CHAPTER 4 STRATEGIES AND PROJECTS FOR ENVIRONMENTAL MANAGEMENT AND IMPROVEMENT

4.1 Basic Strategies and Approach to the Effective Environmental Management

The following basic strategies and approach are recommended to be adopted, aiming at the effective environmental management of the Hanoi City.

a) More emphasis on effectiveness and efficiency in environmental management rather than the scale of overall benefit

b) Realistic, implementable approach, in particular recommending measures within the capacity to pay/afford of the Government/HPC and people

c) Staged development of counter-measures and projects, both structural and non-structural ones, keeping step with the development of economy, affordability of the Government and people, Government reform, etc.

d) Due consideration to the administrative reform policy of the Government, i.e., reduction of government staff, reduction of subsidy, etc. with exception of strategic organizations to cope with the increasing needs including the environmental management

e) Stronger coordination among organizations

f) More emphasis on legal/institutional/organizational measures relative to the structural measures, which necessitate big capital outlay

g) Adopting appropriate technologies, fit to the type of land use, population density, intensity of economic activities, etc., for example central sewerage for the central part of Hanoi, septic tanks for the sub-urban areas

h) Incorporation of environmental consideration into upstream planning, in particular socioeconomic planning and urban land use planning

i) Where deemed appropriate and more efficient as well as reducing the financial burden of the Government, recommendation for the privatization

4.2 Measures and Projects for Sanitary Water Environment

(1) Planning concept

1) Target area

The target area is the urban area with a total area of 136 km^2. Due to the natural drainage conditions, Dong Anh and Gia Lam Urban Areas (EZ 4, 5) do not suffer from flooding. The urban drainage projects are needed and recommended for the right bank side of the Red River. Namely, target area for sanitary water environment is the urban area lying between the Red River and the Nhue River, consisting of seven urban districts of 84 km^2, and adjacent farmland of 52 km^2 in Tu Liem and Thanh Tri suburban districts. The area is divided by a natural watershed of levees along the right bank of the To Lich River into two basins: the To Lich River basin (78 km^2) including the West Lake subbasin (10 km^2) and the Nhue River basin (58 km^2).

2) Protection Levels

Protection levels of the urban drainage plan are set out below:

- The river/drainage channel system: a 10-year return period
- The sewer collection system: a 5-year return period

3) Drainage Zoning

Drainage zoning should be determined based on the natural watersheds in order to minimize the environmental impact on ecosystems after completion of the project. The Study area is divided into the following drainage zones by the rivers, lakes, and watersheds:

- To Lich River Basin (comprising 7 basins): 77.5 km^2
- Nhue River Basin (comprising 4 basins): 57.9 km^2
- Nhue River Basin (rural area): 125.6 km^2
- Bac Hung Basin (Gia Lam): 95.1 km^2
- Duong Basin (Dong Anh): 186.7 km^2
- Ca Lo-Cau Basin (Soc Son): 364.2 km^2

The following drainage methods and direction are proposed for improvement of flood control and urban drainage

Drainage Methods & Directions

River Basin	Present Land Use	Drainage Method	Direction of Drainage
To Lich	Urban	Mechanical drainage combined with regulating reservoirs	To Red River from Yen So site
Nhue	Suburban	Mechanical drainage combined with regulating reservoirs, or natural drainage combined with the same,accompanied by land reclamation works	To Nhue River from the outlets of respective drainage sub-basins

(2) Institutional and regulatory measures

The following institutional and regulatory measures are recommended for achieving the targets set for the sanitary water environment.

1) Overall management of lakes and ponds

Regarding flood control and drainage, HSDC should reserve the right of overall management of these lakes and ponds in the urban area since currently almost all the lakes and ponds are under the control of several authorities, such as MOARD, local communities, and fishing companies due to the multipurpose use of these water bodies.

2) Land use management referring to drainage plan

New planning and substantial changes to the existing land use should be referred to HSDC prior to the approval of higher authorities under the close coordination of HUPI and HSDC. This is because changes in land use in the catchment area greatly influence flood control and drainage works.

3) Organizational Strengthening: HSDC

The framework for organizational strengthening of HSDC is summarized in the following table:

HSDC Organisational Strengthening Framework

Objective	Short Term 2005	Mid Term 2010	Long Term 2020
Re-organize to suit new operational functions	Drainage Functions: • Create new organizational unit for drainage operations • Increase personnel assigned to maintenance of levees • Implement a team of mechanics and electricians dedicated to maintenance of Yen So pumping station	Sewerage Functions: • Create new operational units for each new wastewater treatment plant Sewerage and Drainage Functions: • Create a new sewerage and drainage enterprise for Gia Lam urban district.	Sewerage and Drainage Functions: • Create separate operational divisions for sewerage and drainage functions. • Create a new technical services division to provide engineering, maintenance and construction support to sewerage and drainage operating divisions
Develop human resources	Drainage Functions: • hire personnel for operation of Yen So pumping station and control gates • include funds for staff training in the annual operating budget Management Functions: - provide training and develop skills for business accounting, financial analysis and economic effectiveness of business operation.	Drainage Functions: • provide computers and software tools to engineering department for flood database and mapping project Management Functions: • provide training on pricing strategies and tariff setting for cost recovery	Drainage Functions: • develop software and hardware tools to support engineering analysis and modeling for flood control operations • develop technical skills required to support drainage system operators
Improve financial management	Sewerage and Drainage Functions: • work with the Water Supply Business company to improve billing and collection of sewer revenues • Implement a cost accounting system and develop trends for major cost centers.	Sewerage and Drainage Functions: • Implement progressive tariff increases within the limits of affordability to recover the costs of operating new wastewater treatment plants • prepare multi-year operating budget forecasts linked to investment program planning	Sewerage and Drainage Functions: • replace assets based on economic life-cycle cost analysis • identify cost reduction opportunities using the cost-accounting system.
Implement maintenance management systems	Sewerage and Drainage Functions: • integrate mechanical and electrical maintenance enterprises to provide centralized support to operating enterprises • responsibility for preventive maintenance is shifted to trades located within each operating group	Sewerage and Drainage Functions: • implement a work order system for scheduling of all preventive and emergency maintenance • develop a sewer inventory	Sewerage and Drainage Functions: • develop advanced preventive maintenance technologies
Provide technical support to operations	Sewerage Functions: • implement a central laboratory to support treatment plant process control and operations • Implement an approvals and inspection unit for community and on-site wastewater disposal systems.	Drainage Functions: • Implement a task group within engineering department to develop flood database and maps	Drainage Functions: • develop models to assist operators in optimizing water levels and control flooding • Create a new technical services division to provide engineering support to operating groups

(3) Improvement of the storm water drainage system

1) Short-term

Second stage of the ongoing To Lich River Basin Drainage project should be placed first priority for upgrading the storm water drainage system for the old city center (EZ 1), outline of which is shown below.

Outline of The 2nd Stage Drainage Project

Project Components	Second Stage
1) Yen So Pumping Station : augment of capacity	45 m^3/s
2) Regulating Reservoir (augment of volume) Linh Dam & Dinh Cong Lakes	1.32 million m^3
3) Drainage Channel Enlargement	31 km
4) Bridges/Box Culverts	29 places
5) City Lake Improvement - Dredging - Lakeshore Protection Works	 14 lakes 11 lakes
6) Installation of New Storm-water Sewers Rehabilitation of Existing Sewers	182 km 17 km

In addition, the following measures should be implemented in short-term.

- Dredging and cleaning of existing sewers/channels
- Protection of the Hanoi dyke system under the execution
- Land use control (flood plain management) by HPC as a non-structural flood mitigation measure, comprising of zoning control, and building and development control
- Provision of on-site storage for new estate development
- Flood forecasting and warning system to be linked with a telemeter system
- Public awareness raising including the preparation of a flood risk map

2) Medium-term measures: 2010

The following measures and projects should be implemented for mid-term.

Structural Measures

Main Works	Co Nhue Drainage Basin	My Dinh Drainage Basin
1. Pumping Stations (m^3/s)	12	8
2. Regulating Reservoirs (1,000 m^3)	3,020	1,590
Reservoir Area (ha)	76	40
Spillway (m)	55	26
3. Drainage Channel Improvement (m)	19,200	13,400
Bridges/culverts (place)	30	24
4. Sewer Construction (Area: ha)	1,970	670

3) Long-term measures: by 2020

The following drainage projects should be implemented in Me Tri and Ba Xa basins in long-term.

Structural Measures

Main Works	Me Tri Drainage Basin	Ba Xa Drainage Basin
1. Pumping Stations (m^3/s)	9	6
2. Regulating Reservoirs (1,000 m^3)	1,600	1,070
Reservoir Area (ha)	40	27
Spillway (m)	31	14
3. Drainage Channel Improvement (m)	13,500	8,700
Bridges/culverts (place)	22	16
4. Sewer Construction (Area: ha)	870	440

4.3 Measures and Projects for Clean Water Environment

(1) Planning concept

For the achievement of a clean water environment in the Hanoi City, (i) Protection of Human Health, (ii) Conservation of the Living Environment, (iii) Creation of Attractive Waterfronts should be attained.

In planning for attaining the clean water environment, the following principles should be adopted.

a) Areas with high population density and/or high BOD pollution area have high priority in establishing sewerage systems
b) Areas in the basins of high polluted water bodies, such as urban rivers (To Lich River, Lu River, Set River and Kim Nguu River) or attractive water areas, such as West Lake and other urban lakes also have high priority in establishing sewerage systems
c) The new development area, which is not large in size, but expected to be expanded rapidly, such as new industrial and housing estates will be required to have small scale sewerage systems
d) Except for the above areas, on-site treatment facilities are to be installed properly and a proper septage collection system should be established.

(2) Type of wastewater disposal system

For the treatment of wastewater, the following three types of wastewater disposal systems should be considered depending on the characteristics of the area, taking into account the benefit to accrue as well as cost effectiveness.

a) On-site disposal system: to treat wastewater at each house/building/factory individually. This system includes two methods, simple on-site treatment method to treat toilet wastewater only and high-level on-site treatment method to treat both toilet wastewater and gray water.
b) Community disposal system: to treat wastewater at each community zone, such as housing/industrial estates and business centers.
c) Centralized disposal system: to treat wastewater using the public sewerage system.

Types of wastewater disposal system to be adopted for each environmental zone is shown in Figure 4-1.

Industrial wastewater should be treated individually or communally by a proper system based on polluters-pay principle. In the case of connecting with the public sewerage system, industrial wastewater will be pretreated according to the level of acceptable effluent limits (400 mg/l as BOD level).

The scale of the centralized disposal system is classified, according to the designed sewered population and service area as follows.

a) Small scale disposal system : less than 100,000 or less than 5 km^2
b) Medium scale disposal system: 100,000 - 300,000 or less than 10 km^2
c) Large scale disposal system : more than 300,000 or more than 10 km^2

(3) Zoning and treatment methods

1) Conceptual Treatment Zoning Plan

- environmental zones set up in this JICA Study
- drainage basins
- land use (present and future)
- population density (present and future)
- wastewater and pollution load generation
- the configuration of wastewater disposal systems
- the sewage collection system, particularly the existing sewer systems
- the existing sewerage master plan prepared by UPI of HPC

The delineated sewerage development zones are shown in Figure 4-2.

The planning conditions of the proposed public wastewater treatment zones are summarized below.

The planning conditions of the proposed public wastewater treatment zones

Treatment Zone	Environmental Zone	Service Area (ha)	Population in 2020	Wastewater in 2020 (m^3/d)	Scale
U.T.Zone 1-1	Ho Tay Area	930	57,000	14,800	Small
U.T.Zone2	Old City Center & Red River Right South	2,250	390,000	106,700	Large
U.T.Zone 3	Old City Center	1,350	299,000	77,700	Medium
U.T.Zone 4	Old City Center	500	135,800	35,300	Medium
U.T.Zone 5	Red River Right North West	2,410	175,500	45,600	Large
U.T.Zone 6	Red River Right North West & South	2,870	262,000	74,300	Large
G.T.Zone 1	Gia Lam Urban Area	4,100	311,000	101,300	Large
G.T.Zone 2	Gia Lam Urban Area	200	17,000	4,400	Small
D.T.Zone 1	Dong Anh Urban Area	550	75,000	19,500	Small
D.T.Zone 2	Dong Anh Urban Area	660	75,000	19,500	Small
D.T.Zone 3	Dong Anh Urban Area	2,110	138,000	49,900	Large

U.T.: G.T.: D.T.:

2) Wastewater Treatment Method

The oxidation ditch method is recommended to be adopted for the urban area while for the suburban districts stabilization pond method maybe recommended considering the availability of relatively spacious land area in the suburban districts.

The treatment plant capacity has been designed to reduce BOD level of the wastewater from the level of about 300 (334) mg/ℓ to a level of 20 mg/ℓ in the urban area and from 376 mg/ℓ to a level of 20 mg/ℓ in the suburban districts.

(4) Institutional and regulatory measures

1) Setting appropriate standards for water quality

The surface water quality standards should be set up for the preservation of the surface water quality in consideration of these recommended in the JICA Study. Effluent standards for industrial wastewater should also be set up considering the characteristics of the receiving water, i.e., water bodies used as raw water for domestic water supply, water bodies used for navigation or irrigation purposes or for bathing, aquatic breeding or cultivation and other water bodies.

2) Other regulatory measures

- development of compliance agreements to bring existing facilities into full compliance with standards
- establishment of more punitive systems for enforcement
- instituting a system of water pollution charges
- use existing and new EIA regulations on existing facilities to force new investments in pollution control measures
- setting appropriate discharge standards by types of all facilities

(5) Improvement of wastewater disposal system

1) Short-term measures: by 2005

The project for U.T. Zone 2 comprising two sub-zones, covering the Environmental Zones of Old City Center (EZ 1) and Red River Right Bank-South (EZ3), is selected for the priority projects for early implementation. The project area covers the city center belonging to the Kim Nguu River basin which includes the valuable lake of Hoan Kiem. In order to improve seriously polluted living environment in the area, the following measure should be implemented.

Outline of Priority Projects

Project Components	U.T.Zone 2-1	U.T.Zone 2-2
1) Service Area (ha)	1,033	1,220
- Separate System	233	1,000
- Partially Separate System	800	220
2) Interceptor & Diversion Chamber (unit)	4	-
3) Relay Pumping Station (unit)	2	-
4) Wastewater Treatment Plant (m^3/d)	66,300	40,400

U.T. Zone 2-2 will be implemented after completion of U.T. Zones 3 and 4 covering the whole area of the Old City Center according to assessment of priority for development.

As short-term measures, the following non-structural measures are also proposed to be undertaken.

- Government Support for Installation of Flush toilets
- Regulations for installation of industrial effluent pre-treatment

2) Middle-term measures: 2010

The following projects are recommended to be implemented in the middle-term.

Outline of Middle-term Projects

Project Components	U.T.Zone 3	U.T.Zone 4
1) Service Area (ha)	1,350	500
- Separate System	160	110
- Partially Separate System	1,190	390
2) Interceptor & Diversion Chamber (unit)	7	8
3) Relay Pumping Station (unit)	7	3
4) Wastewater Treatment Plant (m^3/d)	77,700	35,300

3) Long-term measures: by 2020

The following projects are recommended to be implemented in the long-term. Due to the continuity of the projects, projects extended beyond the target year of 2020, extended long-term projects are also shown below.

Outline of Long-term Projects

Project Components	U.T.Zone 5	U.T.Zone 6	U.T.Zone 2-2	G.T.Zone 2
1) Service Area (ha)	2,405	2,868	1,220	200
- Separate System	2,405	2,868	1,000	200
- Partially Separate System	-	-	220	-
2) Interceptor & Diversion Chamber (unit)	-	-	-	-
3) Relay Pumping Station (unit)	2	3	-	1
4) Wastewater Treatment Plant (m^3/d)	45,600	74,300	40,400	4,400

From the financial aspect in HPC, the implementation schedule of the long-term projects is postponed by 2025.

Outline of Extended Long-term Projects

Project Components	G.T.Zone 1	D.T.Zone 1	D.T.Zone 2
1) Service Area (ha)	4,095	550	660
- Separate System	3,704	550	660
- Partially Separate System	391	-	-
2) Interceptor & Diversion Chamber (unit)	5	-	-
3) Relay Pumping Station (unit)	5	3	3
4) Wastewater Treatment Plant (m^3/d)	101,300	19,500	19,500

(6) Improvement of septage collection and disposal

The amounts of septage that require collection and disposal in the future will depend on:

- how sewerage development proceeds over the planning period and
- how frequently septic tanks are cleaned

Sewerage development is proposed in three urban areas as shown in the following table:

Sewerage Development Targets in Urban Areas

Area	Environmental Zone	Pop. Connected To Sewer		
		2005	2010	2020
1. Nhue River Basin	Tay Ho	25%	60%	97%
	Old City Center			
	Red River Right Bank, N/W and South			
2. Gia Lam	Urban Gia Lam	0%	0%	100%
	(Yen Vien Town)			
3. Dong Anh	Phuong Trach center	40%	49%	49%
	Coa Loa – Red River center			
	Urban area (others)			

Note: Suburban zones with densities lower than 30 p.p.ha. are excluded from %

According to the proposed sewerage plan there will still be a large percentage of the population using septic tanks well beyond the year 2010. Improvements in sewerage will, therefore, need to be accompanied by corresponding improvements in septage collection and treatment facilities to prevent environmental degradation, sewer maintenance problems, and potential health hazards from the indiscriminant disposal of septage.

The following assumptions are made to get rough estimate for the septage quantity in the future.

- one septic tank (or vault latrine) system serves on an average about eight persons. The average is higher than the number of people per household to allow for larger installations serving apartment buildings, hospitals, commercial and institutional buildings.
- vault latrines are counted as septic tanks. Although they require more frequent cleaning their number is small therefore their contribution to the daily amount of septage waste is relatively insignificant.
- solids are removed when tanks are ¾ full.
- septic tanks are removed when households are connected to sewers. If tanks are not taken out of service the amount of septage that must be collected will increase significantly despite the implementation of public sewerage systems.

An estimate of septage quantities based on projected sewerage development summarized below:

Urban Populations with on-site sanitation systems

YEAR	Nhue River Basin		Gia Lam		Don Anh	
	Pop. (000's)	m3/d	Pop. (000's)	m3/d	Pop. (000's)	m3/d
1997	1,344	343	129	33	114	29
2005	1,008	257	144	36	140	36
2010	532	136	153	39	160	41
2020	40	10	0	0	342	87

Note: Suburban zones with densities lower than 30 p.p.ha. are excluded

(7) Improvement of Lakes/Ponds Water Environment

Lakes, ponds, and channels are used to collect and drain wastewater and storm water. However, the city's lakes/ponds, especially in the urban area, cannot function as drainage and purification facilities since the lakes/ponds are overloaded by organic waste and nutrients and the bottom layers and sediment are anaerobic. The ecological capacity of the city's waters should be recovered. The city's lakes/ponds become worse and is reduced, and so the polluted surface water in the City shall be prevented by developing properly the utilization of the ecological capacity.

Targeted lakes for improvement are proposed to be those located in old city center EZ 1, and EZ 2 and 3 as well as Ho Tay area EZ 7.

1) Short-term measures: by 2005

Two projects of West Lake Water Quality Improvement and the Main City Lakes Improvement covering the Environmental Zones 1 and 7: Old City Center and Ho Tay Area are selected for the priority projects. The latter should be implemented together with the To Lich River Basin Drainage project.

(a) West Lake Water Quality Improvement Project (Phase 2)

West Lake, which is the largest water body in the Study Area with approximately 5.1 km^2, is one of the most important water bodies to serve three important functions of:

- preserving clean water environment
- flood regulation, and
- providing friendly water environment

At present, HPC is undertaking the Phase I: Infrastructure Project of the West Lake Conservation Project including lakeshore road/park and small-scale sewerage developments. Subsequent to the on-going phase 1, the selected West Lake Water Quality Improvement Project should be implemented as the second phase, main project components of which are presented below.

- Lakeshore dredging work to remove the polluted and anaerobic bottom soil,
- Establishment of the public sewerage system to prevent inflow of wastewater

It would be worth detailed studying of adding another project component of introducing flushing water from the Red River to improve the water quality, particularly in terms of the turbidity of the lake.

(b) Main City Lakes Improvement Project

Main City lakes (14 lakes) located in EZ 1, 2, and 3 as shown in Figure 4-3: Old City Center should serve for the same three objectives as the West Lake and the following measures should be implemented.

- Lake dredging works for 14 lakes: Than Cong, Tho Quang, Trung Tu, Bay Mau, Nahia Do 1, Ngoc Khanh, Hao Nam, Phuong Liet 1 & 2, Trai

Ca, Lang Tam, Thanh Liet, Dam Set and Van Chuong lakes,

- Lake conservation works for 11 lakes excluding Than Cong, Tho Quang and Bay Mau lakes among these 14 lakes: by conservation measures such as construction of lakeshore roads and environmental revetments, planting trees, provision for parks and promenades, and other environmental measures.

2) Middle-term and long-term measures: By 2010 and 2020

Considering the big capital outlay required for the full scale sewerage development and relatively small benefits, the following measures are recommended for the 2008-2015 period.

- Temporal shut-off of dry season wastewater inflow by providing a diversion basin,
- Aeration facilities, including aerator, fountain and diffused aeration devices,
- Provision of a settling basin if possible, with screens used to shut-off inflow of floating particles,
- Dredging of sludge/sediment,
- Lakeshore line conservation for protecting surface water area.

4.4 Measures and Projects for Clean Air Environment

(1) Planning Concept

In order to fight against the major sources of pollution in Hanoi City, the following strategies are as shown below.

- Domestic Emissions
- Industrial Emissions
- Motor Vehicle Emissions

A summary of proposed countermeasures are shown below.

Direct Measures for Achieving a Clean Air Environment

Sector of activity	Strategies and Measures
Domestic	- Promotion of gas for cooking in households - Gradual elimination of coal/wood used as fuel in the urban areas
Industry	- Promotion of cleaner production (including energy conservation) in existing and new facilities - Development of process-specific air emission standards - Increase air emission regulation compliance by inspection and stack measurements - Promotion of use of cleaner fuels (gas, low sulfur fuel oil) instead of coal and high sulfur fuel oil - Adequate stack design (height) to avoid excessive pollutant concentration in ambient air even if emission are within standards
Transportation	- Unleaded gasoline - Low sulfur diesel (500 ppm) and gasoline (100 ppm) - Emission regulations for new motor vehicles (for example: Japan, EEC standards for automobiles and trucks; Taiwan or Japan standards for motorcycles). Unleaded gasoline is a prerequisite to this measure. - Inspection and maintenance programs for motorcycles

Indirect Measures for Achieving Clean Air Environment

Sector of activity	Strategies and Measures
Transportation	- Construction of road infrastructure (improvements to existing network and construction of ring roads) to improve traffic flow - Better public bus system, with low emission buses for routes in the central urban area - Improvements to traffic flow by better signalling - Two-wheeler policy: to avoid traffic congestion and minimize construction of infrastructure - Major improvement to street cleaning activities (water flushing, vacuum and sweeping) - Improvement to road network to eliminate unpaved areas on the side of urban roadways

(2) Measures for air quality Improvement

1) Short-term measures: By 2005

(a) Measures against Industry Related Air Pollution

In short term, the following measures will be undertaken:

- to develop of emission standards for facilities
- to review administrative penalties for violation of pollution control laws
- to complete pollution abatement plans based on EIA for all existing facilities
- to strengthen inspection capability to ensure compliance

(b) Measures against Domestic Air Pollution

No regulatory measures are proposed.

(c) Measures against Traffic Air Pollution

In the short term, measures will be undertaken to implement:

- inspection and maintenance programs for motorcycles

2) Middle-term measures: By 2010

(a) Measures against Industry Related Air Pollution

In the middle term, the following measures will be undertaken:

- the institution of air pollution charges for all major facilities

(b) Measures against Domestic Air Pollution

No regulatory measures are proposed.

(c) Measures against Traffic Air Pollution

In the middle term measures will be undertaken for:

- setting standards for sulfur content in diesel fuel and gasoline
- establishing emission regulations for new motor vehicles

3) Long term measures: By 2020

(a) Measures against Industry Related Air Pollution

In long term measures will be taken for the:

- completion of pollution abatement programs for all facilities

(b) Measures against Domestic Air Pollution

No measures proposed.

(c) Measures against Traffic Air Pollution

In long term measures will be taken for the:

introduction of regulations to force use of unleaded gasoline.

4.5 Measures and Projects for Clean City Environment

The most relevant activities contributing to clean city environment is the solid waste management (SWM). This section will summarize plans for improvement of solid waste management in Hanoi. The plan consists of slogan, principles, targets, measures and projects.

(1) Slogan, Principles and Targets

1) Slogan

Good solid waste management is summarized in the following proposed slogan:

- "Better and more service with higher efficiency"

2) Principles

The proposed principles concerning solid waste management of Hanoi are as follows:

- Application of cost-effective and environmentally sound methods particularly for waste collection, transport and disposal
- 100% waste collection service coverage for all urban population
- Increases of cost recovery through fee collection
- Shift of SWM responsibility to District, and the strengthening of capacity of Districts in SWM
- Promotion of privatization
- Strengthening of the responsibility of enterprises (waste generators) for the management of industrial waste

3) SWM Service Targets

The following service targets are proposed:

- Provide waste collection service for all urban population by 2007
- Implement a complete sanitary landfill in Nam Son by 2004
- Increase the efficiency of waste collection and transport through institutional reform and operational improvement by 2002
- Achieve 100% cost recovery by the year 2005

(2) Institutional and Regulatory Measures

This section explains the institutional proposals as an integral part of the Hanoi Environmental Master Plan. The basic direction shown by these proposals has been discussed and agreed with the Vietnamese side, in particular the Steering Committee for this JICA Study. However, these proposals are worked out as an integral part of the Environmental Master Plan for Hanoi and therefore, it is advised that in-depth and detailed study should be carried out to give body and substance to these proposals and concrete plans should be worked out with specific measures. In particular, measures proposed for privatization should further be looked into carefully by HPC itself from various viewpoints including its economic and financial feasibilities and the way of involvement and supervision by the Government.

These proposals should be understood in this context.

1) Shift responsibility of solid waste management to the District administration from HPC (TUPWS)

It is proposed that HPC shift the responsibility of solid waste management to each urban district. Being responsible for SWM means to take ultimate care of solid waste management, and does not necessarily mean that a responsible body should provide SWM service by itself. Major options are 1) to use employees and equipment of their own, and 2) to contract out SWM services

The reasons for proposing this shift are as follows:

a) SWM service is a community-based service by nature.
b) Size of population is large enough for district to provide efficient service.
c) District administration is financially and administratively capable.
d) Ultimate caretaker (district) will have more choices regarding ways in which SWM services are provided.
e) SWM cost would reduce.

2) Privatization

Form of Privatization: For waste collection, transport, and street-sweeping services, "contract out" is the most appropriate form of privatization. Contracting out is to arrange provision of SWM service by using contractor based on contract.

For treatment and disposal of solid waste, BOO (Build, Own, and Operate) or the concession are applied in Britain and France or other countries. These arrangements are generally referred to as Project Financing Initiatives (PFI).

- Reasons for proposing the privatization include 1) SWM cost reduction, 2) expansion of service area (by using cost saved from the efficiency increase, 3) improvement of service quality
- Arrangement for Shifting SWM Responsibility to Districts and Arrangement for Privatization

3) Steps for the institutional reform

Time schedule shown in this section is only example. Detailed strategy, plan and schedule should be worked out by HPC in the near future. Hanoi Socio-Economic Development Research Institute would be capable of drafting such strategy and plan.

Step 1: UEE receives vehicles (by 2000)

Each Urban Environment Enterprise (UEE) will be given waste collection vehicles and other necessary equipment and facilities including garages. In reality, this change will be done by transferring staff and equipment of the Transport Units to UEEs. In March 2000, URENCO has already decided to implement this change. UEE will also assume responsibility of collection of demolition waste and soil waste.

Note: At present, there are 5 UEEs under URENCO. Each UEE provides waste collection and street sweeping services for one or two urban districts.

Step 2: UEE will be placed under District Administration (2001 – 2005)

The existing 5 Urban Environment Enterprises (UEE) will be detached from URENCO, and placed under the District Administration during 2001 – 2005.

- UEE 1 will be administered jointly by Ba Dinh District and Cau Giay District
- UEE 2 will be administered by Hoan Kiem District
- UEE 3 will be administered by Hai Ba Trung
- UEE 4 will be administered jointly by Dong Da and Thanh Xuan
- UEE 5 will be administered by Tay Ho District

An important condition for this change is that UEE would be provided with

adequate equipment such as waste collection vehicles.

Each UEE will provide waste collection service in the same manner as before. HPC will allocate corresponding budget to each District.

An idea to strengthen the linkage and cooperation among the districts is to establish an inter-district council for solid waste management. Chairman of each district will be members of the council.

Step 3: Districts will be responsible for fee collection (2001)

Each Urban District will assume responsibility for collecting fees from service recipients (households, and governmental, commercial and industrial organizations).

Step 4: UEE will partly or wholly contract out waste collection service (2001 - 2005)

HPC should guide Urban Districts to contract out part of their service in some areas. With emergence of new business opportunities, the private sector would establish private companies that can provide waste collection and street sweeping/watering services. If there will be a few companies, the competition for "better service with less cost" will set in. HPC and Districts should prepare guidelines concerning standards and conditions of SWM services applicable to contractors. HPC should take measures to strengthen the Districts' capacity in contract management.

It is advisable that the said contracting out (privatization) should be done first in non-central districts, and in central districts later. The Hanoi Socio-Economic Development Research Institute proposed the following time schedule:

Districts	Timing of Contracting Out through Tender
- Cau Giay & Thanh Xuan	2001 – 2002
- Tay Ho, Hai Ba Trung and Dong Da	2003
- Hoan Kiem and Ba Dinh	to be decided based on results of formers

Step 5: URENCO will be detached from HPC (by 2005)

URENCO will be detached from HPC, and become an independent company. URENCO will have contracts with each Urban District for provision of

services for the secondary transport and disposal. URENCO will recover cost though contracts, and will not receive any subsidies. At this stage, URENCO will continue to monopolize the waste transfer and disposal business. However, because URENCO recovers all costs in the form of fees instead of subsidies, URENCO will have an incentive to do more service with less cost.

Step 6: Privatization of secondary transport and disposal services (2005 – 2010)

HPC will change monopoly policy of URENCO's service, and encourage that some companies will be established that can provide the secondary transport service. In future, HPC should also encourage private sector to participate in BOO arrangements for waste treatment and disposal. Simultaneously, HPC should establish a regulatory agency that will set standards of waste treatment and disposal services, and monitor compliance of companies.

(3) Municipal Waste Collection and Transport Plan

1) Issue 1: Increase level of cleanliness of streets:

Measures Proposed:

a) HPC should make it compulsory to use either:
   a. containers (350 liter-700 liter) that can be mechanically lifted by trucks or
   b. bags of degradable type
b) Do not use communal containers (6 - 8 m^3) in the city center as they can often be causes of unsanitary conditions. They can be used in suburban areas.
c) Improve the design of dustbins placed in public spaces. They should be larger and easier to empty.

2) Issue 2: Increase efficiency of waste collection and transport.

Measures Proposed:

a) Apply direct collection system (waste is loaded directly into trucks without using handcarts) instead of two step collection with handcarts and trucks because the direct collection system is more efficient. The

switch from the existing collection system to the direct collection would lead to the cost reduction which would be about one million dollar in the first year of introduction and increasing thereafter due to the increasing waste amount, based on the experience in the Danang City.

b) Citizens will use either bags or designated containers

c) Collection workers instead of local residents will put waste into trucks

d) Establish a transfer system with a transfer station in Dong Ngac that is proposed as urgent project.

3) Issue 3: Increase Waste Collection and Transport Capacity

The following measures are proposed as priority project "Improvement of Waste Collection and Primary Transport System". See 6.5.3 (4) of the main report.

a) Procure new waste collection vehicles and containers as planned in the priority project

It is estimated that HPC should procure 230 waste collection trucks and 49 vehicles for water sprinkling and 1,200 containers during 2000 - 2005. An estimated total cost of the procurement of the vehicles and containers during this period is about $18 million.

b) Upgrade the existing two garages (the existing garages of Transport Unit 1 and 2), expand one existing garage (Transport Unit 4), and construct two new garages; one in Hai Ba Trung, and the other for Ba Dinh and Cau Giay under the new garage re-allocation plan proposed.

c) Procure maintenance facility for the central workshop

(4) Municipal Waste Disposal Plan

1) Recommended Disposal Method

a) HPC should apply the sanitary landfill because it is environmentally sound and the most economical.

b) Waste incineration is not feasible for HPC because 1) Hanoi waste calorie is too low, and 2) cost of incineration is eight times costlier than the sanitary landfill. Total cost of waste transport and disposal under the sanitary landfill option is still lower than that under the incineration option as long as the a sanitary landfill site can be located within 300 km from the Hanoi City Center. Major conditions for application of the

waste incineration are 1) calorie of solid waste will reach 1,000 kcal/kg at least, 2) GRP per capita will reach around $5,000, 3) HPC cannot acquire a landfill site within 300 km from the city center. Please refer to the main report Section 5) of 6.5.4 (1) for the recommended strategy for introduction of waste incineration in future.

c) The expected contribution of the power generation project using coal and waste as planned by HPC would not be big considering the amount of waste to be incinerated. If financed and operated by HPC, the project would impose a big financial burden in terms of capital cost as well as O&M cost. The financial feasibility of the project is low with less than 5% of IRR at constant price base and might be lower due to various uncertainties and risks which need further in-depth study.

d) Apply composting only if HPC confirms its economic feasibility in terms of demand, price, and revenue. Large scale composting would not be feasible.

Remark

It is very useful to know the timing of introduction of the first incinerators in other countries.

Bangkok:

Bangkok Metropolitan Authority (BMA) of Thailand intended to introduce the first municipal waste incinerator in early 1980's, when the national GDP per capita was less than $1,000. The first JICA Study on Bangkok Solid Waste Management recommended construction of incinerators with capacity of 600 ton/day. However, BMA's financial conditions did not allow the construction of the planned incinerators. In early 1990's, JICA conducted another solid waste management study that recommended the construction of an incinerator with capacity of 200 ton/day as a pilot project. However, it was only in 1996 when BMA called for a BOT tender for construction and operation of incinerator and other facility. The tender resulted in failure. National GNP per capita reached $2,960 in 1996 (Source: 1998 World Development Indicator, the World Bank). Currently, it seems that BMA intends to construct incinerators using some ODA funds (loan). According to the same source, the corresponding GNP per capita in Vietnam is $290 in 1996.

Surabaya:

In early 1990's, Surabaya, the second largest city in Indonesia, introduced an incinerator with capacity of 200 ton/day on BOT base. Annual average of actual incineration amount turned to be about 130 ton/day, two thirds of the planned amount, while the total waste collection amount was about 800 ton/day. In ealr1990's, Surabaya's Gross Regional Product was about $800 per capita. Before the introduction of the incinerator, Surabaya City spent only a few percent of solid waste management budget for waste disposal, and the remaining budget was used for collection/transport of waste and street sweeping After the introduction of the incinerator, Surabaya city spent about 45 % of the total solid waste management budget for repayments of construction costs, and operation, which caused a significant financial burden on the city.

Kuala Lumpur:

Since 10 years ago Kuala Lumpur was examining the possibility of introduction of a waste incinerator. However, it is only in recent years that Kuala Lumpur has came to seriously planning on an incinerator. Malaysia's GNP per capita is $4,370 in 1996 (same report, World bank)

Singapore and Hong Kong:

These cities have introduced incinerators in late 1980's. GNP per capita of these two cities are $30,550 and $24,290 respectively in 1996 according to the same source.

2) Recommended Urgent Project: Nam Son Phase 2 Sanitary Landfill and Water Transfer Project as the

The urgent project aims at 1) constructing a sanitary landfill in Nam Son (referred to as Nam Son Phase 2 Sanitary Landfill) and 2) establishing a waste transfer system including a waste transfer station in Dong Ngac.

(a) Land Acquisition

Site area of the planned Nam Son Phase 2 Sanitary Landfill is 60ha. HPC plans to acquire all the land during the year 2000. Dong Ngac transfer station will require 6 ha. HPC should acquire the planned land in Dong Ngac by the

end of 2002 at the latest so that the construction would start in the beginning of 2003. Two locations in Dong Ngac (Dong Ngac I and Dong Ngac II) have been identified during the JICA Study. In case HPC cannot acquire either location in Dong Ngac, acquisition of a land in Co Nhue should be considered.

(b) Nam Son Phase 2 Sanitary Landfill

The planned Nam Son Phase 2 Landfill is a sanitary landfill equipped with all necessary facilities and equipment to ensure environmental protection. Planned facilities include embankment, fences, heavy equipment, gas ventilation facilities, monitoring facilities, artificial liner, and leachate collection and treatment facilities. Operation period of Nam Son Phase 2 Landfill Site is 14 years from the beginning of 2004 till the beginning of 2018 based on various design and operational conditions.

(c) Waste Transfer System

The planned waste transfer system, with initial capacity of transferring 1,600 ton/day of waste, consists of three main components, i.e. 1) transfer station, 2) vehicles for the secondary transport of waste from the transfer station to Nam Son landfill site, and 3) access road construction and upgrading of relevant roads and bridges.

The waste transport system with railway would cost much more than the road transport system, and also take much longer time for designing and construction. The waste transport from the city center to Nam Son with no transfer station is at least two times more costly than the planned transport system with a transfer station in Dong Ngac. It is also found that the planned waste transfer system with one transfer station in Dong Ngac is more economical than that with two transfer stations; one in Dong Ngac and the other in Duc Giang.

The waste transfer system will be of non-compaction system based on Hanoi waste condition and cost efficiency criteria. Adequate environmental measures are planned. All transfer area will be paved to avoid leachate seepage, and covered with roof and walls. All waste will be transported to Nam Son within 24 hours. Fences and trees will be provided around the site.

The secondary transport vehicle will be large dump truck of 25 ton GVW with capacity of 26 m^3 (11ton). 44 units of the secondary transport vehicles will be required initially.

3) Future Land Acquisition Plan

In identifying candidate locations for landfill, HPC should consider the following:

a) Minh Tri (150 ha) can be a good candidate location for landfill following Nam Son Landfill Site.
b) Use of Mountain/Valley Areas
   It is possible to use mountain and valley areas as landfill sites. Technology for construction and operation of landfill sites in such area is common. With this view in mind, more locations will appear as potential sites for landfill.
c) Inter-Provincial Landfill Arrangement (Acquisition of land outside HPC area)

In Japan and some other countries, there are many cases where two or more cities have a common landfill site if the cities cannot find a landfill site within the area of jurisdiction. HPC should actively examine this possibility.

(5) Hospital Waste Management

Major recommendations are as follows:

1) HPC should follow the new guideline for hospital waste management issued by the Vietnamese Government
2) Collect and incinerate all medical solid waste
3) Apply incineration as major means of disposal of medical solid waste

(6) Industrial Waste Management

Major recommendations are as follows:

1) Enforce the regulation that stipulates the responsibility of industrial waste generators to manage their own waste
2) Promote establishing joint venture companies that provide industrial waste collection and treatment service

(7) Solid Waste Management Plan for Suburban Districts

1) SWM Responsibility

Each of the five suburban districts has already established an urban environment company in recent years under HPC's policy that each sub-urban district should be responsible for solid waste management.

2) Target Waste Collection

It is estimated that a total of 470 ton/day of solid waste is generated in the five suburban districts, of which 133 ton/day (28%) is collected. It is proposed that the waste collection rates should increase to 36% by 2005, 44% by 2010, and 65% by 2020.

3) Waste Disposal Method and Plan

In principle, each suburban district should apply the sanitary landfill.

It is estimated that each district would need 10 - 15 ha of land for sanitary landfill during the period of 2000 - 2010, assuming that height of landfill is 10m.

Each suburban district has identified future landfill sites within each district as shown below.

Outline of Future Landfill Sites Planned by Each Suburban District

Name of sub-urban district	Location	Area
Gia Lam	Kieu Ky	5.4 ha for the 1st phase, 7 ha for 2nd phase
Dong Anh	Communes of Lien Ha and Viet Hung	10 ha
Soc Son	Nam Son Landfill Site (same as the one used by 7 Urban Districts)	
Thanh Tri	Brick soil excavated hole in commune of Vinh Quiynh	5.4 ha
Tu Liem	A paddy field located in communes of thu Phuong, Thuong Can, and Minh Khai	

Note: Some area of the first phase landfill site of Gia Lam was already used and filled with solid waste transported by URENCO.

4.6 Strategies for Quiet City Environment

Considering that the major pollution source of the noise in the city, in particular in the urban areas, is the traffic followed by others including industrial and commercial activities, the following measures are recommended to be taken in stages.

(1) Regulations and education

1) Observing traffic regulations and manners

As the horns of the vehicles are used frequently, it is estimated that the degree of influence of horns on the noise pollution is rather high. The Assessment Law prohibits the use of horn in the densely populated residential areas from 11:30 and 13:00, and after 22:00. It is necessary to let the drivers know the law and educate them not to use horns so frequently. The discipline for drivers to drive in a line and have "give way" manner is essential and should be acquired in the driving school before getting driving licenses.

2) Application of polluter pay principle:

In order that the standards and regulations against noise pollution be observed properly, application of Polluter Pay Principle should be made. Under this principle, those who generate the noise or vibration, e.g. the owner of the factory, the producer of motorized vehicles or the drivers, should pay penalty when they violate the regulations.

3) Regulations for commercial activities and factories :

Regulations for opening the stores on roadsides are required, which disturb the smooth traffic flow. The regulations to limit the operation or working time should also be established for factories and shops, which produce big noise.

(2) Improvement of Traffic Management System

The following improvements for traffic management system are recommended.

a) Introduction of Traffic Information System
b) Installation of signals, markings and crosswalks

c) Sidewalks and trees
d) Porous asphalt pavement
e) Equipping lights/headlights

4.7 Strategies for Co-existing with the Nature and Provision of Amenity

(1) General Strategies

Despite that Hanoi City is the capital of the country with well over 2 million population, it is still endowed with rich nature resources of green and water even around the city center. On the other hand, rapid urbanization is expected, expanding to the left bank side of the Red River. General strategies for the city as a whole should be, therefore, as follows.

- Not reduce the total area of the green
- Limit the conversion of agriculture land to urban area within the range specified in the Hanoi Urban Master Plan for 2020
- Increase the number and area of the parks
- Increase the total length of the tree lined streets
- Maintain the number and area of the lakes at 1999 level
- Improve the quality of water of the lakes and rivers
- Upgrade the access to the waterfront and provide water and green oriented amenity

(2) Strategies for Each Environmental Zone

Following specific strategies are recommended to each environmental zone, taking into account the current conditions of green and water as well as the future land use of each zone.

Strategies for Co-existing with Nature and Provision of Amenity by Environmental Zone

Environmental Zones	Proposed Strategies
1. Old City Center	- Preservation of the water surface area and water quality of Hoan Kiem Lake by restricting the development around the lake, and direct inflow of waste water. The trees around the lake should be preserved also to give recreational space to the people living in the urban area. The number of the lakes in this zone should also be kept by establishing the regulation. - Water environment of the 14 city lakes located in this area including water quality and access to the waterfront by constructing promenades should be upgraded to provide nature and amenity to the people.
2. Red River Right Bank North – West	- The preservation of the natural area and turning out the new natural zone should be considered as well as the development of commercial area. - Thang Long South Highway is the key road in this area and development along the road should be done carefully so that some green area can remain there.
3. Red River Right Bank South	- The project of constructing a park of 60 ha around Yen So Lake should be realized as planned. The project should be carried out for keeping natural area in this zone and the wastewater from the dwellings should be purified before the discharge into the lake.
4. Dong Anh urban area	- Cau Doi park project with about 300 ha of area including the botanical garden should be realized as planned. It will be the second botanical garden in Hanoi. The diversity of the trees and flowers there should duly be considered because in Hanoi, there are limited kinds of trees and flowers seen.
5. Gia Lam urban area	- The clear zoning for each land use category, such as residential area, commercial area, industrial area, is required especially for this area because this area will be the main industrial area in Hanoi. which will be useful for keeping the water and green area.
6. Sub-urban Area	- About 8,000 ha of agricultural area is planned to be changed into urban land use until the year of 2020. - Agricultural area is one of the green area, and the conversion of farmland should be restricted as far as possible for coexistence with nature.
7. Ho Tay Area	- A big amusement center will be constructed near Ho Tay in 2000 spending VND 130 billion . - The co-existence among people, nature and enjoying amenity is expected to realize in this zone. For the preservation of rich water space of Ho Tay, establishment of promenade around whole lake is needed. The promenade makes it easier to access to water and give people more opportunities to commune with nature by fishing, boating etc. - The preservation of the trees along the streets constructed in French period should be done by establishing the regulation because these streets have unique atmosphere with wide sidewalk and quiet living environment.

4.8 Strategies for Preserving Cultural and Historical Assets

(1) General Strategies

The following strategies are recommended to be adopted for the effective and efficient preservation of the cultural and historical assets.

a) Preparation of the lists of assets and grading
b) Holding the workshop and tours for visiting the assets for upgrading the recognition of their values
c) Reuse and co-existing with the assets
e) Appropriate manner for preservation

(2) Strategies for Each Environmental Zone

The following strategies are recommended for each environmental zone.

Strategies for Preserving Cultural and Historical Assets by Environmental Zone

Environmental Zones	Proposed Strategies
1. Old City Center	- In Hanoi, a list of cultural and historical relics such as pagodas and old houses was prepared only for Ancient Quarters in 1999. The grades are divided into two categories depending how old the assets are. Ancient Quarter itself is the historical asset and it is meaningful to list the assets there, to be sure, but it is proposed to widen the area for registering the assets besides the Ancient Quarter encompassing at least two environmental zones, namely Old City Center and Ho Tay Area. Making more detailed categories for grading depend on the age and value of the relics is also essential. - For precious pagodas, museums and architectures, regular maintenance such as reinforcement of the wall, painting and introduction of new technology for the preservation of the exhibitions (for museums) are required.
7. Ho Tay Area	- Conservation of the Van Mieu, Chua Mot Cot and Ho Chi Minh mausoleum is of great importance. However, it would cost much to maintain in good condition for long time period, which needs high skill. For precious old pagodas and mausoleum, it may be better to apply for UNESCO to be acknowledged and added in the list of the world cultural heritages for receiving the fund for rehabilitation with modern technology. - Regulation on construction density, height of the buildings and land use zoning should be established for the area of valuable urban landscape and French-style buildings located to the east of the West Lake aiming at preserving historical relics.

4.9 Projects and Strategies for Integrated Environmental Management

Though limited in terms of area and pollutants, environmental degradation is already observed in the Hanoi City. It is expected that the situation would become more serious as economy grows and population increases. It is essential to work out appropriate counter-measures in plenty of time based on the comprehensive recognition of the current situation in order that regulations are properly enforced and treatment facility is timely developed. However, the importance of environmental preservation and improvement has only recently been recognized and the institutional framework and organizations for integrated environmental management are yet to be strengthened.

For the integrated environmental management of the city, the following projects and strategies are recommended. Since the institutional strengthening is the basis for the environmental management, these projects should be started in short-term as priority projects and extended toward the middle and long-term time frames.

(1) Implementation of the EMP

Long-term spatial master plan to guide the urban development and land use in the city has already formulated with the target year of 2020. Efforts have been made to prepare long-term socioeconomic development plan, though not yet fully materialized. However, environmental consideration is not yet fully incorporated in these plans.

It is recommended that five environmental experts and specialists be appointed in Hanoi Chief Architect Office and Hanoi Planning Institute. In Hanoi Authority of Planning and Investment, environmental staff should additionally be appointed. It is also recommended that long-term environmental master plan should be formulated which show the basic direction of environmental preservation and improvement as well as specific projects and measures for improvement. In order to reflect the change of external conditions of environment including economic growth and progress of environmental counter-measures, it is recommended that the environmental master plan be amended in a revolving manner, i.e., every five years. Timing of amendment should be in the interval of the amendments of the spatial and socioeconomic plans so that the environmental proposals should be reflected in these plans.

Environmental Coordination Committee (ECC) is recommended to be established with the following two main objectives.

a) Coordinate the Government and public bodies both at the central and local levels and between the central and the Hanoi City.
b) Insure that the recommendations and projects for environmental improvement should be reflected and incorporated in the spatial and socioeconomic plans.

The chairmanship of ECC should be assumed by the Chairman of the Hanoi People's Committee (HPC) with the vice chairmanship by Hanoi DOSTE and HAPI. Considering the special status of the city as the capital, Ministries concerned with environment of the city should also be members with senior staffs at appropriate level. To technically support the committee, a sub-committee should be set up, lead by the Director of Hanoi DOSTE with staffs seconded from the member Departments and Ministries.

Composition of ECC	
Chairman	Chairman of HPC
Vice Chairmen	Directors of DOSTE and HAPI
Members	- Directors of HPC Departments concerned - Senior staffs of Central Ministries concerned
Technical Sub-Committee	Lead by DOSTE

(2) Reinforcement of Hanoi DOSTE

Reinforcement of Hanoi DOSTE is an urgent need for the effective environmental management of the city and should be carried out as soon as possible. At present, one division, Environmental Management Division (EMD) within Hanoi DOSTE is responsible for all the environmental management of the city with only about 20 staff including these on contract basis. It is recommended that the EMD should be upgraded to an Agency within DOSTE and should be given enhanced authority with increased number of staff and budget. Considering the future rising need for abating industrial pollution and environmental awareness raising for reducing pollution loads and for cooperating for the construction of treatment facility, organization shown in Figure 4-4 is recommended for the new Environmental Management Agency.

Accordingly, the Agency should be staffed with about 35 personnel as shown in below.

Summary of Personnel Requirements for the Environmental Management Agency

Division	*Job Title (No. of staff)*	*Total*
Directors Office	• *Director (1)* • *Deputy Director (1)* • *Support staff (1)*	*3*
Administration	• *Chief (1)* • *Finance (2)* • *Support staff (1)*	*4*
EIA and Technology	• *Chief* • *EIA Specialists (2)* • *Environmental Research (1)*	*4*
Environmental Monitoring	• *Chief (1)* • *Senior Environmental Monitoring Specialist (1)* • *Monitoring Technicians (1)* • *Laboratory Manager (1)* • *Laboratory Technicians (1)* • *Information Systems Specialist (1)*	*6*
Pollution Control	• *Chief (1)* • *Environmental Engineers (3)* • *Information System Specialist (1)*	*5*
Inspection	• *Chief (1)* • *Inspectors (3)*	*4*
Public Relations and Environmental Awareness	• *Chief (1)* • *Public relations officer (1)* • *Environmental Coordinator (1)*	*3*
District Environmental management		*6*
Total All Divisions		*35*

(3) Strengthening of the District Level Environmental Management

Strengthening of the district level environmental management is recommended to be in two stages:

First stage	Set up a division of District Environmental Management Division within the Agency
Second stage	Create an Office of Science, Technology and Environment or Office of Environment if Hanoi Department of Environment is created, within the District People's Committee

The first stage should be implemented when the new Agency is established at the earliest timing. Under the District Environmental Management, 4 regional units

are recommended to be set up with 6 staff as shown in Figure 4-5. Regional units will be managed by District Environmental Management staff with altogether 40 staffs seconded from District People's Committees. The second stage should be implemented within the short-term by 2005.

(4) Establishment and Strengthening of the Monitoring System

To grasp the environmental conditions of the city more accurately and their changes by time and season, regular monitoring is recommended for water and air qualities rather project basis. In total, about 40 water sampling points are recommended for regular sampling and analyses, of which about half is for the urban rivers and city lakes including the West Lake located in EZ 1, 2,3 and 7, considering the already degraded water quality as well as their importance as amenity for the people. The rest are for the other major rivers including Red River an Duong River. Number of sampling points for surface water is given below by environmental zone together with these for groundwater.

Monitoring points on Surface Water and Groundwater

Environmental Zone	No. of sampling Points – Surface Water	No. of sampling Points – Gronundwater
Zone 1	14 points	10 points
Zone 2	1 points	10 points
Zone 3	3 points	5 points
Zone 4	2 points	3 points
Zone 5	2 points	3 points
Zone 6	2 – 5 points	7 – 11 points
Zone 7	2 points	
Major Rivers	7 - 13 points	
Total	33 – 42 points	38 – 42 points

Monitoring items should include these for human health and major items for living environment including BOD, COD and SS.

Air quality sampling and analyses should be made continuously by means of automatic continuous analyzers to get various averaging time data for various pollutants. Monitoring items should include Sox, Nox, CO, TSP, PM10 and Pb.

4.10 Strategy and Measures for Strengthening Education and Environmental Awareness Raising

(1) Objective and Strategies

Main objective of strengthening education and environmental awareness and raising (EEAR) is to upgrade the awareness of all the people living in the city and all the organizations doing activities in the city for the importance of preserving environment of the city.

To serve this objective, the following strategies are recommended to be adopted.

a) Active participation of women and mobilizing youth motivators
b) Education of children by experience
c) Awareness raising for the importance of cleaner production
d) Implementation of demonstration program
e) Strengthening awareness among policy-makers and the mass media
f) Establish a Partnership with the Private Sector including local merchants and businesses, large local corporations, international corporations operating in Vietnam, international foundations.
g) Preparation of resource materials for environmental awareness raising
h) International Exchange of Experience including exchanging visits from individual practitioners and specific interest groups, workshops and study tours, and case study dissemination and email conferences over the Internet.
i) Continuation of Cleaner industry program carried out by CEST and CECS funded by the Swiss government.

(2) Measures and Actions

1) Institutional measures

(a) Establishment of Public Relations and Environmental Awareness Division in the New Environmental Agency

As a part of the reinforcement of Hanoi DOSTE which is recommended as a priority project in this JICA Study, new division of Public Relations and Environmental Awareness should be set up within the new Environmental Agency under Hanoi DOSTE.

Under the new District Environmental Management Division of the Agency, regional units are recommended to be set up. These units also would serve

for strengthening EEAR activities at the district level.

(b) Making use of Environmental Fund for EEAR

It is recommended that EEAR should be included in the major objectives of the recommended Environmental Fund to extend financial support to the active participants.

The following programs are recommended to be consideration in-depth toward implementation.

a) Supporting Program for Women and Environment

The program would support education courses for environmental communicators, production of posters, 300,000 leaflets and music compositions, expansion of their TV and radio information, establish 12 pilot clubs on "Women and Environmental Issues", provide funds to purchase communication equipment for use by their district offices, and one vehicle for supervision.

b) Supporting Programs in Environmental Education

This project would assist a limited number of schools located around lakes in Hanoi to strengthen their environmental education activities and to provide a model which can be used to extend and evaluate full-scale coverage in urban areas.

c) Demonstration Project in Environmental Management

Some settlements are springing up without adequate space to construct physical and social infrastructure, or space for recreation. High-density development is also eating up the lakes and wetland systems, causing increasing flooding and pollution. Action among local stakeholders, including owners of land and buildings, district authorities, NGOs and mass organizations offer a better chance to avoid the mistakes in the current pattern of development. This project would include about 2,000 households in Phu Thuong Ward of Tay Ho District and cover an area of between 300 and 600 hectares.

d) Supporting program for Youth Union for the protection and management of lakes and wetland systems

This project is, with the initiative of the Youth Union, to select and appoint 70 activators in 7 districts along the wetland areas of the region, to train these activators with audio-visual and other materials which would be developed for the purpose to enable them to motivate local youths to i) develop monitoring of the condition of the wetlands, ii) undertake wetland cleaning and restoration activities, iii) launch communication and action campaigns in the city, and iv) to assist the motivators to develop overall plans and policies for the wetland systems which could be discussed within HPC. Cooperation should be established with APNEH, DOSTE, HSDC and other technical arms of government as needed.

4.11 Strategies for Human Resource Development for Environmental Management and Services

(1) Objectives

The following actions are recommended for Human Resource Development (HRD) objectives in response to the external influences and constraints.

- Strengthen the human resources within the organizations concerned with the environment, placing emphasis on adapting to the changing and increasing needs for these organizations
- Develop a cadre of environmental management professionals within each of the departments and organizations concerned with the environment of the Hanoi City
- Improve managerial and technical skills for planning, designing, implementing and evaluating investments in environmental projects and capacity building efforts.
- Increase the level of specialization in operation and maintenance units whose activities have a direct impact on pollution control efforts.
- Where possible, re-train and upgrade skills of existing personnel to meet the changing skill sets required for environmental management.

(2) General Strategies

The strategies for achieving the proposed HRD objectives should consist of training and/or hiring personnel to meet the needs of individual investment projects and programs. Thus, each future investment project should include a comprehensive HRD component to ensure successful and sustainable implementation of the project.

For structural projects, HRD should consist of:

- technical assistance at the project identification and planning stage,
- formal training courses during project implementation
- on-the-job training during the commissioning period, and
- technical assistance for a period of at least two years after the implementation of a project
- For non-structural projects that are targeted at a specific organization (e.g. DOSTE) technical assistance and specialized training will be used to introduce and demonstrate new approaches.

(3) Specific Strategies and Programs

1) Hanoi DOSTE

(a) Future Needs

This assessment of basic needs assumes that the new environmental agency will be created, and, soon after, district level environmental management will become established. Because of these proposed organization changes, and the resulting increase in staff, it is necessary to consider both recruitment of new staff and training of all staff.

a) DOSTE Level

In total, 35 professionals, technicians and specialists would be needed to support the new Agency. Given the existing staffing level of the EMD of about 20, it is expected that up to 15 new staff will need to be recruited. It is anticipated that these new recruits will have suitable education background and the basic technical skills to undertake their jobs. Managerial personnel will be needed to lead the seven divisions that will be created.

b) District Level

Qualified and sufficient staff will be needed to work at the district level. It anticipated that up to 40 environmental professionals will be needed. These staff will have to have skills in:

- environmental impact assessment
- environmental education and awareness
- environmental inspection
- complaint and dispute resolution

(b) Strategy and program

The basic HRD strategy is to create a strong cadre of environmental management professionals within the DOSTE Level. This cadre will then provide active leadership to district level environmental professionals. As the capacity develops at the district level, more responsibility will be given to the DPCs. Once effective district offices for are established, the environmental management professionals at the DOSTE Level will concentrate on providing professional guidance to the district level.

a) DOSTE Level

The short term program at the DOSTE Level will be four-fold:

- new staff or inexperienced staff will complete the basic core curriculum;
- advanced courses targeted on staff in different divisions
- leadership, managerial and supervisory training for division heads; and
- leadership, managerial and supervisory training for regional team leaders in district environmental management division.

b) District level

The short term program at the district level will have:

- district environmental professional completing the basic core curriculum
- DOSTE Level district environmental management team leaders providing on the job training to district level environmental professionals

2) TUPWS

(a) Future needs

With expected development of drainage and sewerage facility in the coming years as well as the urgent need for solid waste collection and disposal in sanitary way, environmental service function of TUPWS besides the urban transport function is badly needed including planning and management of the projects. In addition, TUPWS should play the key role in:

- devolution of solid waste management responsibility from HPC level to District level
- privatization with competition (contracting out of waste collection and transport services)

Detach URENCO from HPC, and make it a pure service provider in a long by:

- Integrating planning of environmental services within one core group of environmental management professionals
- promoting a stronger link between master planning directed by HCAO and urban environment infrastructure planning provided by TUPWS

(b) Strategies

In the short term, HRD is modulated by the need to provide engineering and

technical staff with the required qualifications and in sufficient numbers to carry out the planning, engineering and project management of urban water supply, sanitation and waste disposal infrastructures. Strategy may consist of seconding existing qualified staff from each of the service companies (URENCO, HSDC, WSBC) to staff the new Engineering Division. Specialized skills will be developed through technical assistance aimed at a core group of professionals and through the assignment of resident experts who will work within each of the three environmental services areas to strengthen capacity.

3) HAPI

(a) Future needs

It is proposed that HAPI develop the capacity to conduct environmentally sustainable socioeconomic and development planning. HAPI is responsible for the coordination of the sectoral planning of many agencies. HAPI is also responsible for evaluation of the various investment plans. To better evaluate plans, HAPI staff must strengthen its capability in methodology for:

- environmental impact assessment of regional and sector plans
- economic evaluation of environmental improvements
- strategic environmental assessment of policies and plans

(b) Strategies

Considering the characteristics of HRD need for HAPI, basic strategy should be to utilize the external technical assistance and training to introduce and demonstrate new approaches.

The technical assistance should include:

- introduction of new approaches to planning to integrate environmental considerations
- seminars and training course on new approaches
- case studies to test the effectiveness of new approaches
- development of guidance manuals
- review of evaluation procedures in developed and ASEAN countries
- development of methodology appropriate the to needs of HAPI
- case studies to test the new methods and approaches in practice

- development of guidance manuals

4) HCAO

(a) Future needs

The HCAO has the central role in development of the General Urban Master Plan for Hanoi. This plan set outs the proposals for the physical locations of different facilities and infrastructure. The development of this plan is a complex undertaking in spatial planning. Environmental information technologies like Geographic Information System will be indispensable tools in spatial planning in the coming years. Future staff should be capable of handling all these.

(b) Strategies

Considering the characteristics of the HRD needs, external technical assistance should be obtained which should include;

- development of the spatial planning capacity through introduction of geographic information systems to the Hanoi Planning Institute; and
- technology transfer on the methodology of environmental master planning.
- seminar or training courses in methodologies and approaches to environmental master planning
- case studies application - amendment of the Hanoi Master Plan to 2020 to test the methods and approaches in practice
- development of guidance manuals

5) HSDC

(a) Future Needs

In order to improve the environmental conditions of the Hanoi City, the old city center, Ho Tay areas and its surrounding urban areas in particular, various infrastructures are recommended to be implemented in short term and some projects have already been started. Being a company, need will increase for bigger cost recovery especially for sewerage service.

Under the situation, demand for stronger manpower is rising, requiring in the short term:

- For To Lick Basin Drainage project, around 30 engineers, technicians, operators, mechanics electricians and clerical staff would be needed
- For levee maintenance, more than 60 personnel comprising foremen and laborers would be needed.
- For wastewater treatment plants, about 20 personnel including process engineers, process operators, mechanics. Electricians and laboratory technicians would be needed.

In addition, HSDC organization is going to be re-structured to adapt to the changing roles and functions. Accordingly, more management personnel including directors of the departments and heads of various units would be needed as well as more accountants for company accounting.

(b) Strategies

The following strategies are recommended.

Measures for the Improvement of HSDC

Sewerage Functions:	- hire and train personnel to operate pilot treatment plants - hire and train laboratory personnel - hire and train more wastewater treatment plant operators and process engineers to meet the growing number of treatment plants - develop technical skills required to support wastewater treatment plant operators
Drainage Functions:	- hire personnel for operation of Yen So pumping station and control gates - increase personnel maintaining levees - provide computers and software tools to engineering department for flood database and mapping project
Management Functions:	- provide training and develop skills for business accounting, financial analysis and economic effectiveness of business operation. - provide training on pricing strategies and tariff setting for cost recovery - develop financial analysis skills to reduce operating costs and improve fiscal planning

6) URENCO

(a) Future direction and needs of URENCO

Substantial institutional reform is recommended by the JICA Study including:

- devolution of solid waste management responsibility from HPC level to District level
- privatization with competition (contracting out of waste collection and transport services)
- Detach URENCO from HPC, and make it a pure service provider in a long run

If the above is materialized, URENCO will be a private service provider. Even if their status is changed, however, their major role in solid waste management in the urbanized areas is expected to continue. With increasing demand of the waste collection and disposal in sanitary manner, their transport capacity should be strengthened and new expertise should be introduced for efficient collection and transfer and sanitary disposal of the wastes. More management personnel would be required for fulfilling these tasks systematically. If privatized, stronger cost control would be needed. All these necessitate HRD.

Within short term, the following personnel would be required to be developed.

- For sanitary landfill operation, nearly 30 personnel including managers, engineers, equipment operators and scale operators.
- For transfer station and waste transport to landfill site, about 140 personnel including managers, equipment operators and drivers would be needed.

To adapt to the new organization, more management personnel including directors of the departments and heads of various units would be needed as well as more accountants for company accounting.

(b) Strategies

The following strategies are recommended.

Measures for the Improvement of URENCO

Transfer and Disposal:	• hire and train personnel to operate landfill site and transfer station develop technical skills required to support solid waste management operations • hire and train environmental engineers to develop and implement recycling and waste reduction programs
Collection, and transportation:	• hire and train drivers and mechanics for vehicles • improve skills of mechanics to repair modern vehicles • provide equipment and tools
Management Functions:	• provide training and develop skills for business accounting, financial analysis and economic effectiveness of business operation. • provide training on pricing strategies and tariff setting for cost recovery • develop financial analysis skills to reduce operating costs and improve fiscal planning

The Nam Son landfill and transfer system project will create the need for technically competent operators, drivers and maintenance staff with specialized skills to maintain vehicles.

4.12 Strategies and Measures for Strengthening Financial Mechanism for Environmental Improvement and Management

To date, major funding sources for the public undertaking for environmental improvement and environment related services are HPC budget including external soft loans. HPC budget should continue to finance these environmental projects which serve for the public interest of the city. However, the following financial tools and principles are recommended to be considered for introduction in the future.

(1) Beneficiary to pay

For solid waste collection service, stronger cost recovery principle as well as efforts should be made. Sewerage system will be constructed firstly for the central area of the city with high population density where relatively higher income people are living. Since direct beneficiaries can be clearly identified, sewerage charge should be considered to be introduced, probably in the form of surcharge on the water supply charge.

(2) Polluter to pay

In order to prevent external economy for the polluters, polluters should be imposed either penalty or pollution fee level which should be high enough to make them install treatment facility for their effluent and emission.

(3) Establishment and utilization of environmental fund

Though the scale is rather small, environmental fund can be utilized to raise the environmental awareness of the people and enterprises. Fund may be used for funding some pilot treatment project.

(4) Enhancement of HPC budget

Considering the status of Hanoi as the state capital and the important occasion of 1000 year anniversary of the city in 2010 as well as the large discrepancy between the city revenue and GRP generated in the city which is about 7 times difference, it may be advisable to consider the augmentation of HPC revenue and budget.

CHAPTER 5 SELECTION AND EVALUATION OF THE URGENT AND PRIORITY PROJECTS

5.1 Recommended Urgent Project and Evaluation

(1) Necessity and Urgency

Waste Transfer System

Nam Son Landfill site is about 50 km from the city center. It is estimated that the direct transport system without a transfer station is about two times costlier than the transport system with a transfer station. In 1998, URENCO daily collected about 1,000 ton of waste excluding demolition waste and soil waste. It is not possible for URENCO to transport this amount of waste to Nam Son using the existing trucks, majority of which are older than 7 years.

Nam Son Phase 2 Sanitary Landfill

According to HPC's plan, Nam Son Phase 1 site will be full in 3 to 4 years. Planning, designing and construction of a new landfill site usually takes a few years or more. Therefore, it is necessary for HPC to now start a study on the next phase landfill site (Phase 2). Local citizens will not accept construction of landfill site if it is an open dumping site.

(2) Target Satisfaction

Waste Transfer System

The major objective of having a waste transfer system is to reduce cost of waste transport from the city center to the landfill site. It is estimated that the cost of the waste transport from Hanoi city center to Nam Son with the planned transfer system is US$7 million/year in future when waste transfer amount reaches 1,700 ton/day, while the corresponding cost without a transfer system would be at least two times. Thus, the project objective would be achieved.

Nam Son Phase 2 Landfill

Nam Son Phase 2 Landfill Project aims at disposal of solid waste in environmentally sound and economical way. Achievement of the aim gives the following two kinds of benefits:

a) HPC can have a place to dispose of solid waste
b) HPC can dispose of solid waste in environmentally sound and economical way.

The first benefit will be gained as long as HPC acquire the planned land in Nam Son. The second benefit will be gained if HPC implement the project as planned by the JICA Study Team because the sanitary landfill is the most economical method of waste disposal among options.

(3) Beneficiaries and accrued benefits

The beneficiary of the project will be the whole population living in the existing seven urban districts and surrounding urban areas. Accrued benefit can be measured in terms of the waste amount to be disposed of through this urgent project which would be 1,464 tons per day in 2004 when the project will start its operation and 2,330 tons in the final full operation year in 2015.

(4) Cost Effectiveness and Affordability

As mentioned before, the sanitary landfill is the least cost disposal method among all the sanitary disposal options. The JICA Study Team has planned and designed the project in such a way as to be the least cost on the condition that the project would satisfy the project objective and requirement and the relevant Vietnamese standards. Therefore, the planned project is the very cost effective.

This project is a part of the solid waste management improvement (SWM) projects planned for HPC.

It is judged that the implementation of the whole SWM projects is affordable for HPC in terms of 1) ratio of the SWM project cost to HPC's revenue and 2) ratio of the SWM project cost to the Gross Regional Product of Hanoi.

Those ratios are currently around 5% and 0.8%, respectively. With the implementation of the whole SWM projects, the corresponding ratios will increase to 7.7% and 1.2% approximately at the peak year 2005. Then the ratios will gradually decrease, and reach 6.9% and 1.1% in 2010, and 4.9% and 0.8% in 2020.

In general, cities in developing countries find that SWM costs pose a financial burden if the SWM cost ratio to GRP exceeds 1%. The corresponding ratio will be over 1% in Hanoi during the period of 2004 - 2014. During this period, HPC may

feel that the SWM cost is much.

However, considering the fact that Hanoi is the capital city, the planned SWM projects would be affordable for HPC, and HPC would be able to find sources of finances for the required investments.

(5) Environmental Impacts

The primary objective of the urgent project is to contribute to making the city cleaner and more sanitary. However, project of this type may cause some secondary pollution such as water pollution with leachate, etc., if adequate environmental protection measures are not taken.

The JICA Study Team has planned and designed the project (system, facility and equipment) in such a way as to minimize such environmental pollution so that there will be no significant pollution at all.

5.2 Selection of Priority Projects and Assessment of Viability

(1) Selection Criteria and Selected Priority Projects

1) Selection criteria

Among the proposed projects, priority ones are selected considering the following points.

(a) Urgent needs

Solve the problems which are already prevailing or currently affecting seriously the environment of the Hanoi city

(b) Fundamental needs

Strengthen the foundation for the effective and efficient management of environment with a view to;

(c) Complimentarity to other proposed projects proposed in this JICA Study including the urgent project as well as those proposed in other studies.

(d) Continuity with other projects which are either completed or under construction

(e) Completed during 2005-2010

2) Selected Priority Projects by Sector by Type

(a) List of priority projects

Altogether 13 priority projects are selected as shown below by purpose/sector and by type. Six of them are classified as structural type and seven are as institutional/organizational ones.

List of Priority Project by Type

Purpose	Structural	Non-Structural
Integrated Environmental Management		Establishment and Reinforcement of the Monitoring System
		Establishment of Environmental Coordination Committee and Revolving Environmental Master Plan Procedure
		Reinforcement of Hanoi DOSTE
		Strengthening of Environmental Management at District Level
Sanitary & Clean Water	To Lich Drainage	Reform of HSDC
	West Lake	
	14 City Lakes in Old City Center	
	Public Sewerage	
	Septage Collection & Disposal	
Clean City	Improvement of Collection of Solid Waste	Shift of SWM Authority to Districts and Privatization of SWM services
		Study on the Possibility of a Waste Incinerator with Power Utilization for Hanoi
Diversification of Financial Facility		Establishment of Environmental Fund

(b) Priority Projects for Integrated Environmental Management

In order to manage the environment in the Hanoi City more effectively and in more integrated and coordinated manner at present as well as with the new disposal system and treatment facility in the future, strengthening of the existing organizations and better coordination will be essential. The following four projects are proposed in this context.

a) Establishment of Environmental Coordination Committee and Revolving

Environmental Master Plan Procedure

Major objective of establishing the Environmental Coordination Committee (ECC) is to ensure the better coordination among the Departments/Authorities of HPC as well as between HPC and the Central Ministries and other entities including SOEs both Central and Local which are concerned with the preservation of the environment of the City.

b) Reinforcement of Hanoi DOSTE

Major objective is to strengthen the organization of Hanoi DOSTE by

upgrading its status either to Agency or separate Department for Environment and setting up new divisions within its organization together with augmented staffs.

c) Strengthening of Environmental Management at District Level

Major objective is to strengthen the environmental management at district level which is important but very weak at present, either by establishing new new offices concerned with environment within the District People's Committees or establishing Hanoi DOSTE's regional environmental offices.

d) Establishment and Reinforcement of the Monitoring System

Major objective is to reinforce the existing environmental monitoring system in order to better grasp the environmental situation for more effective environmental management.

(c) Priority Projects for Sanitary Water Environment

The chronic flooding in the existing urban area due to the poor rainwater drainage is the most serious problem which is affecting the sanitary condition of the city and the health of the citizens. Another serious problem is the polluted water environment in the urban rivers and the lakes located within the existing urban area. The following projects are selected as priority projects to mitigate these problems.

a) To Lich River Basin Drainage project (2nd stage)

Major objective is to further expand the drainage system which is currently under construction in the northeastern part of the city.

To Lich River Basin Drainage Project (2nd Stage)

i) Yen So Pump Station	45 m^3/s
ii) Regulating Reservoir	132 ha
iii) Drainage Channel Improvement	31 km
iv) Lake Dredging	14 lakes
v) Lakeshore Protection Works	11 lakes
vi) Rehabilitation of Existing Storm water Sewers	
vii) Installation of New Storm water Sewers	

b) Environmental Improvement of City Urban Lakes

Major objective is to provide the amenity and recreational opportunity for the Hanoi citizens and to the tourists by improving the access to the water front of city lakes.

i) Lake Dredging — 14 lakes in Old City Center

ii) Lake Conservation Works — 11 lakes in Old City Center

- Construction Lakeshore Roads
- Planting Tree
- Provision of Parks and Promenades

Note:

14 lakes: Than Cong, Tho Quang, Trung Tu, Bay Mau, Nahia Do 1, Ngoc Khanh, Hao Nam, Phuong Liet 1 & 2, Trai Ca, Lang Tam, Thanh Liet, Dam Set and Van Chuong lakes

11 lakes: excluding Than Cong, Tho Quang and Bay Mau lakes among the above 14 lakes

c) Reform of HSDC

Major objective is to reform the organization of HSDC so that it can effectively manage the new systems of drainage as well as sewerage.

(d) Priority Projects for Clean Water Environment

a) West Lake Water Quality Improvement, Phase 2

Major objective is to improve the water quality of the West Lake which should play the role of a major recreational facility in the city.

i) Lakeshore Dredging Work

ii) Flushing Water Introduction of Diluting Water from the Red River

iii) Establishment of Public Sewerage System

b) Public Sewerage Development for the Old City Center

Major objective is to improve the quality of the surface water in the existing urban area as well as to provide more sanitary environment to the citizens.

Urban Treatment Zone 2-1

i) Treatment Plant: 66,300 m^3/day

ii) Sewerage Service Area: 1,033 ha

Urban Treatment Zone 3

i) Treatment Plant: 77,700 m^3/day

ii) Sewerage Service Area: 1,350 ha

Urban Treatment Zone 4

i) Treatment Plant: 35,300 m^3/day

ii) Sewerage Service Area: 500 ha

c) Septage Collection and Disposal

Major objective is to collect and dispose of the septage, only part of which is at present collected.

i) Treatment Works:

Stabilization Ponds:	4.5 ha
Treatment Capacity:	130 m^3/day

ii) Vehicle Procurement

Year 2000	10 vehicles (5 m^3)
2000 -2005	22 vehicles (5 m^3)

(e) Priority Projects for Clean City Environment

Tay Mo landfill site is filled up already, construction of the new solid waste disposal site equipped with sanitary facility is an urgent task and selected as Urgent Project together with the transfer/transport system, for which preliminary feasibility study is being prepared in the JICA Study. To supplement this urgent project, Primary Collection System project is selected as a priority project. Reform of URENCO is essential to manage the new waste disposal system.

a) Improvement of the Collection System of Solid Waste

Major objective is to improve the waste collection system, which together with the implementation of the urgent project, will meet the target of the clean city. Types and quantities of equipment and facilities to be provided during 2000 ~ 2010 are shown below. Quantities in parenthesis are those to be provided during 2000 ~ 2005.

i) Procurement of Vehicles

Waste Collection Truck	354 units	(232)
Water Sprinkling Truck	74 units	(49)

ii) Construction and Upgrading of Garages

Upgrading or Expansion of Existing Garages	3 units	(3)

Construction of one New Garage 1 unit (1)

iii) Procurement of Equipment and Tools (in 2001)

b) Shift of the SWM Authority to Districts and Privatization of URENCO

Major objective is to upgrade the management capability of the waste management organizations and to enable URENCO to effectively manage the proposed new waste disposal system.

- Shift SWM responsibility to the Districts
- Privatize solid waste management services in the form of "contracting out"
- TUPWS will perform a regulatory function
- Transform URENCO into a pure service provider
- Strengthen cost recovery through fee collection
- Priority Project for Diversification of Financial Facility

To establish a new financial facility for fighting against pollution besides the Government budget will provide a tool for contributing to the mitigation of pollution by implementing model project and raising environmental awareness.

c) Study on the Possibility of a Waste Incinerator with Power Utilization for Hanoi

Though the sanitary landfill is the most economical system among the waste disposal methods, it is desirous that waste volume should be reduced before being disposed of by the landfill, taking into account the urbanization trend of the Hanoi City and increasing difficulty of land acquisition for landfill. Among the intermediate treatment methods, incineration is the most efficient, reducing the waste by 90 % in terms of volume and 80 % in terms of weight.

Incineration necessitate big financial outlay for investment as well as high operation and maintenance cost. At present, calorie of the waste generated in the Hanoi City is lower than the required level of 1,000 kcal. However, as economy of the city grows and income and living standards are upgraded, financial capacity of the people and the Government will be increased and calorie of waste will be increased as well.

Considering that it would take considerable time before implementing the waste incineration for the preparation including the study, design, land

acquisition, financial arrangement, etc., it is recommendable that a detailed study be carried out at the early stage. The contents of the Study should include the followings.

(i) Type of waste incinerator appropriate for the Hanoi City

(ii) Appropriate location of the incinerator

(iii) Expected environmental impacts and alleviation measures

(iv) Expected social impacts and alleviation measures

(v) Executing and management organization of the incineration project

(vi) Recruiting and training of the staff for the operation and maintenance of the incinerator

(vii) Possibility of the utilization of the energy to be generated associated with the waste incineration, aiming at cost reduction

(viii) Estimation of the costs for investment, replacement and operation and maintenance

(ix) Financial arrangement and cost recovery

(f) Establishment of Environmental Fund

Major objective is to set up a fund for pollution abatement and environmental awareness raising with the finance of fines/penalties, contribution of enterprises, external aid as well as the Government budget.

Objective:

Provide additional monies to finance pollution abatement loans to industrial facilities earmarked for specific state environmental management functions (e.g. environmental education and awareness)

Source:

State budget, external aid, revenue from fines or pollution levies, and private donations

Administration:

HPC or Environmental Coordination Committee to determine the annual allocation agency under HPC (HAPI, DOSTE,etc.) for day to day

administration.

Served areas and locations of the major facilities are shown in Figure 5-1. Implementation schedule of the six structural type priority projects are shown in Figure 5-2 together with that of the urgent project.

(2) Assessment of Viability

1) Assessment of Structural Type Priority Projects

The six selected priority projects of structural type will contribute mainly to satisfying the targets of sanitary water environment, clean water environment, clean city environment, and co-existing with nature and provision of amenity. The levels of meeting the targets and the ratios of the covered areas within each environmental zone through the implementation of the priority projects varies depending on the priority projects. Assessment criteria is given in Table 5-1. Contribution of each priority project to satisfying the targets is shown in Table 5-2 by environmental zone and by priority project of structural type.

Specific benefit for the improvement of the environment attributable to the structural type projects, including area served and pollution load reduction are shown in the Table 5-3. Cost effectiveness in terms of cost per beneficiary of each project as in 2010 is shown in Table 5-4.

2) Assessment of Institutional Type Priority Projects

Institutional strengthening is the foundation of environmental management and environment-related services by giving direction, effective and coordinated management as well as efficient provision of services. It will also extend strong support to or in some cases prerequisite to the effective implementation and operation of the environmental infrastructures. Spatially, institutional projects encompass the whole city area in principle.

Environmental Coordination Committee project would contribute through giving clear direction to the environmental management and improvement of the city and stronger coordination among the Departments and organizations at the city level as well as between these in the local and the central levels which is essential due to the status of the city as capital city of the country.

Reinforcement of Hanoi DOSTE would contribute to the effective

management of the environment of the city by adapting itself to the new and rising demand including the industrial pollution control. Together with the priority projects of Strengthening of Environmental Management at District Level, reinforcement of the district level environmental management of DOSTE, local environmental problems would be studied more comprehensively and appropriate solutions would be worked in more timely manner. Strengthening of the public relations and environmental awareness function would contribute to disseminating environmental information and securing more comprehensive understanding of the people about the effects of the environmental improvement projects and facility.

Environmental Monitoring project can be considered as an integral part of the Hanoi DOSTE Reinforcement which would provide rich data and information of the actual situation of the environment to DOSTE.

Reform of HSDC would enable the company to meet the changing and increasing demand for urban drainage control and for providing sewerage service. Shift of SWM Authority and Privatization of SWM service would contribute to the improvement in service efficiency, service quality and expansion of service area.

Environmental Fund project would contribute to the enhancement of environmental awareness raising including for industrial pollution abatement by providing fund for supporting these activities.

3) Complimentary relationship among the priority projects

All the priority projects are concerned with the improvement of the environment of the Hanoi City and complimentary relationship and multiplication effects are observed as shown in Table 5-5. Drainage project would affect very much positively the effect of the sewerage project. Septage collection for the areas served by public sewerage project is not needed. The septage collection project is, therefore, very much dependent on the progress of the sewerage development. Institutional type priority projects, in general, would support the effectiveness and efficiency of the implementation and management of the structural type priority projects. In particular, the success of the drainage and sewerage projects depend on the reform and reinforcement of HSDC while the success of primary collection

project depend on the reform of the solid waste management institution. It is noted that the urgent project of Nam Son Landfill/Waste Transfer System also depends on the institutional improvement.

CHAPTER 6 FUTURE ENVIRONMENT WITH COUNTER-MEASURES

6.1 Water-related Sanitary Conditions

Change or improvement of the water-related sanitary conditions through the implementation of the recommended measures and projects as an integral part of EMP, is shown in Figures 6-1 and Figure 6-2, for 2010 and 2020 respectively. As clearly seen in the figures, by 2020, the whole city including the urban area will be protected from flooding caused by the inadequate urban drainage.

Future Conditions of Water-related Sanitary Conditions with Countermeasures

	1997	2010	2020	Target for 2020
Zone 1 Old City Center	NP (≒1.2)	FP	FP	FP
Zone 2 Red River Righ Bank – North West	NP (≒1.2)	FP	FP	FP
Zone 3 Red River Right Bank - South	SP	SP	FP	FP
Zone 4 Dong Anh Urban Area	NF	NF	NF	NF
Zone 5 Gia Lam Urban Area	NF	NF	NF	NF
Zone 6 Suburban Area	NF	NF	NF	NF
Zone 7 Ho Tay Area	NP (≒1.2)	FP	FP	FP

Note: NP: Not Protected (Protected Level: < 5-year return period)

SP: Sufficiently protected (Protected Level: < 10-year return period)

FP: Fully Protected (Protected Level: ≧ 10-year return period)

NF: No Flooding (Natural Drainage System)

6.2 Water Quality

Progress of the water quality improvement with project condition is shown in Figures 6-3. By 2020, except for limited stretches of To Lich and Set rivers in EZ 3, which would remain slightly polluted, the whole city would be considered clean. Future water quality by environmental zone is also shown below.

Future Conditions of Water Quality with Countermeasures

		1997	2010	2020	Target for 2020
Zone 1 Old City Center	To Lich River	P	S	U	U
	Lu River		U	U	
	Set River		U	U	
	Kim NguuRiver		U	U	
Zone 2 Red River Righ Bank – North West	Nhue River	S	U	U	U
	(upper)	S	S	U	
Zone 3 Red River Right Bank - South	To Lich River	P	S	S	S
	Kim NguuRiver		S	S	
Zone 4 Dong Anh Urban Area	Van Tri Lake	U	S	S	S
	Others				
Zone 5 Gia Lam Urban Area	Bac Hong River	S	S	S	S
	Others				
Zone 6 Suburban Area					
-Soc Song		U	U	U	S
-Dong Anh		U	S	S	S
-Gia Lam		S	S	S	S
-Tu Liem		S	S	S	S
-Thanh Tri		S	S	S	S
Zone 7 Ho Tay Area		S	U	U	U
Major River	Cau River	U	U	U	U
	Ca Lo River	U	U	U	U
	Red River	U	U	U	U
	Duong River	U	U	U	U
	Nhue River (Low)	S	S	U	U

Note: U: Unpolluted, S: Slightly Polluted, P: Polluted

6.3 Air Quality

Out of the selected six air pollutants, the set standards will not be exceeded all the time in the whole city for CO, PM10 and lead which would affect human health. Old city center, EZ 1 would still be polluted by TSP along the highway due mainly to the traffic and slightly polluted due to the same cause. Part of Soc Son, EZ 6 would be polluted by TSP along the major highways. Except these, the city would be free from the air pollution.

The progress of the quality improvement in clean air environment by environmental zone is in Figures 6-4 and 6-5 shown below.

Future Conditions of Air Quality with Countermeasures

	Present			2010			2020			Target for 2020
	TSP	NO_2	SO_2	TSP	NO_2	SO_2	TSP	NO_2	SO_2	U
1. Old City Center	P	U	U	P-U	U	U	P	SP	U	U
2. Red River Right Bank North-West	U-P-S	U	U	U	U	U	U	U	U	U
3. Red River Right Bank South	P-U-S	U	U	U	U	U	U	U	U	U
4. Dong Anh urban area	U	U	U	U	U	U	U	U	U	U
5. Gia Lam urban area	U	U	U	U	U	U	U	U	U	U
6. Rural Areas										
Tu Liem	U	U	U	U	U	U	U	U	U	U
Soc Son	U-P-S	U	U	U-P	U	U	U-P	U	U	U
Dong Anh	U-S	U	U	U	U	U	U	U	U	U
Thanh Tri	U-P	U	U	U	U	U	U	U	U	U
Gia Lam	U	U	U	U	U	U	U	U	U	U
7. Ho Tay area	U-P	U	U	U	U	U	U	U	U	U

Note: U: Unpolluted, S: Slightly Polluted, P: Polluted

6.4 Cleanliness of the city

Due to the implementation of the recommended measures and projects, collection ratio of the generated solid waste would quickly be improved as shown below. All the collected solid waste will be sanitarily disposed of by the recommended facility.

Future Cleanliness in terms of Solid Waste Collection Ratios to Generation

	1998	2010	2020
1. Urban Districts	75%	95%	95%
2. Sub Urban Districts			
2.1 Soc Son	25%	39%	58%
2.2 Dong Anh	19%	38%	61%
2.3 Gia Lam	37%	52%	76%
2.4 Tu Liem	29%	46%	62%
2.5 Thanh Tri	23%	40%	59%
2.6 Total of Sub Urban Districts	27%	44%	65%
3. Total of Hanoi city	65%	85%	90%

In the urban districts, 95% of the generated solid waste would be collected and sanitarily disposed of by 2010 and the same in 2020, which is eventually the maximum ratio considering unavoidable dumping of waste. In the suburban districts, altogether nearly half or 44% the waste would be collected for 2010 and 2/3 or 65% of the generated in 2020. Considering the low density population and agriculture type land use in the suburban districts and high purification capacity of the nature in the area, the ratios seem adequate.

6.5 Noise

With the better traffic management as well as stronger awareness raising for the drivers to minimize the car horn as well as stricter law enforcement, noise caused by traffic which is the major cause of the noise, would substantially be reduced. Consequently, the whole city would be free from noise.

6.6 Green and Friendly Water Environment and Amenity

If measures are taken as recommended in EMP, level of coexisting with nature and amenity can be improved by the year of 2020 in EZ 1, 4 and 7 as shown in the table below, while remarkable changes will not be seen in the areas of Red River Right Bank North-West (EZ 2), Red River Right Bank South (EZ 3) and Gia Lam urban area (EZ 5).

Level of Co-existing with Nature and Amenity at Present, 2010 and 2020 with Counter-measures

Environmental Zones	Present	2010	2020
1. Old City Center	B	A	A
2. Red River Right Bank North- West	B	B	B
3. Red River Right Bank South	B	B	B
4. Dong Anh urban area	B	B	A
5. Gia Lam urban area	B	B	B
6. Sub-urban Area	A	A	A
7. Ho Tay Area	B	A	A

Note: A: Fully satisfied, B: Partially satisfied, C: Not satisfied

6.7 Cultural and Historical Assets

Most of the cultural and historical assets in the Hanoi City are located within Old City Center, EZ 1 and Ho Tay area EZ 7, strategies and measures are recommended for these two environmental zones and future conditions are also assessed only for these two zones.

If measures are taken and regulations are enacted as recommended in EMP, level and conditions of preservation of these cultural and historical assets will be good by 2010 and in 2020.

Level of Preserving Cultural and Historical Assets at Present, 2010 and 2020 with Counter-measures

Environmental Zones	Present	2010	2020
1. Old City Center	B	A	A
2. Red River Right Bank North- West	-	-	-
3. Red River Right Bank South	-	-	-
4. Dong Anh urban area	-	-	-
5. Gia Lam urban area	-	-	-
6. Sub-urban Area	-	-	-
7. Ho Tay Area	B	A	A

Note: A: Fully satisfied, B: Partially satisfied, C: Not satisfied

6.8 Overall Achievement of Environmental Targets for the Hanoi City

As seen in the above, the Hanoi City would be unpolluted in terms of sanitary water environment, either fully or sufficiently protected from inundation caused due to inadequate urban drainage. The city would be clean in terms of solid waste and noise. Water quality would be clean in most of the rivers in the city through only slightly polluted in very limited parts. Old city center would be polluted by TSP and slightly polluted by NO_2. However, they are limited only along the major highways.