

# Annex Q

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*San Salvador Municipal Public  
Company of Urban Cleansing*

## Contents

	Page :
<b>Q San Salvador Municipal Public Company of Urban Cleansing (EMAUSS)</b>	<b>Q-1</b>
Q.1 Introduction .....	Q-1
Q.2 Administration and Organization .....	Q-2
Q.2.1 Selection of the Best Administration and Organizational System .....	Q-2
Q.2.2 Proposed New Administration and Organizational System .....	Q-4
Q.2.3 Proposed Organization for Implementing Waste Management .....	Q-4
Q.2.4 Description of Roles and Functions .....	Q-5
Q.3 Management System .....	Q-21
Q.3.1 Revenue Control System .....	Q-21
Q.3.2 Expenditure Control System .....	Q-23
Q.3.3 Private Sector Participation .....	Q-26
Q.3.4 Contract Systems .....	Q-27
Q.3.5 Quality Control System .....	Q-30
Q.3.6 Human Resources Development System .....	Q-32

## List of Tables

	Page:
Table Q-1: Personnel Table .....	Q-20

## List of Figures

	Page:
Figure Q-1: Proposed Administrative Structure for the Municipal Company .....	Q-5
Figure Q-2: Information Flow Diagram of Waste Fee Collection .....	Q-21
Figure Q-3: Expenditure Control System; Information Flow for Making Acquisitions ..	Q-24
Figure Q-4: Expenditure Control System; Information Flow to Hire Personnel .....	Q-24
Figure Q-5: Expenditure Control System; Information Flow to Control and Supervise Contracts .....	Q-24
Figure Q-6: Quality Control, Monitoring and Supervision System .....	Q-31

## **Q San Salvador Municipal Public Company of Urban Cleansing (EMAUSS)**

### **Q.1 Introduction**

#### **a. Importance of an Institutional System in SWM**

Solid waste management (SWM) stems from a community need; the city's external outlook often leaves a firm impression on both residents and visitors. It differs from other public services because it is an absolute necessity, which must be provided even if the customers make no financial contributions to support it. The service can not be withdrawn or suspended even if beneficiaries do not pay, and as a result the community either benefits or is affected negatively in terms of the attitude or degree of participation from the residents.

Resident participation is only possible when the community becomes aware of the importance of living in a clean and healthy conditions that will protect their health and the environment. Success will depend on the establishment of a well planned collection service with a broad coverage; frequencies and schedules followed with punctuality, and cleanliness of public areas should be maintained with the assistance of the general public. Programs for waste reduction, reuse, and recycling should be implemented and MSW final disposal should be done only at a sanitary landfill where the environment – such as the surrounding water quality, air quality, and soil quality – is sufficiently protected.

These activities will function smoothly through a modern institutional framework. It will also enable an efficient administration that will lead to the development of a sustainable SWM system.

#### **b. Identification of the Existing Institutional Problems**

The rapid urban expansion of San Salvador city and gross regional product growth rate will increase the amount of municipal solid waste (MSW) generated over the coming years. Further services demands due to the considerable waste generation will require a new structure of administration and organization that should respond effectively and efficiently to public need.

The organizational model selected should minimize current limitations that prevent the provision of good MSW services in San Salvador. The existing problems observed are listed below.

- a) The institution's low hierarchy level within the municipal structure.
- b) Weak organizational structure.
- c) Limited decision-making capacity.
- d) Slow administrative procedures.
- e) Human resources in SWM lack motivation.
- f) Considerable number of customers are not realizing their payment.
- g) Fees and tariffs do not correspond to the services provided.
- h) No reliable accounting records to register revenue and expenditure.
- i) The real service cost is unknown.
- j) Collection and cleansing routes that are unevenly balanced.

- k) Insufficient coverage.
- l) There is neither punctuality nor order with respect to collection frequencies and schedules.
- m) The Mariona dumpsite deteriorates the environment and jeopardizes public health.
- n) Machinery and equipment are damaged due to lack of adequate maintenance and low performance due to delays in the supply of spare parts.
- o) There are neither objectives nor goals of service unplanning and development.
- p) There is a lack of control and supervision on the contract works (MIDES).

**c. Key Issues to Improve SWM**

It is necessary to realize substantial change in the organizational system to meet the demands in SWM and to reach the M/P goal in the future. With this in mind, the following should be achieved.

- a) The administrative and organizational system should be strengthened.
- b) The administrative capacity should be improved for technical, commercial, and financial planning; service costs, service quality, and human resources should also be controlled thoroughly.
- c) All customers and service recipients should be identified and located so that the service can be continuously improved through their active participation.
- d) Participation of private activities should be encouraged.

## **Q.2 Administration and Organization**

### **Q.2.1 Selection of the Best Administration and Organizational System**

The common types of institutional systems adopted in Latin America are discussed for the case of San Salvador municipality.

The following are institutional models adopted in Latin America.

- a) Direct municipal management
- b) Autonomous institution

**a. Direct Municipal Management**

This operation lies directly on the municipality that provides its own personnel, vehicle, and equipment. Depending on the city size, the organization in charge of MSW can be under a manager, a department, or included in the structure for health, public works, urban development, or public services. Generally, with respect to the allocation of political and financial resources, SWM is given a lower priority within the municipality's hierarchy compared with other sectors.

The legal framework and administrative procedures reduce efficiency and effectiveness with respect to: acquisition of equipment, spare parts, and tools; personnel mobilization, salary allocation; and coordination with legal advisers, promotion sectors, public communication, and audit counseling, etc.

Solid waste collection services, often given a lower hierarchic level within the municipality, are always vulnerable to political interference in appointment of personnel and acquisition of machinery, equipment, and services. It is difficult to implement modern management techniques and problems often increase when the rate of coverage is also incremented. With this type of model, and in the case of AMSS, private companies are participating in vehicle supply, final disposal in Nejapa, and partially having options of collection works. The central budget finances the services, tariffs linked to the land price are charged directly to the users and collected through electricity bills.

Taking into account these complicated SWM problems in most major Latin American cities, the direct management system is being replaced by other organizational models in the same way as other public services, such as water supply, sewerage, telecommunications, and electricity.

#### **b. Municipal Public Company**

As the cities grow, the management of infrastructure to cope with MSW services becomes more complex. As some services have already been contracted to the private sector, the possibility to establish other institutional models for SWM is being analyzed to reduce restrictions from procedures and regulations imposed by municipal governments. Several types of institutions, such as foundations, corporations, public organizations, quasi-governmental enterprises, and public companies have been established, with a structure of the private company, although the capital is entirely provided by the government. This type of organization intends to reduce these restrictions by achieving administrative autonomy and financial sustainability through billing the service recipients.

These new entities are becoming a success in Latin America where management decisions are not swayed by political considerations, especially in personnel appointments and fixing the level of fees.

#### **c. Conclusion**

On examining the models currently used in Latin America, option b) "Establishment of a Municipal Company" has been selected as the best administration and organizational system due to the following reasons.

- Rapid urban development is generating a permanent demand for public services, mainly waste collection and cleansing of public areas.
- The city's topography requires adequate planning and application of various engineering techniques to service both the downtown area (with high generation rates and narrow streets) and marginal areas where access by collection vehicles is difficult.
- The quality and functioning of public services mainly depend on customers' fees and tariffs that are cross-subsidized; they depend upon the payment capacity, quantity of MSW produced and its sources. In general, the residents are willing to pay a fair and an appropriate amount of fees if services improve.
- In order to efficiently administer the services, a mechanism that can enable technical and financial planning in the medium term and the long term is required. In addition, the mechanism will also facilitate both rapid and precise decisions to be made on a daily basis. With the current

restrictions posed by the legalities and the institutional framework it is almost impossible to have an acceptable performance level.

- The long list of problems that have been mentioned previously confirm that it is necessary to introduce drastic organizational reforms.

### **Q.2.2 Proposed New Administration and Organizational System**

The proposed municipal public company will be entirely administratively and financially autonomous, and will have the purpose of achieving an integrated municipal solid waste management in the Municipality of San Salvador.

The objectives of this entity will be:

- To halt and reverse environmental deterioration caused by the provision of waste services.
- To rehabilitate, to renew, and to expand the infrastructure and coverage.
- To guarantee the quality of services with appropriate controls.
- To improve and to simplify contacts with customers.
- To contribute to the recovery of the environment.

The goals projected to be achieved are:

- To beautify the city.
- To reach a coverage rate of 100% with possibility of participation by private sector (PPS).
- To maintain the roads in a clean condition by mechanical and manual street sweeping methods and by placing waste bins along sidewalks.
- To achieve the sanitary landfill operations in Nejapa for the final disposal of MSW to safeguard environmental quality at economic prices.
- To strengthen the administrative, commercial, technical, and financial structure that ensures high quality and sustainability of this service.
- To develop a highly qualified human resource that is motivated and loyal.
- To promote public participation in all the institutional activities.

### **Q.2.3 Proposed Organization for Implementing Waste Management**

The administrative structure for the new proposed municipal company (EMAUSS) is shown in Figure Q-1. It is very similar to a private company with the same degree of independence and autonomy; all its features are within the judicial framework established by the laws of the Republic of El Salvador for public companies.

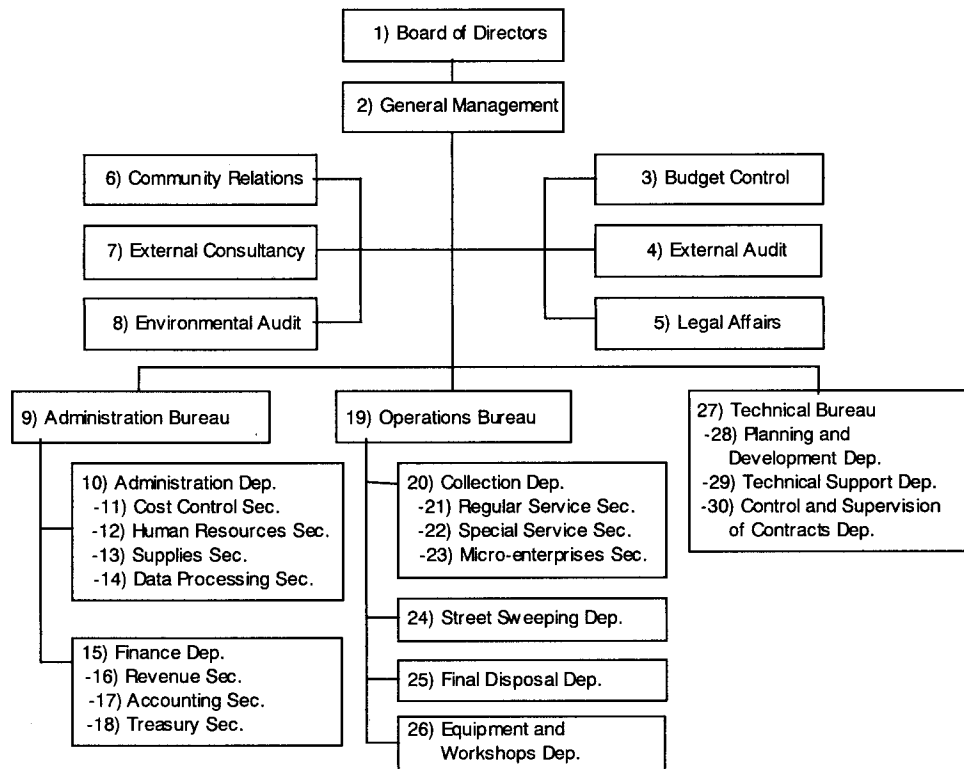


Figure Q-1: Proposed Administrative Structure for the Municipal Company

## Q.2.4 Description of Roles and Functions

### 1) Board of Directors

The board of directors represents the 'Director' within the municipal company and will be formed by the following six members.

- The Mayor of San Salvador who will be the president.
- The Municipal Representative (Sindico Municipal)
- Three council members from San Salvador municipality; they will be appointed by the municipal council.
- One representative from the Chamber of Commerce and Industries of El Salvador.

These members were selected for the proposed Board of Directors so that the municipal council – the competent authority for SWM, and representative of the company's customers, are duly represented.

#### Function:

- Policies
- Supervision

- Approval

**Responsibilities:**

- To establish the policies of the municipal company.
- To approve the annual budget and its results.
- To supervise the administrative, technical, and financial activities.
- To approve the appointment and the dismissal of officials.
- To approve and to supervise contracts with the private sector.
- To approve the level of fees.

**2) General Manager**

The General Manager represents the executive body of the municipal company; it will be headed by a civil engineer or a sanitary engineer with a minimum of five years' experience in solid waste management and business administration. He or she will be the legal representative of the municipal company and will respond to generalities regarding the management of the administrative, technical, and financial activities. If there is no qualified person available, a consultant or an expert having the experience of solid waste management, who assists the general manager to perform the duties, will be employed on a full-time basis.

**Function:**

- Representation
- To command
- To verify

**Responsibilities:**

- To represent the municipal company legally.
- To direct administrative technical and financial activities.
- To control the achievement of institutional goals and objectives.
- To assign functions to Directors
- To enter contracts
- To authorize payment
- To submit issues to the Board of Directors for their approval.
- To watch service quality.

**3) Budget Control**

The role of the Budget Control Division is to enforce, verify, and authorize the public company's budget. A professional with a background in economics and in business administration will be in charge of this area.

**Function:**

- To prepare
- To authorize
- To control

**Responsibilities:**

- To prepare the budget.
- To control the execution of the budget.



- To authorize contracts and expenses.

#### **4) External Audit**

A firm of independent auditors will be hired under contract to satisfy legal and auditing requirements of the public company and to ensure administering and financing practices are satisfactory.

##### **Function:**

- Company auditing and public auditing

##### **Responsibilities:**

- To evaluate and investigate the administrative, economic, and final activities of the municipal company.
- To verify the application of legal norms that govern institutional activities.
- To present an annual auditing report to the Board of Directors.

#### **5) Legal Aspects**

A lawyer with experience in public administration will oversee and supervise all legal aspects of the proposed autonomous municipal company.

##### **Function:**

- To represent
- To defend
- To assist
- To supervise

##### **Responsibilities:**

- To represent and defend the interests of the municipal company.
- To propose necessary legal procedures.
- To legally assist the Board of Directors and the officials.
- To prepare legal documents.

#### **6) Community Relations**

Community Relations are to promote, establish, and maintain public participation and cooperation with the activities of the municipal company. A person with a background in public relations will be in charge of this area. Public participation is vital to sustain the development of SWM services and the municipal company.

In general, it is necessary to instill a sense of pride and self-esteem among residents, especially among those who visit the downtown area and those who live in marginal areas. Little can be achieved by applying the best engineering and administrative practices if the population can not participate and cooperate fully.

##### **Functions:**

- Public Relations
- Promotions
- Formulation and design
- Implementation

- Evaluation

**Responsibilities:**

- Relations with the public and mass media.
- Reception and processing complaints and suggestions from customers.
- Promotion of the institution's image.
- Production and execution of educational campaigns.
- Evaluation of educational activities.

**7) External Consultancy**

In order to strengthen the municipal company and develop its human resources – initially – it is necessary to hire external consultants for a minimum of two years. So far, efforts that have been made to improve services (based on the external assistance in the form of vehicle and equipment) have shown limited success. A large proportion of this is due to lack of an experienced and motivated human resources to closely plan, operate and monitor service activities; human resources must also be able to operate, maintain, and fix damaged equipment that are used for waste collection and street sweeping operations.

Even if collection, sweeping, and final disposal services are expanded by awarding contracts to the private sector, this does not mean that the public sector is exempt from its responsibilities. It is exactly the opposite: It will become even more essential to have professional staff with better training to plan, supervise, and monitor the quality of services provided under contract.

**Function:**

- To consult
- To train

**Responsibilities:**

- To train human resources on service quality.
- To provide consultations on planning, development, operations, monitoring, supervision, and control of contracts.

**8) Environmental Audit**

Public acceptance is closely linked with the efficiency of services operation, it is also linked with the city's environmental quality associated with SWM. Goals and parameters will be fixed in order to constantly monitor the quality of services and the impact of SWM on the environment, and to take mitigation measures.

The auditing office will submit monthly reports to the general manager.

Environmental auditing will be contracted to a firm specializing in this field.

**Function:**

- Control
- Monitoring

**Responsibilities:**

- To control the quality of services.

- To analyze complaints from customers.
- Environmental monitoring:
  - \* Storage
  - \* Collection
  - \* Sweeping
  - \* Haulage
  - \* Final Disposal
- Define the impact on the environment and mitigation measures.

#### 9) Administration Bureau

The Administrative Bureau – divided into the Administration Department and Finance Department – will provide administrative support for the institutional operation. Under the Administration Department, there will be sections responsible for cost control, human resources, supplies, and data processing. Under the Finance Department, there will be a Revenue Section, an Accounting Section, and a Treasury Section. A person with a background in business administration will be in charge of the Administrative Bureau.

#### 10) Administration Department

The Administration Department will gather information related to the operational outcomes and will select, train and supply the necessary human resources. It will also acquire, store, and distribute various supplies. The use of supplies will also be monitored by this section. Institutional activities will be registered, ordered, reported, and filed.

#### 11) Cost Control

This section will request and analyze information of the use of resources, where the resources are spent and its performance will be monitored.

##### Function:

- To register
- To analyze
- To report

##### Responsibilities:

- To request information on how resources are being used.
- To record information.
- To analyze and evaluate the use of resources with respect to expected and real performance.
- To report on findings and propose adjustments.

Indicators on performance and productivity are listed below.

#### (1) Collection (compactors and dump trucks)

1.1	Number of trips/vehicle/day	No./day
1.2	Time elapsed in collection routes	Hours
1.3	Transportation time to the disposal site	Hours
1.4	Time spent on maintenance	Hours

1.5	Distance covered for collection	km
1.6	Distance covered for haulage to the landfill	km
1.7	Average velocity during collection	km/hr
1.8	Average velocity during haulage to the landfill	km/hr.
1.9	Time spent in the sanitary landfill	Hours
1.10	No. of vehicles in operation/day	No./day
1.11	Amount of waste collected by each vehicle in a day	ton/day
1.12	Amount of waste collected each day in a given area	ton/km/day
1.13	Capacity being used/trip	%
1.14	Drivers/vehicle	No.
1.15	Assistants/vehicle	No.
1.16	Workers/vehicle	No.
1.17	Amount of waste collected by each assistant	ton/day
1.18	Useful time/total time	%

**(2) Collection (containers)**

2.1	Number of trips/vehicle/day	No./day
2.2	Time elapsed to replace container	Hours
2.3	Haulage time to the disposal site	Hours
2.4	Time for maintenance	Hours
2.5	Distance covered for haulage	km
2.6	Average velocity for haulage to the site	km/hr
2.7	Time spent in the sanitary landfill	Hours
2.8	No. of vehicles in operation/day	No./day
2.9	Amount of waste collected per vehicle/day	ton/day
2.10	Amount of waste collected per container/day	ton/trip
2.11	Capacity being used/trip	%
2.12	Drivers/vehicle	No.
2.13	Assistants/vehicle	No.
2.14	Workers/vehicle	No.
2.15	Waste amount collected by each assistant in a day	ton/day
2.16	Useful time/total time	%

**(3) Street Sweeping (manual)**

**Sweeping Work**

3.1	Time spent by the workers to get together and go to the site	Hours
3.2	Time elapsed in routes	Hour
3.3	kg/km per route	kg/km
3.4	Useful time/total time	%

**Haulage**

3.5	Number of trips made per vehicle/day	No./day
3.6	Time elapsed in collection routes	Hours
3.7	Transportation time	Hours
3.8	Time for maintenance	Hours

3.9	Distance covered during collection routing	km
3.10	Distance covered during transportation	km
3.11	Average velocity during collection routing	km/hr
3.12	Average velocity during transportation	km/hr
3.13	Time spent in the sanitary landfill	Hours
3.14	No. of vehicles in operation/day	No./day
3.15	Amount of waste collected per vehicle/day	ton/day
3.16	Amount of waste collected per day/district	ton/km/day
3.17	Drivers/vehicle	No.
3.18	Assistants/vehicle	No.
3.19	Useful time/total time	%

#### (4) Sweeping (mechanical)

##### Sweeping Work

4.1	Time to mobilize at the beginning of route	Hours
4.2	Time spent on collection routes	Hours
4.3	Time for maintenance	Hours
4.4	Distance covered in collection routes	km
4.5	Average velocity in collection routes	km/hr
4.6	Sweeping machines operating/day	No.
4.7	Amount of waste collected by each machine in a day	ton/day
4.8	Amount of waste collected each day in a given district	ton/km/day
4.9	Useful time/total time	%

##### Haulage

(same as points 3.5 to 3.19)

#### (5) Sanitary Landfill

5.1	Amount of waste dumped into the landfill/day	ton/day
5.2	Volume of covering material/day	m <sup>3</sup> /day
5.3	m <sup>3</sup> of volume used/week	m <sup>3</sup> /week
5.4	Compacted density	kg/m <sup>3</sup>
5.5	No. of vehicles into the site/day	No. of days
5.6	Number of fast unloading vehicles	No.
5.7	Number of slow unloading vehicles	No.
5.8	Time spent on point 5.6 (fast vehicles)	Hours
5.9	Time spent on point 5.6 (slow vehicles)	Hours
5.10	Equipment cost per day	Colons/day
5.11	Equipment cost for compaction	Colons/ton
5.12	Equipment cost for cover material	Colons/m <sup>3</sup>
5.13	Personnel cost	Colons/day
5.14	Total cost per ton of waste disposed	Colons/ton

#### 12) Human Resources

This area will provide suitable personnel for the municipal company.

**Function:**

- Personnel recruitment
- Selection
- Training
- Task assignment

**Responsibilities:**

- To propose a policy for human resources development.
- To recruit personnel.
- To select and evaluate.
- To constantly train human resources.
- To assign to different areas.
- Labor relationships.

**13) Supplies**

The Supplies Section will be responsible for supplying goods and services on time and appropriately.

**Function:**

- To identify
- To specify
- To request prices and deadlines
- To bid and award
- To contract out
- To store and distribute

**Responsibilities:**

- To prepare the terms of reference (TOR) for bidding.
- To prepare technical specifications.
- To request prices.
- To analyze bids.
- To award contracts.
- To verify quality and conditions.
- To receive and store supplies.
- To distribute and follow up.

**14) Data Processing**

The Data Processing Section will process necessary information and will provide support and assistance to other departments of the municipal company.

**Function:**

- To process
- To produce
- To assist

**Responsibilities:**

- To process institutional information.

- To prepare reports, studies, statistics, etc.
- To provide assistance about data processing to other departments in the municipal company.

#### **15) Finance Department**

Through its sections, it will control and promote activities linked with institutional finances. It will analyze and check the financial situation and will identify, locate, and record the service customers. It will bill and charge the customers for the services provided; it contracts special services. Based on good accounting practices, it will record all cash flow; it protects and safeguard the municipal company's assets (both its own assets and those under its care as bonds); it issues checks. A public accountant will be in charge of this area.

#### **16) Revenue Department**

It will generate institutional income through billing and fee collection based on the services provided to the beneficiaries.

##### **Function:**

- To identify
- To locate
- To bill
- To collect
- To contract out

##### **Responsibilities:**

- To identify and locate household customers.
- To identify, locate, and casually contract out the billing to institutions, commercial enterprises, industries, service industries.
- To bill and to collect waste fees either directly or through a service contract.

#### **17) Accounting**

The Accounting Department will record and analyze the municipal company's income and expenditure, capital assets and liabilities. It should also prepare an annual balance sheet and monthly reports about the situation.

##### **Function:**

- To record
- To analyze
- To inform

##### **Responsibilities:**

- To record all financial and economic movements.
- To keep accounts in order.
- To prepare annual balance sheets and monthly reports about the situation.
- To keep informed sections of Cost Control (use of funds), Revenue (income due to services and arrears of payment), Treasury (fund availability), Budget Control (income and expenditure by item), and

Supplies (funds availability and variation on patrimony).

### **18) Treasury**

To manage and supervise all municipal company's assets, both its own and those provided as a bond or security when services are contracted out to the private sector.

#### **Function:**

- To manage and supervise
- To monitor
- To issue checks
- To receive payments

#### **Responsibilities:**

- To manage institutional funds.
- To issue checks to pay for goods and services.
- To receive payments for services provided.
- To monitor its assets and those provided as bonds.

### **19) Operations Bureau**

The Operations Bureau will be responsible for providing SWM services in an efficient and environmentally acceptable manner. It will direct, coordinate, and control the following aspects of waste management: storage; collection; sweeping; haulage; and final disposal. It will also manage the maintenance of equipment and vehicles. Either a sanitary engineer or a civil engineer who has at least five years' experience in solid waste management will be in charge.

### **20) Collection**

The Collection Department will be responsible for managing the collection of all the city's MSW through regular services provided to: households; institutions; businesses; industries; and service industries (as opposed to sale of goods).

Through direct contracts, it will provide "special services" for large MSW generators and for generators of special waste. It will support primary collection activities, provided by micro-enterprises or community groups, in marginal areas. The department will support these activities by placing, transporting, and cleaning containers.

### **21) Regular Service**

Regular Services will be responsible for services provided to residential areas, businesses, industries, institutions, and service industries on a regular basis. Depending on the frequencies and the schedule already fixed, it should collect waste generated in the Districts of the Municipality.

For these large areas, collection routes will be designed which should be related to waste amount from each area. The reason for this is to maintain a higher efficiency level for vehicles and cost control.

All MSW produced by institutions, businesses, industries and service industries will be collected together with residential MSW, except for waste, due to its quantity, its volume, or its type, which is collected through "special services".



Taking vehicle shortage into account, containers will be used to provide waste services in marginal areas.

**Function:**

- Collection
- Haulage

**Responsibilities:**

- To collect MSW from households, institutions, commercial and industrial plants, and service establishments.
- To strictly follow preset frequencies and schedules.
- To achieve efficiency and productivity targets.
- To maintain a service that is environmentally acceptable.

**22) Special Services**

Special Services will manage MSW not covered by regular collection services due to size, weight, quantity, special handling requirements, type, or quality. Special services will be provided at the request of the customer under a contract.

**Function:**

- To account costs
- To collect
- To haul

**Responsibilities:**

- To analyze and propose handling procedures.
- To analyze and propose service costs.
- To provide storage (if necessary), collection, and haulage services.
- To identify potential customers:
  - \* Large generators (e.g., markets, hotels, restaurants, commercial sites, institutions)
  - \* Non-toxic and non-hazardous special waste (industries, horticulture, bread stores, aviculture, etc.)
  - \* Yard waste from parks and gardens.
  - \* Construction waste

**23) Micro-enterprises**

Micro-enterprises can provide collection services in marginal areas where access to collection vehicles is hindered by the harsh topographical features (steep slopes) and poorly planned city layout. It is usually organized by residents from these areas, as seen through several successful experiences in Latin American countries (Perú, Bolivia, Colombia). This system makes use of cheap unconventional tools and vehicles. In many instances, micro-enterprises provide their services under a concession system, i.e., a fixed fee is collected by the micro-enterprises directly from the customers.

Street sweeping services can also be assigned to micro-enterprises. Recently, street sweeping has been contracted to group of individuals. Micro-enterprises are required to operate as a legal entity so that they can have access to credit.

This section will be in charge of relations and promotion of micro-enterprises that conduct collection and sweeping services. A social promoter should be responsible for this section. The municipal company may provide the necessary containers and haul them to the final disposal site. The municipal company will also be responsible for promotion, planning, and technical assistance.

**Function:**

- To analyze
- To promote
- To organize
- To plan
- To support
- To supervise

**Responsibilities:**

- To evaluate the feasibility of establishing a micro-enterprise in a specific area.
- To promote the establishment of a micro-enterprise and its acceptance.
- To support the organization.
- To plan the services and its operation.
- To provide technical assistance.
- To coordinate the collection services with micro-enterprise.
- To monitor service quality.

**24) Street Sweeping**

Street sweeping services maintain the cleanliness of roads and public areas. This section will direct cleansing and sweeping activities conducted by its own personnel and will supervise those working under a contract. Public waste bins will be maintained clean by efficiently collecting the waste disposed by pedestrians. A technician who has some engineering experience in middle management levels will be in charge of this section.

**Functions:**

- To operate.
- To supervise.
- To provide information.

**Responsibilities:**

- To keep roads and public areas clean.
- To organize task groups and check their performance.
- To monitor the amount of waste swept and collected in an area.
- To monitor the amount of waste collected in public waste bins in an area.
- To supervise the performance and the quality of services provided by private contractors.
- To provide special sweeping and cleansing services after large public

events (e.g., cultural and religious festivals, sports events, political rallies, etc.).

- To coordinate the collection section on frequencies and work schedule.

## **25) Final Disposal**

To ensure that municipal SW disposal at Nejapa sanitary landfill should be carried out in an environmentally acceptable manner through appropriate operation of the service. A civil engineer or a sanitary engineer should be in charge of this.

### **Functions:**

- To control
- To record
- To verify
- To provide information

### **Responsibilities:**

- To ensure that all MSW is disposed of in the landfill, following both the design and the technical specifications.
- To prevent the entry of prohibited substances into the landfill site.
- To record the following information from vehicles that enter the site:
  - \* Date and time when the vehicles enter and leave the site.
  - \* Vehicle plate number and type.
  - \* Origin and type of waste.
  - \* Weight of vehicle (both full and empty)
  - \* Weight of waste
  - \* Area in landfill site where waste was deposited.
  - \* Amount billed for disposal services.
- To record the amount of waste deposited (ton) and cover material used (m<sup>3</sup>) on a daily basis.
- To record the time spent by type of machinery and equipment, personnel and material involved in waste management and excavation, haulage, and placement of cover material each day.
- To record landfill progress (total volume utilized) each week.
- To record rainfall data.
- To estimate the amount of leachate produced, and to record flow rates and pumping times of leachate recycling system.
- To verify efficiency of leachate treatment every three months.
- To record daily the flow, temperature, speed and concentration of methane biogas
- To construct and provide maintenance of physical infrastructure and surrounding vegetation (green buffer zone).
- To prevent unauthorized persons from entering the site.
- To provide information about operation results and costs.

## 26) Equipment and Workshops

This section will provide preventive maintenance programs to ensure a high performance level of equipment and machinery. A mechanical engineer should be in charge of this area.

### a. Efficiency on Collection Equipment Maintenance

$$\frac{\text{Operative.equipment}}{\text{Operative.equipment.} + \text{.Re serve.ma int enance.equipment}} \times 100.(%)$$

### b. Efficiency of Preventive Maintenance

$$\frac{\text{Pr eventive.ma int enance.Cost}}{\text{Pr eventive.ma int enance.cost.} + \text{.Breakdown.repair.cost}} \times 100.(%)$$

#### Functions:

- To maintain
- To repair
- To record

#### Responsibilities:

- To keep a record for each vehicle and machinery; this record should include:
  - \* Vehicle plate number and identification
  - \* Brand of the car, model, type, year
  - \* Motor and chassis numbers
  - \* Engine capacity and fuel consumption in kilometers per gallon of fuel (both loaded and unloaded).
  - \* Tire size and battery type.
  - \* Repairs made, spare parts used, and amount of time mechanics have spent on repairs. Date on which the vehicle went into the workshop and when it left the shop, odometer record.
  - \* Preventive maintenance. Date, type of maintenance, and inputs used. Odometer record.
- Record of minor equipment, tools, inputs used, spare parts purchased, and used. Personnel working hours.

## 27) Technical Bureau

The Technical Bureau will provide technical support to the service operations and will achieve higher coverage and effectiveness. A civil or a sanitary engineer with at least 5 years' experience in SWM will be in charge of this area.

This bureau will plan service developments with a minimum target of 10 years. This target will take into account the following factors: the city's urban development trends; population growth and migration (demographic changes); projected production of MSW and its characteristics (population growth + economic growth - GDP); sanitary landfill size and location; and quantity and type of vehicles and machinery. It will also provide technical support for the various departments in the municipal company.

This bureau will control the quality of services provided both by the municipal company and the private sector, and will operate closely with the External Consultancy.

## **28) Planning and Development**

It will produce the municipal company's technical projects in medium term and long term, and designs its development. The chief engineer of the Technical Bureau will be in charge of this area.

### **Function:**

- To analyze
- To plan
- To design
- To support
- To control and supervise

### **Responsibilities:**

- To participate in the analysis and the decision-making processes of the city's urban development plans (PLAMADUR and METROPLAN 2000).
- To monitor population growth of, new *colonias* and neighborhoods.
- To monitor variations in the production and the characteristics of MSW.
- To plan the expansion of services.
- To produce engineering, architectural, and landscape designs.
- To elaborate operation budgets, cost analysis, technical specifications, and execution of the work schedule.

## **29) Technical Support**

It will provide direct technical support to the service operations, and will have the capacity to assist and temporarily replace those in charge of each operative phase (collection, street sweeping, haulage and final disposal). A civil engineer or a sanitary engineer with at least three years' experience will be in charge of this section.

### **Function:**

- To assist
- To support
- To operate

### **Responsibilities:**

- To provide technical assistance
- To support operation activities

## **30) Control and Supervision of Contracts**

It will verify the effectiveness of services provided based on designs, programs, coverage, specifications, costs, and quality. These controls will be applicable to services provided both by the municipal company and the private sector.

For the control to be effective, it is necessary to design the service operations, performance levels to be achieved, and cost and payments to be made.

### Function:

- To verify
- To control
- To analyze
- To approve or reject
- To authorize

### Responsibilities

- To verify the provision of services.
- To control the quality and performance of services.
- To analyze and confirm the compliance with specifications and terms of the contract.
- To approve the services provided.
- To authorize payments.

The structure proposed to manage the municipal company is designed to be in conformity to service needs. If all the operations are to be provided using its own equipment and personnel, enough human resources and materials should be provided; this will ensure duties are performed smoothly (see Table Q-1). On the other hand, if services all or a part of are to be contracted to private sector there should be a proportional decrease in human resources and materials. In this sense, the Operations Bureau's operational level would be reduced to a minimum which would ensure services to a small sector and be free to counter emergency cases. On the other hand, the Department for Control and Supervision of Contracts would be strengthened.

In the Administration Board, all the sections' activities would be concentrated under the Department of Administration and Finances.

Table Q-1: Personnel Table

Ref. No	Position	Qualification	Number
1)	Board of Directors	Representatives	7
2)	General Management	Civil or Sanitary Engineer (more than 10 years experience)	1
3)	Budget Control	Economist or Business Administrator	1
4)	External Audit	Contracted out	-
5)	Legal Affairs	Lawyer	1
6)	Community Relations	Public Relations Person to answer complains by phone	1 2
7)	External Consultant	Expert on International Cooperation	-
8)	Environmental Audit	Contracted out	-
9)	Administration Bureau	Chief Business Administrator	-
10)	Administration Department	Business Administrator	1
11)	Cost Control Section	Statistician	1*
12)	Human Resources Section	Sociologist	1*
13)	Supplies Section	Supplier	1*
14)	Data Processing Section	Programmer (System Engineer)	1*
15)	Finance Department	Public Accountant	
16)	Revenue Section	Public Accountant	1
17)	Accounting Section	Accountant I	1*
18)	Treasury Section	Accountant II	1*
19)	Operations Bureau	Civil or Sanitary Engineer (5 years	1

Ref. No	Position	Qualification	Number
20)	Collection Department	experience)	
21)	Regular Service Section		
22)	Special Services		
23)	Micro-enterprises Section	Social Promoter (PR Manager)	1
24)	Street Sweeping Department	Engineering Technician	1*
25)	Final Disposal Department	Civil or Sanitary Engineer	1*
26)	Equipment and Workshops Department	Mechanical Engineer	1*
27)	Technical Bureau	Civil or Sanitary Engineer (5 years experience)	1
28)	Planning and Development Department		
29)	Technical Support Department	Civil or Sanitary Engineer (3 years experience)	1 (1)
30)	Control and Supervision of Contracts		

Notes:

- \* Personnel who will not be needed if most of the services are contracted out to the private sector. Their functions will be assigned to the respective director.
- (1) Control and Supervision of contracts would be strengthened with a professional with more experience.

### Q.3 Management System

#### Q.3.1 Revenue Control System

##### a. Functions of Revenue Control

The control of revenue is one of the most important functions to achieve the management of a financially sustainable EMAUSS. The major revenue control functions are as follows.

- Invoice issuance
- Demanding and checking payments
- Listing habitual defaulters
- Maintaining the fee payers' database
- Analyzing the fee collection situations by zones
- Reporting issues from the viewpoint of revenue
- Developing new sources of revenue

##### b. Information Flow

Figure Q-2 shows the information flow of routine work.

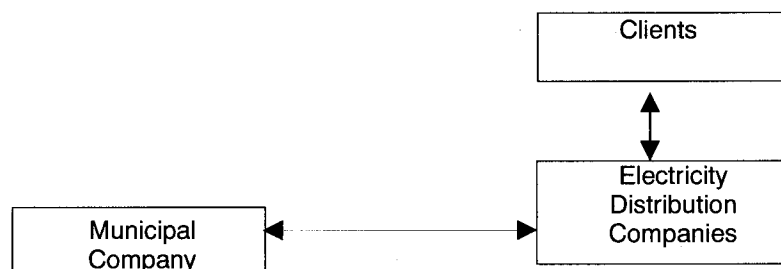


Figure Q-2: Information Flow Diagram of Waste Fee Collection

**c. Database**

In order to control the revenue effectively, an information system based on following database should be developed.

**c.1 Household Customer Database**

- a) Municipal identification code
- b) Identification code in the CAESS/DELSUR database
- c) Name of the head of the house (tariff payer)
- d) Telephone number
- e) Postal code
- f) Address
- g) Income bracket
- h) Records of payment (monthly)
- i) Date
- j) Amount of payment
- k) Records of payment delay

**c.2 ICI Customer Database**

- a) Municipal identification code
- b) Identification code in the CAESS/DELSUR database
- c) Business Name
- d) Telephone number
- e) Postal code
- f) Address
- g) E-mail
- h) Average volume of wastes discharged (m<sup>3</sup>)
- i) Records of payment (monthly)
- j) Date
- k) Amount of payment
- l) Records of payment delay

**c.3 Database of Large Dischargers and Those who Directly Transport**

- a) Identification code
- b) Identification code in the CAESS/DELSUR database
- c) Business Name
- d) Telephone number
- e) Postal code
- f) Address
- g) E-mail
- h) Average volume of wastes discharged
- i) Records of payment (monthly)
- j) Date
- k) Amount of payment
- l) Records of payment delay

**d. Reporting System**

In order to act against non-payment of fees and to improve SWM services, the following reporting system should be established.



### **d.1 Monthly Report of Payment**

- Number of payers
- Amount of payment
- Rate of non-payment
- Comparison charts of the above figures
- Report of payment by zone
- Rate of non-payment by zone
- List of habitual defaulters
- Countermeasures against payment delay

### **d.2 Report of Change of Customers**

- Report from customers
- Report from the company issuing bills under a contract
- Survey report of new customers

## **Q.3.2 Expenditure Control System**

### **a. Functions of Expenditure Control**

In order to have a financially sustainable management system, the overall service costs must correspond to the expected revenue. The Expenditure Control System should therefore consider the following functions:

- A. Prior approval for requests to acquire goods and services.
- B. Control the use of the budget.
- C. To achieve better conditions for acquisition.
- D. To record expenses in an organized manner in order to establish an effective control on costs per activity
- E. To control the quality and certify execution of contracted services; to authorize payments and to impose sanctions.

The following department and sections will be responsible for this system:

- ◆ Budget control
- ◆ Cost control
- ◆ Human resources
- ◆ Supplies
- ◆ Accounting
- ◆ Treasury
- ◆ Control and supervision of contracts

The Operation Department will assess the activities' efficiency by using Performance and Productivity indicators. Success will be measured by the amount of proposed technical goals reached in relation to the expenses spent.

### **b. Information Flow**

The information flows are shown in the following figures: Figure Q-3 "Acquisitions", Figure Q-4 "Hiring Personnel", and Figure Q-5 "Contracts to the Private Sector".

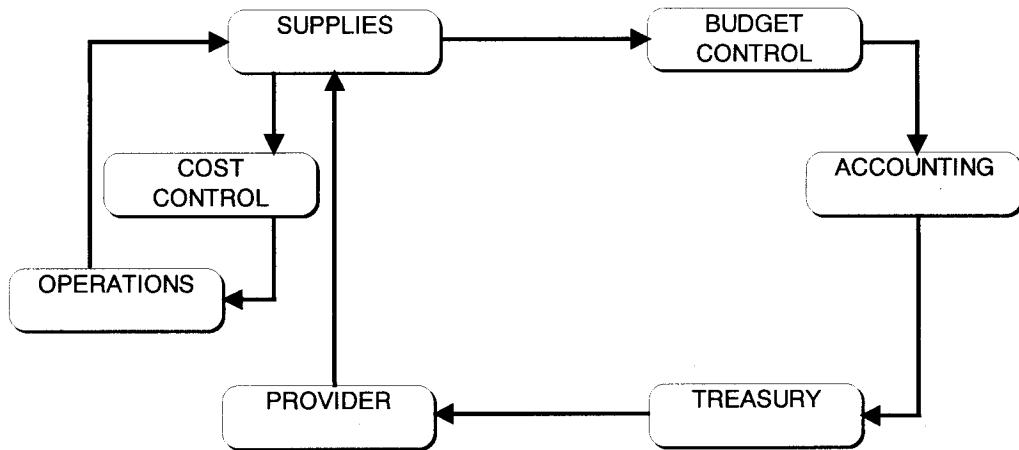


Figure Q-3: Expenditure Control System; Information Flow for Making Acquisitions

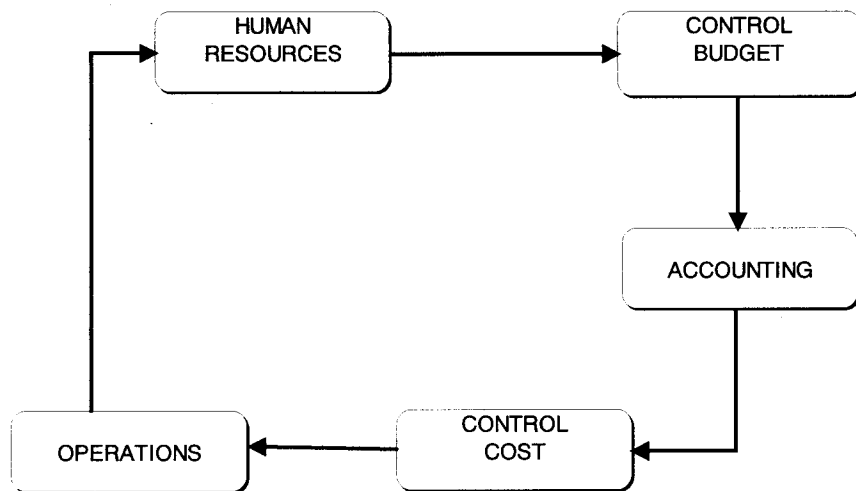


Figure Q-4: Expenditure Control System; Information Flow to Hire Personnel

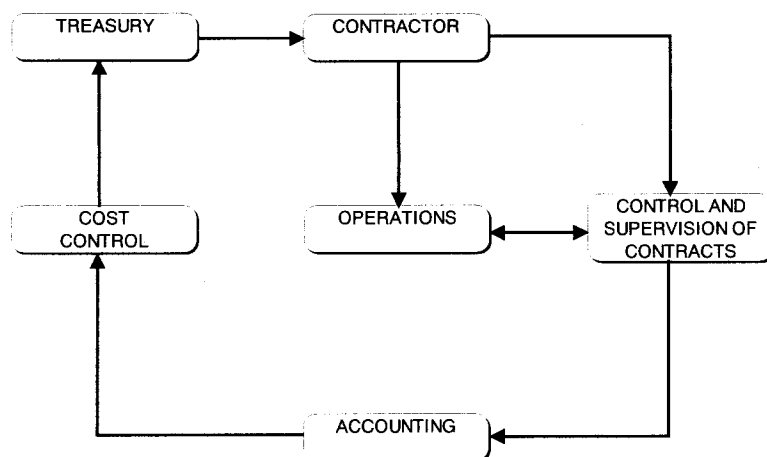


Figure Q-5: Expenditure Control System; Information Flow to Control and Supervise Contracts

### **c. Recording Information**

In order to effectively control expenditure, an information system should be developed which should include the following data base.

#### **c.1 Acquisitions**

##### **c.1.1 Capital Goods**

- a) Brand, model, type, capacity, power
- b) Type of fuel that the equipment or vehicle uses
- c) Useful life
- d) Acquisition cost
- e) Annual depreciation.

##### **c.1.2 Consumable Goods and Materials**

A record will be kept for each Section.

- a) Fuel, lubricants, oil, tires, etc.
- b) Spare parts
- c) Tools
- d) Construction materials
- e) Office stationary
- f) Electricity, water, sewage, telephone

#### **c.2 Personnel**

A record will be kept for each section.

- a) Full name
- b) Place and date of birth
- c) Nationality
- d) Address and telephone
- e) Education
- f) Date the employee started to work at the municipal company
- g) Initial salary and fluctuations
- h) Initial position and variations
- i) Notes about his or her performance
- j) Training

#### **c.3 Services Contracted**

- a) Name of project or service
- b) Type of service
- c) Bidding and approval dates
- d) Signing of contract date
- e) Contract period
- f) Total amount
- g) Partial payments (weekly, monthly, etc. and amount)
- h) Equipment and machinery which the contractor will be using
- i) Contractor's name, position, and responsibilities

#### c.4 Reports

The budget control department will present a brief monthly report containing information on expenditures and compromises acquired. This report will have the following information.

- a) Value of acquisitions.
- b) Total cost of salary for personnel.
- c) Staff turnover.
- d) Payment for services under contract.
- e) Budget balance per item.
- f) Projection of outcome for budget per item.
- g) Weight of MSW collected, swept, transported, and disposed of.
- h) Report about Cost Control.
- i) Report about Environmental Audit.

#### Q.3.3 Private Sector Participation

As defined in the SWM system, four areas could be contracted to the private sector.

- 1) Contract A: Collection and Haulage of Municipal Solid Waste (MSW) in the City's Urban Areas
- 2) Contract B: Collection and Haulage of Municipal Solid Waste in the City's Marginal Areas
- 3) Contract C: Street Sweeping (manual)
- 4) Contract D: Street Sweeping (mechanical)
- 5) Contract E: Final Disposal (Supervision of Nejapa S/L)

##### **Contract A: Collection and Haulage of Municipal Solid Waste (MSW) in the City's Urban Areas**

It includes:

- Household services
- Businesses, industries, services, institutions
- Hospitals
- Special services for large-scale generators
- Haulage of swept MSW

The contractor will provide services with their own vehicle and personnel. Payment will be the lump sum and according to the standard of quality already established. The waste should be discharged at the transfer station.

The municipal company should reserve the right to directly operate at least 25% of serviced areas.

### **Contract B: Collection and Haulage of Municipal Solid Waste for Marginal Areas in the City**

It includes:

- Collection and transport of waste deposited at containers located in marginal areas, where access by collection vehicles is difficult.
- Cleansing and maintenance of containers and cleansing of areas surrounding the container (approximately 30 m<sup>2</sup>/container).
- The contractor will supply its own vehicles, containers, and personnel.

Payment will be made per amount of waste – in metric ton – collected and transported to the transfer station or to the sanitary landfill if trucks with larger capacities are used. Everything should also correspond to the quality standards already set.

### **Contract C: Street Sweeping (manual)**

It includes:

- Manual sweeping in areas pre-established.
- Collection of SW disposed in garbage bin.
- Sweeping of public and recreational areas (green areas, sports fields, etc.).
- Sweeping special services and cleansing for areas hosting a large event (cultural, artistic, sporting, politics, etc.).
- The contractor supplies services with its own personnel, equipment, tools, and materials to the transfer station.

Payment will be made based on the distance of road covered by street sweeping services and in correspondence with quality standards already set.

### **Contract D: Street Sweeping (mechanical)**

It includes:

- Mechanical sweeping in areas pre-established.
- Transport of waste to the transfer station.

Payment will be made based on the distance of road covered by street sweeping services and in correspondence with quality standards already set.

## **Q.3.4 Contract Systems**

### **a. Requirements for the Introduction of the Participation by Private Sector**

Before the private sector can participate in the operation of solid waste services, the following conditions should also be satisfied.

- A collection and haulage system should be designed.
- A street sweeping system should be designed.
- Transfer station.
- Equipment and workshops should be strengthened.
- A system to control revenues should be established.
- A system for monitoring and supervision should be established.

### **a.1 Design for the Collection and Haulage System**

- Urban area
- Marginal area

These designs should include the following:

- An even selection of routes, frequencies, and schedules.
- Define the number and type of vehicles, equipment, and containers.
- Determine the operational costs.
- Training for personnel involved in technical and operational aspects.

### **a.2 Design for the Street Sweeping System**

This design should include:

- Street sweeping routes, frequencies, and schedules.
- Formation of crews.
- Location of sweeping offices (warehouses).
- Definition of operational costs.
- Promotion and establishment of small workers' organization (micro-enterprises) in order to provide the service by themselves.
- Training for micro-entrepreneurs.
- Training for technical personnel.

### **a.3 Equipment and Workshop Strengthening**

It is necessary to integrally reorganize the Preventive and Corrective Maintenance System for equipment and machinery in the Cleansing Office. Currently, there are neither maintenance programs nor indispensable spare parts in stock; acquisitions are made just when the equipment breaks down and then only following a long bureaucratic process (30 to 60 days).

### **a.4 Establishment of a System to Control Revenues**

It is important that enough funds should be provided for municipal company's operation and contracted operation on a timely basis to ensure the success of this service.

### **a.5 Establishment of a System for Monitoring and Supervision**

Permanent control and monitoring on service quality and performance will bring about public support and loyalty to the municipal company.

## **b. Guidelines and Specifications**

In order to create the best conditions for contracts, it is necessary to pre-establish (in a transparent manner) bidding and contracting procedures that will be used. The following should be considered.

### **b.1 Open Competition**

It is the most important factor and consists of cost reduction and introduction of the best technologies and procedures.

## **b.2 Precise Specifications**

Technical specifications and legal requirements will be presented to the bidders in a very precise manner. An opportunity will be given to answer all questions. A draft contract will be attached.

## **b.3 Pre-qualification**

It is advisable to set minimum requirements that bidders should satisfy such as experience in similar works, technical support, and financial capacity.

## **b.4 Scope of Works**

Bidders should know the exact scope of works required and quality and level of service required for the contract. The following should be included where applicable.

- Area to be served
- Type and quantity of MSW to be collected
- Length of streets swept
- Frequencies and schedule
- Minimum characteristics of equipment to be used
- Level and quality of expected service
- Forms to monitor and control the works
- Proposed methods and forms of payment
- Guarantees
- Deductions (reprimand) on payment and fines
- Causes to nullify a contract
- Contract deadlines

## **c. Service Level and Quality**

Bid base and, subsequently, the contract should establish the level and quality of service. Differences can be established based on the type of service, urbanization, and economic level.

Standards related to storage and discharge manner will be defined; these standards should be satisfied by all MSW generators. Standards related to collection, sweeping, transportation, and final disposal should also be respected by contractors.

### **c.1 Storage and Discharge Manner**

Curbside discharge manners:

- Disposable recipients (plastic or paper bag, cardboard box) should have a maximum capacity of 50 liters. Sharp objects should be wrapped with paper or other material to prevent injuries to workers.
- Reusable recipients (e.g., metal, plastic) should have a maximum capacity of 100 liters. It will be provided with a handle and a cover; it should also be in good condition.

## **c.2 Collection and Transportation**

### **c.2.1 Frequency recommended**

- Downtown and high income areas 3 times a week
- Other areas 2 times a week

### **c.2.2 Schedule recommended**

- Monday to Friday 06:00 - 14:30
- Saturdays 06:00 - 10:30

Some considerations should be given to the adjustment of these schedules for a more convenient service, including night shifts. For this purpose, lighting should be provided to specific areas inside the sanitary landfill.

### **c.2.3 Vehicles**

There should be appropriate vehicles to carry out activities in a sanitary manner and facilitate the assignments for workers. In general, vehicles should be in good condition, be suitably painted, have low fumes emission levels or low noise levels. Brakes, lights, tires and windscreen should also be in good condition.

### **c.2.4 Workers**

Workers should have uniforms and protective gear (e.g., shoes, gloves, coveralls, and goggles) and all the tools necessary for their tasks.

## **c.3 Street Sweeping**

Street sweeping frequency might be as follows:

- Downtown: daily
- Residential areas with pavement: weekly

Special services and a collection system with public waste bins will be provided for public areas and places that attract a large number of people. Sweepers will have colorful uniforms to protect them from road accidents; they will have protective gear and all necessary tools to perform their assignments.

## **Q.3.5 Quality Control System**

### **a. Monitoring and Supervision**

The information system to monitor and control is an important resource to verify and improve SWM tasks. Most of the services are repetitive, with small variations from time to time and with special services upon request. Planning and design for these tasks and final evaluation of services make up the quality control system (Figure Q-6).

First, guidelines and quality levels that need to be attained (parameters) should be defined; also, procedures to be followed and activities to be monitored should be determined. This information should be provided to the general public, municipal company's workers, and contractors.



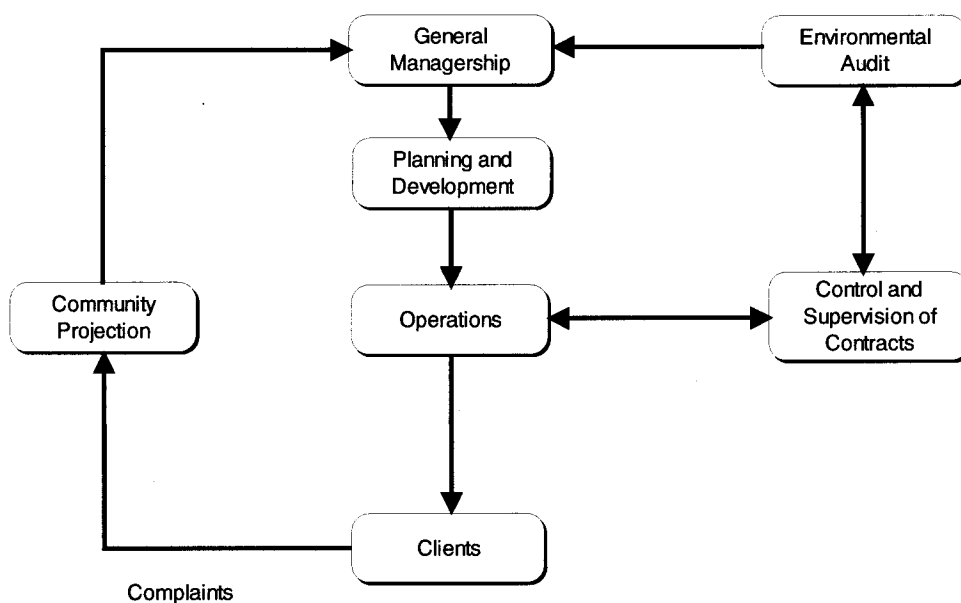


Figure Q-6: Quality Control, Monitoring and Supervision System

### a.1 System Functions

- To establish physical and environmental parameters
- To provide instructions on monitoring procedures
- To verify the degree of compliance
- To recommend necessary adjustments

### a.2 Basic Parameters

#### 1 Storage and discharge

- |     |                               |   |
|-----|-------------------------------|---|
| 1.1 | Appropriate use of recipients | % |
| 1.2 | Discharge at the set schedule | % |

#### 2. Collection

- |     |  |                                    |
|-----|--|------------------------------------|
| 2.1 | Scattered waste                        | % of km covered                    |
| 2.2 | Noise and smoke                        | % of cases coped with (complaints) |
| 2.3 | Compliance of frequencies and schedule | % of cases coped with (complaints) |
| 2.4 | Collection velocity                    | km/hour                            |
| 2.5 | Quantity collected per route           | ton/km                             |
| 2.6 | Cost per ton collected                 | Colons/ton                         |

#### 3. Street Sweeping

- |     |  |                          |
|-----|--|--------------------------|
| 3.1 | Street sweeping efficiency                             | % swept                  |
| 3.2 | Productivity   | km/day/sweeper           |
| 3.3 | Maintenance of waste bins for public areas             | % of total               |
| 3.4 | Street length provided with waste bins for pedestrians | % of total streets swept |
| 3.5 | Street length swept more than once a day               | % of total streets swept |

3.6	Sweeping cost per km	Colons/km
3.7	Amount of waste collected during sweeping per area	kg/day
<b>4.</b>	<b>Final Disposal</b>	
4.1	MSW into the site per source	ton/source
4.2	Length of the work front	m/No. of vehicles at peak hour
4.3	Degree of compaction	Volume (m <sup>3</sup> ) used per ton disposed
4.4	Area covered	% of operational area covered
4.5	Animal and vectors	Yes/No
4.6	Scavengers	Number
4.7	Biogas	No. of vents per hectare
4.8	Leachate	Flow (liters/second)

### a.3 Reports

- On control and supervision of contracts
  - \* To fulfill parameters
  - \* To verify service provision
- On Community Relations
  - \* Complaints from neighbors
- On Environmental Audit
  - \* Assessment of environmental quality
  - \* Evaluate environmental impact
  - \* Recommend mitigation measures

### Q.3.6 Human Resources Development System

The improvement of public services requires the continuous development of strength and skills of the service providers. This basic concept shows two objectives on training human resources. The first is to instill a sense of pride in the public servants toward their work so that they develop a positive attitude and gain public trust for the municipal company. The second is to provide the public servants with necessary skills to improve their work and to ensure a cleaner environment which is comfortable for their citizens.

In order to attain those objectives, it is necessary that the municipality's legislative council approves a new institutional structure and selects appropriate personnel who will provide the services.

It consists of three training courses

- Public Affairs;
- Operations; and
- Support Services.

**a. Public Affairs**

Training on public affairs will help develop morale and good sense to help their community as a group. In this category, there are six classifications that are considered as groups.

**a.1 Course for New Public Servants**

It targets newcomers to the public company, such as administrators, engineers, operators, drivers, etc. They are instructed on institutional activities and indispensable issues about their duties with the objective that they can adapt quickly to their assignments.

**a.2 Course for Heads of Departments and Sections**

It targets directors and chief engineers. It provides them with knowledge and special skills to take care of administrative aspects of their assignments.

**a.3 Course for Supervisors**

This course is aimed at group leaders and sub-leaders directly in charge of supervision on field operations. It helps them to develop skills to face and solve situations and problems that may arise during operations under their supervision.

**a.4 Course for Directors**

This training will be for directors; the objective is to help them with their activities and help them to solve problems at the institutional and governmental level.

**a.5 Public Relations**

This course provides public servants with basic knowledge to help develop better manners that should be used to communicate with and to welcome all citizens. The public servants' behavior reflects the quality of the municipal company to the citizens.

**a.6 Prevention of Criminal Acts**

This course is directed to public servants to help them acknowledge the moral and ethical duties that they should undertake as public officials. This course will deal with the manners in which they should behave and how they should react when they encounter criminal and corrupt activities. Topics are such as alcoholism, non-work related personal activities during office hours, tardiness, unjustified absences, corrupt activities such as sale or unauthorized removal of goods and materials belonging to the institution (oil, tires, batteries, spare parts, use of vehicles), accepting bribery in exchange for leniency towards transgressors, giving favors in contracts or purchases, etc.

**b. Operations**

The specific objective is to provide the municipal company and the personnel with technical and operational skills to improve the SWM services in the following areas.

- Collection and haulage in urban and marginal areas
- Cleansing of roads and public areas
- Sanitary landfill operation
- Planning and development

- Control and monitoring
- Administration and finances
- Community relations
- Environmental education

To achieve these goals, training programs will be done in three manners:

- Short courses
- Service training
- Seminars and workshops

### **b.1 Short Courses**

These courses will be done with the cooperation of academic institutions. By 1999, it is estimated that hundreds of individuals will be providing SWM services in all areas, e.g., collection, haulage, sweeping, final disposal, maintenance, administration, and finances. They come from the private and public sector and, as a result, training should be provided to most service providers for the purpose of obtaining the best results. These courses will last approximately 20 hours in total.

#### **Course 1: Planning and Control of SWM Activities**

- Concepts on planning and control. Objectives and goals. Actions at different levels.
- Urban development (PLAMADUR and METROPLAN 2000); population, urbanization, and income growth. MSW generation, characteristics, composition; waste reduction, reuse and recycling, market for recyclable materials.
- Operation planning in the short, medium and long term. Routine and special activities.
- Control and planning of personnel, supplies and capital goods.
- Institutional budget, use of funds, and cost control.
- Quality control.
- Control and supervision of contracts with the private sector.
- Operation assessment and feedback.

#### **Course 2: Collection and Haulage in Marginal Areas**

- Primary collection. Community organization. Promotion, planning and technical assistance for micro-enterprises
- Collection and haulage system. Routing, frequencies and schedule.
- Primary collection costs.
- Haulage costs to transfer station.
- Service regulation.
- Occupational health.

#### **Course 3: Collection and Haulage in Urban Areas**

- Manner and type of discharge, recipients.
- Routes, frequencies, and schedule
- Type of vehicle and collection style.
- Personnel performance. Incentives.
- Operative costs and control.

- Service regulation.
- Occupational health.

#### **Course 4: Street and Public Areas Cleansing**

- Waste quantity and characteristics.
- Routes, frequencies, and schedule.
- Crew formation.
- Waste bins for public areas. Promotion and financing.
- Tools and equipment.
- Cost and control.
- Service regulation.
- Occupational health.
- Stormwater drainage system. Maintenance and cleansing.
- Quantity and type of waste collected.
- Coordination between sweeping and drainage system maintenance.

#### **Course 5: Final Disposal**

- Planning sanitary landfill operations.
- Access and weight control for MSW.
- Waste source and type.
- Machinery and equipment use.
- Compaction and cover.
- Stormwater control.
- Leachate and biogas control.
- Environmental impact control.
- Scavenger control and encouragement of their retirement from this activity.
- Operation cost and service regulation.
- Creation of an ecological park.
- Occupational health.

#### **b.2 Training on Service**

This training course is targeted to field officials (e.g., collection and sweeping workers, drivers, equipment operators, mechanics, supervisors, and engineers). The main objective is to provide the targeted group with the knowledge and the skills that are necessary to improve their daily work so that they become SWM experts.

The courses are categorized as follows: basic, intermediate, advanced, and directive.

Training on SWM services in other countries will be included for some officials, in addition to specialized formal courses.

#### **b.3 Seminars and Workshops**

After a variety of short courses and training on services, seminars and workshops will be organized to instruct others of what was learned with relation to SWM improvement by the EMAUSS. In these activities, participation by other government and private institutions and NGOs will be encouraged.

Practical applications for SWM services based on the theory learned in short courses and training on service will be promoted.

**c. Support Services**

There are a number of activities that are necessary to be carried out to ensure support for SWM operations. A preliminary list of short courses should pay attention to:

- Preventive and corrective maintenance for vehicles and machinery.
- Safe driving techniques for drivers.
- Safety practices for collection, sweeping, and final disposal workers.
- Basic course on computer use.