

6.2 Recommendations

a. Technical system

aa. Obtainment of basic data and its utilization

- Basic data on the waste stream diagrams and composition of waste were obtained from the Study. It is, however, essential to execute a periodical waste amount and composition survey (WACS) and to compile basic data on daily and seasonal fluctuation of wastes in order to prepare future reviewal of the proposed Master Plan.
- An operation program was developed for the truck scale installed at the Cateura landfill in order to analyze the actual status of collection and final disposal. It is very important to acquire and analyze data on them to accomplish a more efficient collection system and a more desirable final disposal system. The experiences to be gained from the truck scale shall be effectively utilized throughout the country.

ab. Collection

- The collection service by means of curb collection with waste stands shall be extended, or commenced in some municipalities to maintain a beautiful and clean environment.
- As for collection from large producers of waste in HUM, i.e. markets, hospitals, etc., a container (about 1.0 m³) collection system by compactor trucks shall be introduced.
- For the extension and commencement of collection service, collection vehicles and equipment shall be acquired and installation of the waste stand shall be promoted especially in the residential area for the improvement of collection efficiency and maintaining environmental sanitation.

ac. Transfer operation

- Asuncion and F. Mora municipalities, which will dispose of their MSW at the Chaco-i inter-municipal landfill, shall introduce a transfer operation system to reduce waste haulage cost.
- Since the results of the Feasibility Study prove the proposed AML site is

suitable as a transfer station for MSW of the two municipalities, the Paraguayan side is requested to make every effort to acquire the land.

ad. Street Sweeping

- The manual sweeping system is recommended to be continued under the condition of high unemployment and poor roads. The street sweeping service shall be extended or implemented in order to cover the main street in the urban area of each municipality.

ae. Recycling (reduction of wastes and resource recovery)

- For the reduction of waste generation amount and conservation of natural resources, recycling is expected to play a very important role in future MSWM. The municipal governments, therefore, shall make an effort to promote recycling activities in cooperation with the central government.
- Recycling activities by the public sector are not profitable as experienced in neighboring countries. The introduction of a recycling facility shall be carefully examined to avoid financial deadlock and conflict with the present private recycling business including a large number of scavengers.

af. Operation and Maintenance of Equipment

- Upon consideration of financial and technical capabilities of each municipality and transactional aspects, the proposed operation and maintenance system of vehicles and equipment for MSWM are shown below.

Work Items Use of Equipment	Operation	Maintenance & Repair
1. Collection	Each Municipality	Asuncion for their Equipment AMUAM for the other 14 Municipalities
2. Street Sweeping	Each Municipality	Asuncion for their Equipment AMUAM for the other 14 Municipalities
3. Transfer Operation Transfer Station Transfer Vehicles	AMUAM AMUAM	AMUAM AMUAM
4. Final Disposal Chaco-i Unidentified Inter-municipal	AMUAM AMUAM	AMUAM AMUAM

Consequently, we recommend that the AMUAM should establish a new workshop and the Asuncion Municipality should improve and strengthen the present one.

ag. Final disposal

- Since it is very difficult to have a future disposal site in HUM (Asuncion and F. Mora), the immediate construction of the Chaco-i inter-municipal landfill is most desirable.
- The results of the Feasibility Study show the proposed Chaco-i location is suitable as an inter-municipal disposal site of MSW for 6 municipalities including the HUMs. The Paraguayan side is requested to make every effort to acquire the land and to establish regulations through parliament, including restrictions on the use of the surrounding land.
- As for the 9 municipalities whose optimum technical systems for MSWM master plans are "**Inter-municipal disposal at a sanitary landfill(s) 15 km away from their urban center**", they should make an effort to establish an inter-municipal cooperation system and to identify candidates sites for the inter-municipal sanitary landfill as soon as possible.
- The present open and/or controlled tipping landfill operation should be terminated and the sanitary landfill operation shall be applied to the new landfill.

b. Institutional System

ba. Recommendation for each municipality

- The 14 municipalities other than Asuncion shall establish a Department or Section, managed by a selected professional with clear duties, powers and responsibilities over the management of solid wastes in each city.
- Strong emphasis should be made on public participation in MSWM in order to make up the insufficient physical and financial resources of both the service supplier (each municipality) and service user (citizens). Each municipality is, therefore, requested to conduct public awareness programs and school educational campaigns to achieve cooperation. For this purpose, tools prepared by the Study Team, i.e. a video tape and educational pamphlets, shall be efficiently used.

bb. Recommendation for AMUAM

Competence and function of the AMUAM on MSWM in the Metropolitan area shall be developed. It is recommended that the AMUAM shall provide the following services for sound MSWM as the inter-municipal institution of the Metropolitan area.

- provision of the transfer and disposal operation services for the municipalities of the study area;
- provision of the maintenance services for the vehicles and equipments of the 14 municipalities other than Asuncion; and
- establishment of a training program for the officials of all the municipalities in the study area, in collaboration with SENASA, so that it can benefit other Paraguayan municipalities.

Consequently, AMUAM is requested to employ qualified managers and engineers who have a thorough knowledge of MSWM.

bc. Legislation

An appropriate legislation dealing with Solid Waste Management shall be prepared and issued, although the first step required presently is the approval of the Sanitary Code.

bd. Executing bodies

Upon consideration of the very weak financial and technical capabilities of the 14 municipalities other than Asuncion, AMUAM, as shown in Section 1.4 Key Assumptions, shall be the executing body of the First Priority Project and take the responsibility of fund raising, repayment, construction of facilities, procurement of equipment and operation of AML transfer station and inter-municipal landfills, excluding the collection and street sweeping improvement projects in Asuncion. The funds shall be repaid by the rental fee raised from leasing the vehicles for 14 municipalities other than Asuncion and tipping fees of the AML transfer station and inter-municipal landfills.

Although AMUAM is recommended to be the primary executing body for the First Priority Projects, the present capability of AMUAM appears to be insufficient. Therefore, Asuncion Municipality, which has enough experience in MSWM and is the leader of AMUAM, shall strongly support AMUAM for the execution of the

First Priority Project.

be. Financial source

The 14 municipalities other than Asuncion will find it difficult to pay the rental and tipping fees, which recover the whole cost of the First Priority Projects, with the revenues from collection fee. Consequently, the investment cost of the projects by AMUAM shall be subsidized by the Central Government or financed by the donation of both bilateral and multilateral aid agencies. As such, AMUAM, in cooperation with SENASA and 15 municipalities, shall make every effort to acquire such assistance in order to successfully implement the projects.

As for the replacement of equipment and expansion of facilities, the procurement and construction costs shall be covered by the internal reserves of Asuncion (collection fee) and AMUAM (rental and tipping fees).

The cost of MSWM in each municipality shall be recovered through the user fee in principal for establishing self-sustainable MSWM. Since utilities are not in the jurisdiction of municipalities in Paraguay, this situation leaves only user fees and property taxes as possible financial sources for MSWM in the hands of municipalities.

To avoid additional overhead cost and to facilitate bill collection, the user fee for solid wastes may be attached to the yearly property tax billing. In municipalities where user fees cannot be increased to cover the MSWM costs, proceeds from property taxes will have to be resorted to, at least until user charges can be increased or until the population growth permits higher revenues. AMUAM shall subsidize these municipalities with the tax on bus tickets. Regardless of the financing system, two things will be essential. First, accurate cost accounting is needed to establish and maintain a cost-effective operation. Second, the funds collected should be earmarked for capital replacement and operating expenses for MSWM.

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