's Committees, State agencies and people's organizations, and business and production institutions. MOSTE also has broad responsibilities for international activities related to environmental protection, and participation in international environmental organizations.

The People's Committees discharge their responsibilities through the Department of Science Technology and Environment. Most of the responsibilities, except environmental inspection, fall to the environmental management divisions (EMDs) of the DOSTEs. In general, the EMDs of DOSTEs have been delegated the following responsibilities:

- to prepare and submit a provincial environmental protection plan to MOSTE for approval and follow-up implementation
- as assigned by MOSTE, to carry out appraisal of EIA of investment projects and provincial socioeconomic master plans
- to implement environmental monitoring
- to implement environmental pollution control
- to implement waste control
- to propose solutions to environmental protection problems in the provinces

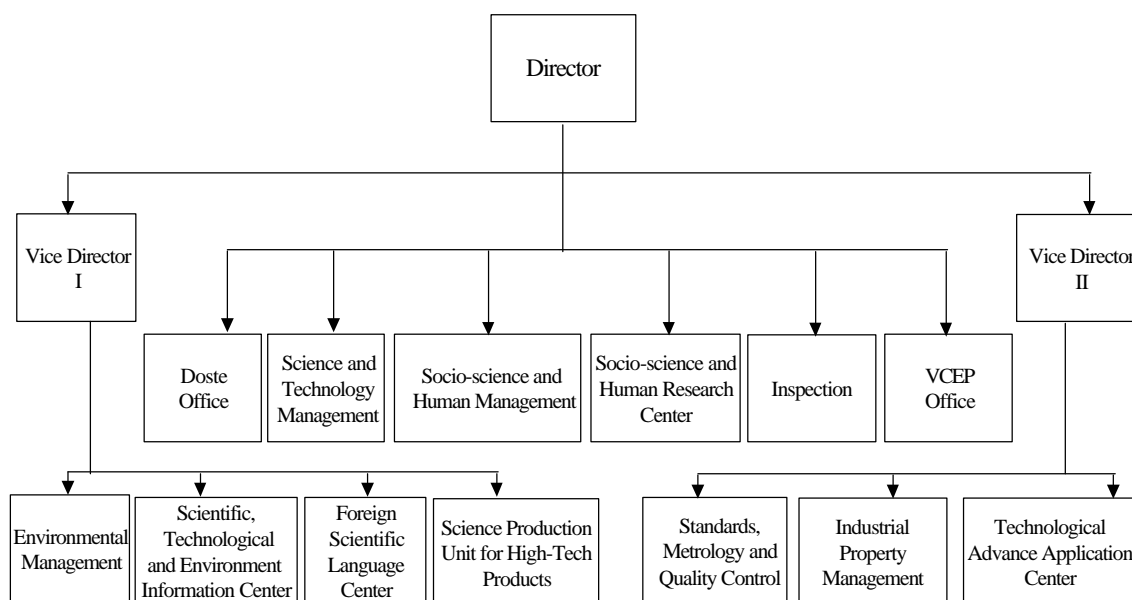
- to cooperate with the inspection agency of the DOSTE in carrying out environmental inspection in the province
- to popularize activities relating to environmental protection, organize and conduct promotional campaigns for environmental protection and cooperation with concerned agencies in enhancing, training and improving environmental awareness in its province

The Haiphong DOSTE is an advisory and professional organ of the Haiphong People’s Committee, carrying out the function of state management in science, technology and environment.

(a) Structure

The organization chart of the Haiphong DOSTE is presented below.

Organization Chart of the Department of Science Technology and Environment



The Environmental Management Division (EMD) is the key organization for environmental protection.

(b) Functions

The EMD performs the following functions:

- provision of advice on environmental policies, strategies and sustainable development
- elaboration of legal documents for environmental protection and the demonstration of leadership to enhance implementation
- control of the implementation of the Law on Environmental Protection and the Haiphong Government regulations and policies on environmental protection
- review and appraisal of environmental impact assessment reports

- surveying the status and carrying out EIAs of existing facilities located in Haiphong to assess the negative impacts and environmental pollution
- control and monitoring of environmental pollution
- education, propagation, and dissemination of information about the law, regulations, and policies on environmental protection
- educating and training environmental officers
- cooperation in the field of environmental protection in Vietnam and internationally

(2) Institutional Aspects of Haiphong Water Supply and Sanitation Project (HPWSSP)

FINNIDA has supplied technical assistance through the HPWSSP in the sanitation sector since 1991. FINNIDA has been building capacity and strengthening SADCO, WSCO, and URENCO.

1) Institutional Strengthening in SADCO

The institutional strengthening activities that are being undertaken by the HPWSSP up to the end of 2000 include:

(a) Finance and Administration

- development of corporate structure and corporate management
- development of financial management, accounting, and management information systems
- human resource development and training

(b) Sewerage and Drainage operations

- development of operations and structure
- improvement of sewerage and drainage records
- improvement of customer registers, billing, collections, and customer relations management
- establishment of operations and maintenance guidelines
- improvement of equipment maintenance practices
- improvement of project and construction management practices

(c) Procurement of computer hardware and software

2) Assistance to URENCO to Increase Organizational Capacity

Through the HPWSSP, FINNIDA is providing assistance to URENCO in form of:

(a) Management Capacity Building

- update of the corporate plan
- development of tariff policy
- promotion of service orientation

- definition of private sector business activities
- (b) Human Resource Development
 - implementation of training plan 2000
 - outline of HRD program for 2001
- (c) Financial Planning and Management
 - tariff policy and cost recovery development
 - training on the Solomon IV accounting software system

3) Technical Assistance to Water Supply Company

The report of the Haiphong People's Committee on HPWSSP Phase II listed the main works undertaken:

- strengthening of management, management system, reorganization of company to be consistent with its mission
- completion of accounting systems in production costs, subcontracting systems for water production units and the consumption departments
- improvement in work discipline and introduction of performance evaluation system
- improvement operation and management of network system
- improvement of money collection practices
- completion of billing system computerization
- computerization of accounting, personnel, salary, and material management systems
- implementation of new water metering system and phasing out of flat rate water billing system

(3) UNDP Pilot Administrative Reform Project in Haiphong VIE/98/003

The pilot Public Administration Reform Project in Haiphong, assisted by the Netherlands Government and UNDP began in November 1998. The Project aims to assist Haiphong City to:

- make reforms and innovations to improve its management capability
- be more responsive to people's needs
- expand the transparency in administration procedure
- enhance people's involvement in the government system

The project has five primary objectives:

- to enhance the capabilities of the Office of the People's Committee (HPCO) and the Department of Organization and Personnel (DOP) for improved interdepartmental co-ordination, human resource management, and dissemination of information in respect of Public Administration Reform

- to assist in establishing a permanent and sustainable mechanism to support the Haiphong Peoples' Committee (HPPC) to oversee and co-ordinate all key activities in urban management (finance, planning, and environment)
- to establish processes and procedures to put in place a local budget preparation and implementation system and to clarify the nature and responsibilities of strategic planning and local planning and their environmental implications
- to clarify processes and procedures and responsibilities for business registrations, construction permits, and to develop the necessary instruments, regulations, organizational structures, and support systems for their implementation
- to introduce new methods and procedures for public utility socialization, assist, in preparation of a pilot case study, and upgrade staff skills in service delivery performance standards and their application

Out of the five objectives mentioned above, the second and fifth ones have direct and immediate relevance for sanitation planning as described below.

Urban Management Co-ordination Council

An Urban Management Co-ordination Council has been set up to function as an interdepartmental coordination body to create Integrated Strategic Planning, Multi-Sector Investment Programs, Public Sector Investment Programs (including prioritization lists), and Inter-departmental Action Plans. The Council will have the role of monitoring and evaluating the operating results of member departments and public service delivery.

Members of the Council include: Vice of HPPC (chairman), leaders of functioning departments:

- Haiphong People's Committee Office
- Department of Planning and Investment
- Urban Planning Institute
- Department of Finance and Pricing
- Department of Science Technology and Environment
- Department of Organization and Personnel
- Department of Construction
- Department of Industry

Case Study on Socialization of Waste Collection

TUPWS has been the focus of public service delivery in Haiphong. Although socialization of some services has already taken place, TUPWS has no experience in formulation of a more general program for socialization. TUPWS wishes to improve the quality of public service delivery and reduce the State budget share of the costs through socialization.

A case study on socialization of solid waste collection has begun in Quan Toan phuong. This case study will involve the transfer of the responsibility for solid waste collection and the collection of fees to the level of local government.

(4) Organizational Settings for Water Supply

1) Central government level

Current lawmaking is based on the 1992 Constitution and on the Law for the Organisation of the Government, 30 September, 1992. The Government of Vietnam has normal planning, budgeting, norm setting and control duties. The ministry level is responsible even for technical design, while the provincial authorities are responsible for construction, operation and maintenance of water supply systems and for making the annual investments required for minor upgrading and investment.

(a) Ministry for Agriculture and Rural Development (MARD)

The main Central Government Institution connected to water supply is the Ministry for Agriculture and Rural Development (MARD), which is responsible for State water resource management. According to the Law on Water Resources, the key responsibilities of MARD include: approval of river basin and hydraulic works planning as authorized by the Government; approval and supervision of the implementation of river basin plans; cooperation with related agencies on basic survey, inventory and evaluation of water resources; flood prevention, and inspection of water resources.

(b) Ministry of Planning and Investment (MPI)

The Ministry of Planning and Investment, through which all ODA funded projects must pass, is responsible for national short and long term planning and coordination with international donors.

(c) The Ministry of Construction (MOC)

The Ministry of Construction (MOC) prepares policies on urban planning and construction management. It issues building standards and guidelines (like price estimates) on evaluation of various construction projects. It is also responsible for the implementation, monitoring and co-ordination of ODA funded water supply projects.

For historical reasons, the MOC has a somewhat anomalous role; it is both the major technical agency responsible for sector regulation and also a consulting and contracting organisation supporting itself through commercial activities. Thus MOC includes within its structure several regional construction enterprises, pipe manufacturing plants, and other units that are expected to compete for contracts on projects approved (and possible

designed) by the MOC. Its design companies (of which the one directly concerned with this sector is the Hanoi-based Vietnam Consultant for Water Supply Sanitation and Environment-VIWASE) not only review technical designs on behalf of MOC, but also act as consulting firms and may actually have prepared those designs.

(d) The Ministry of Science, Technology and Environment (MOSTE)

The main role of MOSTE is to assist the Government with strategies and policy planning matters related to science, technology and environment. MOSTE is the top decision-making body with overall responsibility within the environmental sector. Within the Ministry, the National Environmental Agency (NEA) is the environmental arm, whose main task is to act as co-ordinating body for other Ministries with environmental responsibilities. It is also charged with developing legislation and regulations, programs, control and monitoring systems to enforce the protection of the environment throughout the country.

2) Local government level

(a) Haiphong People's Committee (HPPC)

All urban activities in Haiphong fall under the control and jurisdiction of the Haiphong People's Committee (HPPC), which has an executive body consists of about 20 members. The Chairman is assisted by four Vice-Chairmen. Other members are the directors of the most important of the various 22 city sectional departments, called "Services" or "Committees", each responsible for a particular aspect of city administration, as well as representatives of the Party. The HPPC members are selected from the Haiphong People's Council, a larger body elected every 4 years, which meets periodically (typically 2 to 5 times each year) but which delegates most major decisions to HPPC.

(b) Transport and Urban Public Works Service (TUPWS)

The parent organization of the Haiphong Water Supply Company (WSCO) is the Transport and Urban Public Works Service (TUPWS). TUPWS is the principal city organization concerned with public works. Under TUPWS there are 26 public companies, which are divided into two main groups; state companies, which are autonomous and self-sustained (e.g. WSCO) and public enterprises, which are companies not able to generate enough revenue to cover costs and are thus dependent on subsidies.

(c) Planning Institute

The planning Institute is responsible for physical planning in the city. According to the Decision Provisional Regulations with Decision No.

1094/QD-TCCQ on 7.10.1994 of HPPC, the Planning Institute has the following tasks:

- Planning
- Urban architecture
- Construction planning management

(d) Local implementation organization, WSCO

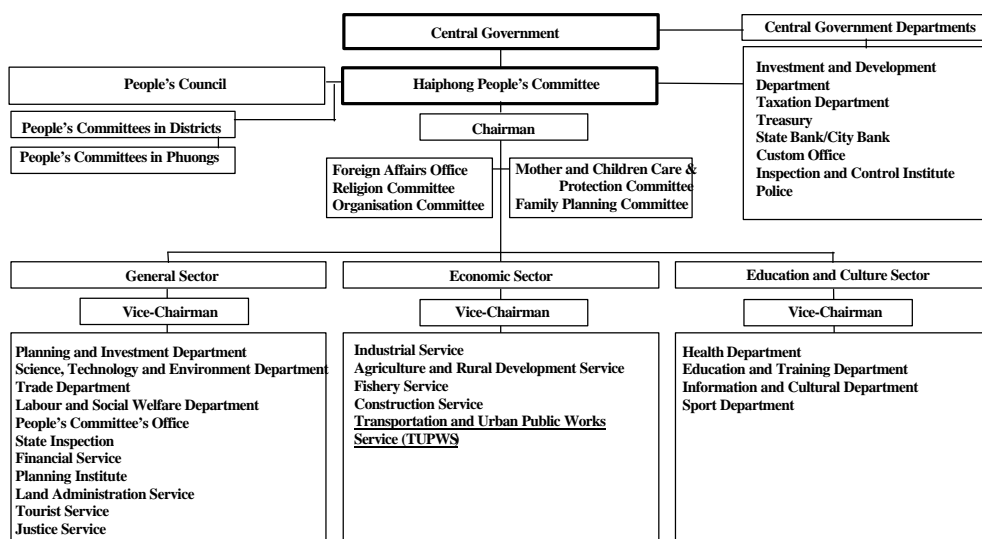
The organization with local responsibility for the water supply sector in the Haiphong City area is the Haiphong Water Supply Company (WSCO), a Public Service Enterprise. In the city organization, WSCO is under Haiphong Transportation and Urban Public Work Service (TUPWS). The company's main task is to produce and supply potable drinking water to WHO standards satisfy the demand required by Haiphong City.

(5) Organizational Settings for Drainage and Sewerage

1) Local Government

The current institutional setting in Haiphong is illustrated in the following figure. The upper stratum of the local government is comprised of the People's Committee (HPPC), the elected People's Council and a number of departments and services that report both to the central government and HPPC. The Haiphong People's Committee (HPPC) is an executive body of 20 members in charge of urban activities. The Chairman is assisted by three executive Vice-Chairmen. The other members are Directors of selected city departments. The HP People's Council is elected every four years.

Local Institutional Setting in Haiphong



With respect to urban environmental investments, the most important departments are the Department of Planning and Investment (DPI) reporting

to the Ministry of Planning and Investments (MPI), which is the pivotal central government organisation controlling investments, and the Department of Investment and Development (DID) reporting to the Ministry of Finance. The Department controls the flow of funds to investment projects, including disbursement of funds borrowed from international sources, through the banking system, e.g. the Bank of Investment and Development.

2) Haiphong Transport and Urban Public Works Service

The Haiphong Transport and Urban Public Works Service (TUPWS) is the umbrella organisation of some 26 public companies, which are divided in two main groups: state companies, which are autonomous and self-sustained, and public enterprises, i.e. companies not able to generate enough revenue to cover their costs and are thus dependent on subsidies. In the former group, TUPWS acts as a monitoring agency only, but in the latter group TUPWS is the channel of subsidy funds. TUPWS is subordinate to the HP People's Council and to the Haiphong People's Committee (HPPC). The current organization of TUPWS is illustrated in the figure on p. 1-27.

TUPWS is the principal organization concerned with various public works from public parks to transportation services. Two companies under the authority of TUPWS are responsible for the sewerage and drainage systems in the Study Area. The Haiphong Sewerage and Drainage Company (SADCO) operates the sewerage and drainage system in the urban centre of Haiphong. The service area comprises the urban districts of Hong Bang, Le Chan and Ngo Quyen. The Urban Management Company operates the Kien An and Do Son sewerage and drainage systems.

Among other city administrations, TUPWS is also a beneficiary of a two year UNDP funded "Public Administration Reform Project", started in 1999. It is to be expected from the Project that city services like TUPWS will be reorganised with mergers and new administrative practices to be proposed. Private sector encouragement is definitely not excluded as an approach for service delivery, since it has proven competitive elsewhere. To coordinate the delivery of public services, an Urban Management Coordination Council, to work on issues of urban management and city planning, has been proposed by the Project.

Within the city, all investment projects are subject to HPPC's approval. The authority of TUPWS to approve designs and cost estimates of projects is limited to projects not exceeding VND 1 Billion. For projects exceeding this limit endorsements of various services, e.g. the Construction Service, Financial Service, Land Administration Service, DPI and DID, must be sought prior to the approval of HPPC.

Tariff setting is also approved by HPPC after clearance by the Tariff Committee comprised of representatives of the Financial Service, Department of Capital Fund Management, Service for Labour, Invalids and Social Welfare and TUPWS. The tariffs are subject to endorsement of the People's Council before implementation by the decision of HPPC.

Funding of the HPPC approved capital investment projects are planned simultaneously with the operations by the companies concerned and submitted through TUPWS for the approval of the Department of Investment and Development. Disbursement of the investment funds takes place in accordance with the annual and quarterly plans pro rata with the audited and appraised progress of the works.

The public enterprises under TUPWS are obliged to submit their annual and quarterly operational plans and consequently their quarterly and annual reports for the approval of TUPWS and further for the information of HPPC and the Ministry of Construction. Based on these plans, the funds for operations of the companies are released by the Financial Service.

The companies under TUPWS are not entitled to recruit new staff or to nominate vice-directors and chief accountants without the approval of TUPWS and HPPC. Prior to the nomination of heads of departments, the companies should consult TUPWS for endorsement. The companies are inspected twice a year and the annual audit of a year will take place normally mid-next year. The audit committee consists of representatives of the Tax Department, the Department of Capital Fund Management, and TUPWS.

3) Haiphong Sewerage and Drainage Company

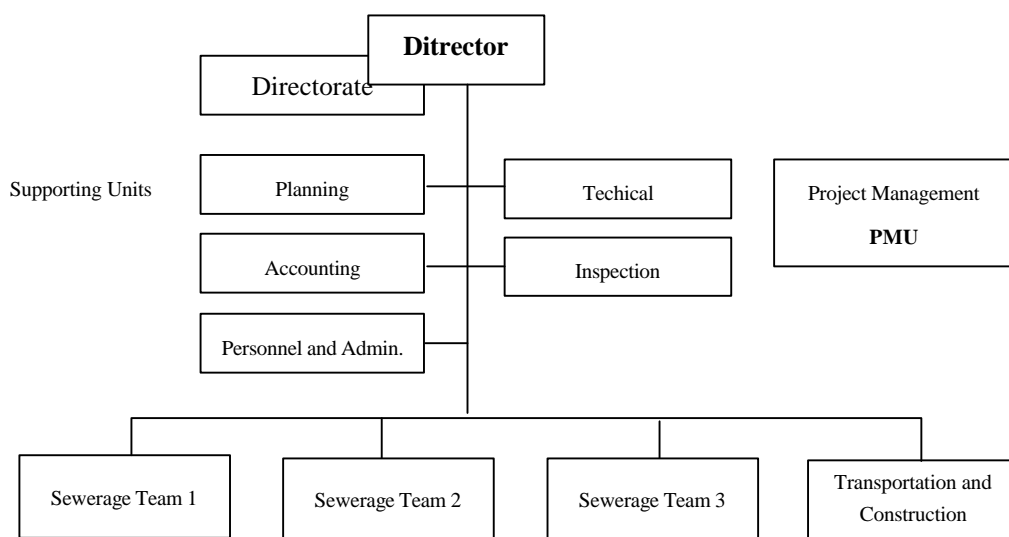
Haiphong Sewerage and Drainage Company (SADCO) was established on August 29, 1995, became a State Owned Enterprise (SOE) and a Public Utility Enterprise in March 1999 (PUE; under Decree No. 56/CP, October 2, 1996). Accordingly, it can enter into contracts with local and foreign parties. Practice in Haiphong, however, is somewhat different. After the Decree on PUEs was issued, some of the TUPWS departments were considered as PUEs, but not yet SADCO. When subsequently in 1999, SADCO was also considered a PUE, no effort was made to change its structure and operations. TUPWS does not yet allow independent operations and retains exclusive rights for signing major contracts on behalf of SADCO. Upon recommendation by TUPWS, the HPPC is responsible for allocation of budget funds for SADCO.

SADCO operates the combined sewer system in the urban centre of Haiphong. The service area covers 37 neighbourhoods (phuong) and about 27 km² of the urban districts (quans) of Hong Bang, Le Chan and Ngo Quyen. SADCO operates the sewer/drainage network and drainage channels,

regulating lakes and tidal gates in the central area and in Quan Toan, Hung Vuong and So Dau.

SADCO has a total of 272 employees. Fifty-one have a university degree and 171 are considered labour. The remainder are non-graduate supervisors and office workers. SADCO manages, maintains, repairs and cleans the entire sewerage and drainage system. In Haiphong, the system includes sewers, manholes, drainage channels, tidal gates, regulation lakes and wastewater pumping stations. SADCO's other operations include: a) management of a capital fund for sewerage and drainage projects, b) construction of sewerage projects, c) production of concrete elements and other construction materials, and d) septic tank cleaning services. Part of these services must be considered as falling under the 30 % allowable (under the PUE decree) non-state order quota. The current organization of SADCO is illustrated in the following figure.

Organization of SADCO



A Project Management Unit (PMU) of SADCO was set up to interface with foreign project partners following a decree on such units within public utilities or PUEs. The PMU is the counterpart organisation for ODA projects including the Haiphong Water Supply and Sanitation Programme (HPWSSP) and the World Bank, Vietnam Three Cities Sanitation Project, Haiphong Sub-Project (1B Project). Accordingly, the PMU is required to submit financial statements to external bodies such as auditors approved by the World Bank and other international organizations

As a rule, SADCO applies for operational funds from the HPPC. Funds applied for are substantially more than those obtained and therefore, there is a backlog of work to be done in the field of sewer network cleaning and rehabilitation. Since January 1, 2000, the HP Water Supply Company, on

behalf of SADCO, collects a wastewater fee from water users. This is likely to be used for capital construction in non-project areas.

4) Other Organizations

Besides TUPWS a number of HPPC's services and departments are also involved in reviewing and approving plans and proposals of the sanitation sector organisations, such as:

- The Construction Service, which is the principal organisation in the construction sector, e.g. controlling a number of contracting and consulting companies. The Construction Service approves designs for construction works in investment projects
- The Planning Institute is in charge of long and short term strategic planning and physical planning of the city. The Institute is responsible for the preparation of the Haiphong Sewerage and Drainage Master Plan
- The Department of Science, Technology and Environment is responsible for setting technical standards, promotion of new environmentally friendly technologies for production and for monitoring of compliance with environmental regulations
- The Foreign Relations Office assists all projects receiving foreign support by arranging necessary clearances and simplifying procedures
- The Haiphong Hygiene and Epidemiology Institute monitors the quality of water in rivers and lakes from a public health point of view

The local administration is further split into smaller units each headed by a People's Committee. The city is divided into districts (quang), the central urban area covering three districts: Hong Bang, Ngo Nguyen and Le Chan. The districts are further divided into wards (phuong), each phuong containing 2,000-2,500 households with 10,000-15,000 inhabitants. The phuongs are further comprised of clusters (cum) and smaller quarters (to).

(6) Organizational Settings for Nightsoil Collection and Disposal

As explained in the earlier sections, the Haiphong Transport and Urban Public Works Service (TUPWS) is the umbrella organization responsible for all sanitation-related activities. Nightsoil collection and disposal for the 3 old urban districts is under the authority of URENCO, a company under TUPWS.

There is no authorized agency for nightsoil collection and disposal outside the URENCO cover area. In Kien An and Do Son, nightsoil management is controlled by local Public Works Company. However, there is no facility for collection and disposal. In KA, there is one person responsible for nightsoil and septage under the planning dept. There is no immediate plan to create a separate organization for nightsoil management in KA. Previously, there was a team for nightsoil management in DS. Since the number of bucket latrine has reduced, there is no longer need for such a team.

Within URENCO, nightsoil collection is the responsibility of Environmental Department No. 1. This department is also responsible for constructing and upgrading sewer connections to houses. The total number of staff in this department is around 40, headed by one supervisor and one deputy supervisor.

(7) Organizational Settings for Septic Tank Sludge Collection and Disposal

As explained in the earlier sections, the Haiphong Transport and Urban Public Works Service (TUPWS) is the umbrella organization responsible for all sanitation-related activities. Septic tank sludge collection and disposal for the 3 old urban districts is under the authority of SADCO, a company under TUPWS. In 1995, Quan Tuan was included under SADCO's management.

There is no authorized agency for nightsoil collection and disposal outside the area covered by SADCO. In Kien An and Do Son, septage management is controlled by the local Public Works Company. However, there is no facility for collection and disposal. In Kien An, there is one person responsible for nightsoil and septage under the planning department. There is no immediate plan to create a separate organization for septage management in Kien An.

Septic tank sludge collection was carried out by URENCO until the responsibility was transferred to SADCO in June, 1998. As shown in Sec. 2.1.6 (3), there are four production units within SADCO. Septic tank sludge collection and disposal is a responsibility of the Transportation and Construction Department, one of the four production units.

At present, there are around 20 staff working for the Transportation and Construction Department. About 12 are directly working for septage collection and disposal. However, depending on the need, 20 Phoung level staff also assist with septage management work. It may be noted here that in addition to septage collection and disposal, the Transportation and Construction Department also has responsibility for cleaning existing sewer pipes and constructing new sewer pipes.

(8) Organizational Setting for Solid Waste Management

The Haiphong City (HPPC) is responsible for solid waste management (SWM) in its jurisdiction area.

The Department of Transport and Public Works is the principal HPPC department responsible for administration of SWM. The Planning Department, DOSTE and the Department of Health are also involved in administration of SWM. The Planning Department is responsible for selecting the locations of landfill sites and other major SWM facilities. DOSTE is responsible for matters related to hazardous waste management and landfill. The Department of Health is responsible for administering hospital waste management.

In Haiphong City area, there are three companies that provide SWM services. Urban Environment Company (URENCO) is responsible for the three urban districts, i.e., Hong Bang, Le Chan and Ngo Quyen. Kien An Urban Works Company is responsible for Kien An Urban District. Do Son Public Works Company is responsible for Do Son Town and areas located along Route 14 that run from the city center to Do Son. Those three companies are under the control of TUPWS.

There are no SWM companies in the rural districts of Haiphong City. There are no SWM services provided in the rural districts.

URENCO is specialized in SWM services only, while both Kien An Company and Do Son Company provide not only SWM services but also drainage service, road maintenance and some other services.

The SWM services include the following:

- Collection, transport treatment and disposal of solid waste
- Street sweeping
- Water sprinkling
- Collection, transport and disposal of night soil

The said three companies collect all kinds of solid waste as shown below:

- household waste
- office and commercial waste including market waste
- industrial waste
- street waste
- demolition waste

The said three companies apply landfill as the means of waste disposal. There are no intermediate treatments practiced in Haiphong. There are no facilities specialized in treatment of industrial waste or hospital waste. All these wastes go to municipal landfill sites.

At present, there are two municipal landfill sites, Trang Cat Landfill Site and Do Son Landfill Site.

It is the policy of HPPC to replace latrine toilets with septic tanks. URENCO has replaced about two thirds of latrine toilets so far in the three urban districts. It will take a few more years to complete the replacement program.

1.2 Necessity of Sanitation Master Plan

Haiphong City is one of the most important cities in Vietnam with the third largest population next to Ho Chi Minh City and Hanoi. The city forms the North Economic Triangle together with Hanoi and Quang Ninh province with the biggest international trading port in the northern region of the country. The population is increasing and the economy is growing. Large-scale industrial development as well as tourism development are envisaged. Aiming at incorporating the above into the future land use, a long-term spatial plan was developed and is expected to be approved in 2001 by the Prime Minister.

As the economy develops and population increases, pollution loads also increase in various forms and environmental quality including surface water quality has been degraded. Due to the city being low lying and in a flat delta area with a tidal fluctuation of about 4 m, flooding has occurred almost every year due to the inadequate drainage system. The collection and disposal capacity of solid waste is running out, endangering the sanitary condition of the residents. Although some sanitation plans have been prepared and some have been put into effect they are limited in area and scale.

A long-term sanitation improvement plan should be worked out which should be coordinated with the long-term spatial plan. The plan should cover the improvement in the sectors of water supply, drainage, sewerage and solid waste management as well as surface water improvement in Haiphong City. Facility and system plans should be worked out in these sectors. Institutional and organizational plans and recommendations should be made to support and operate the improvement facility and systems. Among the formulated projects/measures, priority projects should be selected for short-term implementation and feasibility studies undertaken their design and assess their effect and feasibility.

A Sanitation Master Plan (SMP) for the improvement of the Haiphong City is, therefore, needed and will be worked out in this JICA Study in cooperation with HPPC.

1.3 Concept for the Formulation of Sanitation Master Plan

In principle, the formulation of the Sanitation Master Plan consisted of.

- Determination of the current conditions and problems,
- Predicting the future degradation of sanitary/environmental situation, and
- Identifying alleviation measures and improvement plans along with cost estimates and implementation schedules

It is noted that projects/studies which are either currently being carried out or scheduled to be implemented by HPPC (including 1A, 2A and 1B projects assisted by the World Bank (WB) and the projects assisted by FINNIDA) have been duly considered and are incorporated in the Study.

More specifically, the formulating procedure was comprised as follows:

- (1) Determination of the Study Scope
 - Demarcate the Study Area
 - Setting the target year
 - Main focus in undertakings/projects by public initiative rather than the private initiative
- (2) Collection of data, information, carrying out field surveys/analyses, interviews, discussion with the cooperation by HPPC and other concerned organizations, etc.
- (3) Grasping the Current Conditions
 - Socio-economic conditions
 - Sanitation condition, environmental condition including surface water quality
 - Legal, institutional, organizational frameworks
- (4) Setting the Future Macro-frame
 - Population, GRP, per capita GRP, industrial growth/industrial zones
 - Land use
- (5) Consultation with the Authorized Plans & Coordination with the Relevant Plans
 - Coordination/incorporation of the authorized plans
 - Coordination, incorporation of other plans if their recommendations are deemed appropriate and complimentary to JICA SMP
- (6) SMP Formulation
 - 1) Classification of the Study Area based on
 - Current sanitation/environmental conditions
 - Current intensity of growth including population density as clear indicator

- Future growth potential
 - Distinction of the needs for public undertaking and projects by private initiative by area within the Study Area
- 2) Basic direction/strategy by classified area and determination of the depth of study required in the JICA Study
- 3) Sanitation improvement plans by sector (facility/system plans)
- Sectors
 - water supply
 - drainage
 - sewerage
 - septage
 - lake improvement
 - solid waste management
 - Coordination among sectors
 - Basic planning procedure for sector studies
 - prevailing problems
 - design and planning targets
 - alternative measures/projects and the selection of the optimum project for F/S
 - preliminary design and cost estimate
 - phased development and implementation schedule
- 4) Sanitation improvement plans (Institutional measures)
- Legal and institutional measures
 - Re-organization/reinforcement of administrative and managing bodies
- (7) Selection of the Priority Projects
- Urgency for implementation
 - Need for carrying out F/S in this Study, i.e., no detailed study being carried out to date
- (8) Financial Requirement, Implementation Schedule and Affordability for Implementation
- Financial Requirement
 - Implementation Schedule
 - Affordability for Implementation
- (9) Assessment of Improvement of Sanitation Condition to be Achieved by SMP
- (10) Carrying out F/S on the Selected Priority Projects
- 3 Priority Projects: Drainage, Sewerage, Solid Waste Management
 - Facility/system plans, cost estimate, implementation plan, project evaluation

(11) Implementation of Pilot/Demonstration Project for Water Treatment

- Demonstration of environmental improvement, technology transfer, awareness raising for the citizens and the concerned organizations
- Reference for the full scale development in the future

1.4 Macro-frame for Sanitation Master Plan

1.4.1 Population Frame for the Study Area

- (1) Understanding of the population frame of the approved City Master Plan and direction of amended Master Plan

Population frame of the Approved City Master Plan is shown in the table below. Since the predicted population in 2000 is much greater than the present population, the population in 2010 is expected to be less than predicted.

Population frame of the Approved City Master Plan

No.	Target	Unit	Existing condition	Predicted	
			1991	2000	2010
1	2	3	4	5	6
1	Natural increase	%			
	Entire City		19.22	15.00	11.00
	Urban		12.73	11.00	8.00
2	Mechanical increase		6.06	9.00	14.00
3	Comprehensive increase				
	Entire City		25.28	24.00	25.00
	Urban		18.79	21.00	22.00
4	City population	1,000 persons	1,517.8	1,767.3	2,154.3
5	Urban population		511.0	674.0	1,050.0
	Including inner city(3districts)		369.2	550.0	750.0
	Do Son		25.7	38.5	46.3
	Kien An		58.7	70.4	78.0
	Minh Duc		8.0	15.0	30.0
	Vat Cach		10.0	20.0	30.0
	Other		53.4	80.0	96.0

Revision of the master plan is being carried out and population projections will also be revised. The population frame will be reduced.

	Master Plan Approved in 1993	Amended Master Plan
Haiphong City Population	2,154,000 (2010)	1,950,000 (2010 estimation)
		2,200,000 (2020 target)

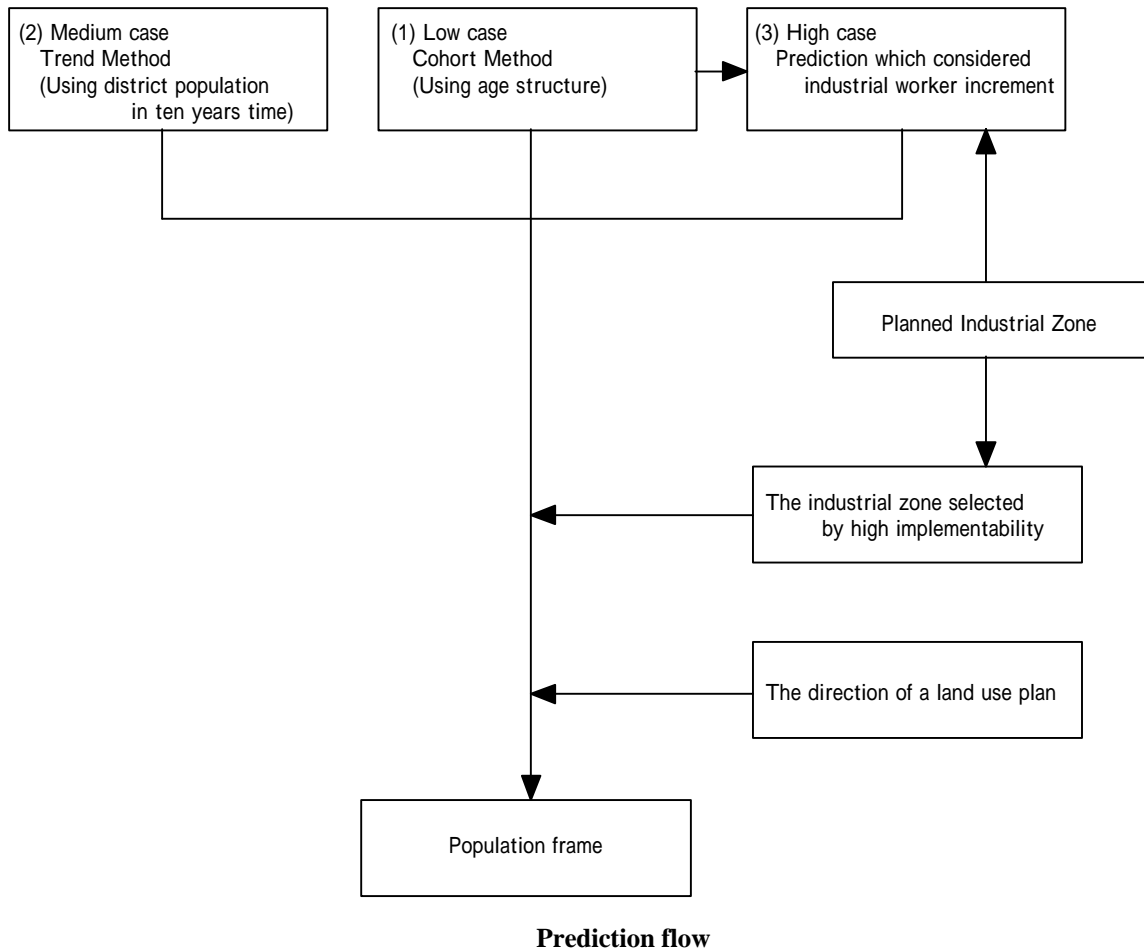
- (2) Methodology

The population prediction procedure is illustrated by the following flow chart.

The future population of Haiphong City is predicted by three methods, and a future population scale will be set. Furthermore, considering the direction of land use in

the master plan and the possibility of industrial development, the population frame will be finalised.

The future population frame of the entire Haiphong City will be determined by sub-district.



(3) Prediction Results

The results of the three methods set the predicted 2020 population at between 2,000,000 and 2,200,000.

Prediction Result

	1999	2010	2020
Low Case	1,677,465	1,875,953	2,024,334
Mid Case		1,921,280	2,134,568
High Case		1,940,273	2,228,658

(4) Population frame for the Sanitation Master Plan

1) Setting conditions

The population frame for the SMP was established on the basis of the above-mentioned predictions of the previous table and by considering the following two views.

(a) Implementability of the industrial zone

Although the area of industrial zones in amended Master Plan serves as 2420ha, a high industrial zone area of implementability for this study is set up on the basis of the hearing from each entrepreneur and others.

Industrial area	Revised Master Plan			The JICA Study Team		
	2000	2010	2020	2000	2010	2020
1. Nomura	153	153	153	153	153	153
2. Vat Cach	100	150	310	100	150	200
3. Thuong Ly-So Dau	100	120	150	100	120	150
4. Quan Tru	20	28	30	20	25	30
5. Cong Doi-Van Trang	10	15	20	10	15	20
6. Tien Hoi	10	20	20	10	10	20
7. Dong Hai	97	150	150	97	97	97
8. Dinh Vu	164	639	937	164	200	300
9. Minh Duc	30	70	100	30	70	100
10. Ben Rung	30	150	250	30	100	200
11. Vu Yen	20	50	100	20		
12. Hai Thanh	30	50	50	30	30	50
13. Processing Zone	150	150	150	150		
Total:	914	1,745	2,420	914	970	1,320

(b) The view of a land use plan for amended Master Plan

The planned land use in the 3 central urban districts are rather restricted. The future population increase should, therefore, be absorbed mainly in the expanding areas outside of the 3 central urban districts.

2) Population Frame for the Study Area set by the JICA Study Team

	1999 (persons)	2005 (persons)	2010 (persons)	2015 (persons)	2020 (persons)	Area (km2)
Study area						
1. Hong Bang Dist.	97,565	103,715	108,796	113,844	118,861	15.20
2. Ngo Quyen Dist.	171,623	177,017	181,890	186,765	191,642	12.24
3. Le Chan Dist.	146,204	151,036	155,327	159,616	163,904	4.42
4. Kien An Dist.	73,001	82,594	90,432	98,269	106,107	26.70
5. Do Son Town	30,560	33,580	36,262	38,944	41,626	39.50
6. Quan Toan	4,161	4,994	5,827	6,410	6,993	5.00
7. Minh Duc	19,197	22,806	26,158	29,908	33,658	15.62
8. Dinh Vu						11.52
9. New Development Area	12,280	17,237	21,216	25,197	29,179	22.13
SA total	554,591	592,978	625,908	658,954	691,969	152.33
Augmented area						
South of Hong Bang						
Nam Son Com.	6,288	7,417	8,546	9,674	10,803	3.99
An Dong Com.	14,608	17,440	20,076	22,371	24,654	6.77
South of Hong Bang Total	20,896	24,856	28,621	32,045	35,457	10.76
South of Le Chan						
Du Hang Kenh Com.	22,801	28,739	34,046	38,776	43,473	2.69
Vinh Niem Com.	11,102	15,543	19,984	24,424	28,865	5.63
South of Le Chan Total	33,903	44,282	54,029	63,200	72,339	8.32
Southeast of the City						
Dong Hai Com.	16,180	19,604	22,749	25,508	28,251	9.52
Dang Lam Com.	10,115	13,150	16,184	19,219	23,265	4.62
Dang Hai Com.	7,522	9,403	11,283	13,164	15,044	2.98
Nam Hai Com.	7,543	9,429	11,315	13,200	15,086	5.74
Trang Cat Com.	7,971	8,755	9,598	10,277	10,955	14.94
Southeast of the City Total	49,331	60,340	71,128	81,367	92,601	37.80
Augmented Area Total	104,130	129,478	153,779	176,612	200,397	56.88
Effective Study Area Total	658,721	722,456	779,686	835,566	892,366	209.21
Hai Phong City	1,677,465	1,797,542	1,909,322	2,015,649	2,120,692	1,507.66

Industrial Zone

Area (ha)	2000	2010	2020
1. Quan Toan	100	120	150
2. Minh Duc	30	100	200
3. Dinh Vu	164	200	300

Labor (persons)	2000	2010	2020
1. Quan Toan	2,000	6,000	7,500
2. Minh Duc	900	5,000	10,000
3. Dinh Vu	820	6,000	12,000

1.4.2 Economic Frame for the Study Area

(1) GRP of the Study Area

Precise details of the incomes and occupations of inhabitants of the Study Area are unavailable. However, a rough approximation can be made of the value added, or GRP per capita of the population of the study area as a whole if certain assumptions are made. For this purpose it is assumed that since the designated study area is (for the vast majority of the population), relatively densely populated, the sole occupation of residents is in industrial or commercial activities. Per capita income therefore, in 1998, and in 1998 prices, was assumed to be the same for the industrial/commercial population of Haiphong City as a whole, namely VND9,426,600.

The total population of the study area is assumed to consist of the population of the concerned districts, i.e. Hong Bang, Le Chan, and Ngo Quyen Districts in Class A Area, plus Kien An District, Do Son Town and Quan Toan Town in Class B, plus Min Duc and the New Development Area in Class C (the population of Dinh Vu in Class C Area is assumed negligible). In 1998, the total population of these areas was about 544,500.

As shown earlier in this report, the 1998 total industrial/commercial population of Haiphong City as a whole was 729,900. Therefore, 185,400 can be considered as outside the study area. GRP in non-study area can therefore be estimated on the basis of an industrial/commercial population of 185,400, whose per capita income is VND9,426,600, plus an agricultural population of 929,700, whose per capita income is VND1,709,500.

As shown below, average GRP per capita for the non-study area of Haiphong City is therefore VND2,992,600, while for Haiphong as a whole it is VND5,103,400. In 1998, therefore, the study area, with about 30 % of Haiphong City's population, accounted for about 60 % of the city's GRP.

Population and GRP in Study area and Remainder of Haiphong City, 1998.

	Population (thousand)	GRP per capita (VND thousand)	% of Total Haiphong Population	Total GRP (VND billion, 1998 prices)	% of Total Haiphong GRP
Class A Area	407.75	9426.6	24.6	3843.7	45.4
Class B Area	105.75	9426.6	6.4	996.8	11.8
Class C Area	31.0	9426.6	1.8	292.2	3.4
Total A, B and C	544.5	9426.6	32.8	5132.8	60.6
Other Areas	1115.15	2992.6	67.2	3337.0	39.4
Total Haiphong	1659.65	5103.4	100	8469.8	100

Source: Statistical Abstract 1995-1998, Haiphong City, 1999

(2) Industrial Zones

According to the Haiphong Department of Planning and Investment (Revised City Master Plan June 2000) Haiphong plans to develop ten industrial parks or zones. These are:

An Hai District

Nomura

Dinh Vu

VND Hai

Vu Yen

Vinh Niem

Thuy Nguyen District

Minh Duc-Ben Rung

Kien Thuy District

Processing Zone No. 96

Hai Thanh

Hong Bang District

Quan Toan-Vat Cach-Thuong Ly

An Lao/Kien An Districts

An Trang-Tien/Hoi-Quan Tru

These are proposed to cover a wide range of production, i.e. high technology, chemicals, steel production, shipbuilding and repair, shoes, garments, building materials, and machinery. The total numbers of factories planned for 2010 and 2020 are 1,847 and 2,400 respectively.

The Department of Planning and Investment (“Haiphong – Potential Attractive Investment Environment”, 1999) states that the Nomura Industrial Park is considered the best in Vietnam in terms of the quality of its infrastructure. It has an area of 153 ha, an independent power station of 50 MW, a wastewater treatment plant, and other public facilities. It can accommodate over 100 manufacturing plants. Another major project is the Dinh Vu Economic Zone, which has an area of 1150 ha, and will eventually include an industrial park, deep-sea port with annual handling capacity of 12 million tons; it is planned to connect to Haiphong, Hanoi and China by railway.

The Nomura Industrial Park and the Dinh Vu Economic Zone both offer packages of financial incentives to potential investors. These include corporate income tax

relief, reduced profit remittance taxes, exemptions from import taxes on raw materials and equipment, and other incentives such as simplified investment and licensing procedures, and provision of infrastructure.

These incentives are typical of the many industrial zones, economic zones, or export processing zones that are being developed all over Vietnam. There are 63 industrial zones in the country, and three export processing zones.

There are however concerns that the construction of infrastructure is proceeding at a far greater pace than is warranted. The Ministry of Planning and Investment report has recently estimated that it could take up to 20 years to fill empty spaces in the country's growing number of industrial zones (Vietnam Investment Review, 28 May 2000).

So far, investments in industrial parks in Haiphong have been extremely disappointing, with large excess capacity in the parks created so far, with Nomura being a conspicuous example.

Success of the industrial zones, in Haiphong as elsewhere, depends on the same factors that will determine the pace of economic growth in general. As specified by IFC, these include improved streamlining and transparency of investment approval procedures, accelerated equitization program, deregulation and permitting foreign equity investments in domestic enterprises, clarification of BOT regulations, financial reform, in particular removal of interest rate caps (Source: Vietnam: Country Assistance Strategy of the World Bank Group 1999-2002, World Bank, 1998).

The Haiphong Pilot SOE Equitization Project, assisted by IFC and AusAid, is designed to accelerate the process of divestiture and transfer of ownership to the private sector, to be used as a model to be replicated elsewhere in the country. Rights would be auctioned, with targeted enterprises being small to medium sized industry in a range of sectors.

(3) Economic Growth Projections

The following table shows estimates of population growth in Haiphong City, broken down in terms of the Study Area and non-Study Area population. It is expected that the overall population, as well as that specifically in the Study Area, will grow by about 30 % over the period.

Actual and Estimated Population Growth, Haiphong City 1999-2020

Unit: thousands

Year	1999	2005	2010	2015	2020
Study area A, B and C	554.6	593.0	625.9	659.0	692.0
Other (Non-Urban) Areas	1122.9	1204.5	1283.4	1356.7	1428.7
Total City	1677.5	1797.5	1909.3	2015.6	2120.7

Source: 1999 Census, Study Team estimates

As summarized in the next two tables, the Haiphong City government envisions two alternative city plans, Scheme 1 and Scheme 2. Both involve a continued increase in the rate of growth in industry, construction, services and commerce. Agriculture however is expected to grow at a minimal rate. The difference between the two schemes is based on different assumptions about the rate of economic policy reform at the national level.

Projected Annual Growth Rates by Major Economic Sector

Annual growth rates in %

	2001-2005		2006-2010	
	Scheme 1	Scheme 2	Scheme 1	Scheme 2
Industry, Construction	10.0	11.7	11.0	12.5
Agriculture, Forestry, Aquaculture	2.5	2.5	2.0	1.5
Services, Commerce	9.3	9.3	9.0	10.0
All Sectors	8.5	9.5	9.0	10.0

Source: Proposed Revision to City Master Plan, Haiphong, June 2000

Projected Components of Economic Structure of Haiphong City

Percentages of total GRP

	2001-2005		2006-2010	
	Scheme 1	Scheme 2	Scheme 1	Scheme 2
Industry, Construction	39	40	42	43
Agriculture, Forestry, Aquaculture	13	12	9	8
Services, Commerce	48	48	49	49
All Sectors	100	100	100	100

Source: Proposed Revision to City Master Plan, Haiphong, June 2000

In assessing the feasibility of these projections, judgment must be made about the pace at which Vietnam carried out the policy reforms required to stimulate economic activity. These include trade liberalization, banking, private investment, and improved efficiency of state-owned enterprises.

The World Bank (Source: Vietnam: Preparing for Take-off?, World Bank, December 1999) expresses these concerns, and its short-term projections of GDP growth are very sensitive to the assumptions made about the pace of policy reform. It estimates GDP growth for 1998 and 1999 at 4 % per annum. Thereafter it identifies a slow reform scenario and an accelerated reform scenario for Vietnam as a whole. Under the former, it estimates that there would be a 3.5 % growth of GDP in 2000, and 3.0 % annual growth rate between 2000 and 2002. Under the

accelerated reform assumption, the World Bank projects growth rates of between 4 and 5 % for 2000, 5.5 – 6.5 % for 2001, and 6.0-7.0 % for 2002.

It is stated in the revised master plan for Haiphong that the Vietnam government requires Haiphong to have an annual growth rate 1.2 to 1.3 times higher than that for the nation as a whole. Making this adjustment to the World Bank figures would suggest annual growth rates under the slow policy reform scenario, and making the most conservative assumptions, of 4.2 % for 2000, and 3.6 % thereafter. Under the most optimistic assumptions, the growth rates would be 6.5 % for 2000, 8.45 % for 2001, and 9.1 % for 2002.

The above therefore suggests a reasonable coincidence between the projections of Haiphong City and the independent assessment of the World Bank, as long as the necessary economic reforms take place. This becomes particularly important in Haiphong, whose future growth rate, due in particular to its role in international trade and commerce, exemplified by the performance of the planned industrial estates, will be particularly sensitive to the pace of economic reforms at the national and local levels.

It is therefore proposed that the GRP projections of the HPPC are taken as a high case scenario, and alternative environmental programs are assessed in terms of their sensitivity to alternative, less optimistic assumptions.

The lower case scenario would assume a slower rate of policy reform, and uses the 4.2 % growth for 2000 and then 3.6 % up to 2004, after which time it assumes the high growth scenario (i.e. with a 5 year delay) of 6.5 % in 2005, 8.45 % in 2006, and 9.1 % in 2007. It then maintains this rapid growth rate of 9.1 % up to 2010. Growth rates beyond this are entirely speculative, and 5 % is assumed here between 2010 and 2020 for both high and low case scenarios.

Projected GRP and HPPC Expenditure: High and Lower Case Scenarios

VND Billion, 2000 prices

	Actual	Projected, High Case Scenario				Projected, Lower Case Scenario			
	1998	2000	2005	2010	2020	2000	2005	2010	2020
GRP total Haiphong*	8470	9161	14422	23227	37860	9161	10996	16492	26882
GRP study area**	5133	5552	8942	15068	24464	5552	7129	11922	19433
HPPC *** Expenditure	763	825	1299	2092	3410	825	990	1485	2421

For 2000, assume 1998, 1999, 4 % per year

* : HPPC projection

** : HPPC projection. Assume the study area growth corresponds to that forecast for industry and commerce, using 10 % 2001-5 and 11 % 2006-10)

***: Assumed same rate of growth as for Haiphong GRP

For the lower case scenario, it is assumed that the study area GRP increases at the same rate as under the high case scenario. (Based upon the HPPC projections, in the high case scenario between 2000 and 2005 GRP for total Haiphong will increase by 57 %; in the study area it will increase by 61 %. Between 2005 and 2010, total Haiphong GRP in the high case scenario will increase by 61 %, and in the study area by 68 %. So between 2000 and 2005, under the lower case scenario, GRP in the study area is projected to increase at 61/57 times the total Haiphong rate. Between 2005 and 2010 study area GRP increases at 68/61 times the total Haiphong rate.)

The above table projects GRP for the whole of Haiphong and for the study area, as well as HPPC revenue, on the assumption that economic growth in the city proceeds at the rates set out earlier (Scheme 1), and that HPPC revenues increase at the same rate as the growth in the city's GRP. Growth in the study area under the high case scenario, and, with delay (i.e. after 2005), in the lower case scenario, is based on HPPC's predicted growth for industry and commerce.

World Bank estimates of household incomes in Haiphong (in estimates made in Three Cities Appraisal Report page 44) and a summary of a Consumer Survey commissioned by FINNIDA, quoted in the Draft Feasibility Study Report for the 2A Water Project) imply that disposable incomes are approximately 50 % of GRP. This adjustment is made in the table below.

In view of the uncertainties involved in the various predictions of GRP, the Study Team uses a compromise scenario, based upon averaging of the high and lower case scenarios. Total GRP and HPPC expenditure data are therefore as follows:

Projected GRP, Haiphong City and Study Area: Average Scenario

billion dong, 2000 prices

	1998	2000	2005	2010	2020
GRP Total Haiphong	8470	9161	12709	19860	32371
GRP Study Area	5133	5552	8036	13495	21948
HPPC Expenditure	763	825	1145	1789	2916

Projections of the above aggregate GRP data are presented below in per capita terms as well as in terms of disposable incomes.

Projected Per Capita GRP and Disposable Income, Haiphong City and Study Area: Average Scenario: Years 2005, 2010, 2020

thousand dong, 2000 prices

	2005	2010	2020
GRP Total Haiphong*	7070	10401	15264
GRP Study Area**	13551	21560	31717
Disp.Inc. Haiphong	3535	5200	7632
Disp. Inc. Study Area	6776	10780	15859

The foregoing estimates are presented below in US\$ terms:

Projected Per Capita GRP and Disposable Income, Haiphong City and Study Area: Average Scenario: Years 2005, 2010, 2020

	US\$, 2000 prices		
	2005	2010	2020
GRP Total Haiphong*	505	743	1090
GRP Study Area**	968	1540	2266
Disp.Inc. Haiphong	253	371	545
Disp. Inc. Study Area	484	770	1133

The rate of growth of HPPC expenditure is particularly uncertain. The assumption here is that it will proceed at the same rate as that of GRP. On the one hand, recent trends indicate that HPPC expenditure has not kept up with GRP growth (it was half that recorded over the 1995-98 period). This would be in accord with the increase of private sector activity. On the other hand, the process of decentralizing governmental responsibilities may mean that HPPC takes on additional functions now in the hands of the national government, which would suggest a relatively rapid increase in its expenditures.

1.4.3 Future Land Use Plan and Zoning

- (1) Future Land Use Plan For Haiphong City for 2010 and 2020 Contemplated by HPPC

- 1) Outline of Haiphong City Master Plan Approved in 1993

The fundamental concept of the master plan is summarized below.

- (a) Size of the urban area

The Population Projection in the urban center repetitive for the year 2000 was 550,000 and for 2010 was 750,000 (the allowance was up to 1 million).

- (b) Orientation for spatial development (Three main directions for development of the city)

The plan envisaged:

- Full exploitation of land in the existing urban areas and expansion towards the outskirts (to the South and South-East)
- Formulation of new urban areas to the North of Cam River (in Tan Duong and Vu Yen areas of Thuy Nguyen District)
- Development of Industrial Zones (IZs) and satellite urban areas in Vat Cach, Kien An, Road 14, Dinh Vu, Minh Duc (Thuy Nguyen), together with the central urban area to become Hai Phong urban group

(c) Density of urban land

In 2000: 60 m²/person, 1.7 times higher than the current level.

In 2010: 68 m²/person, 2.64 times higher than the current level.

(d) Layout of space and urban architecture

Development of new Export-Processing Zones (EPZs) and concentrated IZs:

- Dinh Vu EPZ (1,200 ha)
- Road 14 EPZ and Concentrated I.Z (600-1,500 ha)
- Vat Cach Port I.Z (50-100 ha)
- Minh Duc-Ben Rung-Thuy Nguyen (500-1,000 ha)
- Construction of residential area
- Maintaining and developing maintaining and developing buildings of typical architecture built before 1954
- Improvement and upgrading apartments built after 1954
- Improvement of living conditions for the naturally developed urban areas in the outskirts, along national roads and for the villages planned to be urbanized in the direction of increasing the percentage of multi-storey buildings and concentrating many beautiful villas in the old streets for rent for foreigners
- Urbanization of new areas in the orientation of modernization and synchronized development of infrastructure; residential quarters will be organized in the model of street squares; trying to reach the target housing rate of 6m²/person by 2000 and 8 m²/person by 2010
- Organization of public and specialized centers
- Administrative, cultural and sporting centre will be located in Lach Tray Street (opposite An Bien Park)
- Commercial and banking transaction centres and representative offices, etc. will be on the two parallel streets running from the main port's gate to Tam Bac River
- Science and technique training and research centre and post-graduate complex will be in Lach Tray Street (from Dong Quoc Binh Ward to Rao Bridge), specialized high-school will be in Kien An
- Health-care centre is planned to be expanded from Viet-Tiep Hospital to Tran Phu Prison
- Centres for international fairs, supermarkets, technical and economic exhibitions are planned to be located from Dong Khe Cultural Park (along the new road from Cat Bi Airport to Five-way Intersection)
- Local centres in districts (whose population each is around 100,000) will be the administrative and political centres of the districts
- Nature-protection areas, cultural and resort parks, tourist sites and sporting complexes will be organized

Demand and land scale

Unit: 1000m²

No.	Land types	Existing condition	First stage 2000		Long term 2010		Anticipation	
			Total	Expansion	Total	Expansion	Total	Expansion
1	2	4	5	6	5	6	5	6
I	Civil land	7,112	16,005	8,893	28,125	12,120	44,640	25,565
1	Living area (including village and communes in urban area)	5,100	11,000	5,900	16,500	5,500	24,060	11,960
2	Public	770	1,430	660	3,375	1,945	5,000	2,975
3	Vegetation	480	1,650	1,170	4,500	2,850	12,580	9,280
4	Traffic	762	1,925	1,163	3,750	1,825	3,000	1,350
II	Non Civil land	12,188	16,995	4,807	22,875	5,880	25,360	9,550
1	Production	3,848	7,500	3,652	11,906	4,406	15,848	6,000
2	External traffic & focal technical infrastructure	1,570	2,435	865	3,549	1,114	5,000	2,100
3	Specialized centers (Health, Training)	100	390	290	750	360	1,000	450
4	Military	130	130		130			
5	Rivers and lakes	2,060	2,060		2,060		4,060	1,000
6	Others	4,480	4,480		4,480			
III	Total I and II	19,300	33,000	13,700	51,000	18,000	70,000	35,115

Source Haiphong City Master Plan Approved in 1993

2) Outline of revision of Haiphong City Master plan towards 2020

(a) Characteristics of Haiphong City

Haiphong City is a port city, an economic, industrial, commercial, tourist and service centre of the Northern coastal region; the main gate to the sea of the Northern provinces; an important traffic hub of the North, with favourable relationships with Laos and southern provinces of China, an urban area with great importance of national defence, and with good conditions for becoming one of the "Open Economic Zones" of the country.

(b) Development targets of Haiphong City

Development targets are "Sustainable Development in terms of economy, culture, society and national defence, to meet the targets of economic growth, with higher level of social progress compared with the average level of the country; to become one industrial, commercial, tourist and service centre, one of the main port in the North, together with other provinces, to form a key economic zone that can inspire and stipulate economic development in the region".

(c) The major direction for the development

The urban development area will include:

New urban areas: North Cam River, South-East, North-West, Road 14,

Satellite urban areas: Minh Duc-Rung Ferry Station, Do Son, Nui Deo (Deo Mountain), Kien Thuy, An Lao

(d) Size of the urban area

By 2010, four urban districts' population is expected to be 510,000. (By 2020, population will be 590,000)

The area in three districts area (Hong Bang, Ngo Quyen, Le Chan), the so called inner city, will be a restricted development area. By 2005, inner city's population will be 425,000 and by 2020, it will be 450,000.

(e) Orientation for space development

- Inner City area

Initializes to raise land-use efficiency include:

To fully exploit the existing land fund, restricting the development of high-rise buildings in some areas in the former city

To lower population density in the old-street quarter to 500 persons/ha from the current level of 1,086 persons/ha

To decrease construction density; to increase green-tree, static traffic, public areas

To fully exploit unused land, land whose use has shifted from production to civil purpose, and the land of low usage efficiency.

- New urban areas

To develop new urban area in North Cam River (Binh Ferry and Vu Yen).

To develop new urban area along both sides of Road 14 (Haiphong-Do Son).

To develop new North-West urban area (Vat Cach-Dai Ban).

To develop new South-West urban area (Kien An-Tien Hoi).

Plan for industrial zone

There are five large concentrated industrial zones with the total area of 2,400 ha. Including

North-West I.Z: 100 ha.

South-East I.Z. (Dinh Vu) 1,500 ha.

North-East I.Z. (Trang Kenh, Minh Duc, Ben Rung) 300 ha.

Southern I.Z. (Road 14) 400 ha.

South-West I.Z. (Van Trang, Kien An Dist.) 100 ha

The size of each I.Z. should be appropriate for the use and exploitation of land and to promote investment attractiveness.

It is proposed to scale down the size of Road 14 I.Z. so as to minimize environment pollution impacts on the region due to industrial development.

Scale of Industrial Zones

Industrial area/centre	Scale (ha)		
	2000	2010	2020
1. Nomura	153	153	153
2. Vat Cach	100	150	310
3. Thuong Ly-So Dau	100	120	150
4. Quan Tru	20	28	30
5. Cong Doi-Van Trang	10	15	20
6. Tien Hoi	10	20	20
7. Dong Hai	97	150	150
8. Dinh Vu	164	639	937
9. Minh Duc-	30	70	100
10. Ben Rung	30	150	250
11. Vu Yen	20	50	100
12. Hai Thanh	30	50	50
13. Processing Zone	150	150	150
<u>Total:</u>	<u>914</u>	<u>1,745</u>	<u>2,420</u>

The direction of the amendment from the approved Master Plan

Although the fundamental concept of development has not changed with the approved master plan, it decreases development scale and is more implementable.

(2) Future Land Use Plan for the Sanitation Master Plan assumed in the JICA Study

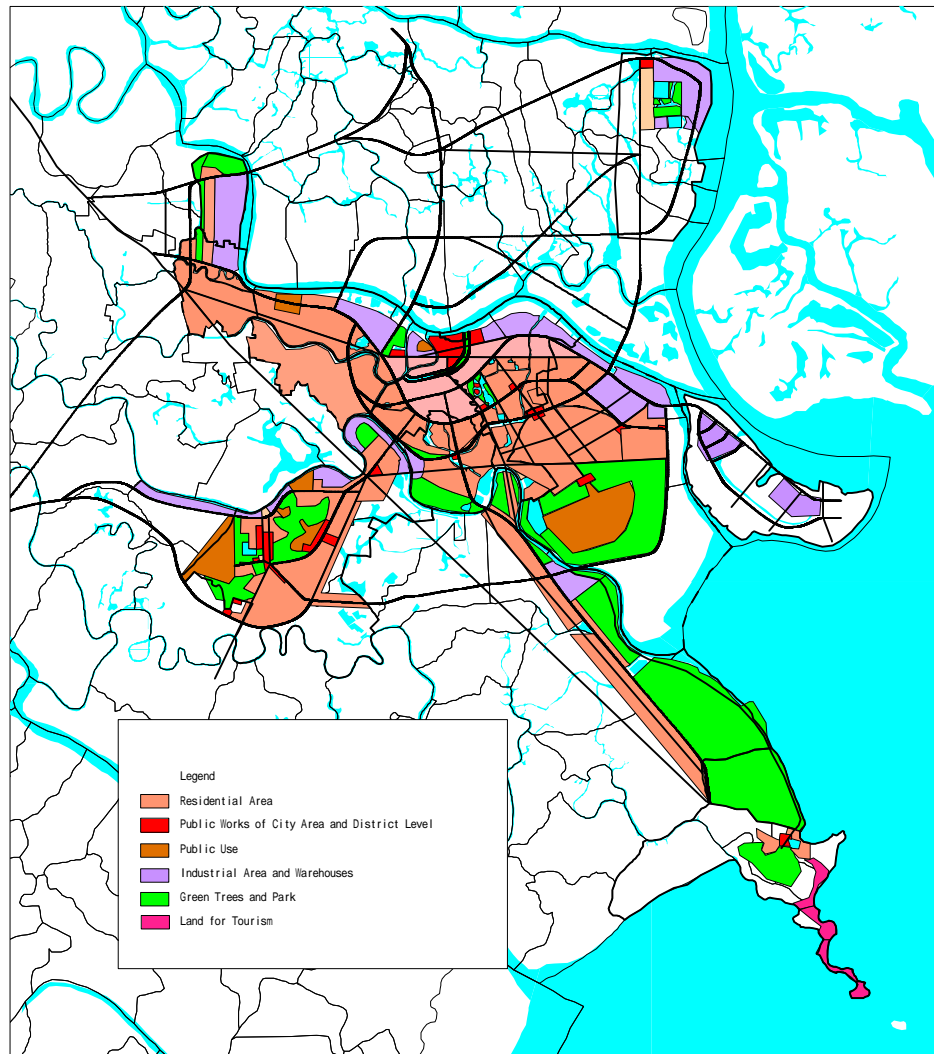
The future land use plan was made based on the population frame prepared by the JICA study, reflecting the view of the amended Haiphong City Master plan as shown below.

Since there is less population according to the JICA Study than that forecasted by the amended Master Plan, the future development area in the land use plan decreased.

It is assumed that population movement to the new urban areas from the 3 urban districts would be lower than that projected in the amended Master Plan.

Projected industrial zone area has decreased based on the investigation of their implementability. Especially the land use of the New Development Area is changed from industrial use to recreational use mainly.

Future Land Use Plan for 2020



(3) Zoning of the Study Area

The Study Area is classified into 3 categories in consideration of the following:

- Population density, and the expansion tendency of the urban area
- The development trends in the amended Master Plan and Land Use Plan prepared by the JICA Study Team

Zone A Areas which already have a high population density 40 pers/ha)

Three Central Urban Districts (Hong Bang, Le Chan, Ngo Quyen) and Du Hang Kenh Commune (south of Le Chan District)

Zone B The area to which urbanization is in progress rapidly in recent years (High growth area)



Kien An, Do Son, Quan Toan and 7 Communes around the 3 Central Urban Districts; Nam Son, An Dong, Vinh Niem, Dong Hai, Dang Lam, Dang Hai and Nam Hai

Zone C The area that will be developed based on the Master Plan



Minh Duc, Dinh Vu, New Development Area

It may be noted here that subsequent sector planning for water supply, drainage, and sewerage requires minor adjustment in the zoning due to specific requirement of the each sector. These sector specific zones are named as class. Class A, B, and C for the drainage is the same as sewerage, while these are slightly different for water supply. Definitions of these classes are given in respective sector planning.

<ul style="list-style-type: none"> • Rehabilitation of intake and WTP • New transmission mains • Improvement of distribution network • Total Capital Cost • Implementation period 	<p>An Duong WTP Cau Nguyet WTP Vat Cach WTP Do Son WTP Quan Vinh intake</p> <p>City Center, Vat Cach-Quan Toan, Do Son, other</p> <p>all area</p> <p>US\$62.7 million</p> <p>2001-2020</p>
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1.5.2 Drainage

Target of the drainage improvement plan is to reduce flood occurrence in the study area. For Class A area, this is to be achieved by integrating three drainage catchments namely, Southwest, Northeast and An Kim Hai, and by increasing storage capacity by rehabilitating channels and constructing new sewers and lakes. For Class B area, this is achieved by constructing and rehabilitating new sewers, rehabilitating tidal gates and constructing new channels.

The salient features of the drainage improvement plan is given below:

Class A Area, short term up to year 2010

<ul style="list-style-type: none"> • Area • Population • Rehabilitation of existing sewer • Construction of new sewer • Rehabilitation of channels • Rehabilitation of lakes • Rehabilitation of tidal gates • Pumping stations • Rehabilitation of existing channel • Construction of new channel • Channel maintenance road • Demolition of tidal gate • Construction of tidal gate • Discharge gate • Phoung Luu site development • Phoung Luu Lake construction • Road from Road No. 5 to lake site • Box culvert • Implementation Period 	<p>1103 ha</p> <p>240,000 (in 2010)</p> <p>170 km</p> <p>7.6 km</p> <p>Southwest and Northeast channels</p> <p>4 nos.</p> <p>6 nos.</p> <p>2 nos.</p> <p>An Kim Hai Channel, 10 km</p> <p>500 m</p> <p>21 km</p> <p>One at Cam River</p> <p>Two, at Cam River and Lac Tray River</p> <p>One at Du Hang</p> <p>28 ha</p> <p>24 ha</p> <p>400m</p> <p>450m</p> <p>2001 to 2010</p>
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Class A Area, long term up to year 2020

Class B Area (Kien An)

Total Capital Cost for Drainage Improvement Plan US\$238.6 million

1.5.3 Sewerage

The sewerage improvement plan for Class A area recommends collecting and treating all wastewater satisfying Vietnamese standard. Where combined sewer already exists, a combined sewer system will be used, while where no combined sewer currently exists, a separate sewer system is recommended. For Class B area, central sewerage, a simplified sewer system and septic tanks are proposed based on population density.

The salient features of the sewerage improvement plan is given below:

Class A Area, short term up to year 2010

-
- Treatment Plant Near Vinh Niem Tidal Gate
 - Treatment process Aerated lagoon
 - Treatment capacity 36,000 m³/day
 - Implementation Period 2004 to 2010

Class A Area, long term up to year 2020

- Area 5241 ha
- Population 575,000 (in 2020)
- Collection System Combined and Separate Sewer System
- Estimated Sewage 71,000 m³/day (in 2020)
- Combined Sewer Overflow 60 nos.
- Sewer pipeline (big dia) 35 km
- Sewer pipeline 370 km
- Pumping Station 5 nos.
- Treatment Plant 2 nos.
- Treatment capacity 72,000 m³/day
- Implementation Period 2011 to 2020

Class B Area (Kien An)

- Area 2670 ha
- Population 106,000 (in 2020)
- Central treatment plant 1 nos. (8,000 m³/day)
- Main pumping station 2 nos.
- Simplified treatment plant 3 nos.
- Sewer pipe 160 km
- Implementation Period 2004 to 2020

Class B Area (Do Son)

- Area 3950 ha
- Population 42,000 (in 2020)
- Simplified treatment plant 2 nos.
- Sewer pipe 49 km
- Implementation Period 2004 to 2020

The Sewerage Improvement Plan also includes a Septage Collection & Disposal Plan (Total Direct Cost US\$19.4 million).

The estimated Total Direct Cost for the Sewerage Improvement Plan is US\$299.6 million

1.5.4 Water Quality Improvement for Lakes and Channels

Lakes and channels in urban Haiphong are heavily polluted by sewage and need to be rehabilitated urgently. In the water quality improvement plan for lakes and channels, a series of measures were proposed that supplement the proposed sewerage and drainage plans in the Master Plan. The main target of the plan is to meet the Environmental Standard, TCVN 5942-1995.

The salient features of the water quality improvement plan are given below. The main components of the plan are based on the on-going World Bank 1B Project and rehabilitation plan by Park Service.

Construction of Interceptor Sewers around Lakes

- | | | |
|-------------------------|----------------------|--------|
| • Interceptor Sewers | Tien Nga Lake | 0.6 km |
| | Sen Lake | 0.4 km |
| | An Bien-Mam Tom Lake | 1.6 km |
| • Implementation Period | 2001 to 2004 | |

Lake Rehabilitation Projects (Dredging)

- | | | |
|-------------------------|--------------------------|---------|
| • Target Lakes | Tien Nga Lake | 2.3 ha |
| | An Bien Lake | 20.0 ha |
| | Mam Tom Lake | 2.1 ha |
| | Sen Lake | 2.0 ha |
| | Du Hang – Lam Tuong Lake | 6.6 ha |
| • Implementation Period | 2001 to 2004 | |

Strategic Operation of Drainage System for Water Quality Improvement

- | | |
|-----------------------------|------------------------|
| • Target Lakes and Channels | all lakes and channels |
| • Implementation Period | 2001-2020 |

Total Capital Cost for Water Quality Improvement Plan US\$2.9 million

1.5.5 Solid Waste Management

The solid waste management improvement plan covers the following three aspects, i.e. 1) waste collection and transport, 2) waste disposal, and 3) hospital waste management, each of which is an integral part of solid waste management. The salient features of each aspect are given below:

Waste Collection and Transport

- | | |
|-----------------------|--|
| • Planning Objective | Improvement of efficiency and sanitation |
| • Principle Direction | From “Open system” to “Closed system” |
| • Proposed System | <ul style="list-style-type: none"> • Mechanical waste loading into vehicles, • Direct collection system using bins placed at fixed locations |

- Target for the Direct Collection 35 % of the solid waste will be collected by applying the direct collection system by 2005.
- Target Collection

	<u>Generation</u>	<u>Target Collection</u>
- 2000	630 ton/day	471 ton/day (75 %)
- 2005	899 ton/day	761 ton/day (85 %)
- 2010	1,148 ton/day	1,086 ton/day (95 %)
- 2020	1,517 ton/day	1,441 ton/day (95 %)
- Collection Service Target In terms of population, 100 % of non-agricultural population by 2010 in the 4 urban districts, and by 2012 in Do Son. (85 % on average in 2000)
- Main Types of Equipment
 - Waste discharge Use of bins to be placed at fixed locations
 - Waste collection vehicles Compactor with mechanical lifter
- Institutional Recommendations
 - Legal improvement for clearer definition of responsibility of generators of industrial waste, and demolition waste, etc, and the stronger enforcement
 - Increases in cost recovery through fee collection
 - Strengthening of URENCO's capacity as service provider
 - Promotion of privatization (contracting out) and socialization and competition

Waste Disposal

- Disposal Method Sanitary landfill of semi-aerobic type
- Locations of Future Landfill Sites
 - For Hong Bang, Le Chan & Ngo Quyen: Trang Cat Site (see below)
 - For Kien An
 - 2001-2004: Trang Cat Phase2 Landfill Site
 - 2005-2011: Place (10 ha) at the foot of Mount Mam Bong, in Xuan Son village, Truong Son Commune, An Lao

After using up this site:

 - 2012-2020: Place inside the Dyke System of Van Uc River (0.5 km from the Dyke entrance that is 0.5 km from Khue Ferry) in Chien Thang commune, An Hai District
 - For Do Son Do Son (2003 - 2020)
- Phased Development Plan of Trang Cat Site
 - Phase 1 Landfill (existing site) 5 ha 1998 –2001 (to be filled up soon)
 - Phase 2 Landfill 5 ha 2001 - 2005 (own fund of HPPC)
 - Phase 3 Landfill 33 ha 2005 - 2014 (subject to the F/S)
 - Phase 4 Landfill 2015 - (outside of 60ha)
- Types of Waste to be Received
 - Solid waste excluding industrial waste

- Incineration residue of medical waste and leachate treatment sludge
- Main Facilities to be Provided
 - Dyke (waste retaining structure)
 - Leachate collection & treatment system
 - Gas ventilation system
 - On-site road
 - Heavy equipment
 - Weighbridge
 - Heavy equipment
 - Environmental monitoring facility
- Cover Soil
 - Weekly application
- Post-Closure Site Management
 - Leachate collection/treatment and environmental monitoring should continue as long as leachate is generated, and land level is stabilized.

Hospital Waste Management

- Objective
 - Safe disposal of infectious waste eliminating risks of transmission of infectious diseases that may arise by contacting infectious waste
- Proposed System
 - Consists of the following components:
 - In-hospital storage room for infectious waste
 - Waste collection vehicles
 - Treatment (incineration)
 - Landfill for incineration residue
- Method of Treatment: Incineration
- Direct Beneficiaries
 - 18 health care organizations (9 hospitals and 9 medical centers, located in the 4 urban districts and Do Son Town, as well as people who may directly contact infectious waste.)
- Indirect Beneficiaries
 - Whole population of the 4 urban districts including neighboring areas and Do Son Town (704,000 in 2005)
- Cost Recovery
 - Hospitals should pay the fees.

Total direct cost for solid waste management improvement plan is estimated to be US\$52.6 million during 2001-2020.