

3.2 Existing Site Description

3.2.1 New Parcel B

The project site is located on the left bank of Wawa River in the upstream section of Marikina River, 16km northeast of Quezon Circle. It is located 4 to 5 km northwest of the existing San Mateo Landfill site (Parcel A). The land is government owned, but is located within Sitio Enigan, which consists of 75 households.

The majority of New parcel B is located within the area restricted to development in the Marikina watershed, so called NIPAS. With the cooperation of the Study Team, MMDA prepared the request for the exclusion of New Parcel B from development restrictions for the final disposal site, and started proceedings to acquire the approval of DENR and the Presidential Taskforce.

3.2.2 Natural Conditions of the Project Site

The project site has an undulating relief generally covered with bushes and grass. Few small creeks are found traversing the site all the way to the river. The test pit investigations showed that surface soils consist mainly of clayey silt (MH and ML) in the uppermost one (1) meter depth, with medium to low plasticity. Laboratory permeability tests of the clayey silt detected a permeability coefficient ranging from 1.326×10^{-5} cm/s to 4.068×10^{-5} cm/s. Such permeability coefficient value is categorized as impervious, indicating the existence of a natural impermeable barrier against seepage of leachate.

The proposed site is characterized by steep rolling hills. This topographic character prevents normal utilization of the area for economic purposes. The types of plants identified were mostly common species and part of secondary growth vegetation. No major rivers or surface water bodies are found within the project site. Available secondary information indicated that there are no threatened, endangered or rare species of animals identified in the project sites.

3.2.3 Socio-Economic Conditions

The project site is located specifically in Barangay San Rafael, whose population comprises 15% of the total population of the Municipality Rodriguez, which had a population 12,285 in 1995.

Bgy. San Rafael is one of the most densely populated areas in the municipality of Rodriguez at 1,024 persons per sq. km. The population of San Rafael is distributed among 2,660 households resulting in an average of 4.6 members per household. All the households in Sitio Enigan own their houses while 94% do so in Bgy. San Rafael. However none in Sitio Enigan and only 8% in Bgy San Rafael own their home lot. Instead they are free occupants because the land is owned by the government.

In Sitio Enigan, agriculture, hunting and forestry are the main employers having 49% of the labor force. Services are the next biggest employer with 29%. The rest are employed in construction and trade.

3.3 Preliminary Design

3.3.1 Design Conditions

(1) Landfill Site Development

The disposal volume forecast for landfill design in 2009 is 21 million m³, assuming an apparent specific gravity of the incoming waste and compacted waste at 0.4ton/m³ and 0.8 ton/m³ respectively. The required volume of the covering soil is assumed at 15% of the disposal waste volume.

The project area is estimated at 130.2 ha, consisting of three valleys with a height difference of 180 m. The design of the landfill site is based on a phased landfilling method that will require construction of three dikes at the bottom of each valley to reduce the discharge of leachate. Furthermore measures will be taken to reduce storm water inflow from the surrounding areas. Perforated pipes will be placed along the present creeks to collect groundwater and to prevent its intrusion into the landfill layers.

The design leachate treatment capacity is decided based on the rainfall data taken over the last 20 years. The design capacity of the leachate treatment facilities is set at 1,400 m³/day, under a condition of maximum use of active landfill area. The design quality of influent leachate is chosen considering the lowest values obtained by JICA study and EMB. The design effluent quality shall be set to strictly satisfy the standard value established in the Philippines.

The leachate treatment plan includes a circulation system in which the collected leachate circulates between the landfill waste and the anaerobic lagoons in the dry season. In addition, sand filtration and active carbon treatment systems shall be installed for the final phase of leachate treatment to obtain a better effluent quality. The proposed treatment method is shown in Figure 2.5 below.

(2) Access Road

The main design criteria for the access road are summarized below:

- a) Average Daily Traffic : 1,000 to 2,000 vehicles
- b) Design speed : 40 km/hr
- c) Minimum radius : 50 m
- d) Maximum grade : 8.0 %
- e) Pavement width : 7.0 m
- f) Shoulder width : 1.0 m
- g) Superelevation : 10 %

The road should be an all-weather structure, strong enough to resist erosion.

(3) Operation

The following are the basic conditions for operation and periodic maintenance of the landfill site:

- Waste receiving and land filling will be undertaken for 6 years.
- Waste receiving and land filling will be done 24 hours, 7 days a week.
- Two sets of vehicles for landfill use will be provided, each working 8- hour shift.
- Soil covering work will be done for 8 hours during the daytime, 7 days a week.
- Soil needed for covering will be obtained at the site, and the excavation work will be done for 8 hours during the daytime, 7 days a week.
- Monitoring will be conducted by private inspection bodies.
- Monitoring will be continued for 15 years after closing the landfill site. Inspections needed for every item of the environmental management procedure will be implemented at the same point once a month.

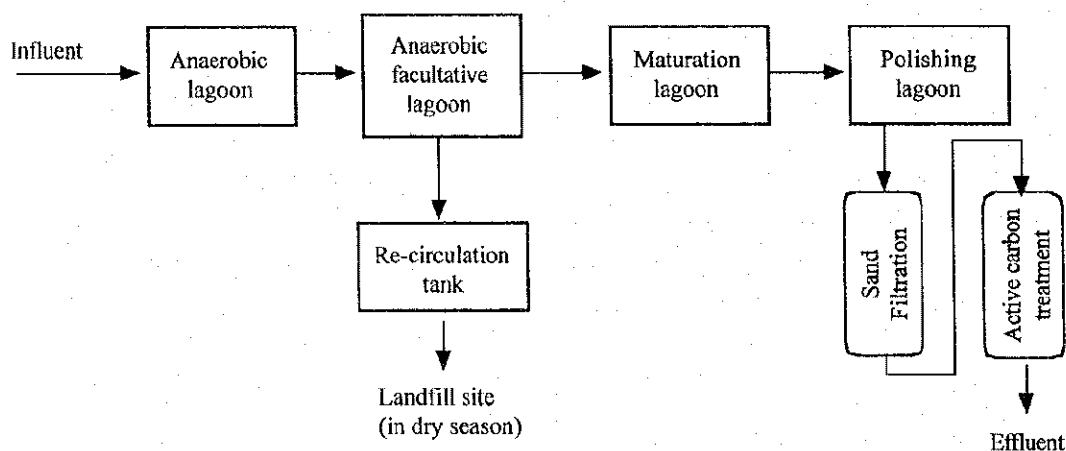


Figure 2.5 Leachate Treatment Method

3.3.2 Preliminary Design

(1) Landfill Site Development

The final disposal site should have functions such as storage, seepage control, leachate treatment. To secure the functions, the following facilities are planned.

- Storage: Main dike, dividing dike
- Seepage control: Clay Liner
- Treatment: Leachate treatment plant

Daily soil covering and movable fence are considered to control waste scattering and odor.

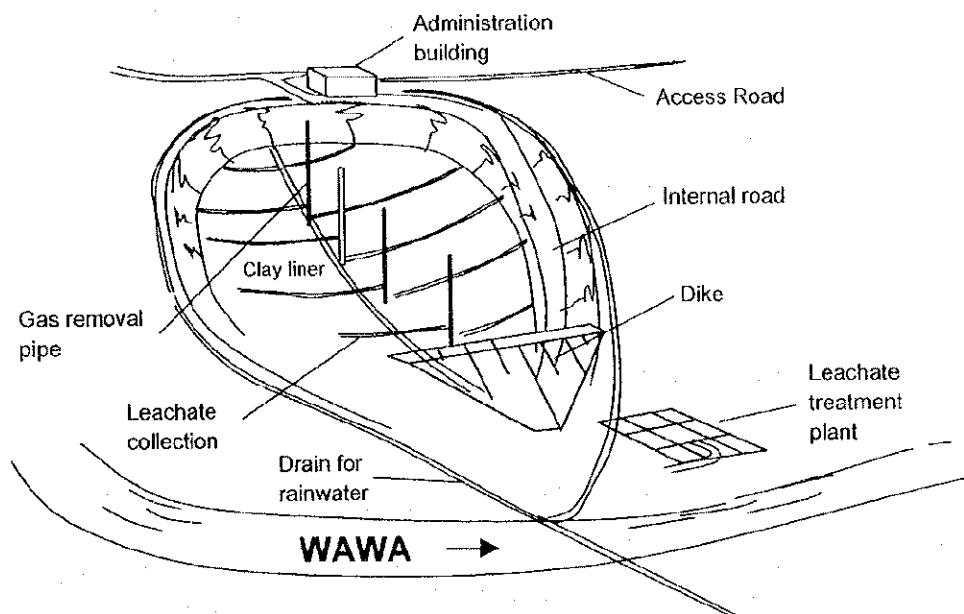


Figure 2.6 Design Concept of New Sanitary Landfill

Since the permeability of the top soil in the project site is from 1.461×10^{-5} to 2.814×10^{-5} , which is small enough to cut the seepage of leachate, a clay liner is proposed for seepage control of the leachate generated in the disposed waste. A perforated pipe will be installed on the clay liner to collect the leachate generated in the disposed waste. It will also serve to collect landfill gas.

Leachate treatment facilities are planned to improve the quality of raw leachate to the effluent quality stipulated in the standard.

The buildings for administration are planned in the administrative area consisting of office, weigh house, store house, repair shop, tire washing/wash spray.

Monitoring wells will be constructed at the down stream side of the main dike to monitor the seepage of leachate by analyzing the groundwater quality.

(2) Access road

About 300m to 500m width of road corridor was identified by the basic alignment study conducted on the 1:10,000 topographic maps. Aerial topographic mapping with 1:2,000 scale was done for this corridor.

The preliminary design of the access road was conducted using these aerial maps. A typical cross section is given in Figure 2.7.

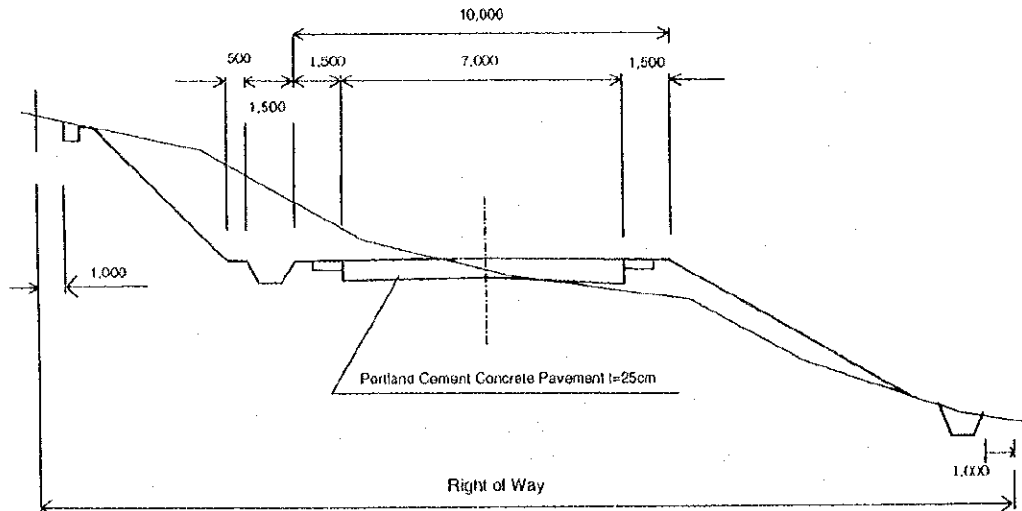


Figure 2.7 Typical Cross Section

The distance between the administration gate of the project site and existing San Mateo SLF is 6.9km, and between the site and the northeast end of the town Rodriguez is 8.4km. The pavement structure is adopted considering the heavy traffic. Standardized bridges with spans of 20m and 40m are considered for crossing the creek. Concrete pre-stressed piles are considered for the foundation of the bridge. Pre-stressed concrete I beam is adopted for the superstructure.

3.3.3 Summary of Project Cost

The total investment and O&M cost is displayed below. After completion of the landfill operation, leachate will be generated for a long time. Therefore, it is assumed that the leachate treatment plant will be operated until 2015 and that monitoring will be done until the end of 2030.

1	CONSTRUCTION	(million Peso)
1-1	Construction of New Parcel B	3,190
1-2	Construction of Access Road	1,096
	Sub Total (1)	4,286
2	OPERATION & MAINTENANCE	
2-1	Periodical Facilities Construction	1,293
2-2	Operation & Maintenance	1,284
2-3	Leachate Treatment	133
2-4	Monitoring	112
	Sub Total (2)	2,822
	Grand Total	7,108

3.4 Implementation Plan

3.4.1 Implementation Schedule

The implementation schedule of the Project is presented in Figure 2.8.

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Institutional Establishment											
Reinforcement of Performance of LGU											
Reinforcement of Performance of MMDA											
Establishment of Waste Recording System											
Establishment of Tipping Fee Collection System											
Development of the New Parcel B SLF Site and Construction of Access Road											
Proclamation for the New Parcel B	■										
Environmental Impact Statement	■										
Land Acquisition		■	■	■	■						
Detailed Design and Tender Document		■	■	■	■						
Construction				■	■	■	■	■	■	■	■
Landfill Operation											
Improvement of the Contract System				■	■	■	■				
Establishment of the Monitoring System				■	■	■	■				
Operation and Maintenance						■	■	■	■	■	■

Figure 2.8 Implementation Schedule

3.4.2 Institutional Arrangement

Considering the background of the target project, the study team recommends to establish a joint implementing body between DPWH and MMDA. Combining the experiences of these two agencies, a joint implementing body will function better rather than if either of them alone undertakes this project.

The basic demarcation recommended is as follows:

- 1) Land acquisition and protection should be undertaken by MMDA alone;

- 2) Compensation scheme should be undertaken mainly by MMDA in the presence of LGUs in NCR; and
- 3) Each process from ECC clearance to construction should be undertaken jointly by MMDA and DPWH.

The ECC (Environmental Compliance Certificate) is an indispensable milestone of the project. ECC is issued by evaluating EIS (Environmental Impact Statement) and designated attachments. The preparation of EIS is the responsibility of the project proponent, MMDA and partly DPWH.

3.4.3 Establishment of Tipping Fee Collection System

A tipping fee is proposed as additional fund source for the sound operation of the sanitary landfill. As for the implementing body of fee collection, the LGU is considered to be the suitable agency because of its close contact with residents in the conduct of its SWM activities. The designation of containers or bags is recommendable to the LGUs in NCR.

3.4.4 Compensation Scheme to Local Community

Neighboring communities to the project site are more or less affected by the construction and operation of a sanitary landfill regardless of its design to mitigate negative effects. Relevant municipalities are Antipolo, San Mateo and Montalban in Rizal Province. Immediate neighbors in the said municipalities are all initially illegal residents in the state-owned land, but they have the same right to claim the compensation for inconvenience caused by a public facility as legitimate residents according to the Philippine legal system. In cognizance of this, an "improvement compensation package" is recommended, which intends to mitigate uneven share of benefit and burden derived from collective solid waste dumping in a specific location.

To establish the "improvement compensation package", a "community relations ad hoc committee" should be set up by the attendance of MMDA representatives, LGU officials and community leaders belonging to the affected municipalities. The discussion in the tripod committee shall lead to a "package compensation deal" which shall be incorporated in New Parcel B Sanitary Landfill project and accordingly budgeted.

3.5 Project Evaluation

The development of the New Parcel B SLF site has been evaluated from the technological, social, environmental, economic and financial viewpoints. The overall evaluation concludes that the development of the New parcel B SLF site and the construction of the access road should be implemented as early as possible to prevent a garbage crisis in 2003. It is said that the reasons why current environmental problems prevail is the inadequate construction of previous landfill sites. Taking this matter into account, the detailed design, construction and operation should be in accordance with international standards.

4. ENVIRONMENTAL SURVEYS FOR NEW SANITARY LANDFILL DEVELOPMENT PROJECT

4.1 Background

In accordance with Philippine regulations, MMDA should prepare and provide an Environmental Impact Statement (EIS) as the proponent of the project. This environmental survey is presented by the Study Team as the basic data for the EIS, which MMDA may use to prepare an EIS.

4.2 Scoping Session

To promote and acquire social acceptance of the project, a series of scoping sessions were held. The first level scoping session was held October 20, 1998, at the office of PTFWM in DENR. Representatives of EIA-RC, EIA-EMB, MMDA, and JICA, and some local consultants attended the session. Important issues raised during the session were as follows:

- MMDA, JICA and the EIA Study Team should coordinate with the Barangay Captain of San Rafael, Rodriguez (formerly Montalban), Rizal.
- The scope of work, such as survey items and survey points, was checked.
- It was suggested to the proponent to make an early start on drawing up plans and strategies on the social acceptability aspect.

The second level scoping session (on-site scoping session) was held on November 13, 1998, at the Rodriguez Ancestral Home, Rizal Province. Participants from the local community came from the mayor's office, the *Sangguniang Bayan*, and non-government organizations. EIA-RC, EIA-EMB, PTFWM-EMB, MMDA, JICA were adequately represented. Important issues raised during the open forum included the implementation of the project in a protected area under NIPAS, problems at existing San Mateo SLF and how these can be prevented in the proposed project, benefits to the host community, and environmental concerns on water, air, noise, and odor.

4.3 Methodology of Survey

The methodology of the environmental survey for an EIS, which was requested at the first level scoping session, is shown in Table 2.3.

Table 2.3 Survey Items, Sampling Points, Sampling Times

Survey Item	Sampling Point	Sampling Time	
Socio-economy	Population, Household, Employment, Income, Land & Resource Use, Health Condition, Education, etc.	Study area & its surroundings	1 time
Ecology	Vegetation, Wildlife	Study area & its surroundings	1 time
Air Quality	SO _x , NO _x , CO, TSP Climate (Wind Direction, Wind Velocity, Temperature, Humidity)	1 point (surrounding area)	1 time (3 days continuously)
Water Quality	pH, BOD, SS, DO, E-coli, inventory of wells/ springs (groundwater resources)/ surface water bodies	4 points (upstream: 2, downstream: 2, vicinity area)	1 time
Soil	Heavy metals (Pb, Hg, As, Cd)	4 points	1 time
Odor	Odor Concentration, H ₂ S, Methane	2 points (surrounding area: 1, nearest residence: 1)	1 time
Noise/ Vibration	Noise/ Vibration Level by Transportation, Background Noise/ Vibration Level, Traffic Volume by Type	6 points (for road transportation: 2, for background level: 2, for traffic volume: 2)	1 times (24 hours continuously)

(1) The Atmosphere

Atmospheric conditions were surveyed with regard to:

- Meteorological Conditions
- Rainfall
- Temperature
- Relative Humidity
- Cloud Cover
- Prevailing Winds
- Tropical Cyclone
- Air Quality Survey

(2) Terrain

The terrain survey items covered:

- Physiography
- Regional Geology
- Structural Geology
- Local Geology
- Summary Result of the Subsurface Investigation
- Chemical Characteristics of the Soil

(3) Hydrology

Hydrological conditions were investigated with regard to:

- Groundwater Source

- Quality of Groundwater
- Groundwater Pollution Susceptibility
- Surface Water Source

(4) *Vegetation*

The vegetative surveys covered:

- Ecology and Vegetation of the Proposed Sanitary Landfill Project
- Endangered/Threatened/Rare Species

(5) *Vibration Investigation, Traffic Count and Noise Survey*

The noise and vibration investigation covered both dry and wet season investigations

(6) *Socio-Economic Aspects*

The socio-economic conditions were investigated with regard to:

- Demography
- Housing Characteristics
- Toilet and Water Facilities
- Social Services
- Employment and Income

(7) *Perception of the Project*

In order to identify the public perception for/against the project, two techniques were applied. The one is a questionnaire survey which was carried out for 30 respondents in Sitio Enigan, 20 in Barangay Pintong Bocaue (San Mateo) and 90 in Barangay San Rafael. The other is to analyze the opinions and ideas presented by the participants who attended the scoping session at the municipal hall of Rodriguez.

The results of the surveys are summarized in Table 2.4.

Table 2.4 Perceptions of Respondents in Affected Communities on Problems and Impacts of the Proposed Landfill Project

Item	Sitio Enigan	Barangay San Rafael
Perceived Community Problems	(%)	(%)
Absence of/ poor roads	11	50
No electric service	14	12
No running water	5	2
Lack of work opportunities	-	17
Pollution from San Mateo Landfill	52	11
Pollution from Foremost Farm	18	-
Impacts of quarrying operation	-	8
Total	100	100
Percentage of respondents for perceived positive impacts:		
None	100	100
Percentage of respondents for perceived negative impacts:		
Pollution of air, water and foul odor	54	65
Spread of diseases	46	35
Total	100	100
Percentage of respondents for measures to be taken:		
Transfer the proposed land fill site	88	89
Repair /expand existing landfill	-	6
Emplace a good landfill system	8	5
Constant consultation	4	-
Total	100	100

Source: The JICA Study Team

PART 3 - PILOT PROJECTS



1. INTRODUCTION

Among the priority projects identified by the Study Team in the Master Plan, the following three pilot projects were selected by the Metro Manila Council for urgent implementation:

- 1) Improvement of Collection System
- 2) Community-based Recycling and Public Relations
- 3) Environmental Education

The result from these pilot projects are presented in the following sections.

2. IMPROVEMENT OF COLLECTION SYSTEM

2.1 Objectives

The main objective of this study was to identify a suitable method for waste collection in areas with low waste collection coverage, and establish a suitable mechanism for operational sustainability. The results are intended to serve as models for similar areas in Metro Manila, and thus contribute to reaching the Master Plan targets of 80% collection coverage in 2005 and 90% in 2010.

2.2 Project Areas

The three project areas were selected from LGUs with a collection rate lower than 65% and/or other problems with waste collection. The three selected areas are Barangay 182 in Manila, Kalayaan in Quezon and Bayan-bayanan in Malabon.

2.3 Implementation

The project has been carried out in four stages described below:

(1) *Preparation and Planning Stage*

The preparations comprised selection of projects areas, focused group discussions with residents in the area and preparation of an action plan.

(2) *Implementation and Verification Stage*

The project commenced with a area clean-up activity to increase the residents participation. Monitoring and inspection was carried out during the implementation.

(3) *Modification and Systematization Stage*

Based on observations during the implementation stage, countermeasures to improve the system were identified. Finally an implementation manual was prepared

(4) *Extension Stage*

Based on the manual, the LGUs can plan and implement an extension of the system.

2.4 Findings

The pilot project revealed that the proposed primary collection system with pushcarts is an effective system especially in inaccessible areas. Some issues to consider in extending the system to other areas are summarized below.

- An appropriate location and design of the communal collection storage must be selected.
- Support and participation by both the residents and the barangay/LGU must be reached.
- An appropriate financing mechanism, including establishment of a collection fee, must be identified.
- A suitable integration of the primary waste collection and waste transport systems must be established.

3. COMMUNITY-BASED RECYCLING

3.1 Objectives

The objectives of this pilot project was:

- to study typical waste management practices at generation source, i.e. the households,
- to identify ways of public participation on solid waste management at the community level,
- to improve residents' understanding and responsibility for waste-related matters and environmental issues, and
- to improve the master plan considering the results of the pilot project.
- to provide a model for community participation in solid waste management and recycling.

3.2 Project Areas

Out of six candidate areas two were selected. The criteria for selection included level of interest in recycling activities, presence of strong leaders, willingness to contribute time to the project and work towards its sustainability. The two selected sites were Soldier's Village, Barangay Sta. Lucia, Pasig, and Barangay 193, Pildera II, NAIA, Pasay.

3.3 Implementation

After planning by the Study Team and MMDA, the project was implemented in cooperation by the Study Team, MMDA and the community.

(1) Soldier's Village

The recycling system practiced in Soldier's Village promotes segregation of waste at source, group collection with a recycling center as the repository for waste. The efforts to establish a recycling program involved meetings with residents and community leaders, organization of a core group and construction of a recycling center.

(2) Barangay 193

The concept for recycling adopted in Barangay 193 involved installation of recycling stations, with three sacks for recyclable waste, at selected streets. The efforts to establish a recycling program involved meetings with residents and community leaders, organization of a core group, provision of equipment and conducting a workshop.

3.4 Findings

(1) Soldier's Village

Findings from the activities at Soldier's Village are summarized below.

- Households do not segregate their waste according to instructions, and additional recycling in the Recycling center is often necessary.
- Not all recycled material will be bought by the junkshops, and furthermore their priorities change from time to time.
- Participation in the recycling activities is high, but some households continue to sell their recyclables directly to junk buyers

(2) Barangay 193

Findings from the activities at Barangay 193 are summarized below.

- Recycling stations were occasionally used as garbage bins and in some cases also stolen.
- Proper maintenance of the recycling stations is required to ensure a long life length.
- Strong leadership is necessary to increase and maintain the residents' commitment to the project.

4. ENVIRONMENTAL EDUCATION

4.1 Objectives

The objectives of this pilot project is:

- to promote the importance of teaching the public, especially the young, on proper solid waste management for a safe and healthy living environment, and
- to make students realize their responsibility for keeping the environment from further degradation.

4.2 Implementation

The pilot project was implemented in the form of an educational tour for 45 students and 11 teachers from 17 high schools in Metro Manila. The one day tour included visits at the Payatas open dump site and the San Mateo Sanitary Landfill. On the way to the sites lectures about solid waste management was given. The students were also requested to answer a pre-tour questionnaire and a post tour questionnaire. To reach a wider audience an audio-visual presentation of the tour was prepared in VHS format.

4.3 Findings

The results from the questionnaires indicated that the tour had enlightened the students on solid waste management matters in general, and the conditions in Metro Manila in particular. The visits at the dumpsite offered a close contact with waste dumping and contributed to a better understanding of waste management related problems.



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