

**BASIC DESIGN STUDY REPORT
ON
THE PROJECT
FOR
URGENT EQUIPMENT SUPPLY
FOR
WASTE MANAGEMENT
IN
HANOI CITY
IN
THE SOCIALIST REPUBLIC OF VIETNAM**

July 2002

JAPAN INTERNATIONAL COOPERATION AGENCY

NIPPON KOEI CO., LTD .

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US\$ = United State Dollars

J¥ = Japanese Yen

VND = Vietnamese Dong

Preface

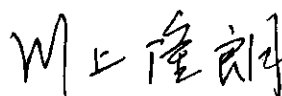
In response to a request from the Government of the Socialist Republic of Vietnam, the Government of Japan decided to conduct a basic design study on the Project for Urgent Equipment Supply for Waste Management in Hanoi City in the Socialist Republic of Vietnam and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA send to Vietnam a study team from January 10 to February 8, 2002.

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

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

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



July, 2002

Takao Kawakami
President
Japan International Cooperation Agency

July, 2002

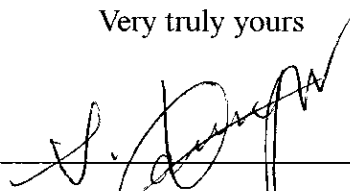
Letter of Transmittal

We are pleased to submit to you the basic design study report on the Project for Supply of Equipment for Waste Management in Hanoi City in the Socialist Republic of Vietnam.

This study was conducted by Nippon Koei Co., Ltd., under a contract to JICA, during the period from December, 2001 to July, 2002. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Vietnam and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

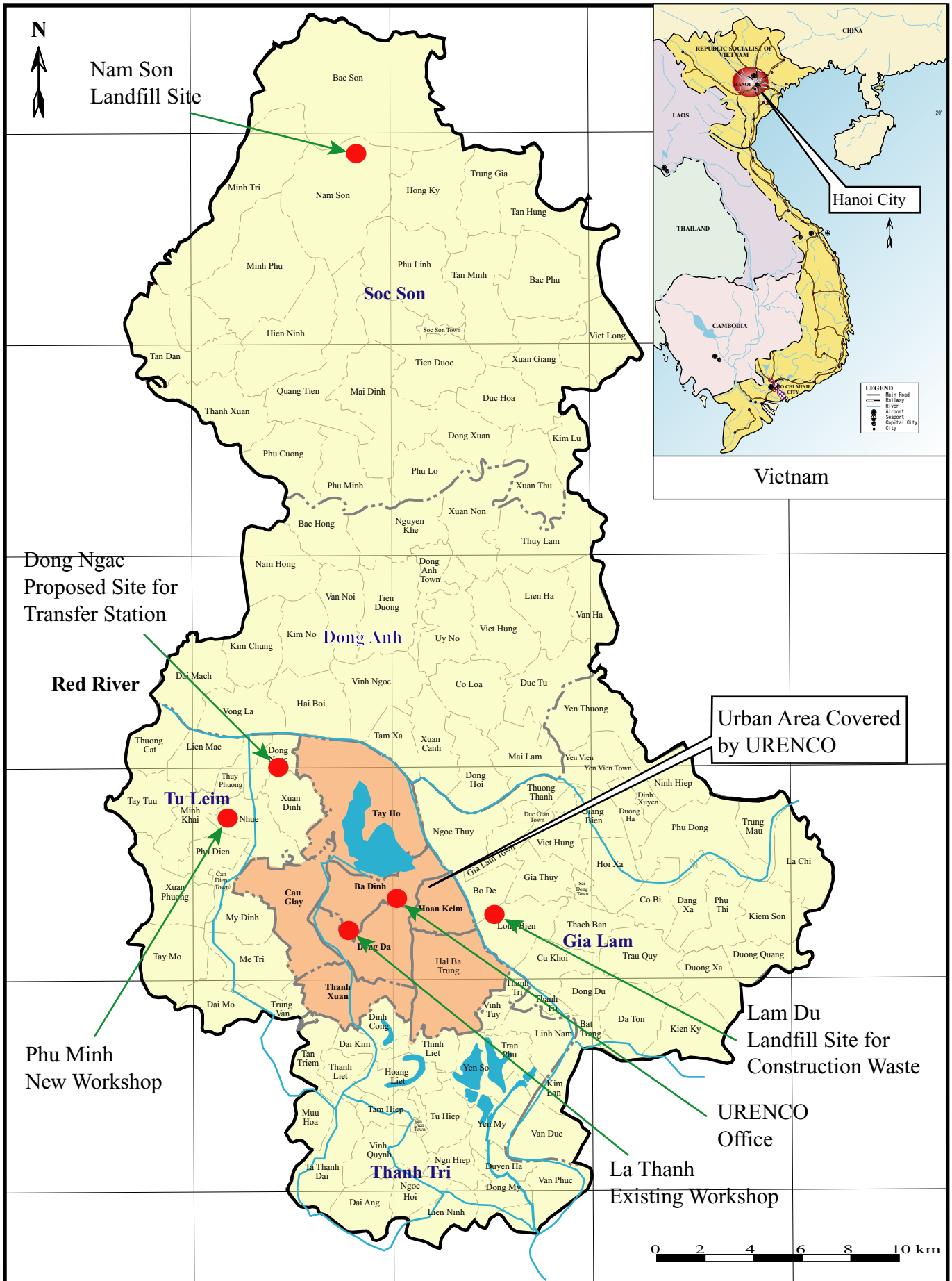
Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours



Shigeru Kanaya

Project manager,
Basic design study team on the Project
for Supply of Equipment for Waste
Management in Hanoi City in the
Socialist Republic of Vietnam



The Project for Urgent Equipment Supply
for Waste Management in Hanoi City

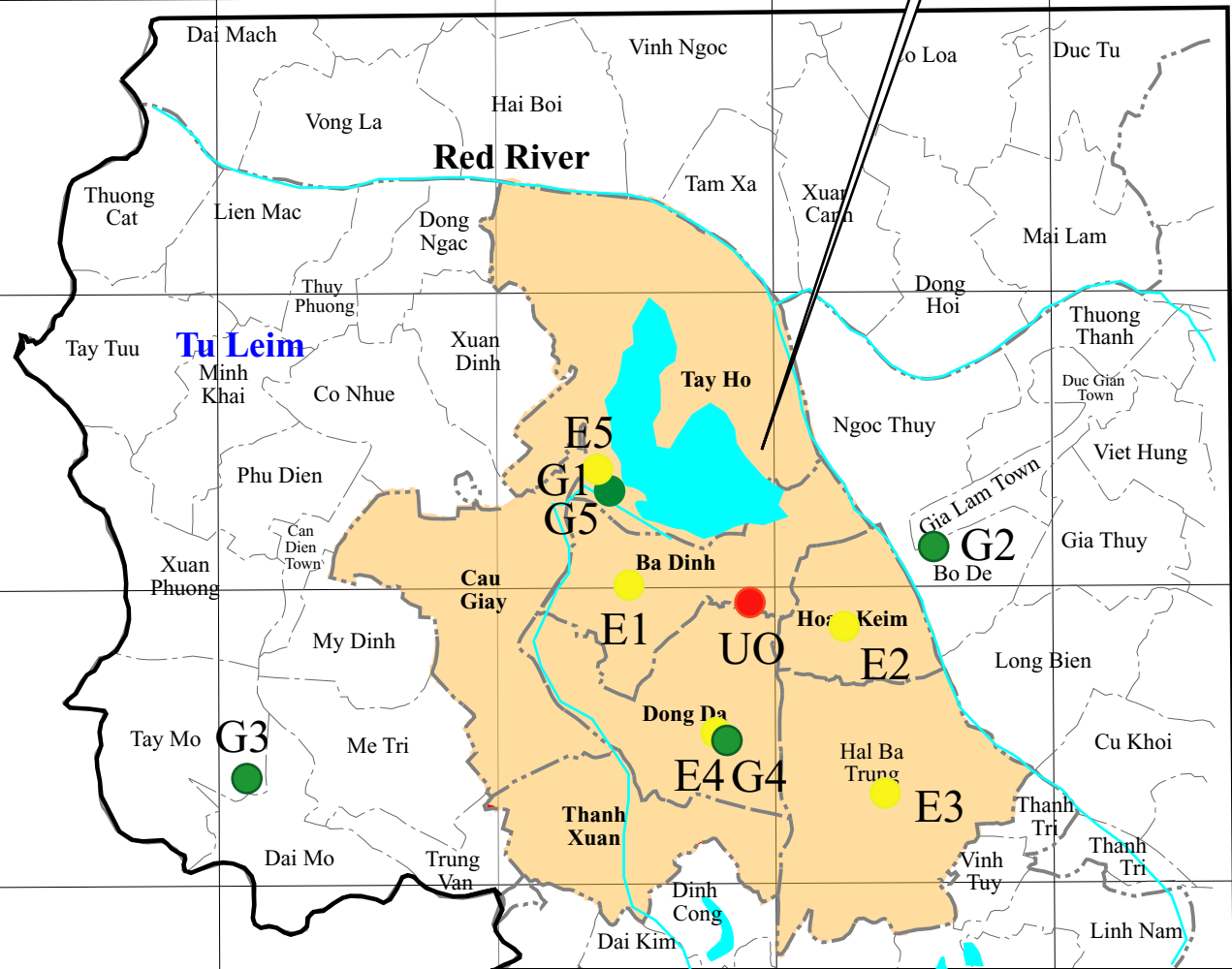
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Study Area Map



- E : Urban Environmental Enterprise of URENCO (UEE)
- G : Garage
- UO : URENCO

Urban Area Covered by URENCO



The Project for Urgent Equipment Supply for Waste Management in Hanoi City

Nippon Koei Co.,Ltd.

Location Map of Urban Environmental Enterprise and Garage of URENCO

Abbreviation

(Official Organizations)

ADB	: Asian Development Bank
CIDA	: Canadian International Development Agency
DOST	: Hanoi Department of Science, Technology and Environment
HAPI	: Hanoi Authority of Planning and Investment
HPC	: Hanoi People's Committee
JICA	: Japanese International Cooperation Agency
JBIC	: Japan Bank for International Cooperation
MOSTE	: Ministry of Science, Technology and Environment
MPI	: Ministry of Planning and Investment
NEA	: National Environment Agency
TUPWS	: Hanoi Transport and Urban Public Works Service
URENCO	: Hanoi Urban Environment Company
UEE	: Urban Environmental Enterprise
UNDP	: United Nation Development Plan
NGO	: Non-Government Organization

(Others)

APHA	: American Public Health Association
AWWA	: American Water Work Association
BOD	: Biochemical Oxygen Demand
CH ₄	: Methane
COD	: Chemical Oxygen Demand
DO	: Dissolved Oxygen
EIA	: Environmental Impact Assessment
GDP	: Gross National Product
GRP	: Gross Regional Product
NH ₃	: Ammonium
ODA	: Official Development Assistance
SO ₂	: Sulfur Dioxide
TCVN	: Vietnamese Standard
WEF	: Water Environment Federation

SUMMARY

1. Background

The Vietnam Republic on the Indochina Peninsula faces the Bay of Tonking to the east and the South China Sea and Siamese Sea to the south. It is 1,650 km long from north to south and faces Laos and Cambodia to the west and China to the north. A tropical climatic zone characterizes the southern district, while a subtropical climatic zone prevails in the northern district. The country experiences a southwest monsoon, with particularly high rainfall between May and September. Vietnam, with a population of 77.5 million people, has a land area of 331,680 km², which is approximately 90 % of the size of Japan. The project being planned is located in the Red River Delta in Hanoi City, the capital of Vietnam.

After the Asian economic crisis, the Vietnamese economy made a substantial recovery from a period of decreased economic growth between 1998 and 1999. The country posted an economic growth rate of a resounding 6.7% in the year 2000. The economic restoration and the recovery of the economic growth rate is attributed to the increase in investment projects initiated and financed by the Government and public enterprises.

Economic development and urbanization in Vietnam increased after the introduction of the Doi Moi policy. The rapid growth brought about by the development activities, however, has had numerous adverse sanitary and environmental impacts, such as public health problems, insufficient public water supplies and inadequate sewage systems, especially in the urbanized areas. In response to the above issues, the Government of Vietnam (GOV) enacted the Environmental Protection Law in 1993.

2. History of the Study

The capital of Vietnam, Hanoi City, with a population of 2.6 million, is facing environmental issues such as insufficient infrastructure, flooding from an inefficient drainage system, and pollution from an inefficient waste management system. In response to these problems, GOV made a request for “The Study on Environmental Improvement in Hanoi City” to the Government of Japan (GOJ) and GOJ carried out a pre-feasibility study of the SWM (Solid Waste Management) project as a part of the study. The work included a survey of the existing conditions of SWM and the preparation of a plan for the improvement of SWM, including the final disposal site in Hanoi City.

GOV implemented the solid waste management plan and started construction of the final disposal site etc. Accordingly, GOV made a request for Grant Aid for the procurement of waste collection and transporting equipment, which is considered an urgent priority. In

response to the above request, GOJ dispatched a preparatory study team and conducted a survey in July 2001. Subsequently, in January 2002, JICA, the agency entrusted by GOJ, dispatched a basic design study team with the task of examining and designing improvements to the solid waste management system in Vietnam. Discussions were held between GOJ and GOV, and both parties recognized the need for the transportation equipment for solid wastes to be given high priority.

3. Existing Conditions of Solid Waste Management System in Hanoi City

The present SWM system in Hanoi City, from collection to final disposal, is carried out by the Hanoi Urban Environment Company (URENCO), who will also be the executing agency in this project. The collection ratio of municipal solid waste in Hanoi City is estimated at 82.5 % (2001) and the remaining 17.5 % is either discarded into ditches, ponds and roads or collected for other uses. Hanoi City has implemented some countermeasures for solid waste management, based on “The study of Environment Improvement in Hanoi City” and has carried out construction projects such as the final disposal site etc.

Solid waste generated in Hanoi City is transported to the disposal site, on the north side of the Nam Son area, located 50 km away from Hanoi City. The site uses the landfill method. There are no transfer stations available, and the collected waste is transported directly to the final disposal site by compactor trucks, which makes the efficiency of the solid waste operation very poor. The establishment of an environment monitoring program at the landfill site is also urgently required.

The problems arising in Hanoi City and the countermeasures being considered are shown in the following table.

Existing Problems	Countermeasures
Shortage and deterioration of collection vehicles (low efficiency of waste collection)	-Renewal of equipment, preparedness of Workshop equipment
There are no transfer station and collection vehicles transport waste directly to the final disposal site. (inefficient transportation)	-Introduce a transfer system by construction of Dong Ngac transfer station
Inefficient leachate treatment system at the final disposal site	-Implement hygienic land filling at the final disposal site. -Preparation of a leachate treatment plant -Implement environmental monitoring
Deteriorating city environment caused by odor and exhaust gas, non-collected waste and the use of poorly maintained small vehicles etc.	-Improvement of solid waste management system, including the introduction of new collection and transporting vehicles
Low efficiency of waste fee collection and a decreasing collection rate leading to a high rate of subsidy from Hanoi City	-Improvement of financial conditions, including charges for waste collection
Non adoption of direct collection system of waste leads to primary and secondary collection, resulting in low efficiency and high cost	-Improvement of solid waste management system including organizations -Proceed with a direct collection system from applicable areas
Shortage and deterioration of Workshop equipment (low efficiency of operation rate)	-Renewal of equipment
No monitoring system and organizations	-Establishment of monitoring system and organization, including equipment

4. Outline of Survey

The shortage of equipment necessary for carrying out efficient solid waste management, and the advanced deterioration of equipment, poses very serious problems for the executing agency, URENCO. If this situation continues, the solid waste management problems in Hanoi City will become more severe. The survey team concluded, through careful discussion with the Vietnamese side, that procurement of the necessary equipment, such as collection and transportation vehicles, workshop equipment and monitoring equipment must be given the utmost priority in order to improve the SWM system in Hanoi City.

The target year for project realization is 2004, and the primary area being targeted is the center of Hanoi City, located on the right bank of the Red River, covering seven urban districts with an area of 84 km² and approximately 1.84 million residents. The collected waste is estimated at 1,494 ton/day (not including industrial waste, medicinal waste and construction waste).

The 11-ton type dump trucks that were originally requested for secondary transportation from the Transfer Station to the Final Disposal Site were changed to large type compactor trucks (Loading volume: App. 16 m³) and will be utilized instead for primary collection. In case the construction of the transfer station is not completed by the target year, consideration was given to a supporting system for smooth operation.

The Workshop is an indispensable facility as it is essential for continuous maintenance work. However, almost all of the equipment currently in use at the Workshop is in poor condition. In addition, the workshop lacks much of the equipment necessary for the maintenance of old vehicles with high performance. In order to provide for efficient and high quality maintenance work for the waste management fleet, appropriate equipment is urgently required.

The “Environment Guideline of Final Disposal Site” prepared jointly by MOC and MOSTE in January 2001, recommended the mandatory monitoring of the final disposal site. However, the proposed monitoring, based on the above guideline, has not been implemented to date and the executing organization does not currently have the capacity to do so. The preparation of a monitoring plan and its execution has become a problem requiring urgent resolution, and assistance is therefore required under the Grant Aid.

According to the above policy, the following equipment is recommended as Grant Aid:

The List of the Equipment for the Project

Item	Basic Specification	Unit	Qty
I. Equipment for Waste Collection / Transportation			
1.1 Small compactor truck	Loading capacity: 6m ³	Unit	5
1.2 Medium compactor truck	Loading capacity: 10m ³	Unit	40
1.3 Large compactor truck	Loading capacity: 16m ³	Unit	25
II. Equipment for Workshop			
2.1 High pressure pump adjuster	8/12 cylinders	Unit	1
2.2 Surface grinding machine	Table surface: 1400*400	Unit	1
2.3 Cylinder boring machine	Bore dia.: 31-150mm	Unit	1
2.4 Automobile checking equipment	Engine checking	Set	1
2.5 Wheel alignment machine	For large truck	Unit	1
2.6 Valve grinding machine	Diesel engine valve	Unit	1
2.7 Four post vehicle lifter	Lift capacity: 16 ton	Unit	1
2.8 Brake tester for truck	Allowable axle mass: 10 ton	Unit	1
III. Equipment for Environmental Monitoring			
3.1 Heyroth sampling bottle	Surface water, Capacity: 1L	Set	1
3.2 Van Dorn water sampler	Ground water, Capacity: 3L	Set	1
3.3 Water level meter	Rope length: 30m	Set	1
3.4 Portable water quality meter	PH, EC, DO, Temperature, Turbidity	Set	1
3.5 Thermohygrometer	Temp.: -10 ~ 60 , RH: 20 - 99%	Set	1
3.6 Portable gas detector	CH ₄ , SO ₂ , CO, NH ₃	Set	1

5. Cost for Vietnamese Side and Schedule

The cost to be covered by the Vietnamese side in the implementation of this Grant Aid project, mainly involving the installation of equipment in the Phu Minh Workshop, is estimated to be 2 million J/yen. The monthly budget for operation and maintenance is estimated at VND 10.2 billion. Of that, fuel, lubricants and spare parts will account for

about 75 %. URENCO has a reasonable budget for the SWM operation, and no difficulty is foreseen in this regard.

For the implementation of this project, 3 months is necessary for the detailed design, 1.5 months for bidding, 5.5 months for procurement of equipment, 2 months for transportation and 1 month for installation; a total of 13 months altogether.

6. Effect of the Project

After completion of the renewal of collection vehicles under this project, the executing agency (URENCO) can improve the collection and transportation work of the SWM system substantially. In addition, it will be possible to remove or substantially reduce the environmental impact caused by solid waste treatment. As for the upgrading of Workshop equipment, an increase in the efficiency of operation and maintenance work and in the rate of operation is expected.

This project is designed to improve the solid waste management system with the following results in mind:

Direct effect

- Increases in collection vehicles will result in an increase in the collection volume of solid waste
- Increasing the collection volume and expanding the collection area will result in an increase in the collection ratio
- Renewal of vehicles and provision of maintenance equipment will lead to an increase in the operation ratio
- Maintaining a coverage ratio of 100% in the targeted area will result in an increase in the number of beneficiaries.
- Operation and maintenance work for equipment in the Workshop will result in high performance
- Establishing a monitoring system at the Nam Son final disposal site

Indirect effect

- Improvement in the rate of collection and transportation will result in a decrease in piling time
- Improvements in collection methods under the project will lead to an increase in the charge collection ratio, thereby reducing the level of financial support that URENCO requires from Hanoi City.

Through this project, a tremendous effect on the targeted environment is expected, which could prevent the present ambience worsening dramatically. Furthermore, the project is expected to contribute to an improvement in the living environment of the city's residents. URENCO, the executing organization, possesses both the necessary manpower and a high capability in terms of operation and maintenance work, and is also sufficiently financially stable .

Accordingly, the utilization of Grant Aid in this solid waste management project should provide a highly positive outcome and it is judged likely to be of huge benefit to the targeted recipients.

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CHAPTER 1

BACKGROUND OF THE PROJECT

CHAPTER 1 BACKGROUND AND HISTORY OF THE PROJECT

1.1 Existing Conditions and Problems of URENCO

1.1.1 Existing Conditions

Municipal solid waste management (SWM) in Hanoi City, Vietnam is currently undertaken by URENCO. It includes primary collection, transportation and final disposal. The collection ratio of municipal solid waste is estimated at 82.5% (in 2001) and the remaining 17.5% ends up in ditches, ponds or roads. Half of the population of Hanoi City lives in the urban areas where economic activity and Government administration activities are concentrated, and the poor traffic environment has an impact on waste management activities. Solid waste generated in Hanoi City is transported to the disposal site 50 km away in the Nam Son area north of Hanoi City. At the disposal site the waste is treated using the landfill method. At present there is no transfer station and the collected waste is transported directly to the final disposal site on a daily basis. Each waste transport vehicle can manage only two trips per day, resulting in very low efficiency.

At present, the following problems impair the operation of URENCO, and urgent action is required to improve the solid waste management system.

- 1) Due to the low efficiency of solid waste collection, the unit rate in Hanoi City is nearly 2.5 times that of Danang City (due to an inability to conduct direct collection because of very narrow roads).
- 2) Due to vehicle shortage and poor vehicle condition, the waste collection activity operates at a very low level of efficiency.
- 3) A transfer station is not available and collected wastes have to be transported to the disposal site directly, resulting in low efficiency.
- 4) Waste that is not collected in the urban areas spoils the beauty of the streets and is responsible for foul air in the surrounding area.
- 5) The utilization of many small and badly maintained vehicles for direct transportation contributes to the deteriorating environment.
- 6) Proper leachate treatment is not conducted in the final disposal site.

Hanoi City, however, is tackling the growing problems of the solid waste management system. Presently, Hanoi City is proceeding with some of the countermeasures for the improvement of solid waste management proposed in the Master Plan prepared by JICA in 2000 (Study on Environmental Improvement for Hanoi City). However, due to inadequate funding and technical deficiencies, the above problems remain unresolved at

the present stage. In the meantime, the shortage and deterioration of the transport vehicles poses major problems for the URENCO waste collection and disposal operation. If this situation is allowed to continue, the treatment of solid waste in Hanoi City is expected to deteriorate further. Against this background, the Government of Vietnam (GOV) has requested Grant Aid from the Government of Japan (GOJ).

1.1.2 Development Plan

At the Communist Party Conference held in April 2001, two guidelines, the “Development Strategy for 2001-2010” and the “Social-Economic Development Plan for 2001-2005”, were approved. At this meeting it was confirmed that the policy of socialism has to be continuously upheld in the future, but at the same time the country must proceed with the adoption of a market economy and the utilization of direct investment by foreign countries. Socio-economic development targets were set as follows:

- Establishing the foundation of industrialization and modernization before 2020 through education, human encouragement and programs focused on science improvement.
- Keeping the economic growth rate at 7.5 % over the next 5 years, and accomplish a doubling of income by 2010.

At present, several projects are being planned that are linked to the waste management system. These include completion of basic infrastructure service projects such as water supply and sewerage for major cities, including Hanoi City, improvement of urban transportation capacity, increasing the water supply capacity in urban and industrial areas, etc. The “Comprehensive Development Plan for Hanoi City to 2020”, establishes a target of 100 % of the solid waste generated in the city to be treated by proper collection, transportation and treatment technology.

1.1.3 Socio-Economic Conditions

The Government of Vietnam introduced the Doi Moi policy at the 6th Communist Party Conference in 1986, which was aimed at improving economic efficiency and proceeding with economic development by economic reform and free-market economic policies. Economic growth rate in 2000 was recorded at 6.7%, based on this policy, and a 7% growth rate is expected in 2001. After the Asian economic crisis, the Vietnamese economy made a considerable recovery from the depressed economic growth rates of 1998 to 1999. The increase in economic activity and the recovery in economic growth rates have been partly attributed to an increase in investment, supported by Government spending in the areas of Government activity and public enterprise. There was also an

increase in exports, leading to an expansion of investment by Government enterprises and foreign firms. In recent years, higher growth rates in the fields of mining and industry have helped to sustain the overall growth rate. The employment rate in urban areas improved in 2000 and the consumer price index remained very steady. The growth rate of exports increased by 24 % in 2000 compared to the previous year, which even surpassed the values for that year of neighbors Thailand and Malaysia.

1.2 Background of Required Grant Aid and Outline of the Project

Economic development and urbanization in the Socialist Republic of Vietnam intensified after the introduction of the Doi Moi policy. However, this rapid growth has had negative sanitary and environmental impacts, such as public health problems, insufficient public water supplies and inadequate sewage systems, especially in the urbanized areas. In response to these problems, the Government of Vietnam (GOV) enacted the Environmental Protection Law in 1993, primarily to improve environmental conditions in the affected areas. Hanoi, the capital city of Vietnam, and other adjoining cities, have also been facing environmental problems such as traffic congestion brought about by insufficient infrastructure, flooding from inefficient drainage systems, and pollution from inadequate sewerage treatment systems and inefficient waste management. Of these problems, the solid waste issue is one of the most serious facing the city. For example, inappropriate solid waste management, such as uncollected waste on the road or waste illegally dumped into lakes, ponds and rivers, can block drainage lines or pollute surface water and groundwater, which could eventually pose serious risks to public health from diseases such as diarrhoea. This environmental degeneration significantly affects about 2.6 million Hanoi residents, as well as visitors to Hanoi, including tourists.

Hanoi City, for its part, has been studying projects to solve the waste management problem. As a part of this process, GOV made a request for Grant Aid to GOJ in 1995 for the procurement of equipment such as waste collection vehicles. In response to this request, GOJ proposed a pre-feasibility study of the solid waste management project as a part of “The Study on Environmental Improvement in Hanoi City”, to be conducted by the Japan International Cooperation Agency (JICA). The Vietnamese side could then review the request after considering the results of JICA study. GOV agreed with this proposal and made a subsequent request for Grant Aid for the “Project for Urgent Equipment Supply for Waste Management Project in Hanoi City in 1998”.

GOJ entrusted the study to JICA, the official agency responsible for implementing technical assistance and expediting the proper execution of Japan’s Grant Aid. JICA dispatched a Preparatory Study Team in July 2001 and confirmed the validity of the Project such as construction of a final disposal site and the establishment of a solid waste

management system, which the Vietnamese side should implement based on a master plan prepared by JICA.

GOV submitted a request for the required equipment, based on the premise that the current collection ratio would decline in the future due to the deterioration of the waste collection vehicles presently in use. Accordingly, JICA dispatched a basic design study team in January 2002 to improve the solid waste management system in Vietnam. Discussions were held between GOJ and GOV, and both parties recognized the need for the solid waste transportation equipment request to be given high priority.

Japan's grant aided project is aimed at improving the solid waste management system in Hanoi City, focussed on the following target categories:

- Equipment for waste collection and transportation
- Workshop equipment
- Monitoring equipment for the final disposal site.

1.3 Tendency of Japanese Assistance

Several urban solid waste management and environment improvement projects in Hanoi City have been carried out by International Organizations and Countries, such as JICA, UNDP, Australia, Spain, Germany, etc.(as shown in Table 1.3-1 and Table 1.3-2). One proposed project, "Improvement of Environment in Hanoi City", is based on the recommendations in the master plan report prepared by JICA.

Table 1.3 1 List of Waste Management Projects in Hanoi City

Year	Name of Project
1993	Cau Dien compost plant project (UNDP)
1997	Industrial solid waste treatment project (Private sector)
1998	Control of waste discharge project (Australia)
1998-2000	The study on environment improvement in Hanoi City (JICA)
2000-2002	Modification of Cau Dien compost plant project (Spain)
2002	Supply of waste collection vehicles to URENCO (Germany)

Table 1.3 2 List of Environment Management Projects in Hanoi City

Year	Name of Project (Excluding water supply and drainage projects)
1997-2000 2000-2004	Vietnam/Canada Environment project, Phase1 and Phase2 (CIDA)
1998-2000	Toxic substance environment project VIE97/031 (UNDP/SIDA)
1998-2001	Evaluation of environment on investment plan project (UNDP/SIDA)
2000	SAPROF of Hanoi drainage project (JBIC)
1996-1999 1999-2000	Preservation of Hanoi Dike system project, Phase 1 and Phase 2 (ADB)
1998-2003	Development of urban infrastructure (North Tan Long-Van Tri) project (JBIC)

1.4 Tendency of Other Donors

The two projects outlined below, supported jointly by the Spanish and German governments, are currently being carried out. These projects form part of the SWM project in Hanoi City and are intended to improve URENCO's SWM system, as is the Grant Aid project. Therefore, the proposed plans are to be prepared with consideration of these projects.

(1) **Construction of Cau Dien Compost Plant**

The construction of a compost plant, supported and financed by the Spanish Government, was started in June 2001 by Industrial Leblan Co. and it is expected to commence operation in May 2002. The facility will be delivered to URENCO at the end of 2002. In this plant it is expected that 13,200 ton/year of compost will be produced from 50,000 ton/year of raw solid waste. The direct investment cost is estimated at VND 62 billion (US\$ 4.13 million, Feb. 2002, 1US\$=VND 15,038) and US\$400 million of that amount will be covered by the soft loans granted by the Spanish Government at a rate of 1% per annum repaid over 15 years.

(2) **Supply of Waste Collection Vehicles to URENCO**

The project 'Supply of Waste Collection Vehicles' is being undertaken by the German Government. Equipment will be delivered to Vietnam from 2002 onwards. The proposed equipment consists of fifteen 6-ton type and twelve 8-ton type compactor trucks. The large 8-ton vehicles will be completely assembled and imported from Italy, while the 6-ton trucks will be produced in a local factory in Vietnam. The 6-ton compactor trucks use engines and bodies produced by a Japanese manufacturer, and the hopper and loading system is produced in Vietnam. The assembly and manufacturing of the compactor trucks will be carried out by a local enterprise.

CHAPTER 2

CONTENTS OF THE PROJECT

CHAPTER 2 CONTENTS OF THE PROJECT

2.1 BASIC CONCEPT OF THE PROJECT

2.1.1 Purpose of the Project

Hanoi City is currently implementing a solid waste management project to mitigate deteriorating environmental conditions, as recommended in the Master Plan of “The Study on Environmental Improvement in Hanoi City”. The project has adopted the slogan “Providing more service, more efficiently”. The following solid waste projects are presently being carried out by the executing agency:

A flow chart of the treatment system for solid waste, from collection to final disposal, is shown in Appendix 6.

- Effective transportation and collection of municipal solid waste using a transfer station: Implementing the plan and design of the transfer station.
- Improvement of the operation ratio of collection and transfer vehicles and proceeding with the renewal of equipment: Promoting the purchase of vehicles using a grant from the German Government.
- Establish an appropriate workshop operating system to maintain and increase the operation ratio of the equipment: Construction of a new Workshop in Phu Minh.
- Continue construction of the Final Disposal Sites and carry out environmental monitoring and sanitary landfilling under appropriate conditions: Improving the leachate treatment system.
- Proceeding with the reduction and reuse of organic matter in municipal solid waste by the introduction of a Compost Plant: Begin the test operation of a new composting plant funded by Spanish Government.
- Proceeding with the appropriate treatment of industrial waste, including medical waste and construction waste such as soil and materials: Maintaining the existing incinerator for medical waste in Cau Dien and the final disposal site for construction waste in Lam Du.
- Proceeding with the restructuring, alteration and organizational improvement of the solid waste management system: Reconstructing and strengthening the organization of URENCO.
- Improvement of financial matters, including charges for waste collection: Reviewing the existing disposal fee charging system.

The project aimed at the improvement of the solid waste management system in Hanoi City is being implemented by URENCO, based around the projects outlined above. The necessary collection and transfer equipment, workshop equipment and monitoring equipment will be procured under the Japanese Grant Aid for URENCO, which is the executing agency. This project is designed to improve the solid waste management system in Hanoi and the following results are expected:

- Volume of collected waste: The increase in collection vehicles and the collection ratio will result in an increase in the volume of solid waste collected.
- Collection ratio of waste: Increasing the collection volume and expanding the collection area will result in an increase in the collection ratio.
- Operation ratio of collection vehicles: Renewal of collection vehicles and the provision of maintenance equipment will lead to an increase in the operation ratio.
- Targeted population: Maintaining a coverage ratio of 100% in the targeted area will result in an increase in the targeted beneficiary population.
- Piling time of solid waste: Improvements in collection and transportation will result in a decrease in piling time.
- Ratio of charge collection: Improvements in collection methods under the project will lead to increases in the charge collection ratio, reducing the need for financial support for URENCO from Hanoi City.

2.1.2 Outline of the Project

(1) Collection and Transportation Vehicles

Dong Ngac has been selected as the location for a proposed Transfer Station, which is intended to become the hub of the transfer system. The implementation of this project is to be carried out according to the Government laws and regulations. Land utilization has already been completed and approval from the Hanoi Architect Office under HPC has been obtained. Additional time is still required to complete remaining items such as building approval, consultation with local residents, negotiation of land acquisition, detailed design of engineering works and construction of access roads, including widening of roads. The 11-ton type dump trucks originally requested for secondary transportation from the transfer station to the Final Disposal Site has been changed to large type compactor trucks for primary collection. If construction of the transfer station is not completed by the Grant Aid delivery time, consideration of a supporting system for the

existing transfer system, from collection in the city area to the Final Disposal Site, shall be provided by Vietnamese side.

The equipment requested by GOV is as shown below.

Table 2.1-1 Collection and Transportation Vehicle

NO.	Equipment	Main Specification	Quantity
1	Small type compactor truck	Loading volume: Approx. 6m ³	5 units
2	Medium type compactor truck	Loading volume: Approx. 10 m ³	40 units
3	Large type compactor truck	Loading volume: Approx. 16 m ³	25 units

(2) Workshop Equipment

Maintenance work for URENCO's equipment is carried out in its own Workshop, and the handcarts used for primary solid waste collection are fabricated in this Workshop. The Workshop is an indispensable facility as it is necessary for current and future maintenance work. However, much of the equipment currently used in the Workshop has deteriorated badly. In addition, the equipment is not adequate for maintenance of high performance vehicles. Against this background, the equipment shown in Table 2.1-2 was selected. This equipment is essential in order to ensure the delivery of efficient and high quality maintenance work for vehicles belonging to URENCO. It will also improve operational safety and extend the service life of existing equipment.

Table 2.1-2 Equipment List for Workshop

No.	Name of Equipment
1	High pressure pump adjuster
2	Surface grinding machine
3	Cylinder boring machine
4	Automobile checking equipment <ul style="list-style-type: none"> • Nozzle Tester • Diesel Smoke Meter • Fuel Consumption Gauge • CO/HC Analyzer • Pressure Gauge Set • Circuit Tester
5	Wheel alignment machine
6	Valve grinding machine
7	Four post Vehicle lifter
8	Brake tester for truck

(3) Monitoring Equipment

The "Environment Guideline of Final Disposal Site" was published by MOC and MOSTE in January 2001. However, the monitoring proposed in the guideline has not been carried out at the Nam Son final disposal site and an environmental monitoring plan

needs to be prepared and implemented urgently. Since the purpose of this project is the improvement of the solid waste management system in Hanoi City, it is logical that the required monitoring equipment should be included in the Grant Aid in order to strengthen URENCO's monitoring plan. URENCO is to be designated as the organization in charge of the monitoring plan and evaluation, but it is expected that the more sophisticated monitoring will be done by external professional laboratories. The required equipment is shown in Table 2.1-3. It should, however, be noted that the existing leachate treatment plant is a temporary facility.

Table 2.1-3 Equipment List for Environment Monitoring

No.	Name of Equipment
1	Sampling equipment for ground water
2	Sampling equipment for surface water
3	Water level Indicator
4	Hand held conductivity/pH meter
5	Temperature/Humidity monitor
6	Portable gas detector

2.2 BASIC DESIGN OF THE REQUESTED JAPANESE ASSISTANCE

2.2.1 Design Policy

(1) Basic Policy

The Basic Policy for this Project is as follows.

- Items required for the Project will be selected on the basis of urgency and need, with the overall objective of improving the system of solid waste management in Hanoi City.
- Through discussion between the Vietnamese and Japanese sides, the project equipment will consist of a fleet of vehicles for waste collection/transportation, workshop maintenance equipment and environmental monitoring equipment.
- The fleet of vehicles to collect and transport waste from the city area to the Nam Son Final Disposal Site should be the highest priority for the Project. Other items related to the Transfer Station or the landfill will be considered a lower priority.
- The target year for the project plan is set as the year 2004.

- The specification and quantity of the waste collection/transportation vehicles required should be based on the condition of the existing equipment and realistic waste collection targets.
- Regardless of whether or not the transfer station has started its operating by the target year, 2004, the project equipment should cover the collection of waste from the generation source.
- Regarding the projection data for population and solid waste quantity, it is appraised that the existing data prepared during the preparatory and master plan study are considered reasonable and that those data have been fully utilized in this report.

(2) Natural Environmental Aspects

The climate in Hanoi City is categorized as subtropical with a monthly air temperature of between 15°C and 30°C and humidity of about 80%. Annual precipitation is between 1200 mm and 1800 mm, reaching more than 400 mm per month in the rainy season, when the city often floods, leading to traffic problems. In order to cope with these climatic conditions, the vehicles provided for the Project should be equipped with suitable measures, such as anticorrosive painting.

(3) Social-Economic Aspects

1) Target Population

The waste collection service provided by URENCO covers the seven major urban districts in Hanoi City; Ba Dinh, Tay Ho, Hoan Kiem, Hai Ba Trung, Dong Da, Thanh Xuan and Cau Giay. Table 2.2-1 shows the projected population growth to 2010, based on the urban development master plan of Hanoi City. The target population for this Project in 2004 is expected to be 1,844,000.

Table 2.2-1 Population for URENCO service

Year	Predicted population (thousand people)
2001	1,815
2002	1,825
2003	1,834
2004	1,844
2005	1,854
2006	1,863
2007	1,873
2008	1,882
2009	1,892
2010	1,902

Data Source: JICA preparatory study report

2) Waste Generation Quantity

The unit generation ratio of municipal solid waste is estimated to be 767 g/day/capita, which means that 1,385 tons of waste are generated daily. According to URENCO's data, 1,126 tons per day of waste were collected and transferred to Nam Son Final Disposal Site in 2000, which equals about 81% of the total. Table 2.2-2 shows the projected solid waste generation and collection amounts for 2000-2010 used for URENCO's management plan, which indicates generation of 1,494 tons per day with the assumption of an 89% collection rate in the target year of 2004.

Table 2.2-2 Projection of Solid Waste Quantity covered by URENCO

Year	Unit generation rate (g/day-capita)	Estimated generation quantity (tons/day)	Target collection rate	Estimated collection quantity (tons/day)
2000	767	1,385	81%	1,126
2001	802	1,455	82.5%	1,200
2002	837	1,528	84%	1,281
2003	875	1,605	86%	1,384
2004	914	1,686	89%	1,494
2005	955	1,771	91%	1,614
2006	997	1,857	94%	1,743
2007	1,040	1,948	95%	1,850
2008	1,085	2,042	95%	1,940
2009	1,132	2,142	95%	2,035
2010	1,181	2,246	95%	2,133

Data Source: JICA preparatory study report and F/S report for Dong Ngac Transfer Station

Note)

The target waste quantity adopted for this Project is 1,494 tons per day, which is 914 g/day-capita¹, based on the projected economic growth of Hanoi. The unit waste generation rate tends to increase as the economy grows and many developed countries face problems such as the rising cost of waste disposal and difficulty in securing land for waste treatment facilities. To reduce the impact of these trends, efforts to reduce the rate of waste generation should be reflected in the solid waste management plan. It is recommended that an additional scenario of waste generation that incorporates a policy of "Reduce, Reuse and Recycle" should be evaluated for the long-term plan.

¹ In Japan, the national average rate was estimated to be 1,114 g/day-capita in 1999 and to be usually more than 1,400 g/day-capita in large cities with a population of 500,000 or more.

3) Scavengers (Waste Pickers)

Table 2.2-3 shows the present recycling situation in Hanoi City. Valuable items such as waste plastic and metals are collected at various stages and places throughout the city.

Table 2.2-3 Recycling in Hanoi City

Collection points	Collectors	Activity areas	Tools
At the generation sources	Street scavengers	Waste storage or discharging point	Steel hook, clipper, basket, bag, etc.
	URENCO employees, citizens	Residential buildings, URENCO handcarts	Bag
	Junk buyers	Residential buildings, offices, restaurants, hotels	Basket, bag
At the landfill site	Farmers near the landfill, scavengers	Nam Son Landfill, Kiu Ky Landfill	Steel hook, clipper, basket, bag, etc.

Data Source: JICA preparatory study report

Recycling activity in the Hanoi area has a functioning market base and the Project should consider the utilization of the current system in the waste collection plan. According to the results of the social interview survey conducted by the Study Team at the Nam Son Final Disposal Site, scavengers who pick up valuables from the waste dumped at the site receive a cash income but also face serious health risks from their scavenging activity.

Therefore, management of the landfill operation by URENCO and HPC should consider the protection of scavengers by developing a suitable waste acceptance plan at the site with restrictions on access to parts of the site on the grounds of health and safety.

(4) Procurement Policy

Industrial development in Vietnam has been increasing and some joint ventures or state companies that are capable of manufacturing the waste collection vehicles have been established and have achieved satisfactory business results. Under these circumstances, both Japanese and Vietnamese manufacturers will be included on the list of suppliers for the Project, provided that the quality of the product meets the required specification.

The items for the Project will be delivered and transferred to the Vietnamese side at a designated site in Hanoi City.

(5) Management Policy of URENCO

URENCO should be required to prepare for the operation and maintenance of the equipment provided by the Project by developing a suitable and efficient organization and management system.

For the waste collection and transportation vehicles, URENCO should prepare the allocation and operation plans for the vehicles through consultation with the five Urban Environmental Enterprises (UEE). The organizations involved in the UEEs are shown in Appendix 10.

URENCO should also prepare installation and operation plans for the equipment for the new Workshop in Phu Minh.

For the equipment for environmental monitoring at the landfill site, URENCO should reinforce the existing department with a qualified engineer to carry out the basic monitoring at the site. Regular monitoring, which requires more sophisticated analysis, will be carried out by outside laboratories on a contract basis under the supervision of URENCO.

(6) Basic Policy for the Selection of Equipment

1) Equipment for Waste Collection and Transportation

- Vehicles should be equipped with a loading arm for holding handcarts (0.45m³) in order to fit in with the current waste collection system.
- The vehicle body should be of the type currently used in Hanoi, a compressing and compacting type with a rear loading system, .
- Three types of waste collection/transportation vehicles have been selected to collect the waste under various road conditions, the small, medium and large types described in Table 2.2-4.

Table 2.2-4 Type of Waste Collection/Transportation Vehicle

Type	Body Capacity	G.V.W.
Small compactor truck	Approx. 6m ³	G.V.W. shall cover the weight of body with a full load of waste with a specific weight of 0.6 ¹
Medium compactor truck	Approx. 10m ³	
Large compactor truck	Approx. 16m ³	

1. The coefficient 0.6 is the standard used by the vehicle registration agency

2) Equipment for the Workshop at Phu Minh

- The high priority items are the equipment for the maintenance and testing of the existing vehicle fleet and associated spare parts.

3) Equipment for Environmental Monitoring

- The equipment will be simple and portable, suitable for use at the site to monitor water quality of leachate, surface water and ground water, and gas quality generated from the landfill site.

(7) Procurement Policy

In principle, under Japan's Grant Aid scheme, Japanese or Vietnamese products should be purchased. However, when the two Governments deem it necessary, the Grant Aid may be used for the purchase of products from a third country.

2.2.2 Basic Plan

(1) Project Plan

1) Comparison with Original Request

As previously noted, the selection of equipment for the waste collection and transportation system is mainly based on their urgency. The purpose of this Project is the improvement of the overall waste management system in Hanoi City, which is shown in Figure 2.2-1. A comparison of the equipment originally requested for the Project and the result of selection is shown in Table 2.2-5.

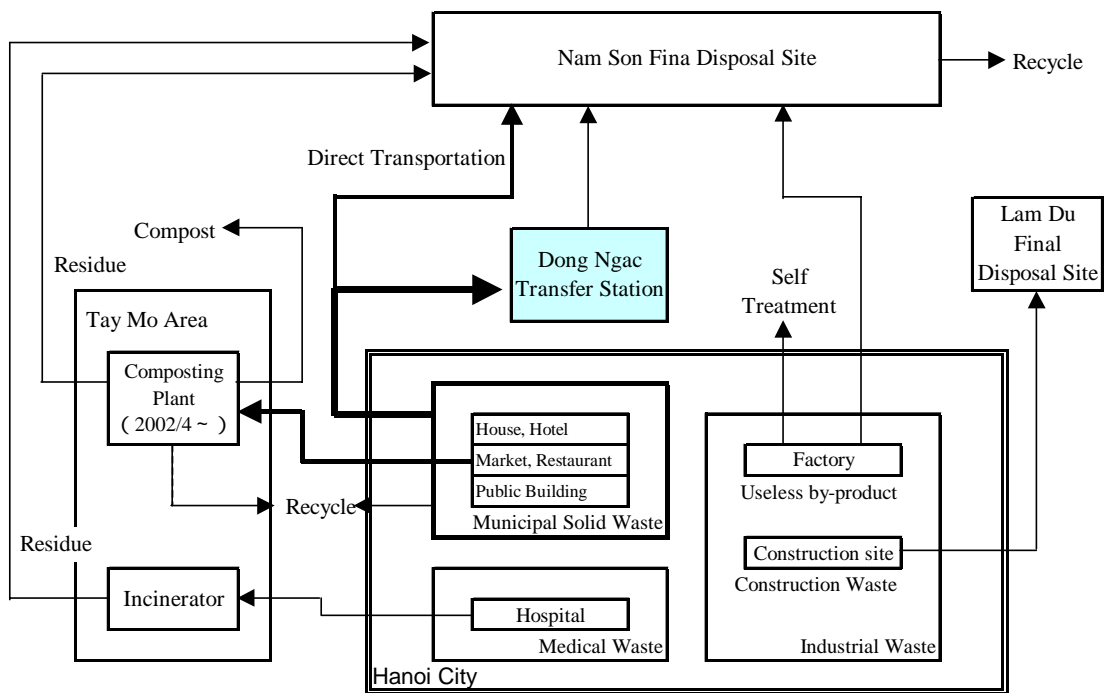


Figure 2.2-1 Solid Waste Management Flow in Hanoi City

Table 2.2-5 Comparison between Requested and Selected Items

Original Request at Preparatory Study			After Basic Design Study		
Item	Spec.	Q'ty	Item	Spec.	Q'ty
I. Equipment for Transfer Station			Equipment for Transfer Station		
1.1 Weigh bridge	30 t	1	Not included for this Project		
1.2 Wheel loader	2m ³ Bucket	3			
1.3 Tank lorry	6m ³	1			
1.4 Vehicle washing pool	For large truck	1			
1.5 Workshop		1			
1.6 Dump truck	2.5 t	1			
1.7 Auxiliary equipment		1 set			
II. Equipment for primary transportation			Equipment for primary transportation		
2.1 Small compactor truck	2.5 t	17	Small compactor truck	App. 6m ³	5
2.2 Medium compactor truck	5.0 t	73	Medium compactor truck	App. 10m ³	40
2.3 Waste bin	240 l	5,000	Not included in this Project		
2.4 -	-	-	Large compactor truck	App. 16m ³	25
III. Equipment for secondary transportation			Equipment for secondary transportation		
3.1 Dump truck	11.0 t	45	Not included in this Project		
IV. Equipment for landfill			Equipment for landfill		
4.1 Landfill Compactor	26 t	1	Not included in this Project		
4.2 Excavator	0.8m ³	1			
4.3 Dump truck	7-10 t	1			
4.4 Bulldozer	180 HP	1			
4.5 Monitoring equipment		1 set	Monitoring equipment		1 set
V. Other specialised equipment			Other specialised equipment		
5.1 Sweeper	5.0 t	3	Not included in this Project		
5.2 Vacuum truck	5.0 t	2			
VI. Equipment for Workshop			Equipment for Workshop		
6.1 High pressure pump adjuster	8/12 cylinders	1	High pressure pump adjuster	8/12 cylinders	1
6.2 Surface grinding machine	10kw	1	Surface grinding machine	10kw	1
6.3 Cylinder boring machine	4.5kw	1	Cylinder Boring Machine	4.5kw	1
6.4 Automobile checking equipment		1 set	Automobile checking equipment		1 set
6.5 Wheel alignment machine	For large truck	1	Wheel alignment machine	For large truck	1 set
6.6 Valve grinding machine	5 kw	1	Valve grinding machine	5 kw	1
6.7 Engine lifter	10 t	1	Four post Vehicle lifter	16 t	1
6.8 Brake tester for truck	For large truck	1	Brake tester for truck	For large truck	1
6.9 Other equipment		1 set	Not included in this Project		
VII. Spare Parts	5%	1 lot	Spare Parts		1 lot

2) Equipment Receiving Plan

The compactor trucks allocated to the five Urban Environmental Enterprises (UEE) under URENCO depend on the regional characteristics and road conditions as described in Table 2.2-6. Each UEE and its garage has enough space to park the equipment at the site.

Table 2.2-6 Compactor Truck Allocation Plan

UEE	Urban District	Allocation Plan		
		Small	Medium	Large
UEE 1	Ba Dinh, Cau Giay	2	11	4
UEE 2	Hoan Kiem	3	11	2
UEE 3	Hai Ba Trung	-	3	10
UEE 4	Dong Da, Thanh Xuan	-	4	9
UEE 5	Tay Ho	-	4	-
Reserve (to be allocated on occasion)		-	7	-
Total		5	40	25

Data Information Source: URENCO

All the workshop equipment for the Project is to be installed in a new workshop at Phu Minh, construction of which has almost been completed. The equipment layout plan prepared by URENCO is attached in Appendix 9.

As the environmental monitoring equipment for the Project is small and portable, all items will be kept in the administration building at the Nam Son Solid Waste Management Enterprise.

(2) Equipment Plan

1) Equipment for Waste Collection and Transportation

a) Equipment Selection Flow

Equipment is selected using the following procedure.

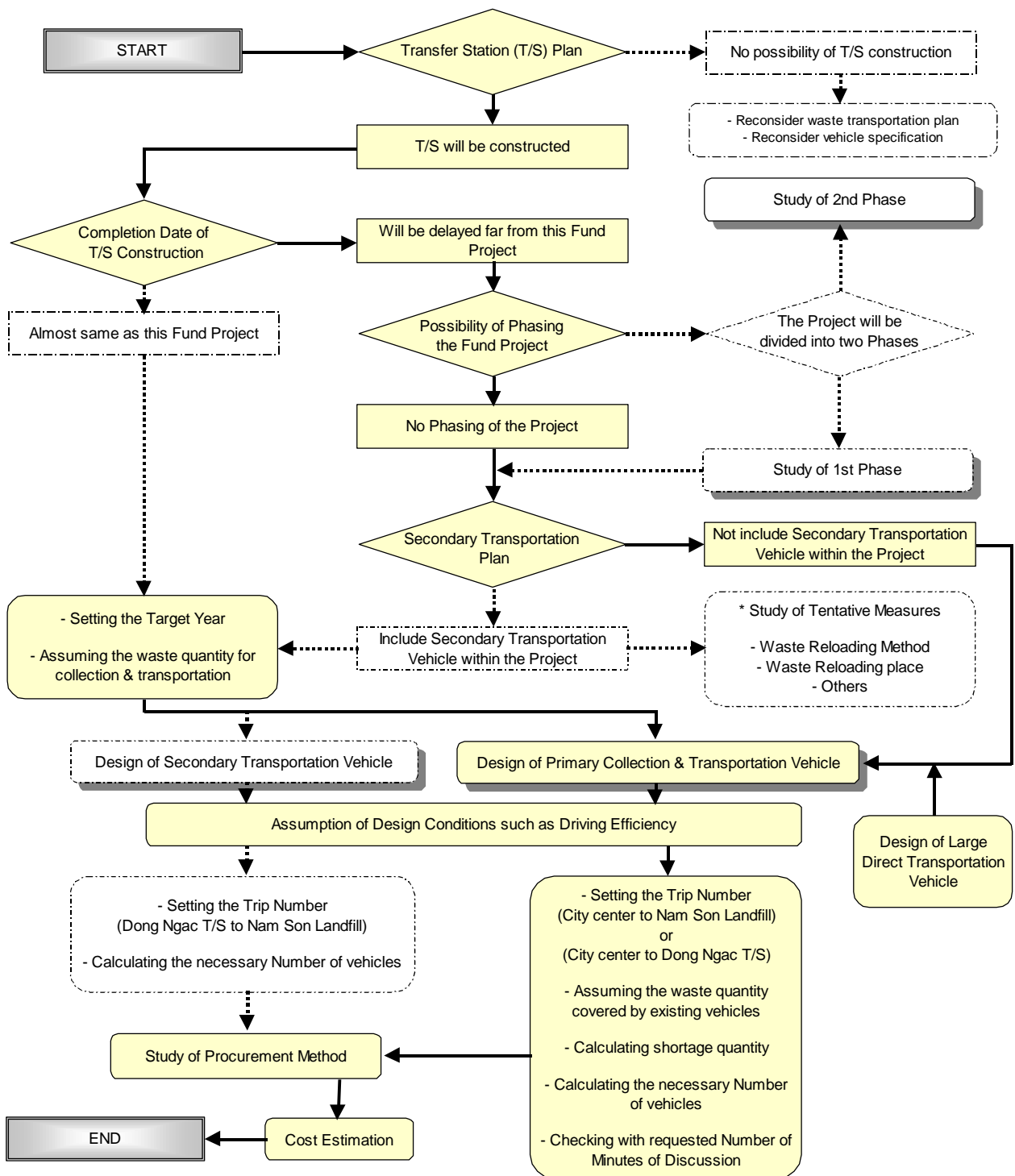


Figure 2.2-2 Equipment Selection Flow

The design conditions for equipment selection are as follows.

- A Transfer Station will be constructed.
- The Project is not to be divided into two phases.

- Equipment for secondary transportation is not included in this Project because it is uncertain whether the transfer station can start operations during the implementation period of this Project.
- Large compactor trucks that can collect the waste are considered for the Project in order to improve the handling of waste prior to the construction of the transfer station.

Three types of compactor truck - small, medium and large - were selected. The utilization plan is shown in Figure 2.2-3.

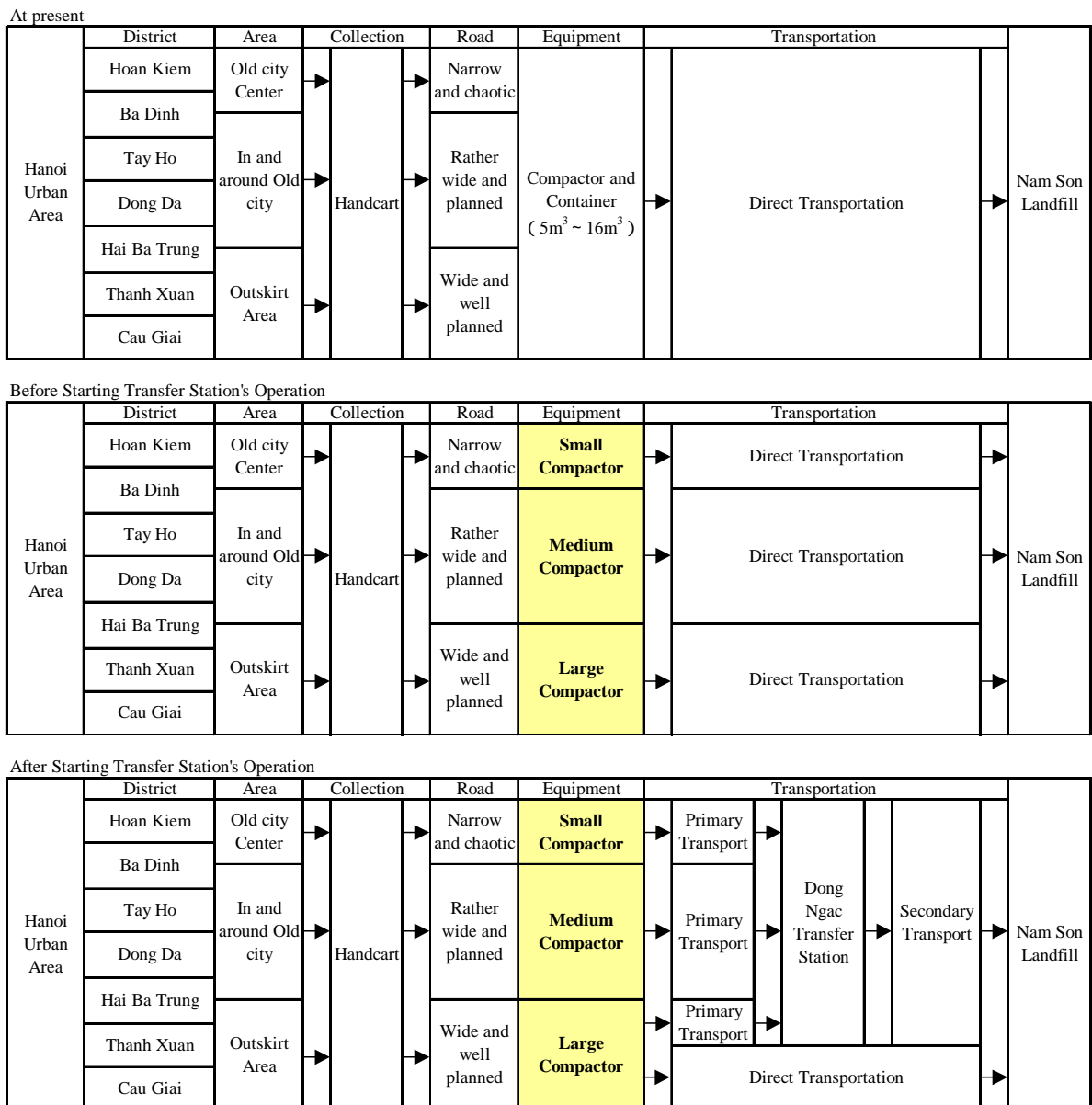


Figure 2.2-3 Waste Collection and Transportation Flow

As Figure 2.2-3 shows, the small compactor trucks will be used mainly in the old city center where the roads are narrow and complicated. The medium ones will be used in the area surrounding area the old city center where the roads are wider, while the large compactor trucks will be used in the newly developed areas on the city's outskirts.

b) Design Conditions

- Loading Capacity of the Compactor Truck

The loading capacity for each truck is based on the following calculation.

Averaged Loading Capacity (t/vehicle)

$$= \text{Loading Capacity (m}^3\text{)} \times \text{Loading Efficiency} \times \text{Bulk Density (t/m}^3\text{)}$$

The loading capacity is as follows.

Small compactor truck: 6 m³

Medium compactor truck: 10 m³

Large compactor truck: 16 m³

Loading efficiency is assumed to be 0.9, based on past experience.

Bulk Density is estimated to be 0.55 (t/m³), based on past records.

Small compactor truck: 6 m³ × 0.9 × 0.55 = 2.97 3 (t /unit)

Medium compactor truck: 10 m³ × 0.9 × 0.55 = 4.95 5 (t /unit)

Large compactor truck: 16 m³ × 0.9 × 0.55 = 7.92 8 (t /unit)

The loading capacity of the existing vehicles owned by URENCO is assumed to be the the capacity noted on URENCO's list, since loading efficiency has already been incorporated.

- Rate of Operation

The rate of operation is the percentage of actual operation days in a year. This rate gradually decreases because of the necessity for frequent maintenance as the vehicles age. The rate assumed for this project is as shown in Table 2.2-7, based on URENCO's data. For the basic design calculations, it is assumed that the vehicle working life is ten years. URENCO, in principle, decided on a policy of the usage life of waste transportation vehicles to be ten years in accordance with depreciation policy in Vietnam. In reality, however, URENCO uses vehicles for more than ten years due to the shortage of vehicles.

Table 2.2-7 Rate of Operation for Compactor Truck

Usage Year	1	2	3	4	5	6	7
Rate	90%	89%	88%	87%	86%	84%	82%
Usage Year	8	9	10	11	12	13	14
Rate	80%	78%	75%	72% for Scrap	69% for Scrap	66% for Scrap	62% for Scrap

- Trip Number

Two scenarios were examined.

Case 1) Transfer Station (T/S) is constructed at the Target Year (2004)

In this case, the Dong Ngac Transfer Station (T/S) will be constructed by the target year 2004. The Hanoi side should provide equipment for the operation of the T/S, such as a wheel loader and secondary transportation trucks. The operation capacity of the T/S is assumed to be 700 tons per day, which is less than half of the waste quantity collected in 2004, 1,494 tons per day. This means that the remaining 800 tons or so of waste must be transported directly from the city to the Nam Son Final Disposal Site. It is assumed that the number of trips from the city to the T/S will be four per day and twice a day from the city directly to Nam Son. The direct transportation situation is shown in Table 2.2-8.

Table 2.2-8 Direct Transportation Plan with T/S Operation

Item	Loading Capacity	Unit	Operation Rate	Trip No.	Transport Quantity
Existing Mercedes	8 t	1	82%	2 times	14 t/d
Large compactor (German)	8 t	12	88%	2 times	169 t/d
Medium compactor (German)	6 t	15	88%	2 times	159 t/d
Large compactor (This Project)	5 t	25	89%	2 times	356 t/d
Medium compactor (This Project)	5 t	11	89%	2 times	98 t/d
Total	-	-	-	-	796 t/d

Case 2) Transfer Station (T/S) is NOT constructed at the Target Year (2004)

In this case there will be two trips per vehicle per day directly from the city to Nam Son.

c) Calculation of Vehicle Numbers

Case 1) Transfer Station (T/S) is constructed at the Target Year (2004)

The number of vehicles is determined as follows, with the calculations shown in Table 2.2-9.

Small Compactor Truck: 5 units (same as requested)

Medium Compactor Truck: 40 units (same as requested)

Large Compactor Truck: 25 units (same as requested)

Table 2.2-9 Waste Collection Capacity with T/S Operation (2004)

Vehicle Type	Loading Capacity	Unit	Operation Rate	Trip No.	Collection Quantity
Direct Transportation					
Existing Mercedes 1418	8 t	1	82%	2 times	14 t/d
Large compactor (German)	8 t	12	88%	2 times	169 t/d
Medium compactor (German)	6 t	15	88%	2 times	159 t/d
Large compactor (This Project)	8 t	25	89%	2 times	356 t/d
Medium compactor (This Project)	5 t	11	89%	2 times	98 t/d
Sub-total	-	-	-	-	796 t/d
Transportation to T/S					
Existing Mercedes 1314	5 t	6	82%	4 times	99 t/d
Existing Hyundai Small	2 t	2	78%	4 times	16 t/d
Existing Hyundai Medium	5 t	2	78%	4 times	32 t/d
Small compactor (This Project)	3 t	5	89%	4 times	54 t/d
Medium compactor (This Project)	5 t	29	89%	4 times	517 t/d
Sub-Total	-	-	-	-	718 t/d
Collection Quantity in Total	-	-	-	-	1,514 t/d
Target Collection Quantity	-	-	-	-	1,494 t/d

Case 1) Transfer Station (T/S) is NOT constructed at the Target Year (2004)

In this case, about 339 tons of waste per day will not be collected by vehicles that have less than ten years use (in 2004), as Table 2.2-10 shows. Therefore, URENCO should take measures, such as overtime work or the usage of old trucks, to cover the collection shortfall.

Table 2.2-10 Waste Collection Capacity without T/S Operation (2004)

Vehicle Type	Loading Capacity	Unit	Operation Rate	Trip No.	Collection Quantity
Direct Transportation					
Existing Mercedes 1418	8 t	1	82%	2 times	14 t/d
Existing Mercedes 1314	5 t	6	82%	2 times	50 t/d
Existing Hyundai Small	2 t	2	78%	2 times	8 t/d
Existing Hyundai Medium	5 t	2	78%	2 times	16 t/d
Large compactor (German)	8 t	12	88%	2 times	169 t/d
Medium compactor (German)	6 t	15	88%	2 times	159 t/d
Small compactor (This Project)	3 t	5	89%	2 times	27 t/d
Medium compactor (This Project)	5 t	40	89%	2 times	356 t/d
Large compactor (This Project)	8 t	25	89%	2 times	356 t/d
Collection Quantity in Total	-	-	-	-	1,155 t/d
Target Collection Quantity	-	-	-	-	1,494 t/d
Shortage Quantity for Collection	-	-	-	-	339 t/d

2) Equipment for Workshop

a) Criteria for Selection

The criteria for the selection of the Workshop equipment are as follows.

- The equipment shall be selected in accordance with Japan's Grant Aid policies, which emphasizes urgency and effectiveness.
- The equipment should be selected by the priority applied by URENCO only in case its necessity is recognized.
- The equipment should enable the inspection of engines, brakes and bodies of the vehicles. The data from these inspections should be regularly submitted to the Agency of Car Registration under the Ministry of Transport.
- The equipment should enable the maintenance of both the vehicles provided by this Project and the existing old vehicles, since URENCO should continue to use these vehicles to meet the shortfall in waste collection.
- The equipment should be operated and maintained by URENCO itself, with an adequate budget.
- The equipment should be installed, with the necessary base construction, by the Vietnamese Side. A Supervisor should be dispatched by the supplier.

b) Selected Equipment for the Project

The list of the equipment selected for the Project is shown in Table 2.2-11.

Table 2.2-11 The Equipment of Workshop

Item	Spec.	Unit	Purpose of use
1 High pressure pump adjuster	8 cylinder	1	Diesel engine pump maintenance
2 Surface grinding machine	10kw	1	Diesel engine maintenance
3 Cylinder Boring Machine	4.5kw	1	Diesel engine maintenance
4 Automobile checking equipment		1 set	Diesel engine nozzle, Exhaust, Fuel Consumption, CO/HC, Oil Pressure, Circuit
5 Wheel alignment machine		1	Wheel maintenance
6 Valve grinding machine	5kw	1	Valve re-facing for engine maintenance
7 Four Post Vehicle lifter	16 t	1	Vehicle lifting for maintenance
8 Brake tester for truck		1	Braking balance test

c) Equipment Layout Plan

The layout plan for the project equipment at the Workshop in Phu Minh has already been prepared by URENCO, as Appendix 9 shows.

At the new Workshop, where construction work was completed including administrative building in March, and started operation in April 2002.

d) Equipment Installation Plan

It has been agreed between the Vietnamese side and the Study Team that the installation of the Workshop equipment shall be borne by URENCO. URENCO should apply to HPC to appropriate a separate budget for the installation of the equipment by the time this Project is officially approved by the governments of both Vietnam and Japan.

The supplier of the equipment is to dispatch a supervisor for the assembly and installation of the equipment so that URENCO can set up them up accurately.

e) Operation and Maintenance Plan

Since the operation and maintenance plan for the Phu Minh Workshop has already been approved by HPC, no additional workers need to be hired for this Project at the Workshop. URENCO should appropriate the expenses related to the spare parts and consumption articles, but those costs should be covered by URENCO because there is no newly introduced equipment.

3) Equipment for Environmental Monitoring

a) Environmental Monitoring Plan

In Vietnam, MOC and MOSTE have released a joint circular “Guiding the Regulations on Environmental Protection for the Selection of Location for, the Construction and Operation of, Solid Waste Landfill Site (No. 01/2001/TTLT-BKHCNMT-BXD, January 18,2001)”. A fundamental guideline for environmental monitoring of the water and air quality is provided in the circular. The JICA Study on Environmental Improvement for Hanoi City, completed in July 2000, also proposed environmental monitoring at the Nam Son Final Disposal Site. The environmental monitoring plan mentioned in these documents is summarized in Table 2.2-12.

Table 2.2-12 Environmental Monitoring during Landfill Operation

Item	Surface Water	Groundwater	Landfill Gas and Air
Monitoring Point	At least 2 points upstream and downstream of the leachate discharge. One point is added in case the water source is located within 1 km of the site.	At least 4 points (upstream: 1 point, downstream: 3 points)	In the administration room: 1 point At the Landfill site: 4 points
Monitoring Item	According to TCVN-5942	According to Vietnamese standards (TCVN)	According to Vietnamese standards (TCVN)
Frequency	Water Flow: 6 times a year Chemical Analysis: 3 times a year	3 times a year	4 times a year

It is recommended that monitoring mentioned above should be carried out by a specialized laboratory in Hanoi on a contract basis. URENCO should act as the organization responsible for the planning and evaluation of the environmental monitoring. In addition, URENCO will also undertake the basic monitoring at the landfill site. Therefore, it is recommended that some portable environmental monitoring equipment suitable for the purpose will be provided as part of the soft component part of the Project. A draft of the soft component plan is described in Clause 2.5.1 of Chapter 2.

b) Criteria for Selection

The criteria for the selection of the environmental monitoring equipment are as follows.

- The equipment shall be portable, without any necessity for additional analysis.
- The Monitoring items shall be leachate, surface water, ground water, landfill gas and air.
- Water quality monitoring shall include temperature, flow, level, pH, electric conductivity, turbidity, DO and so on.
- Elements for air quality monitoring shall be CH₄, SO₂, CO and NH₃.

c) Selected Equipment for the Project

The list of the equipment selected is shown in Table 2.2-13.

Table 2.2-13 Equipment for Environmental Monitoring

	Item	Specification	Purpose of use
1	Heyroth Sampling Bottle	Capacity: 1L	Surface water sampling
2	Van Dorn Water Sampler	Capacity: 3L	Ground water sampling
3	Water Level Meter	Probe dia.: 13mm Rope length: 30m	Ground water level measuring
4	Portable EC/pH Meter	pH: 0.00 ~ 14.00 EC: 0 ~ 199.9S/m Temp.: 0 ~ 80.0	Measuring pH, EC and Temperature
	Portable Turbidity Meter	Turbidity: 0 ~ 800mg/L Temp.: 0 ~ 50 Cable Lead: 2m	Measuring Turbidity
	Portable DO Meter	DO: 0 ~ 19.99mg/L, (0 ~ 199%)	Measuring DO
5	Thermohygrometer	Temp.: -10 ~ 60 RH: 20 ~ 99%	Measuring Temperature and Relative Humidity
6	Portable Gas Detector	CH ₄ (0 ~ 100%LEL or methane 0~5%) SO ₂ (0 ~ 30ppm) CO (0 ~ 75ppm) NH ₃ (0 ~ 75ppm)	Measuring landfill gas (CH ₄ , SO ₂ , CO, NH ₃)

d) Operation and Maintenance Plan

URENCO now plans to reinforce one of its department, the Environmental Technical Consultant Center, formerly the Center of Industrial Waste Treatment and Research, adding the function of environmental management of solid waste handling, including monitoring at the site. This department will take care of the environmental monitoring using the equipment provided by the Project, in cooperation with the Nam Son Solid Waste Management Enterprise under URENCO. The environmental engineers from both sections are trained for environmental monitoring.

2.2.3 Basic Design Drawing

(1) Equipment for the Project

Table 2.2-14 shows the final list of the equipment proposed for the Project.

Table 2.2-14 The List of the Equipment for the Project

Item	Basic Specification	Unit	Q'ty	
I. Equipment for Waste Collection / Transportation				
1.1	Small compactor truck	Loading Capacity: approx.6m ³	Unit	5
1.2	Medium compactor truck	Loading Capacity: approx.10m ³	Unit	40
1.3	Large compactor truck	Loading Capacity: approx.16m ³	Unit	25
II. Equipment for Workshop				
2.1	High pressure pump adjuster	8/12 cylinders	Unit	1
2.2	Surface grinding machine	For engine block	Unit	1
2.3	Cylinder Boring Machine	Bore dia.: 31~150mm	Unit	1
2.4	Automobile checking equipment	Engine Checking	Set	1
2.5	Wheel alignment machine	For large truck	Unit	1
2.6	Valve grinding machine	Diesel Engine Valve	Unit	1
2.7	Four post Vehicle lifter	Lift Capacity: 16t, 4 lift	Unit	1
2.8	Break tester for truck	Allowable Axle Mass: 10 t	Unit	1
III. Equipment for Environmental Monitoring				
3.1	Heyroth Sampling Bottle	Surface water, Capacity: 1L	Set	1
3.2	Van Dorn Water Sampler	Ground water, Capacity: 3L Depth: 30m	Set	1
3.3	Water Level Meter	Rope length: 30m	Set	1
3.4	Portable Water Quality Meter	pH, EC, DO, Temperature, Turbidity	Set	1
3.5	Thermohygrometer	Temp.: -10~60 , RH: 20~99%	Set	1
3.6	Portable Gas Detector	CH ₄ , SO ₂ , CO, NH ₃	Set	1

(2) Major Specification of Equipment

Table 2.2-15 shows the major specifications of the equipment proposed for the Project.

Table2.2-15 Major Specification of the Equipment

No.	Equipment	Major Specification	Level	Unit
I	Equipment for Waste Collection / Transportation			
1.1	Small compactor truck	Loading Capacity: approx. 6m ³ , Pay Load: 3.6 ton or more	Standard	5
1.2	Medium compactor truck	Loading Capacity: approx. 10m ³ , Pay Load: 6.0 ton or more	Standard	40
1.3	Large compactor truck	Loading Capacity: approx. 16m ³ , Pay Load: 9.6 ton or more	Standard	25
	Equipment for Workshop			
2.1	High pressure pump adjuster	Pump application: 8/12, Drive Motor: 7.5 kW	Standard	1
2.2	Surface grinding machine	Table surface: approx. 1400X400mm	Standard	1
2.3	Cylinder Boring Machine	Boring diameter: 31-150mm	Standard	1
2.4	Automobile checking equipment			
1)	Nozzle tester	Pressure gage: 0 - 500 kgf/cm ²	Standard	1
2)	Diesel smoke meter	Display: 0-100%	Standard	1
3)	Fuel consumption meter	Portable type, Gasoline, Light oil	Standard	1
4)	Exhaust emission analyzers	CO: 0-10% vol HC: 0-10,000ppm vol	Standard	1
5)	Hydraulic test gauge set	Portable type	Standard	1
6)	Circuit tester	Analog type	Standard	1
2.5	Wheel alignment machine			
	Toe-in gauge	Range: 100-2100mm	Standard	1
	Camber-Caster-Kingpin gauge	Camber angle, caster angle, Kingpin angle	Standard	1
	Turning radius gauge	Max. load/wheel: 5 ton	Standard	1
2.6	Valve grinding machine	Grinding capacity: max. 100mm	Standard	1
2.7	Four post Vehicle lifter	Drive on type, Capacity: 16 ton	Standard	1
2.8	Break tester for truck	Allowable axle mass: 10 ton, Braking force 250/1000/3000 kgf	Standard	1
	Equipment for Environmental Monitoring			
3.1	Heyroth Sampling Bottle	Capacity: approx. 1 liter, rope length: 10 m	Standard	1
3.2	Van Dorn Water Sampler	Capacity: approx. 3 liter, rope length: 30 m	Standard	1
3.3	Water Level Meter	Probe: Thermister type, Rope length: 30m	Standard	1
3.4	Water Quality Meter (EC, pH)	Portable, Range : pH:00-14.00, EC: 0-199.9S/cm	Standard	1
	Water Quality Meter (Turbidity)	Portable, Range : 0-800 NTU,0-800 mg/L	Standard	1
	Water Quality Meter (DO)	Portable, Range : 0-19.99mS/m, 0-199%, 0-50.0mg/L, 0-500%	Standard	1
3.5	Thermohygrometer	Portable, Range: Temp.: -10-60 , R.H.: 20-99%	Standard	1
3.6	Gas Detector(CH ₄)	Portable, for CH ₄ ,Range: 0-100%LEL/0-100vol%	Standard	1
	Gas Detector(SO ₂)	Portable, for SO ₂ ,Range: 0-30ppm	Standard	1
	Gas Detector (CO)	Portable, for CO, Range: 0-75ppm	Standard	1
	Gas Detector(NH ₃)	Portable, for NH ₃ , Range: 0-75ppm	Standard	1

(3) Basic Design Drawing

Reference drawings of the main equipment for the Project, the waste collection and transportation trucks, are attached in Appendix 11, 12, and 13. A sketch of a Handcart, required for design of the loading arm, is attached in Appendix 14.

2.2.4 Implementation Plan

(1) Implementation Policy

The Project shall be implemented under Japan's Grant Aid scheme.

The Government of Japan (GOJ) appraises the Project to see whether or not it is suitable for Japan's Grant Aid Scheme, based on the Basic Design Study Report prepared by JICA, and the results are then submitted to the Cabinet for approval. The project, once approved by the Cabinet, becomes official with the Exchange of Notes (E/N) signed by the Government of Vietnam (GOV) and the Government of Japan.

After the Exchange of Notes, GOV will select the consulting firms for the Project's implementation recommended by JICA in order to maintain technical consistency with the basic design of the project. The consultant will provide the consulting services including the detailed design study, assistance for conducting the procurement, and appropriate supervision and guidance to the contractor.

The basic scope of those concerned with the Project is as follow.

1) Implementation Agency

The agency responsible for the implementation of this Project will be the Hanoi Peoples Committee (HPC) and the executing body will be URENCO, which has had experience with solid waste management in the city for more than forty years. GOV shall be required to appoint the responsible persons and full-time counterparts to the project. They will be in close contact with the consultant and contractor in order to implement the Project smoothly. A consultant shall be appointed to coordinate the Project.

2) Consultant

GOV will enter into a contract with the consultant, who shall be a Japanese national, for consulting services with regard to designing, tendering and supervising procurement for the Project. The scope of consulting services will include the following:

- a) To conduct the detailed design study for the project.

- b) To assist the GOV in conducting the procurement in a fair and proper manner.
- c) To provide appropriate supervision and guidance, on behalf of GOV, to the contractors.
- d) To conduct inspections of products and services in the course of the project implementation, including cargo inspection contracted out to an inspection organization.
- e) To conduct inspections at the completion stage and at the end of the warranty period.

3) Contractor

The Contractors shall be Japanese nationals who are capable of procurement of products and services in a proper manner under the Grant. Sustainable post-supply services for equipment, such as the supply of spare parts or quick and appropriate repair and maintenance, will be required after the Project. The contractor shall give careful consideration to providing such a service system, including the use of a subcontractor.

4) Necessity for Dispatch of a Supervisor

Assembly and installation of the equipment for the Workshop, particularly the vehicle lifter and the brake tester, will require highly skilled and experienced supervision. Therefore, the supplier of the equipment will dispatch a supervisor during the set up period to oversee installation of the equipment by URENCO.

(2) Implementation Conditions

As has previously been mentioned, some important points related to the procurement of equipment are summarized as follows.

- a) Some joint enterprises for vehicle manufacturing with companies from industrialized countries have been established in Vietnam in recent years.
- b) The equipment for this Project shall be delivered to the appropriate site (URENCO's facilities).

(3) Scope of Works

Demarcation of the scope of works for the Project for both countries is as follows;

- a) Responsibilities of the Japanese Side
 - Procurement of the waste collection/transportation vehicles

- Procurement of the equipment for the Workshop
- Procurement of the equipment for the environmental monitoring
- Marine and inland transportation
- Trial operation and adjustment.

b) Responsibilities of the Vietnamese Side

- Receipt and inspection of the equipment
- Registration of the waste collection/transportation vehicles
- The necessary construction for the assembly and installation of the equipment for the Workshop, as outlined below.

Item	Construction
Vehicle Lifter	Foundation and Installation work
Brake Tester	Foundation and Installation work
Others	Assembling, placing and electrical work

- Completing the construction of the new Workshop at Phu Minh
- Exemption from customs duties, internal taxes and other fiscal levies.
- Banking Arrangements (B/A)
- Budget preparation for suitable operation and maintenance of the Project equipment.

(4) Consultant Supervision

The Consultant, in strict adherence to Japan's Grant Aid Scheme, will carry out the consultation work for the Project with a consistent project team, from the detailed design to procurement supervision, reflecting the results of the basic design study. The consultant will dispatch Japanese engineers to Vietnam to supervise the assembly and installation of the equipment for the Workshop and the delivery of other equipment. Other engineers will also be dispatched for the soft components associated with the environmental monitoring equipment.

1) Basic Policy for Procurement Supervision

- The Consultant will provide the following services at each procurement stage

Stage	Services
1. Before Procurement	Detail Design Study Preparation of Tender Document Assistance for Opening of Tenders Tender Evaluation Assistance for contracting
2. During Procurement	Procurement Supervision Inspection of the products Preparation of reports

- The procedure for tendering shall be approved by URENCO, and then a public announcement will be carried out in such a way that all potential tenderers have a fair opportunity to learn about and participate in the tender. Invitation to prequalification or to tender will be advertised in a general circulation newspaper in Japan.
- All tenders will be opened on the date, and at the time and place, specified in the Invitation to Tender immediately after the closing time, in the presence of URENCO, the Consultant and the tenderers. As soon as possible after opening the tenders, the Consultant will assist URENCO to prepare the Form of Contract.
- The Consultant provides supervisory services for the Project, including the approval of the specifications and schedule, to ensure that the works executed by the contractor are in compliance with the Contract, in consultation with URENCO. The Consultant will conduct a pre-shipment inspection of the equipment procured, to be carried out by an inspection agency assigned by the Consultant. Inspection for the equipment procured in Vietnam shall be carried out before shipment from the factory.
- The equipment shipped from Japan to Hai Phong Port, Vietnam, shall also be inspected in accordance with the Contract.

2) Schedule Supervision

- The Consultant will verify progress with the Contractor regarding the execution and progress of the procurement of the equipment.
- The Consultant shall issue instructions where necessary to prevent delays in procurement of the equipment, based on consultation about the monthly progress of each item.
- In the case of locally made equipment, any sub-contractor shall observe the schedule strictly, under the responsibility of the Contractor.

(5) Quality Control Plan

The quality control plan for the Project is as follows.

- The specification and quality of the equipment will be inspected with respect to the detailed design drawings.
- Quality inspection will be carried out at the factory by the time of completion of factory base assembly, or before shipping.
- Assembling and installation of the workshop equipment will be conducted by the Vietnamese side and supervised by the Consultant and engineer dispatched by the supplier.
- Approved licenses for the waste collection and transportation vehicles issued by the car registration agency of the Ministry of Transport will be inspected by the Consultant.
- Mechanical functioning of the loading arm of the waste collection and transportation vehicles will be checked during the operational testing period in the factory.

(6) Implementation Schedule

The implementation schedule of the Project is as follows, based on Japan's Grant Aid scheme.

- Detail Design
 - Field Survey
 - Tender Document

Duration
} 3 months
- Tendering and Procurement
 - Tendering and Evaluation
 - Contracting
 - Manufacturing
 - Transporting

Duration
} 1.5 months
5.5 months
2 months
- Spot Supervising Total duration: 8.0 months
Practical duration: 0.7 months in Japan, 1.0 month in Vietnam
- Soft Component 1.5 months x 2 times

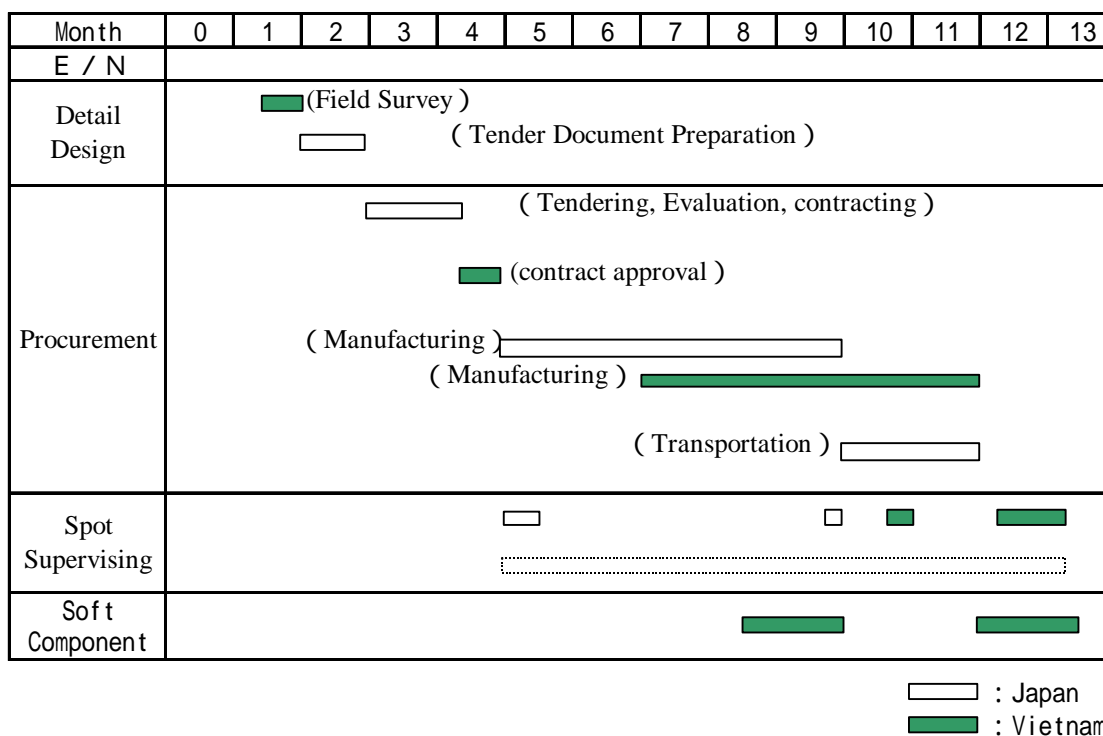


Figure 2.2-4 Implementation Schedule

2.3 OBLIGATIONS OF RECIPIENT COUNTRY

2.3.1 Obligation of Recipient Country

Should the project proceed under the Grant Aid of the Japanese Government, the GOV, as the recipient country, and URENCO, as the implementation organization, should ensure that the following conditions are met:

- 1) Provide data and information necessary for implementation of the Grant Aid.
- 2) Carry out appropriate operations, storing and maintenance by UEE for the procured equipment (compactor trucks) under the Grant Aid.
- 3) Establish an appropriate organization to carry out the operation and maintenance of the monitoring equipment procured under the Grant Aid.
- 4) At the new Phu Minh Workshop, where construction work was completed in March, appropriate staff shall be allocated to the facility before the equipment is received.
- 5) Execute the required installation work and obtain the necessary budget for equipment under the Grant Aid.

- 6) Ensure operation and maintenance funding for the equipment procured under the Grant Aid.
- 7) Appoint the required operation and maintenance staff for the equipment procured under the Grant Aid.
- 8) Maintain and use properly and effectively the contracted facilities and equipment procured under the Grant Aid.
- 9) Arrange unloading, customs clearance and tax exemption for the equipment procured under the Grant Aid from Japan at the port of disembarkation in the recipient country.
- 10) Ensure the receipt and tax exemption of equipment procured locally under the Grant Aid.
- 11) Exempt Japanese nationals from customs duties, internal taxes and other fiscal levies that may be imposed in the recipient country with respect to the supply of the products and services under the verified contracts.
- 12) Accord Japanese nationals whose service may be required in connection with the supply of the products and the services under the verified contract, such facilities as may be necessary for their entry into the recipient country and their stay therein for the performance of their work.
- 13) Arrange exemption from customs charges and corporation taxes for equipment procured under the Grant Aid.
- 14) Bear the following commission to the Japanese bank for banking services based upon the Banking Arrangement (B/A)
 - Advising commission of Authorization to Pay (A/P)
 - Payment commission.
- 15) Bear all expenses, other than those to be borne by the Grant Aid, necessary for the transportation and installation of the equipment.
- 16) Prohibit the diversion of the equipment procured under the Grant Aid for commercial and military purposes.

Table 2.3-1 Items to be Covered by Recipient Side

Items	Items to be Covered by Recipient Side (GOV)
Equipment for collection and transportation	Ensure safe storage and garaging for vehicles and spare parts under the Grant Aid. Supply oil and consumable materials after delivery. Necessary applications and procedures to the government required under the Grant Aid
Workshop equipment	Installation work of procured equipment after delivery and inspection, work including foundations, installation of a power supply, field inspection etc.
Monitoring equipment	Ensure safe storage for the monitoring equipment

2.3.2 Project Cost Undertaking by Vietnamese Government

A major undertaking to be covered by the Vietnamese Government is the installation of the workshop equipment. The cost is estimated at VND 237 million, as shown in Table 2.3-2.

Table 2.3-2 Project Cost Undertaking by Vietnamese Government

Category and Item	Project amount (Million VND)
(1) Engine Lifter Installation	167
(2) Break Tester Installation	20
(3) Other Installation of Equipment	100
Total	237

At present, the Phu Minh Workshop, which is the receiving site for the equipment, is under construction by URENCO at their own expense, estimated at 2.0 million Japanese yen.

2.4 OPERATION AND MAINTENANCE PLAN

2.4.1 Basic Policy for Maintenance

The expected service life of large vehicles in Vietnam is about ten years. Automobile inspection licenses have to be obtained from the registration department of the Ministry of Transport. However, because many of the existing vehicles currently used in URENCO's operation are badly deteriorated (in use for more than ten years), they find it difficult to pass the automobile inspection examination and URENCO's licenses for their old vehicles are obtained with special consideration from the Ministry of Transport. Judging from this situation, it can be foreseen that the condition of the existing vehicles will continue to deteriorate even after the completion of the Grant Aid.

The vehicles delivered under the Grant Aid are required to be kept in satisfactory condition. As such, periodic maintenance shall be conducted in order to detect and

remedy faults promptly since it is necessary to detect minor problems as early as possible in order to prevent serious problems. In Vietnam, inspections of large vehicles are carried out every six months, and legal periodic maintenance is mandatory. URENCO presently carries out preventive maintenance based on government laws. For the maintenance of targeted equipment in this project, preventive maintenance is required as a basic policy.

2.4.2 Description of Maintenance Work

The current standards of maintenance work for the collection and transfer vehicles and dump trucks operated in the URENCO are shown in Table 2.4-1. Basically, all of the targeted equipment procured under the Grant Aid shall undergo continuous maintenance work based on the existing standards.

Table 2.4-1 Conditions of Maintenance

Maintenance Standards	Mileage	Description of Maintenance Work
Small scale maintenance Level 1	Each 3,000 km	Carry out maintenance work of exterior, electrical circuit, tires and related devices by UEE and confirm their function, including oil supply.
Middle scale maintenance Level 2	Each 7,000 km	Carry out maintenance work of exterior, electrical circuit, oil pressure device, tires and related devices by UEE. Repair of body and replacement of parts required, if necessary, according to working conditions and result of inspections.
Large scale maintenance Level 3	Each 10,000 km	Carry out general maintenance work such as damage, frictional wear, deformation, cracks etc. of each part in the Workshop. Carry out repair, replacement and adjustment of engine, transmission, electrical circuit, tires and oil pressure device, close to full overhaul. If necessary, replace oil pressure system, repair body sheet metal and provide painting.
Large scale maintenance Level 4	15,000 – 20,000 km each (20,000-30,000 km each: Japanese car)	Maintenance work is same as level 3, carry out full overhaul work in Workshop, giving priority to engine, brake, clutch and tires with associated mechanisms.

Data source: URENCO

2.4.3 Preparation Plan of Spare Parts

- (1) Spare parts for the targeted equipment shall be replaced according to operation hours and mileage. Spare parts are categorized as either maintenance replacement parts or repair replacement parts and need to be prepared according to the periodic maintenance plan or the expected cycle of wear or breakage.

- (2) In this plan, spare parts for a minimum of one year's operation are required after 2,000 hours or 25,000 km of operating mileage of vehicles.
- (3) After that, all of the required spare parts for operation have to provided by the Vietnamese side alone. The necessary budget required for operation shall be prepared by URENCO.

2.4.4 Maintenance Organization of URENCO

URENCO is a public corporation, conducting the collection, transport and treatment of solid waste for the seven urban districts in Hanoi City. The organization of URENCO is shown in Figure 2.4-1. Related organizations under the Grant Aid are the headquarters of URENCO, the Workshop Division and the five UEEs. The official regulations and duties of each of the concerned departments and enterprises are shown in Table 2.4-2. The equipment provided under the Grant Aid shall be maintained and managed by those respective organizations.

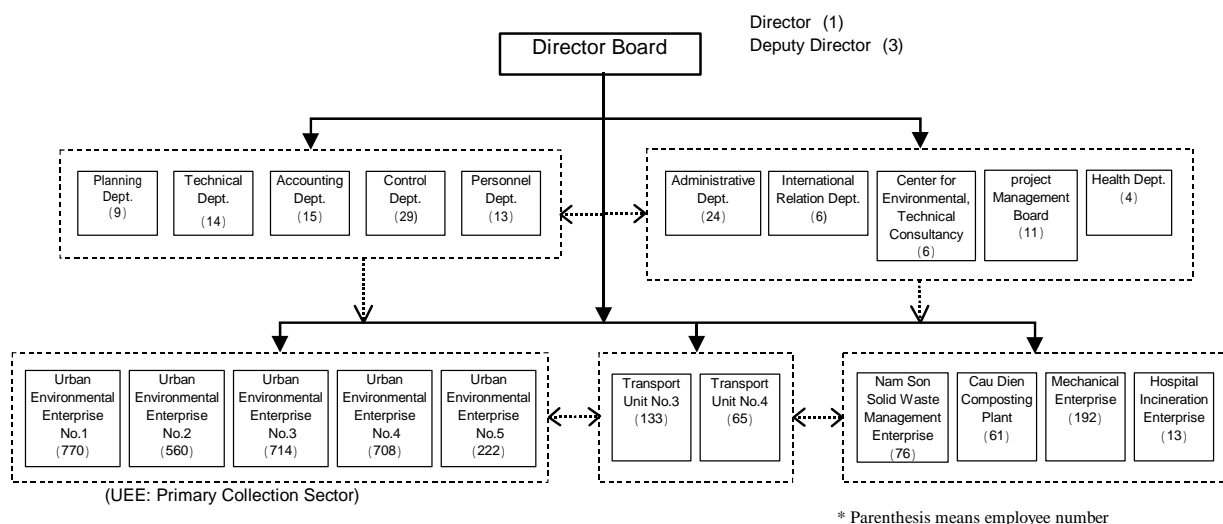


Figure 2.4-1 Organization Chart of URENCO (April 2002)

URENCO have a total of 3,548 personnel (as of January 2002), approximately 1.4 % of whom are temporary or contract employees (Refer to Table 2.4-3). URENCO engineers, technicians and skilled workers have sufficient experience in operation and maintenance of collection and transfer vehicles and other related equipment. In addition, they have demonstrated a high level of performance in the management of the construction work at the Workshop and the final disposal site. URENCO has more than 40 years experience in maintenance work for their equipment and they have sufficient technical capability. Accordingly, they can carry out the required maintenance work after the delivery of the equipment without difficulties, as the executing organization for this plan.

Table 2.4-2 Regulations and Duties of URENCO

Section	Description of Duty	Duty Area
URENCO Head Quarter	Operation and management of entire treatment system for solid waste, supervision and guidance of financial, technical, organizational and institutional matters. Activated as executing organization of Grant Aid plan and having direct responsibility for the items to be covered by GOV.	Entire system of solid waste management
Workshop	Maintenance and repair work of vehicles higher than level 3, which cannot be carried out by each UEE. In this plan, the workshop receives the equipment directly and is responsible for operation and maintenance.	La Thanh Workshop and Phu Minh Workshop
Urban Environment Enterprise (UEE) 1	Collection of solid waste, transportation, cleaning of public space and streets, daily maintenance work of collection vehicles, level 1 and level 2 maintenance work. In this plan, UEEs receive collection and transfer equipment directly and are responsible for operation and maintenance.	Ba Dinh area Cau Giay area
Urban Environment Enterprise (UEE) 2		Hoan Kiem area
Urban Environment Enterprise (UEE) 3		Hai Ba Trung area
Urban Environment Enterprise (UEE) 4		Dong Da area and Thanh Xuan area
Urban Environment Enterprise (UEE) 5		Tay Ho area
Nam Son Landfill Management Enterprise	Operation and management of the final disposal site in Nam Son	Nam Son Solid Waste Treatment Complex
Cau Dien Composting Plant	Operation and management of the composting plant in Cau Dien	Cau Dien Composting Plant

Data source: URENCO

Table 2.4-3 URENCO's Staff

No.	Category	Number of Staff
1.	Management staff	142
2.	Senior staff (university graduate)	5
3.	Engineer (university graduate)	198
4.	General staff (administration)	139
5.	Technician (high school graduate)	2,256
6.	Worker (elementary/junior high school graduate)	458
7.	Temporary staff	50
	Total	3,548

Data source : URENCO (as of January 2002)

2.4.5 Implementation Organization

After completion of the procurement of equipment under the Grant Aid, operation and maintenance work will be carried out by URENCO staff. It is required, therefore, to nominate the following staff for operation from each concerned department.

Table 2.4-4 Required Number of Staff

Organization	Manag-e ment	Enginee-r s	Technic-i ans	Workers	Total
President	1	-	-	-	1
International Relation Dep't	1	-	-	2 (clerk)	3
Accounting Dep't	1	-	-	1 (clerk)	2
Technical Dep't	1	1	1	2 (clerk)	5
Environment Technical Consultant Center	1	1	-		2
Nam Son Landfill Management	1	1	1	2 (clerk)	3
Workshop	1	2	8	16 (clerk)	27
Urban Environmental Enterprise	5	5	5	140 (driver/assistant)	155

Data source : URENCO (As of January 2002)

The required technical levels for the operation and maintenance work in this plan are as follows :

- University graduate : 21 (Management / Engineer)
- University graduate : 5 (Clerk)
- High school graduate : 16 (Technician)
- Elementary/junior high school graduate : 155 (Worker)

In the event that the Grant Aid is approved, the absolute number of collection vehicles for solid waste collection in the UEEs will be insufficient at the start of the operation if the transfer station construction is delayed. The necessary additional vehicles shall be arranged by utilizing the existing deteriorated vehicles belonging to URENCO. The 140 personnel required, consisting of drivers and helpers for the Grant Aid vehicles, will be covered by the existing staff of URENCO and newly hired employees.

For the workshop equipment provided by the Grant Aid to the new Phu Minh Workshop, the new workshop will be operated by a newly established organization, as shown in Appendix 8. An assignment plan required for the operation (Refer to Table 2.4-5), including budget, has already been established. It is, therefore, not necessary to hire new employees for the operation of the Grant aid equipment.

Table 2.4-5 Manpower Allocation in the New Workshop

Staff	Assignment in new Workshop
Management and clerks	17
Engineer (mechanical/electrical)	-
Technician (mechanic, electrician, welder, painter)	16
Other workers	51
Total	84

Data source : URENCO

For the water and gas quality monitoring equipment at the Final Disposal Site, the Environmental Technical Consultant Center (ETCC), belonging to URENCO headquarters, shall be responsible for carrying out the management and technical guidance. To conduct continuous monitoring at a high level of performance, and to carry out analysis and evaluation of the data obtained by monitoring in the future, it is necessary to establish a management organization and assign an engineer in charge of the environment monitoring at ETCC. For the monitoring work at the Nam Son Final Disposal Site, the establishment of an organization and the assignment of an engineer is also required to ensure that the monitoring work proceeds continuously and at a high level of performance. The proposed monitoring equipment can only monitor a limited range of parameters. Therefore, items such as heavy metals require external professional laboratories, according to requirement.

2.4.6 Operation and Maintenance Cost

The operation and maintenance costs for this project to be covered by URENCO are estimated as shown in Table 2.4-6 (Assumed at 25 days cycle for one month operation)

Table 2.4-6 Operation and Maintenance Cost

Items	Unit	Q'ty	Unit Cost ¹ (VND)	Cost for One Month ² (VND)
1. Manpower Cost ³ (Driver)	M/M	70	1,080,000	75,600,000
2. Manpower Cost ³ (Helper)	M/M	70	900,000	63,000,000
3. Fuel Cost ³ (70 Vehicles: @4km/l)	Liter	87,500	3,709	324,538,000
4. Oil and Others (10% of item 3)	Lot	1		46,313,000
5. Repair and Maintenance Cost ⁴ (Including Spare Parts Cost)	Lot	1		260,587,000
6. Management (10% of items 1 to 6)	Lot	1		77,003,000
Total				847,040,000

Note 1 Unit cost- as of February, 2002

Note 2 Rounded down under 1,000 VND

Note 3 Source: URENCO interview

Note 4 Source: URENCO's Report

The annual budget for the operation and maintenance that URENCO must meet is estimated at VND 10.2 billion.

In this project, the Grant Aid is aimed not only at improving the solid waste management system in the target year 2004, but also at supporting the shortfall of service vehicles and providing countermeasures for the badly deteriorated vehicles as an urgent measure. The trial calculation shown above for operation and maintenance costs includes only the equipment proposed under the Grant Aid and excludes the costs for existing equipment.

It is expected that all the deteriorated vehicles will remain in operation, and that the ratio of solid waste collection will be increased together with a decrease in the cost of fuel and maintenance work. It is possible that the execution of this project will improve the financial condition of URENCO. Moreover, the delivery of equipment in this project will not cause a negative impact to the operation and management of URENCO.

2.5 Other Relevant Issues

2.5.1 Soft Component Plan

(1) Background

Economic development and urbanization in the Socialist Republic of Vietnam intensified after the introduction of the Doi Moi policy. On the other hand, however, rapid growth has caused numerous negative sanitary and environmental impacts, such as public health problems, insufficient public water supplies and inadequate sewage systems, especially in the urbanized areas. Among those problems, the solid waste issue is one of the most serious facing the city. Approximately 1,400 tons of solid waste is generated daily in Hanoi City, but some of uncollected waste is left on the road or illegally dumped into lakes, ponds and rivers, and it may cause the blockage of drainage lines or the pollution of surface water and groundwater.

Therefore, Hanoi City is currently implementing the solid waste management project in the various stages from collection to final disposal to mitigate the worsening environmental conditions caused by solid waste, according to the recommendations described in the Master Plan of “The Study on Environmental Improvement in Hanoi City”. The project adopted the slogan “ Providing more service, more efficiently”.

From the point of view of urgency and sustainability for the improvement of the solid waste management system in Hanoi City, waste collection and transportation equipment is selected as a main component of Japan’s Grant Aid project. In addition, Workshop equipment for improvement of the operation and maintenance of waste collection and

transportation equipment and environmental monitoring equipment for landfill site are also selected for the Project.

In Vietnam, MOC and MOSTE have released a joint circular “Guiding the Regulations on Environmental Protection for the Selection of Location for, the Construction and Operation of, Solid Waste Landfill Site (No. 01/2001/TTLT-BKHCNMT-BXD, January 18,2001, herein after “national guideline”). The fundamental guideline for environmental monitoring of the water and air quality is provided in the circular. However, an environmental monitoring program has not yet been carried out at Nam Son landfill site. Planning and implementation of an environmental monitoring program is a priority issue for Hanoi City and URENCO is now planning to add the responsibility for environmental monitoring to an existing department of URENCO, the Center for Industrial Waste Research and Treatment. URENCO is to be designated as the organization in charge of planning and evaluation of the environmental monitoring. URENCO will also take care of the day to day monitoring, which is relatively simple and only needs to be carried out at the site. The more sophisticated monitoring will be done by outside professional laboratories.

Based on the above, technical support for establishment of the integrated environmental monitoring (“Soft Component”) should be provided as part of the Project. “Soft Component” includes training in the use of the monitoring equipment provided by the Project, technical advice to URENCO on the planning and implementation of environmental monitoring programs, and institutional and educational support for URENCO to ensure that the monitoring is sustainable beyond the time frame of the Project.

(2) Output

The major outputs from the Soft Component with regard to the environmental monitoring will be improvements in the environmental management skills of URENCO and establishment of an environmental monitoring and evaluation system at the landfill site. Furthermore, it is expected that this environmental monitoring system will act as a model case of sanitary landfill management for other cities in Vietnam. Outputs of the Soft Component are as follows.

- Preparation of the environmental monitoring plan for the Nam Son landfill site
- Establishment of the environmental monitoring system
- Improvement of the environmental monitoring skills of URENCO
- Establishment of monitoring wells around the Nam Son landfill site
- Appropriate implementation of the environmental monitoring program

- Accumulation and analysis of environmental monitoring data
- Publication and dissemination of the environmental information
- Technology transfer on sanitary landfill management through a seminar.

(3) Implementation Type

Management Support Type

(4) Activity

A Japanese consultant will carry out the advice and guidance component for the staff of URENCO, as shown in the following figure. The soft component also includes holding meetings with related organizations such as MOSTE, TUPWS and DOSTE for the establishment of the environmental monitoring plan.

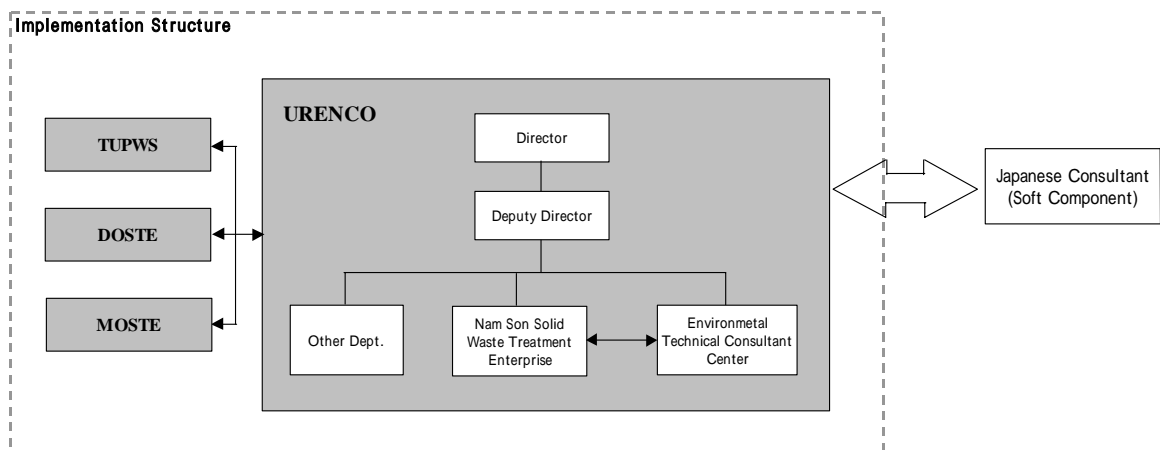


Figure 2.5-1 Implementation Structure for Soft Component

1) Work Component and Outputs

Table 2.5-1 Work Component and Putputs

Component	URENCO	Expectation	Outputs
Technical support for environmental monitoring planning	Center of Industrial Waste Treatment and Research	- Environmental monitoring will be planned and implemented by following the national Guideline of MOC/MOSTE. - Institutional and educational improvement of URENCO for environmental management	Environmental monitoring plan
Technical support for preparation of monitoring wells	- Environmental Technical Consultant Center - Nam Son Solid Waste Treatment Enterprise	- Monitoring wells for underground water will be set up at the suitable location. - Assumption of underground water flow	Underground monitoring wells
Guidance on monitoring equipment for the Project	- Environmental Technical Consultant Center - Nam Son Solid Waste Treatment Enterprise	- Improvement of environmental monitoring skills of URENCO by using the handling manual.	- Equipment handling manual - Data management manual
Holding of a Seminar	- URENCO - MOSTE - DOSTE - Others	- Sharing of environmental monitoring information. - Technology transfer by introducing examples of environmental monitoring systems in Japan	- Seminar notes - Video Tape

2) Implementation Methods

a) Technical support for environmental monitoring planning

Technical support includes providing assistance and advice to URENCO regarding methods, frequency, monitoring items and implementation structure for environmental monitoring, leading to the establishment of the environmental monitoring plan at the Nam Son landfill site, in line with the national guideline.

b) Technical support for preparation of monitoring wells

Monitoring wells for groundwater should be prepared around the Nam Son final disposal site by the Vietnamese side. The consultant will advise on the number, location, depth and diameter of wells, based on analysis of the existing groundwater data.

c) Guidance on monitoring equipment

A monitoring equipment users manual, to include monitoring methods and data evaluation, will be prepared by the consultant. The data collected will complement the data collected by the professional laboratories.

d) Seminar

A seminar will be held by URENCO and the consultant in order to share the sanitary landfill management information with other related agencies. At the seminar, the consultant will also discuss the Japanese experience of environmental monitoring.

3) Consultant Assignment Schedule

YEAR	2002		2003										
MONTH	11	12	1	2	3	4	5	6	7	8	9	10	
Equipment Procurement			Manufacturing				Transportation			Delivery			
Consultant				—————					—————				
Work Items				<div style="border: 1px solid black; padding: 5px; text-align: center;"> a. Technical Support for Environmental monitoring plan </div>									
				<div style="border: 1px solid black; padding: 5px; text-align: center;"> b. Moni'g Well </div>					<div style="border: 1px solid black; padding: 5px; text-align: center;"> c. Manual </div>				
									<div style="border: 1px solid black; padding: 5px; text-align: center;"> d. Seminar </div>				

Figure 2.5-2 Consultant Assignment Schedule

4) Work Plan

Months		1	2	3	
Session		Phase 1		Phase 2	
a. Technical support for environmental monitoring planning	a.1 Preparation of draft monitoring plan	—————			
	a.2 Discussion with related agencies			
	a.3 Finalization of monitoring plan		—————		
b. Technical support for preparation of monitoring wells	b.1 Analysis of existing data	—————			
	b.2 Field survey		—————		
	b.3 Preparation of monitoring well plan		—————		
	b.4 Digging (by Vietnamese side)			
c. Guidance of monitoring equipment of the Project	c.1 Preparation of handling manual			—————	
	c.2 Guidance for use of equipment				—————
d. Seminar	d.1 Preparation of Seminar			—————	
	d.2 Holding of Seminar				
	d.3 Preparation of Seminar report				—————

Figure 2.5-3 Work Plan

(5) Type of Soft Component

This soft component is carried out as “Japanese Consultant Direct Support Type” in order to transfer the environmental monitoring technology because of low experience in Vietnam.

CHAPTER 3

PROJECT EVALUATION AND RECOMMENDATION

CHAPTER 3 PROJECT EVALUATION AND RECOMMENDATIONS

3.1 Project Effect

3.1.1 Target of Project

Rapid economic development and the growing urbanization of Hanoi City has resulted in an increase in solid waste generation. However, the inefficiency of the SWM system and of the organization responsible for waste collection means that they cannot cope with the volume of waste being generated. The result is adverse sanitary and environmental problems due to illegal dumping of waste, sewage system blockages, water pollution, etc. These environmental aggravations significantly affect about 2.6 million Hanoi residents, as well as tourists and travelers.

This project aims to contribute to resolving the environmental problems facing Hanoi City by improving the capability of the Solid Waste Management System.

3.1.2 Expected Results

At present, numerous problems regarding waste collection are being experienced by the responsible organization, URENCO, including insufficient and poorly maintained waste transport vehicles. The poor condition of the waste transport fleet has a major effect on waste collection and transportation efficiency and this is expected to deteriorate further as the volume of waste increases in the future. In addition, the workshop equipment needed for maintenance of vehicles is in poor repair, while monitoring work at the final disposal site can still not be carried out properly, several years after the start of operations, due to a shortage of monitoring equipment.

As a response to the above problems, the implementation of this Project is expected to have the following effects :

- 1) An increase in the number of collection vehicles will increase the collection ratio and collection volume of solid waste.
- 2) The repair and renewal of vehicles and the provision of maintenance equipment will lead to an increase in the operation ratio.
- 3) Maintaining a coverage ratio of 100% in the targeted area will result in an increase in the targeted beneficiary population.
- 4) Improvement in collection and transportation will result in a decrease in waste piling time.

- 5) Improvement of collection methods under the project will lead to an increase in the charge collection ratio, thereby reducing the financial support that URENCO requires from Hanoi City.
- 6) Operation and maintenance work for equipment in the Workshop will result in better performance.
- 7) Establishment of a monitoring system at the Nam Son final disposal site.

Table 3.1-1 shows the problems facing SWM, the possible countermeasures and the effect of improvement.

Table 3.1-1 Problems of WMS and its Countermeasures and Effect of Improvement

Existing Conditions and Problems	Countermeasures in This Plan	Effect of Improvement
The shortage and deterioration of waste transporting equipment decreases the operation efficiency. Some equipment is already over the normal service life; 73% of vehicles used by URENCO need to be renewed.	Delivery of 70 of waste collection and transport vehicles	(1) If a Transfer Station is available Maintaining a coverage ratio of 100% of targeted volume of collected waste by direct transportation and primary collection with delivered vehicles. (2) If a Transfer Station is not available Waste is transported directly to final disposal site. In this case 77% of targeted volume of collected waste is covered. The remaining volume may be covered by overtime, using the existing equipment belonging to URENCO. This would result in a coverage ratio of 100% of the targeted volume of collected waste
Deterioration of the environment caused by the use of many small and poorly maintained waste collection vehicles.	Delivery of 70 waste collection and transport vehicles	The introduction of new and larger vehicles will result in an increase in operational efficiency and reduced environment impacts (noise, odor, vibration and fine particles).
Shortage and deterioration of equipment for maintenance of vehicles in Workshop.	Delivery of workshop equipment for maintenance of vehicles used by URENCO.	Improved operational efficiency in the Workshop, and increased rate of operation for collection and transfer equipment. In addition it will extend the service life of equipment.
An environment monitoring plan in Nam Son final disposal site has not been prepared, and the environment impact on the surrounding area is not known.	Delivery of simplified, hand-carried equipment (monitoring of water quality, gas).	Establishing an environment monitoring plan will enable the changes in the environment at the final disposal site to be determined. It will then be possible to establish countermeasures aimed at reduction of the environmental impact.

3.1.3 Affected Beneficiaries and Indices of Effect

The targeted beneficiaries include the residents living in URENCO's service areas, business people working in the area, residents who live along the collection and transporting route, those living adjacent to the final disposal site, and foreign visitors. The citizens of Hanoi City are expected to receive the maximum benefit. The total area of

Hanoi district is estimated at 927 km², which includes the seven urbanized areas and urban districts located on the right bank of the Red River. These areas, with an estimated area of 84 km², are the collection areas targeted by URENCO. The targeted population of Hanoi City is expected to reach 1.84 million by 2004.

There are also plans to proceed with the urbanization of the Tu Lien and Thanh Tari districts, located in the area surrounding the seven urban districts, and the Gia Lam and Don Anh districts located on the left bank of the Red River. These new urbanized areas are also likely to be targeted collection areas of URENCO. The residents who live in these areas are likewise expected to receive benefits in the future. Table 3.1-2 shows the benefits expected due to the Grant Aid

Table 3.1-2 Indices of Effect of the Project

Targeted Items	Existing Condition (2001)	Targeted Year (2004)
Increased Volume of Waste Collection	1,200 ton/day	1,494 ton/day
Increased collection Ratio	82.5%	89%
Increased operation ratio for collection vehicles	71% (Confirmed by field survey)	88.3%
Increased targeted population for waste collection	1,815,000	1,844,000
Decrease piling time of waste in urban districts	Maximum 11.5 hours/day	Maximum 6.5 hours/day
Improvement of collection ratio of waste charges	61.5%	72.7%

With regard to the above table, the collection ratio of waste is planned to reach 95 % in 2007, and the targeted collection ratio in the target year is fixed at 89%. For the operation ratio of the collection vehicles, the indicated rate of loading is based on experience rather than full loading capacity, and the target value is fixed by calculation, taking into account annual changes in the rate of operation of Grant Aid equipment and existing equipment.

Due to the increased collection capacity, vehicles will be able to operate three (3) trips a day from the urban district to the final disposal site under present circumstances. However, it will be reduced to two trips a day by the target year if the Transfer Station is not available by then. At present, it takes approximately five hours for a round trip and 1.5 hours for collection of waste in urban districts.

Table 3.1-3 Time Schedule of Waste Collection

Working Hour	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	1st trip					2nd trip					3rd trip					
1st trip	collection		unloading													
2nd trip		transportation		return		collection		unloading								
3rd trip (overtime)							transportation		return		collection		unloading			
at present	discharge					11.5 hours						collection				
in future	discharge		6.5 hours				collection									
							time saving effect									

Note) It is assumed that garbage is discharged onto the street at the same time when the collecting operation starts

For the ratio of waste charges collection, the value used for 2004 is estimated assuming that URENCO's target is 95% by 2010, with equal annual increments assumed.

3.2 Recommendation and Problems to be Solved

(1) Construction of Transfer Station

In order to improve the SWM system, GOV must proceed with the construction of the Transfer Station. At present, almost all waste collected in the targeted areas is transported directly to the Nam Son final disposal site, located about 50 km away from the city, by compactor trucks. This situation results in poor transportation efficiency. To reduce the SWM operational costs, construction of a Transfer Station needs to be carried out in the early stages of the project.

(2) Introduction of a Direct Collection System

At present, a direct collection system cannot be effectively conducted in URENCO due to the very narrow access roads in the targeted collection areas. The collection vehicles can not access these areas easily. Accordingly, URENCO is carries out the waste collection via a two-step system. Most of the waste generated in the city is collected by handcarts and then transferred to the collection vehicles. However, along the wide main roads and the newly constructed roads in the suburbs, it is possible to increase the efficiency of waste collection by employing direct waste collection. With a direct collection system, a reduction in the waste collection charge can be expected. It is, however, necessary to take

into serious consideration the effect on the livelihoods of the more than 2000 URENCO staff who are employed as handcart waste collectors.

(3) Establishment of a System of Waste Collection Charges

URENCO collects a fee for waste collection from the residents who directly benefit. The collection ratio in 2000 which was estimated at 61.5 %, amounting to VND 9.15 billion, but this amount accounted for only 7% of the total URENCO revenue for that year (approximately VND 130.4 billion). Hanoi City's payment to URENCO, based on the entrustment contract in 2000, was about VND 102.4 billion, which meant that URENCO relied heavily on Hanoi City for its revenue. A reduction in operating costs for SWM is therefore a very important issue for Hanoi City and improvements in the charging system and the rate of fee collection are considered essential.

(4) Waste Separation and the Use of Bins and Plastic Bags

One of the problems caused by litter waste is the odor generated. It affects the environment in the city and can partly be blamed on the inefficient collection system. The existing system allows the residents to put the waste directly on the side of the road, without bins and plastic bags. In order to improve the system, it is necessary to introduce environmental education, both to increase resident's awareness of the issue and to establish appropriate rules for waste disposal. With the utilization of bins and plastic bags designated by URENCO, the present waste collection system can be changed from the two step system to a direct collection system. If the segregation and separate collection of waste is enforced by the Government in the future, the use of designated plastic bags etc. will provide an effective method of proceeding with it's implementation.

(5) Environmental Education

In order to prevent environmental pollution caused by litter waste and the odor it produces, it is necessary to raise the awareness of each resident, and URENCO is required to play the role of a leader in environmental education. Environmental education should concentrate on recycling, reuse, and reduction of waste. Environmental education should be jointly carried out with organizations such as TUPWS, DOSTE, HPC, educational organizations and local groups.

(6) Leachate Treatment Plant

According to the results of the water quality survey of the Nam Son final disposal site conducted by the Basic Design Survey Team, the quality of several samples taken from wells and rivers are above standard. At the moment, the leachate treatment plant constructed by TUPWS in 2001 is out of order and leachate treatment is being conducted using temporary facilities. In addition, the final design of the leachate treatment system as

a permanent facility is not yet completed. The Nam Son landfill site will be used for at least another 10 years and reduction of the environment impact caused by leachate from the site is critical. Preparation of a leachate treatment system that can cope with the increased volumes expected in the future should take place in the early stages of the project.

(7) Establishment of Environment Monitoring at the Nam Son Final Disposal Site

At the Nam Son final disposal site there is a major potential for environmental impact caused by gas and leachate generated by landfilling, and continuous environment monitoring is essential. It is therefore recommended that a water and air quality monitoring program be established, based on the “Environment Guideline of Final Disposal Site” prepared by MOC and MOSTE in January 2001. URENCO should be responsible for the environment monitoring planning and evaluation, and should carry out the environmental monitoring work, using Grant Aid equipment, as an integral part of landfill management. To ensure the efficient conduct of the monitoring program, suitable training of monitoring staff is recommended.