

### C.3.5 Final Disposal System

#### C.3.5.1 General Site Condition

The existing final disposal sites for the DF are Santa Catarina (SC) and Bordo Poniente Etapa IV (BP IV). SC is located at about 16 km from the DGSU office on the Mexico-Puebla highway. BP IV is located about 4 km north-east of Mexico city international airport.

#### C.3.5.2 Geological Condition

BP IV is located on the Texcoco ex-lake area, where an underground aquifer is highly saline and not-suited for drinking purposes. Which has a comparative advantage than any other locations that stands on a potable aquifer.

Meanwhile BP IV stands on very soft, highly compressible, clayey layers of about 60 meters thickness. It implies that if landfill is embanked in a thick layer in one operation in a short period, landslide and/or slope failure will easily take place. Therefore, the following are principally required in order to maintain safe operation of solid waste landfill on such a soft and compressible ground:

- thinner landfilling operation.
- time passage for stable ground subsidence and consolidation.

SC is located on the outer slope of an ex-volcano caldera. Although major groundwater exploitation is not exercised near the SC site today, it is a disadvantage of SC site that it stands near on a water aquifer from which potable water is currently taken.

#### C.3.5.3 Landfill Structure

##### a. Bordo Poniente Etapa IV (BP IV) Site

BP IV employs the bottom impermeabilization with single high-density-polyethylene (HDPE) membrane (1.0 mm thick) sheet. The membrane is spread in a cell on the original ground level and on the slopes of 1.5 m in Etapa III and 0.8 m in Etapa IV high surrounding embankment road. The membrane is anchored in the edge of the surrounding road (see Figure C-8).

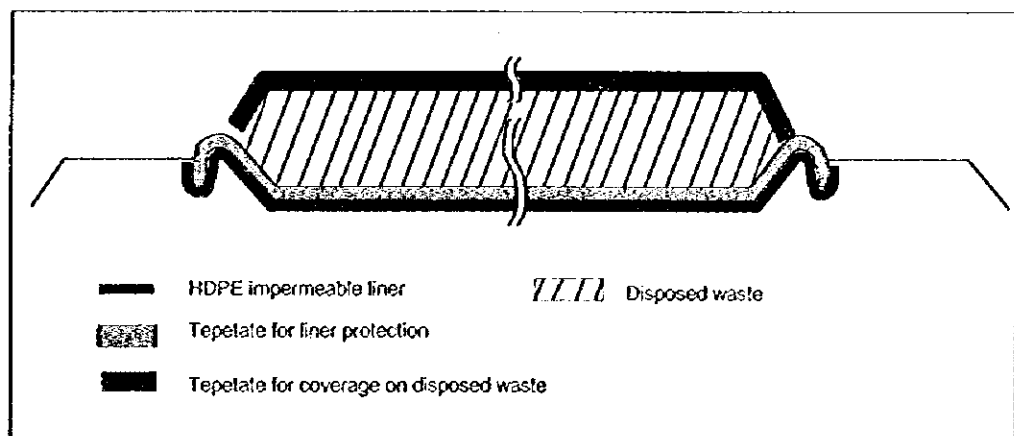


Figure C-8: Landfill Structure of Bordo Poniente Etapa IV

The soil called "tepetate", which is basically clayey silts materials, is spread and compacted over the membrane for preventing a damage on the membrane by landfilling operation.

Once SW are disposed up to the same level of surrounding embankment road, the cell receives materials suited for large trailers' traffic (e.g., construction debris). From that level, waste are disposed of, compacted and shaped to the design level (i.e. 8 meter high) at once and receive the final soil (tepetate) cover of 30 cm thickness.

Although BP IV employs the bottom impermeable liner, it does not yet employ leachate collection piping system. At present, leachate is seeping out at cells' slope bottom on to the surrounding road. It creates a problem of operation today and the near future that the road condition is being deteriorated especially when it rains.

The BP IV landfill structure will start to install biogas removal facilities (e.g. chimneys) in 1998.

#### **b. Santa Catarina (SC) Site**

SC initially did not employ the bottom impermeable liner. In the beginning of year 1997, when the landfill level was raised to reach to the road under which water main pipe is located, SC landfill employed the following for impermeabilization:

- mortar spray on the hill slopes and synthetic impermeable layer on the roads.
- single HDPE membrane (1.0 mm thick) sheet on the mortar-lined slope.

The waste is carefully dozed toward the slope liner when the landfill face is vertically raised.

SC employs leachate collection piping system for the upper part where the impermeable liner is installed. The leachate collected through the piping is impounded at the 2 Nos. of leachate storage lagoons. Leachate in the lagoons are transported to the evaporation lagoon in BP by cistern trucks.

SC employs biogas removal facilities (i.e. chimneys) which are 104 in total today (1997) the interval is about 50 meter to each other in the area of about 15 ha (i.e., about 7 chimneys per hectare). The depth of biogas removal chimneys varies from 25 meters to 33 meter.

Figure C-9 below (not to the scale) shows a general view of SC landfill structure.

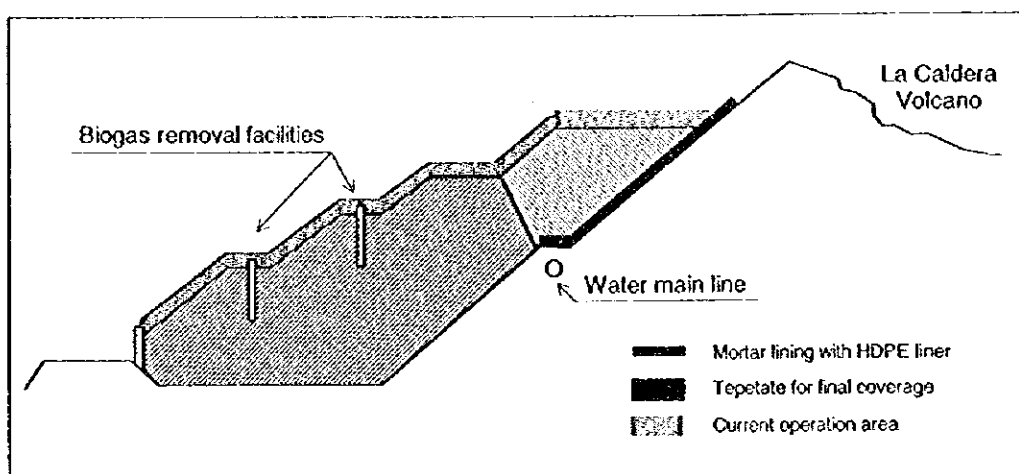


Figure C-9: Landfill Structure of Santa Catarina Site

Table C-25 below summarized the landfill structure of BP IV and SC.

Table C-25: Landfill Structure of BP IV and SC.

Item	BP IV	SC
Bottom impermeable liner	HDPE liner (1.0 mm thick)	Mortar lining and HDPE liner (1.0 mm thick) for upper slope only
Leachate collection system	No yet	Yes (partly)
Leachate treatment system	Transport to BP evaporation lagoon by cistern trucks	Transport to BP evaporation lagoon by cistern trucks
Biogas removal facility	No yet	Yes
Top liner	Not planned	20 cm vegetation soil layer on 30 cm tepetate layer

#### C.3.5.4 Landfilling Operation

Both BP IV and SC are currently applying bulldozers for waste accumulation and compaction. BP IV operates 24 hours continuous operation. Meanwhile SC operates from 6:30 a.m. to 6:30 p.m. from Monday to Friday and 6:30 a.m. to 2:00 p.m. on Saturdays (6 days a week). It is estimated that BP IV and SC daily receives about 9,000 tons and 2,000 tons respectively.

Table C-26: Landfilling Operation of BP IV and SC

Item	BP IV	SC
Working hours	24 hours	12 hours
Working days	7 days a week	6 days a week
Working equipment	Bulldozer 12 Nos. Vibro-Compactor 3 Nos. Backhoe 1 No. Pay Loader 3 Nos. Dump Truck 12 Nos.	Bulldozer 3 Nos. (D8N) Motorgrader 1 No. (12-G) Vibro-compactor 1 No. (CA-25) Dump truck 3 Nos. (12m <sup>3</sup> )
Weighbridge control	Yes	No
Daily disposal volume	about 9,000 ton/day	about 2,000 ton/day
Working cell size	• Rainy season "80m x 750m" to "100m x 500m"	Basically whole area of about 5 ha

Item	BP IV	SC
	<ul style="list-style-type: none"> <li>• Dry season "230m x 400m" to "250m x 800m"</li> </ul>	
Daily soil coverage	about 1,200 m <sup>3</sup> /day Basic practices	about 340 m <sup>3</sup> /day Not sufficient
Items of Contract-out	all items	all items

One of the most important practices of landfilling operation is the daily soil coverage. Both BP IV and SC employs tepetate, but the two sites are different in the intensity of the soil coverage practices.

#### a. Bordo Poniente Etapa IV (BP IV) Site

In theory, landfill operation should employ "daily soil coverage", which means waste disposed should be covered with soil daily either it is on a working face or on a final shaping of a cell.

- It must be a matter of course that final shaping of a cell receives the soil coverage. However,
- Although daily cover must be performed theoretically over the dumping areas after every journey in order to reduce the adverse effects caused by uncovered solid waste until final disposal activities re-start, in the BP IV case, it is convenient to analyze and determine the real need for such practice on dumping areas of cells which operate continuously 24 hours a day.

In view of the above discussion, it can be evaluated that BP IV in general achieves appropriate operation practices of soil cover on waste.

#### b. Santa Catarina (SC) Site

Meanwhile, SC disposal site still today admits material recovery by waste pickers group on its landfill area, which impinges on practices of daily soil coverage on disposed waste. Consequently, disease vectors such as flies and mosquitoes are observed and furious odors are evident on the working cells in SC.

Since SC site has slope impermeabilization, the waste is carefully dozed toward the slope liner when the landfill face is vertically raised.

### C.3.5.5 Landfill Management

Landfill management can normally be referred to the management for mitigating negative environmental impacts of landfill (e.g., hygiene and safety control for people related to the landfill site, or such as leachate/biogas/odor management etc.). However, in addition to the mitigation management, there are precautions ways of the landfill management, for example environmental monitoring (of air, ground and surface water, landfill subsidence), and there are also active ways of landfill management in view of: long term effect of disposed waste; and future reuse of the sites.

Therefore, the current landfill management of BP IV and SC will be diagnosed herewith by categorizing into the following 3 categories.

- a. Mitigation Management
- b. Precaution Management
- c. Active Management

a. Mitigation Management

Mitigation management of the final disposal system can be referred to:

- Hygiene control and Safety control (incl. Waste-pickers control).
- Leachate management (incl. Surface water control).
- Biogas management.
- Odor management.

Table C-27: Landfill Mitigation Management of BP IV and SC

Item	BP IV	SC
Hygiene control	OK	Need to be improved
Safety control	OK	Rooms for improvement
Leachate management	Need to be improved	only partial
Surface water management	Rooms for improvement (e.g., road condition)	appropriate
Biogas management	No yet	Yes
Odor management	appropriate (with soil coverage and buffer zone)	Need to be improved

a.1 Bordo Poniente Etapa IV (BP IV) Site

BP IV disposal site employs appropriate hygiene and safety control. Its odor management can also be evaluated appropriate in view of daily soil coverage and enough buffer zone distance.

Bottom impermeable lines are mitigating the soil and groundwater pollution by leachate, however, leachate is trickling out at the cells' slope bottom and deteriorating the road conditions. Meanwhile, it does not yet employ biogas removal/collection systems.

a.2 Santa Catarina (SC) Site

The biogas of SC disposal site is collected and burned at the end of the ventilation pipes in the closed zones of the said landfill.

The leachate generated in SC is mainly due to the percolation of rain. (Therefore, surface water management plays an important role in leachate management.) Collection of this leachate is partial and is done by means of open channels that form part of pluvial sewerage of the site; this leachate is carried by gravity, and they are carried by cistern trucks and taken to the evaporation lagoon in the Bordo Poniente Etapa III.

It is worth mentioning that there is a plan to construct a chemical-physical-biological treatment plant for this leachate, with a design capacity of 4.0 liters/second.

**b. Precautious Management**

As for precaution measures of final disposal system, BP IV employs groundwater monitoring (piezo-meters, periodical sampling and laboratory analysis of leachate), and ground movement monitoring.

SC has 27 pits to monitor the travel of biogas to the surrounding areas.

**Table C-28: Landfill Precautious Management of BP IV and SC**

Item	BP IV	SC
Groundwater monitoring	OK	No*
Ground movement monitoring	OK	No*
Leachate analysis	OK	OK
Biogas travel monitoring	No	Yes

\* The monitoring is not done by the DGSU but done by Comisión Estatal de Aguas y Saneamiento de Estado de México (CEAS).

**c. Active Management**

When viewing an objective of stabilizing the disposed waste, "active management" can be referred to several measures of facilitating the decomposition of the waste disposed.

**c.1 Leachate Recirculation**

An easy, not-costly and effective method for treatment of leachate is to collect and recirculate the leachate through the landfill. During the early stages of landfill operation the leachate will contain significant amounts of TDS, BOD<sub>5</sub>, COD, nutrients, and heavy metals. When the leachate is recirculated, the constituents are attenuated by the biological activity and by other chemical and physical reactions occurring within the landfill. For example, the simple organic acids present in the leachate will be converted to CH<sub>4</sub> and CO<sub>2</sub> because of the rise in pH within the landfill. An additional benefit of leachate recycling is the recovery of landfill gas containing CH<sub>4</sub>.

Therefore, leachate recirculation is recommended for BP IV. Meanwhile, since most part of SC does not have bottom impermeable liner, applicability of leachate recirculation for SC site should carefully be examined in terms of whether the SC landfill structure permits leachate to be pumped-up from the interior of landfill and to be poured on the surface part of SC.

**Table C-29: Landfill Active Management of BP IV and SC**

Item	BP IV	SC
Leachate re-circulation	Not yet practiced, but recommended.	Not yet practiced. Its applicability to be investigated.

### **C.3.6 Hospital Waste Management**

#### **a. General Aspects**

Solid wastes, generated in hospitals and health centers, bring risks and difficulties, especially in relation to their right management; this is due mainly to the infectious characteristics of some of their fractional components. Other factors contribute to increase these risks and difficulties are, for instance, the heterogeneity of their composition, the presence of sharpened objects, and the eventual presence of minor quantities of toxic-inflammable-and-low-intensive-radioactive substances. Notwithstanding the last part, most of the wastes generated by hospitals are much less dangerous than common municipal wastes.

The risks, above mentioned, involve on the first hand all the staff that must manage the solid wastes, inside and outside of the health centers. If these staff members are not sufficiently trained and equipped with tools and protective gears, they will be exposed to pathogen germs. Additionally, they will be exposed to sharpened objects, such as; syringe's needles, surgical knives, and pieces of glass.

Another important issue is a risk these wastes pose on other persons in the hospitals. Especially to the group of patients with an especial risk of getting infections as a consequence of the exposition to pathological agents, whenever wastes are not managed appropriately.

The implementation of the management norms for solid wastes which are generated within the medical units stresses out the necessity to evaluate, to quantify, and to forecast the amount of solid wastes that must be considered as part of an integral management of health centers.

An adequate classification of the wastes that are generated in a health center allows them to be efficiently, economically, and safely managed. This classification facilitates appropriate segregation of wastes, and reduction of sanitary risks and waste management costs. This is because the safest and most expensive systems will be assigned just not to all but to the fraction of wastes that require these systems.

The diverse components can be classified by considering the location of their source, combustibility, organic characteristics, dangerousness, and decomposition. These can also be classified by considering the chemical elements and components that form the wastes.

Wastes are classified using as a criteria the risks they represent to public health, generation source, and treatment and final disposal given to them. The classification is as follows:

- i. Municipal Wastes (Non-hazardous).** These are generated in areas where there is no contact with patients. Within this group, the following type of wastes can be obtained:
  - **Recyclable Wastes** which are the ones that can be transformed into new raw materials. They can be incorporated to the same productive processes which created them originally or to alternative processes which create other consumption goods.

- Rejected Wastes which are all the ones which can not serve any purpose, benefit or recovery. These must be sent to the final disposal site.
- ii. Infectious - Biological Wastes (Hazardous). These are defined as all the wastes in any physical state which are generated in any medical unit and, due to their biological-infectious characteristics represent a danger to the ecological equilibrium and environmental health. These can be put together in four categories, which require different type of management.
- Healing and Miscellaneous Materials. These include all the materials that have been in contact with the patients, such as; bandages, appositives (external medical application), gauze, cotton, compresses, hyssops (aspergilles), equipment for venoclysis (except for needles), catheters or boungies, bags and recipients of fluid collections, gloves, masks, caps, dischargeable surgical clothes, etc.
  - Biological wastes. This category includes microbiological wastes, body fluids and feces from the sampling of patients. The material generated by experiment with animals of laboratories (blood samples, feces and other fluids), as well as disposable Petri dishes enter this category too.
  - Sharpened Objects. These include hypodermic needles, syringes, Pasteur pipettes, scissors, shaving blades, surgical knives (bistouries), crystals, etc. They must have been in contact with human patients and/or animals during a diagnostic treatment or investigation. Additionally, all sharpened objects that have not been used, but which have been rendered useless or contaminated should be included.
  - Pathological Wastes, which are the ones that include parts of the human or animal body, organs, tissues, biopsies, etc.
- iii. Special Wastes, which are those that, due to their characteristics of their composition and nature, require a special study and management. Among them the following are included:
- Radioactive Wastes. These are classified according to their type or radioactivity. It should include any type of material used and disposed in processes where radioactivity is utilized.
  - Pharmaceutical Wastes. It should include the expired pharmacies and/or decomposed or contaminated medicines. They must be eliminated as soon as possible. These could be pills, suspensions, injectable solutions, etc.
  - Chemical Wastes. Include analytical reactives and substances utilized in the processes of diagnostic, and the treatment to patients (chimiotherapy).

It is very important to know the type of wastes generated in health centers in order to provide an appropriate management for them. Additionally, it is very important to know the diverse areas that generate this type of wastes; this data will help to design the routes of internal collection and to quantify the amount of containers and bags necessary for the internal management.



## b. Regulatory Framework

Infectious-Biological Wastes (IBR), which are generated in health centers (hospital wastes) are considered by the Mexican Official Norms as hazardous. In view of this, all the regulating laws within the juridical framework for the management of hazardous wastes are applicable to them. Likewise, there exists a set of laws specifically applicable to them.

Table C-30 describes the hierarchical structure of the regulatory framework that is applied in Mexico to the management of the biological-infectious wastes, as well as the federal offices responsible to enforce them.

Table C-30: Juridical Hierarchy of the Environmental Regulatory Framework for Hazardous Wastes

Legal or Normative Official Ordinance	Responsible Entity within the Federal Executive Office
Political Constitution of the Mexican United States	Secretary of the Government (Governor)
Ecological Equilibrium and Environmental Protection Law (LGEEPA)	Secretary of Environment, Natural Resources, and Fisheries (SEMARNAP)
Regulations of the "LGEEPA", for Controlling Hazardous Wastes	SEMARNAP
Regulations for the Terrestrial Transport of Hazardous Wastes	Secretary of Transport and Communications (SCT)
Mexican Official Norms for Hazardous Wastes	SEMARNAP
Mexican Official Norms for the Hazardous-Infectious-Biological Wastes	SEMARNAP, SCT, Secretary of Health (SS), Secretary of Work and Social Prevision (STPS).

### COMMENTS:

1. In general, the Mexican Official Norms are derived and must be structured according with the General Law of Meteorology and Normalization. The Secretary of Commerce and Industrial Foment (SECOFI) is the federal office in charge of their application.
2. The formulation, publication, and enforcement of the Mexican Official Norms depend on the Federal Executive Offices responsible of the issue being study; whenever the Regulatory Impact Assessment-RIA had already been approved by the SECOFI.
3. Other complementary legal ordinances are the General Law of Meteorology and Normalization, as well as the General Law of Health and its regulations related to the Sanitary Control for the disposal of organs, tissues, and corpses

In addition, there are resolutions and judicial decrees or decisions which include ordinances, and/ or obligations applied to hazardous wastes.

## c. Generation

### c.1 Background

The qualitative and quantitative characterization of the problem is very important to approach any program to control risk situations derived of inappropriate hospital waste management.

This characterization will lead to measure the physical spaces necessary to manage the different types of wastes. It will also help to define the technical alternatives that can be utilized for the treatment of each of the fractional components and to select the equipment and measures for that purpose.

Unfortunately, the information available on this matter is not yet enough in most cases. Furthermore, the little information available is sometimes unreliable or limited in its application to particular situations. This has led to the adoption of solutions that experience has demonstrated subsequently that they were inadequate. As a consequence, the risks, as they were mentioned previously, increase.

This is why it is very important to develop a methodology that allows adequate management of the solid wastes (for both the infectious-biological wastes and the municipal wastes) which are generated in medical units, since they account for most of the waste generated in those units.

Up to date, a series of studies about the generation of wastes have been conducted in several hospitals at each one of the different levels of service. These studies have presented some of the basic indicators of the wastes generated in this type of establishments. The wastes which were studied showed sharp differences in their composition and quantity in dependence of the number of patients served and type of service provided to them.

### c.2 Solid Wastes Generation

The quantity of solid wastes generated in a hospital unit is in function to the diverse activities that are developed within it. Consequently, it will depend on various factors; for instance, the quantity of medical services offered in the establishment of health, the degree of complexity of the medical services, the size of the medical unit, the proportion of the external patients attended, and the quantity of personnel that work in the hospital. It is not easy to establish an estimation of the quantity of wastes produced by a hospital by accounting such a big diversity of factors.

The DGSU has done some research about the generation of hospital wastes. Table C-31 shows some of the results obtained in those investigations, regarding the generation rate of these wastes. On the other hand, Table C-32 summarizes the number of medical institutions, beds, and employees in the DF which are factors that define the forecast of hospital waste generation. Table C-33 shows the estimates of the generation of these wastes (in 1997).

Table C-31: Hospital Waste Generation Ratio at the Medical Institutions in the GDF

Type of institution	unit	Generation rate	Remarks
Medical institution	Level 1 kg/consultation room/day	1.279	External consultation clinics.
	Level 2 kg/bed/day	4.730	Hospital with less than 50 beds.
	Level 3 kg/bed/day	5.390	Hospital with more than 50 beds.
Laboratory	kg/laboratory/day	6.343	
Veterinary	kg/employee/day	1.700	

Table C-32: Number of Factors Affecting Total Waste Generation

Institution Delegation	Medical institution			Laboratory	Veterinary
	Level 1 Consultation room	Level 2 Bed	Level 3 Bed	Number of Laboratory	Number of employee
Alvaro Obregon	526	286	2,413	28	63
Azcapotzalco	249	274	1,304	9	35
Benito Juarez	237	1,365	2,297	79	150
Coyoacan	321	210	403	39	85
Cuajimalpa	362	21	0	7	14
Cuauhtemoc	849	2,144	2,877	223	71
Gustavo A.Madero	620	1,991	2,381	64	116
Iztacalco	145	1,004	85	7	44
Iztapalapa	399	1,549	314	28	124
M.Contreras	199	77	200	4	15
Miguel Hidalgo	972	745	1,781	81	56
Milpa Alta	111	11	74	0	3
Tlahuac	285	308	228	0	15
Tlalpan	588	181	2,350	24	84
V.Carranza	487	304	499	28	42
Xochimilco	429	125	0	5	23
Total	6,779	10,595	17,206	626	940

Table C-33: Daily Waste Generation Amount

Unit : kg/day

Institution Delegation	Medical institutions				Other institutions			Total
	Level 1	Level 2	Level 3	Total	Laboratory	Veterinary	Total	
Alvaro Obregon	673	1,353	13,006	15,032	178	107	285	15,317
Azcapotzalco	318	1,296	7,029	8,643	57	60	117	8,759
Benito Juarez	303	6,456	12,381	19,140	501	255	756	19,896
Coyoacan	411	993	2,172	3,576	247	145	392	3,968
Cuajimalpa	463	99	0	562	44	24	68	631
Cuauhtemoc	1,086	10,141	15,507	26,734	1,414	121	1,535	28,269
Gustavo A.Madero	793	9,417	12,834	23,044	406	197	603	23,647
Iztacalco	185	4,749	458	5,392	44	75	119	5,511
Iztapalapa	510	7,327	1,692	9,529	178	211	388	9,918
M.Contreras	255	364	1,078	1,697	25	26	51	1,748
Miguel Hidalgo	1,243	3,524	9,600	14,366	514	95	609	14,975
Milpa Alta	142	52	399	593	0	5	5	598
Tlahuac	365	1,457	1,229	3,051	0	26	26	3,076
Tlalpan	752	856	12,667	14,275	152	143	295	14,570
V.Carranza	623	1,438	2,690	4,751	178	71	249	5,000
Xochimilco	549	591	0	1,140	32	39	71	1,211
Total	8,671	50,114	92,740	151,526	3,971	1,598	5,569	157,094

The Institute of Health Services at the DF, together with the GDF, started the elaboration of a systematical program to manage adequately and appropriately the wastes. Consequently, the collection and disposal of infectious-biological and pathological wastes were given in concession to the private sector. The infectious-biological wastes undergo chemical treatment or sterilization in special places as

autoclave and they are sent subsequently to the municipal final disposal sites. The original quantity of wastes from hospitals will increase by 10% when they are finally disposed; this is due to the chemicals that are added to the processes and treatments. On the other hand, the pathological wastes are incinerated and the remnants are hauled to the municipal final disposal sites. The costs of incineration are approximately 4 Pesos/kg (excluding collection services).

The treatment and disposal of the wastes from the hospital are done currently according to the existing norms. On the other hand, it is known that this norm could be modified in 1999. Therefore, a generator of hospital wastes which produces 1 kg/day will be able to perform an adequate treatment, such as the incineration in situ.

## C.4 Social Aspects

### C.4.1 Storage and Discharge System

#### a. Management of Solid Wastes at the Generation Source

In general terms, in the Federal District (and in all the country), a culture for the management of solid wastes at the generation source has not developed yet.

Solid wastes are put together in containers of various types and capacity and dumped.

Domestic storage is carried out mainly and frequently in containers (*botes*) and polyethylene bags. The containers - of different sizes and materials - are used commonly without their covers. When they carry organic wastes, they become malodor spots and if collection delays, they foster the proliferation of harmful fauna.

Plastic bags, which are widely used by the population, are provided by merchants for the packing and carriage of the merchandise acquired.

Among the containers used, cardboard boxes, metallic and plastic containers, paper bags and wooden boxes are frequently found. Obviously, these items have been designed for other purposes and they are sometimes inappropriate.

Regarding the storage of bigger generators, such as businesses and other services, wastes are accumulated in 200-liter *tambos* (drums). In big businesses, some materials such as cardboard boxes, packages, metal and paper among others are recovered for commercial purposes. Segregation of materials is also carried out in some offices with papers, while some hotels do so with bottles and food wastes, which are delivered to waste-pickers with no charge or part of the payment or tip for the collection service.

In middle-income houses, the increase in generation of packages and containers has caused an excessive wastes, whose volume surpasses by far the people's capacity to re-use them. On the other hand, in low-income sectors, people separate some materials when they represent a certain value in order to sell them. Because they usually have to sell them in bulk, separated materials are stored for a long time and occupy a considerable volume of space particularly in small houses.

Regarding industrial, construction, biologically infectious and hazardous industrial wastes, their storage method is determined by the corresponding Mexican Official

Norm (NOM), issued by the Environmental Secretariat (SEMARNAP). The compliance with this norm is, however, limited.

Besides, due to the fact that there is no separation of wastes at the houses, several commercial businesses and certain health centers, the mixed wastes are dangerously managed by the collection staff and by waste-pickers at the "pre-scavenging" and segregation stages at the recovery plants.

House cleaning and inter-domestic management of solid wastes have always been socially and traditionally left in the hands of the female.

#### **b. Emptying and Handing of the Generated Solid Wastes**

Once the wastes are stored, a role of generators is limited to bringing it to a sweeper or a collecting truck; in the worst case, wastes are dumped on public road, on abandoned land, to ravines or water streams, if the collection service is not available.

In the first case, wastes are handed to a sweeper, who works for the GDF and daily sweeps the streets. The relation between the community and the sweeper is close and they trust each other, because it can have lasted for many years, and sometimes the neighbors identify him/her and allow to enter in their houses. The neighbors tip the sweeper per day or weekly. The weekly amount goes from 2 pesos to 15 pesos per house.

In the second case, neighbors bring the wastes when a collecting truck passes by two or three times a week. The relation of the neighbors with the collection team is not as close as that with the sweepers, but they still pay "tips" or "voluntary contribution". In the case of single families, the tip goes from 2 pesos to 5 pesos. When the containers are bigger, more than one or very bulky, the tips go from 6 pesos to 20 pesos.

The commercial stores bring their wastes in drums to the collecting trucks, which makes the service slow and inefficient. The trucks receive a fixed payment monthly or every 15 days, that goes from 20 pesos to 400 pesos per 15 days, and is known as "*finca*". Its amount can be greater when there exist customary institutionalized *fincas* or establishments with greater waste production.

#### **c. Solid Wastes Segregation Program**

This pilot program that was launched in 1996 by the DGSU aims at the separation of solid wastes generated at the source into three categories: organic matter, sanitary wastes and solid recyclable elements (glass, cardboard, iron, aluminum, construction debris and others).

The program currently operated in 13 sites, among which, a DF's government building, Virreinal building and housing unit in the Cuajimalpa delegation were the first ones to have this program implemented in 1996 whereas the DGSU's headquarters, the main building of the Department of Public Safety and the Metro's (subway) Childhood Development Center were included in 1997.

Likewise, it should be mentioned that seven Childhood Development Centers were also implemented as of August 1998, which are located in the delegation Cuauhtemoc and attached to the following public bodies: the Supreme Court of Justice, the Presidency of the Republic, the Ministry of Internal Affairs (Secretaria de

Gobernacion), the National Lottery, GDF, Department of Labor and Social Prevention and the National Autonomous University of Mexico (UNAM).

The population that took part directly in these 13 sites adds up to 8,500 people, distributed in 110 office areas, 34 houses and 50 preschool groups.

The development of this program has included the following activities:

- Diffusion of the program through instructive talks.
- Supplying of informative material (brochures and posters).
- Verification of the appropriate separation of wastes.
- Separated wastes collection service.
- Quantification of the amount of wastes generated per site.

It is worth mentioning that the program diffusion and propagation was slow but important for its success.

The separate collection service, the quantification of wastes and sometimes the verification of the proper separation have required to hire persons from the private sector, with an exception of the program diffusion and the preparation of reports, which are done by DGSU's personnel.

Table C-34: Solid Waste Separation Program: Amount Generated During 1998<sup>(1)</sup>

Wastes	SITE								TOTAL <sup>(3)</sup>
	Unit	Housing unit	GDF Bldg. No. 1	Viceroyal Bldg.	DGSU	Public Safety Bldg.	CDC Metro	7 CDC <sup>(2)</sup>	
Organic	kg	26,862	21,109	10,857	32,234	59,407	10,168	16,431	177,068
Recyclable	kg	22,290	59,307	35,427	62,320	57,609	6,779	10,083	271,815
Sanitary	kg	8,001	20,105	10,856	12,894	45,006	13,865	10,830	121,557
Total	kg	57,153	100,521	57,140	107,448	180,022	30,812	37,344	570,440
Average generation	kg/inhab /day	0.833	0.359	0.256	0.282	0.191	0.387	0.255	
Separation efficiency		88%	92%	93%	91%	86%	100%	78%	

(1) Data projected as of the second half of September/98, based on the tendencies observed in period (January 1st - September 15th)

(2) Sites incorporated as of August 17, 1998

(3) In the period of January 1st - September 15th, a total of 384,371 kg in wastes were generated at the 13 sites.

CDC: Childhood Development Center

Source: "Programa de Separacion de Residuos Solidos, Informe de Actividades Septiembre 1998", Secretaria de Obras y Servicios GDF.

The program uses recipients, plastic bags or stick-on logos with different colors, according to the type of waste that will be stored: green for organic wastes, orange-colored for sanitary products, gray in the case of containers or logos, and transparent for recyclable products. The bags, containers or cylinders, are supplied by the administration of the participating site.

Table C-34 shows that generated organic material accounts for approximately 47% in housing complexes and almost 26% at institutional buildings. On the contrary, recyclable materials represent 55% of institutional buildings' wastes and only 39% of housing complexes. Finally, sanitary waste accounts for 14% of housing units and an average of 19% of institutional wastes.

The program has also proved that the per capita production of solid wastes of the sites is 0.833 kg/inhabit/day in average.

The separation efficiency at the source is high: 89% at the housing and from 86% to 93% at institutional buildings. The program has demonstrated the possibilities to diffuse the separation practices, to raise people's consciousness and to promote public participation.

The following objectives of this program are being achieved:

- Increase in the recycling levels.
- Sanitary collection of the wastes.
- Active participation of the community.
- Development of an ecological consciousness in the population.
- Limited decrease in the remained life span of the sanitary landfill.

It is worth mentioning that the incorporation to this program is voluntary, and the site interested in joining it should do so within the following framework:

- DGSU: It coordinates actions, informs the population, monitors, assesses and disposes of the collected waste.
- Participating site: It participates in the process, provides the materials, and prepare the central deposit.

The aforementioned hinders a better performance of the program and has an impact on current costs.

#### **d. Other Projects to Minimize the Wastes**

Only a slight part of citizens joins the ecological organizations which make efforts to promote solid wastes segregation programs. These efforts have been carried out independently and in housing units and condominiums.

In the delegation Tlahuac, specially in Villa Centroamericana and INFONAVIT Tlaxcanes housing units, garbage was separated according to the organic and inorganic parameters, so as to minimize the volume of wastes in the final disposal. With organic wastes, there was an intention to elaborate compost to be used as the soil conditioner of green areas and of the delegation. Inorganic wastes were sent to small gathering centers (centros de acopio) in order to commercialize the recovered elements.

Another effort in which private sectors has helped is the installation of gathering centers (centros de acopio) at the supermarket parking lots of Aurrera company. In this program, people bring separated wastes without receiving payment at all, but the fact of having collaborated in the environmental protection. The recovered wastes are mainly tires, glass bottles, paper and cardboard. This is one of the most enduring programs, as operated for three years. Due to the lack of diffusion, however, it has not had the expected impact. In summary, the community efforts to implement solid wastes segregation programs have not been as successful as desired due to several reasons.

Besides, the DGMA, DGSU and INARE carry out actions jointly or independently in search of the minimization and recycling of solid wastes as follows:

- The use of containers financed by France failed due to the opposition of collectors, as they could not receive tips nor separate recyclable material.
- Another effort to place containers at markets was not successful either due to a lack of participation from the public.
- The University of Mexico (UNAM) was not successful in installing containers to separate combustible and non-combustible wastes. The people did not participate.
- The INARE had a relative success in some isolated campaigns.
- A campaign to re-use glass bottles by the soft drinks manufacturers was successful at the beginning, but later it failed due to imposed problems. However, a program of returnable beer bottles was successful.

## C.4.2 Collection and Haulage System

### a. Sweepers

The sweeper's initial function was sweeping streets and sidewalks of secondary streets assigned by the corresponding delegation, but due to the increase in wastes to be collected and the possibility to increase their revenues, now he/she picks solid wastes of the houses door to door.

There exist sweepers on the payroll (stably hired) and temporary sweepers (hired by periods) in this activity, who are paid by the GDF and adding up to almost 8,500 workers.

Besides, it is estimated that 3,000 or more voluntary sweepers carry out this activity; they rent the garbage carts and drums in order to work. The daily average cost of this rent is approximately 20 pesos.

The sweepers on the payroll earn 2,200 pesos per month, and temporary ones 950 pesos but the volunteers have no salary.

The cleaning area structure in the delegations varies according to the number of staff, but in general terms it consists of the following: one unit department head, one office boss and the people responsible of the sectors, who are known as "*cabos*" (chiefs or supervisors). The number of sectors per delegation varies; e.g. Alvaro Obregon has 5 sectors, whereas Gustavo A. Madero has 30. Each sector has at least one *cabo*.

Sweepers are grouped by sectors, and they are assigned the work routes of average one kilometer a day per worker. They classify the work routes into two, "good" and "bad" stretches, in accordance with the economic income they can earn by means of the tips. They work for several years in the same stretches, except when his/her behavior deserves a punishment (absence and drunkenness, among others) and they are shifted to "bad" stretches. The duration of the punishment may be variable.

Sweepers begin their working day at 5 a.m., yet their official schedule is from 7 a.m. to 3 p.m. They sweep the streets from 5 a.m. to 7 a.m., and from that hour they pick the garbage of houses, segregate the most worthy wastes in the market and then sell them.

Due to the limited capacity of their containers, sweepers only collect wastes from houses and small businesses, and at the same time, they separate the materials. Once the cart is full, they bring it to a spot agreed on by the team of the corresponding zone



to discharge wastes in their drums to a collection truck. At this place, they pay from 5 pesos to 20 pesos per discharge to the truck driver. On average, each sweeper makes two discharges in his/her working day.

The income obtained by each sweeper per month depends on the socio-economic level of the population attended to and is estimated as follows:

Table C-35: The Income of Sweepers per Month

Concept	Income per month (Pesos)		
	Formal sweeper	Temporary sweeper	Volunteer sweeper
1. Salary	2,200	950	-
2. Tip or fee	1,000	1,000	1,000
3. Trading of recovered materials	600	600	600
Total	3,800	2,550	1,600

The products recovered are mainly paper, cardboard, aluminum and all types of bottles; yet *chacharas* (home utensils and appliances) represent the higher income. The segregated materials are traded at gathering centers (*centros de acopio*) of the *colonias* where they work.

There are other types of sweepers that work for the DGSU, through contracted enterprises, and they sweep the primary roads of the city. This personnel is not syndicated and does not belong to the formal economic structure of the workers.

#### b. Collectors

In order to carry out waste collection, the GDF by means of the delegations employs almost 2,500 formal truck drivers and 3,400 assistants, who belong to Section 1 of the Cleaning Union, which is affiliated to the Only one Workers' Union of the Federal District.

Apart from this formally paid staff, there are "volunteers", who do not earn a formal salary but join the collection teams; they are estimated to be about 4,000 people. These volunteers may not be included in the payroll until they work for as long period as 15 years. They are linked with the formal structure through truck drivers.

The union controls the infrastructure, human resources, organization and operation of the collection and transport system.

The collection process has the following features: the sector which will be rendered the service (in general terms, the distribution of collection trucks is based on *colonias*) is determined by the cleaning unit chief, and the collection frequency is controlled by the truck driver. Although it has been tried to improve the design of the collection routes by specifying such components as stop points and schedules, the cleaning staff comes back to the original method of ringing bells at the previous points where they have been fathering wastes since a long time, at least 15 years ago.

The truck goes over its route and the bell is rung to call the attention of neighborhood, including houses and offices. The assistant receives the wastes and takes care of the tips left by the users. When the garbage is in a container, it is discharged to the truck, and when it is delivered in bags, he tears them off to spread the wastes on the back of the truck. Within the vehicle, the assistant sorts and separates the wastes.

The segregated materials are packed in sacks and bales and placed on the sides and awning of the truck. Aesthetically speaking, the vehicle with these features does not have a good appearance.

At the end of the tour, prior to the discharge at the transfer stations, the by-products are commercialized in one of the 370 gathering centers (*centros de acopio*) that exist in the DF. Most of these informal places do not pay taxes and buy all types of wastes. Besides, they also commercialize the segregated materials outside the transfer stations by selling them to middlemen, the leader of *pepenadores* (waste-pickers).

This material recovery process in the collection trucks is known as *prepepena* (pre-scavenging). At this stage, the wastes are not highly polluted like those picked at the recovery plants. The most common recovered materials are cardboard, aluminum, paper, mattress, furniture, bottles and *chacharas*.

Each vehicle has a driver (as the key person, therefore he considers the truck belongs to him), one or two assistants paid by the GDF and two or three "volunteers".

The driver distributes the revenue obtained during the tour (tips or *finca*) and by selling recovered materials: 50% is divided into equal shares among the assistants and volunteers, while the remaining 50% is for the driver.

The following table shows an estimated breakdown of the monthly revenues of the collection team members by their positions. Obviously, if the team has more assistants or volunteers, their revenues will be less.

Table C-36: Revenues of Driver, Assistant and Volunteer

Position	Income per month (Pesos)				
	Salary	<i>Finca</i> /tip	Sales of recyclable products	Payment by sweepers	Total
1. Driver (on the payroll)	2,500	3,500	3,000	750	9,750
2. Assistant (on the payroll)	2,200	1,750	1,500	375	5,825
3. Volunteer	-	1,750	1,500	375	3,625
				<b>Total</b>	<b>19,200</b>

Source: JICA study team

From this total, they pay for additional fuel to that provided by the GDF and minor repairs of the vehicle.

### C.4.3 S/P Management System

#### a. Separation of By-Products

Since 1930 in Mexico City, recyclable by-products have been recovered from the garbage due to economic, instead of ecological, reasons. For a long time, the segregation of by-products was carried out at open dumping sites in unhealthy conditions for the selecting personnel. To cope with this situation, selection plants (S/Ps) were established and have offered better working conditions, since they are roofed facilities with infrastructure required for the selection activity, and they are also furnished with the basic sanitary facilities for workers.

Currently, the DF has three S/Ps with a total installed capacity of 5,500 ton/day.

The organization and operation of the S/Ps is carried out coordinately by the DGSU and the waste-pickers groups. Maintenance of the equipment and facilities, reception of wastes and general coordination of plants are carried out by the DGSU, whereas the selection, conditioning and trading of by-products are carried out by each selecting group (formerly known as *pepenadores*).

Both the operative and maintenance activities of the plants under the responsibility of the DGSU have been contracted with entities of the sector, which include the control of harmful fauna, maintenance of weighbridges, transportation of the waste-pickers groups' staff from the S/P to the housing units and vice versa, and the verification of vigilance services to the facilities.

There are nine small and middle private enterprises contracted for the three plants, which are in charge of the operative activities previously mentioned and employ 415 workers.

Besides, in order to give maintenance to the three S/Ps, there exists a contract with other three private companies, which employ 100 workers.

On the other hand, the DGSU has its own professional, administrative and support staff, which is in charge of the supervision the contractors' job. The control of operative activities is done by 30 people for the three plants; the supervision of maintenance activities is conducted by other 30 people and the technical, administrative and general maintenance staff is formed of 45 persons.

#### b. Waste-Pickers' Social Development

The first open dumping sites appeared in the eastern and western zones of the city. The open dumping sites became job sources for hundreds of families that lived on and with the garbage. In order to facilitate their daily work, the waste-pickers placed themselves next to or even inside the dumping sites, forming squatter settlements with no drinking water, sewerage or electric power services. As a consequence, severe health, family and communal problems arose, such as promiscuity, alcoholism, prostitution and drug addictions.

Due to the magnitude of the social problems posed by open dumping sites, the authorities outlined some actions to solve them. These included the closure and sanitation of these sites, and in 1985 they started to operate the Bordo Poniente sanitary landfill.

Through the implementation of the sanitary landfill technique and the arrangement with the waste-pickers groups, it was possible to close the Milpa Alta, Bordo Xochiaca, Tlalpan, Tlahuac, San Lorenzo and Santa Fe dumping sites.

### **c. Wastes Selection Plants**

The sanitary operation of the landfills would implicate the absence of waste-pickers at working faces of landfills. Therefore, the city authorities proposed the installation of the S/Ps with appropriate working conditions for the waste-pickers.

The negotiations and agreements with the waste-pickers groups were reached with difficulty, and the installation of the three S/Ps (at San Juan de Aragon, Bordo Poniente and Santa Catarina) took almost ten years.

#### **c.1 San Juan de Aragon**

It has an installed capacity of 2,000 ton/day, with four sorting conveyers in two modules. In 1997, from a total of 700,000 tons of wastes that entered the plant, 660,000 tons were processed. 30,700 tons of by-products were separated, which counted for only 4.7% of the processed garbage. Among the wastes that were received, 40,000 tons corresponded to bulky wastes that were not processed.

The greater amounts of recovered by-products include plastics, glass, cardboard, paper and ferrous cans (in that order), representing 86% of the total amount recovered.

The selecting staff of this plant is approximately 500 workers, but the average number of selectors that worked per day was 458 in 1997. This personnel was distributed to three shifts (morning, evening and night shifts).

#### **c.2 Bordo Poniente**

It has an installed capacity of 2,000 ton/day, with four sorting conveyers in two modules. In 1997, from a total of 610,000 tons of wastes that were received at the plant, 598,000 tons were processed and 30,000 tons of by-products were separated, which counted for only 5% of the processed garbage. Among the wastes that were received, 12,000 tons corresponded to bulky wastes.

The greater amounts of recovered by-products include plastics, glass, metal plate and paper (in that order), representing 89% of the total amount recovered.

The selecting staff of this plant is approximately 400 workers, but the average number of selectors that worked per day was 350 in 1997. This personnel was distributed to three eight-hour shifts (morning, evening and night shifts).

It is also reported that in seven months of 1997, 950 tons of special wastes - including hazardous wastes - were received in this plant.

#### **c.3 Santa Catarina**

It has an installed capacity of 1,500 ton/day, with three sorting conveyers and is under a process to increase its capacity by 1000 ton/day.

In 1997, from a total of 455,000 tons of wastes that were received at the plant, 412,000 tons were processed and 32,000 tons of by-products were recovered, which

counted for 7.6% of the processed garbage. Among the wastes that were received, 43,000 tons corresponded to bulky wastes.

The greater amounts of recovered by-products include glass, PET, cardboard, metal plate and paper (in that order), representing 86% of the total amount recovered.

The selecting staff of this plant is approximately 400 workers, but the average number or selectors that worked per day was 353 in 1997. This personnel was distributed to two eight-hour shifts, yet in certain periods there was a single shift.

This plant started working in February 1996, one year and eight months after the other two started to work.

Apart from the group of selectors in the plant, there exists a group constituted by almost 300 waste-pickers, who separate the products at the working faces of Santa Catarina's controlled landfill. More information on by-products and on personnel attendance could not be obtained, as the leader of the waste-pickers group does not disclose it.

#### d. Waste-Pickers' Health Conditions

The information of the Secretariat of Health and the DGSU which was included in the 1996 document "Relevance of Municipal Solid Wastes on Public Health" records private medical consultation data, according to the reasons for consultation among the samples of solid wastes pickers in the DF.

Table C-37 shows that respiratory infections (36.1%) and diseases derived from diarrhea (12.4%) constitute the main causes in external consultation.

Table C-37: Private Medical Consultations for Waste-Pickers,  
According to the Reasons for Consultation (%) - DF 1995

Reasons for Consultation	%
Respiratory infections (*)	36.1
Diarrhea related diseases (*)	12.4
Accidents and Violence	9.3
Mycosis	3.1
Urinary tract infections	1.5
genital-urinal disorders	9.9
Parasites	10.9
Tuberculosis	2.1
Other causes	14.7
Total	100.0

Source: SSA and DGSU  
(\*) Selected Reasons

Regarding cholera, a report by the DGSU informs that due to the outbreak of this disease in the separators' population (waste-pickers), a study on the transmission link was carried out, which in turn showed that a cockroach (*periplaneta americana*) was the carrier of "vibrio cholera". This fact remarked the importance of controlling the harmful fauna that proliferates at the solid wastes accumulations.

The most frequent accidents are the following: wounds by sharp objects on hands, fingers and arms; and contusions and bruises both in the limbs and the head. Besides, burns and dislocations also occur.

All the plants present high concentration of suspended particles or dust. In spite of having been provided with the necessary equipment, the selectors (waste-pickers) do not want to use it.

The scarce data obtained on severe accidents at the three recovery plants show that six accidents took place in the last five years within the electromechanical maintenance personnel. No data on accidents of waste-pickers exist.

#### e. Selectors (Waste-Pickers) Groups

In Mexico, the hierarchical organization of the waste-pickers group dates from a long time ago, and the head of this organizations is the "leader", historically represented by deceased Rafael Gutierrez Moreno. The current waste-pickers groups or associations have followed this vertical organization scheme to different degrees.

The leader controls the trading process and also determines the distribution of the benefits derived from the functions of the S/Ps. In this distribution, the leader and the *cabos* (supervisors) take a substantial amount of the benefits.

These organizations, whose legal recognition as business associations is not defined yet, are the following:

- San Juan de Aragon: "Asociacion de Selectores de Desechos Solidos de la Metropoli, A.C."
- Bordo Poniente: "Frente Unico de Pепенadores A.C."
- Santa Catarina: "Union de Pепенadores del DF Rafael Gutierrez Moreno, A.C."

These organizations, which pretend to be associations, are not such in fact, as the segregators (waste-pickers) are not partners and the benefits are not distributed as in an normal association. It must be stressed that they are private informal enterprises, which are literally owned by the leaders and pay no taxes, nor do they pay for welfare to the personnel. Informally, however, the leaders employ medical insurance in cases of illness and accidents, for which the waste-pickers must pay 60 pesos each every six months.

The customers of the plants - middlemen between the S/Ps and the by-products' processing industries - have commercial links with the leaders. This relation goes back as far as when there existed open dumping sites. In some occasions, these links are not based on an economic theory of benefit maximization.

In San Juan de Aragon, there is only one purchaser that directly transforms the material purchased and is known as RIMEX (Reciclados Industriales de Mexico), which buys the plastics recovered at the plant.

The industries to which the by-products finally reach are both domestic and international ones. An approximate income estimated from the annual sale of by-products during 1996 is the following:

San Juan de Aragon	\$11.7 million
Bordo Poniente	\$25.2 million
Santa Catarina	\$28.7 million

#### **f. Benefits for Waste-Pickers**

As a result of the staggering process of long negotiation with waste-pickers, the benefits and subsidies granted to the waste-pickers by the GDF have been diverse and expensive:

- Investment for the construction and installation of the three S/Ps.
- Operational expenses of the S/Ps.
- Maintenance expenses of the S/Ps.
- The GDF fostered coordination between FIVIDESU and SERVIMET (housing credit institutions) to facilitate waste-pickers the acquisition of houses. Through the FIVIDESU, two housing complexes were constructed: one in Iztapalapa (Avenida 11) and 170 houses out of 550 were endowed; the other one was built in Tlahuac (Manuel H. Lopez Housing Complex), where 131 houses out of 204 were also endowed.
- With the assistance of the Secretariat of Public Education, 1,200 children and youngsters were registered in the surrounding educational centers of the new complexes.
- The necessary assistance was provided for those waste-pickers that chose an "indemnity", as well as the transfer to the appropriate place for the 127 families that requested so.
- Once the new families moved to the housing complexes, they received further assistance to be incorporated to the society with the help of a social worker per every ten families.
- They are assisted with transportation from their houses to the plant and vice versa.
- The DGSU helped with the loading of recovered by-products to the purchaser's vehicle.

## **C.5 Institutional, Organizational and Financial System**

### **C.5.1 Institutional System for Solid Waste Management**

#### **C.5.1.1 Legislation and Regulation**

In Mexico, any issue, like the one referring to environmental aspects, has the legal support given by the Political Constitution of the Mexican United States which establishes, in several articles, concepts related to the environment, natural resources and public health. They are listed as follows:

**Article 4** establishes the right for every person to protect his/her health; it also points out that imbalance on the ecosystem should not affect the population nor individuals.

**Article 24** defines that the use and exploitation of productive resources should be done by paying attention to the conservation of them and also of the environment.

**Article 27** establishes the need to conserve natural resources and to pay attention to populated areas with the purpose of preserving and restoring environmental balance.

**Article 73** refers to the elaboration of laws regarding the protection of the environment and the restoration of ecological balance.

Within the framework of environmental regulation in Mexico, there are instruments which allow to define criteria to differentiate hazardous waste from non-hazardous ones; as well as powers for Federal, State and Municipal governments to deal with them; and also obligations and specific precepts that are applied to hazardous wastes.

The legal hierarchy of the environmental regulatory framework regarding hazardous waste is shown in the following table:

Table C-38: Environmental Regulatory Framework

Legal Instrument	Responsible Entity
Political Constitution of the United Mexican States.	Secretariat of Governance
Ecological Balance and Environmental Protection Law (LGEEPA)	Secretariat of Environment, Natural Resources and Fishing (SEMARNAP)
LGEEPA Regulation on hazardous waste.	SEMARNAP
Other instruments	Other entities of the Public Sector

Within the regulatory framework for the control of hazardous wastes, they are described as those wastes, in any physical state, which due to their corrosive, toxic, poisonous, reactive, explosive, inflammable, or biological infectious characteristics represent a hazard to ecological balance or the environment.

In addition to the definition of the Mexican official Norms (NOM), the regulation and control of activities which are considered highly hazardous and the generation, treatment and final disposal of hazardous materials and wastes is included in the Federation powers. This implies that the control of wastes which are not specified as hazardous is a competency of state and local governments.

Now, regarding the above, it is worthy to define some considerations which are contained in the LGEEPA:

**Article 7** The States take charge of the following powers, according to what this Law and local laws state regarding this matter:

- Fraction VI The *regulation* of the collection, haulage, storage, management, treatment and final disposal systems of solid waste and industrial waste which are not considered hazardous according to what article 137 of LGEEPA states.

**Article 8** The Municipalities take charge of the following powers, according to what this Law and local laws state regarding this matter:



- Fraction VI *The application of legal precepts regarding the prevention and control of the effects on the environment caused by generation, haulage, storage, management, treatment and final disposal of solid waste and industrial waste which are not considered dangerous according to what article 137 of LGEEPA states.*

**Article 137** *The operation of municipal solid waste collection, haulage, storage, transfer, reuse, treatment, and final disposal systems are subject to authorization from municipalities and the DF, according to their local laws on the matter and applicable Mexican official norms.*

The Secretariat (SEMARNAP) would elaborate norms which are referred to in Article 137 shown above.

**Article 138** *The Secretariat would promote reaching agreements on coordination and consultation with the state and municipal governments with the purpose of:*

- I. *Establishment and improvement of a municipal solid waste collection, treatment, and final disposal systems; and*
- II. *Identification of alternatives for reuse and final disposal of municipal solid waste; it will include to elaborate inventory of those wastes and their sources.*

These articles suggest, from the normative perspective, the participation of a series of organizations and institutions from both the private and social sectors as is shown in the following figures.

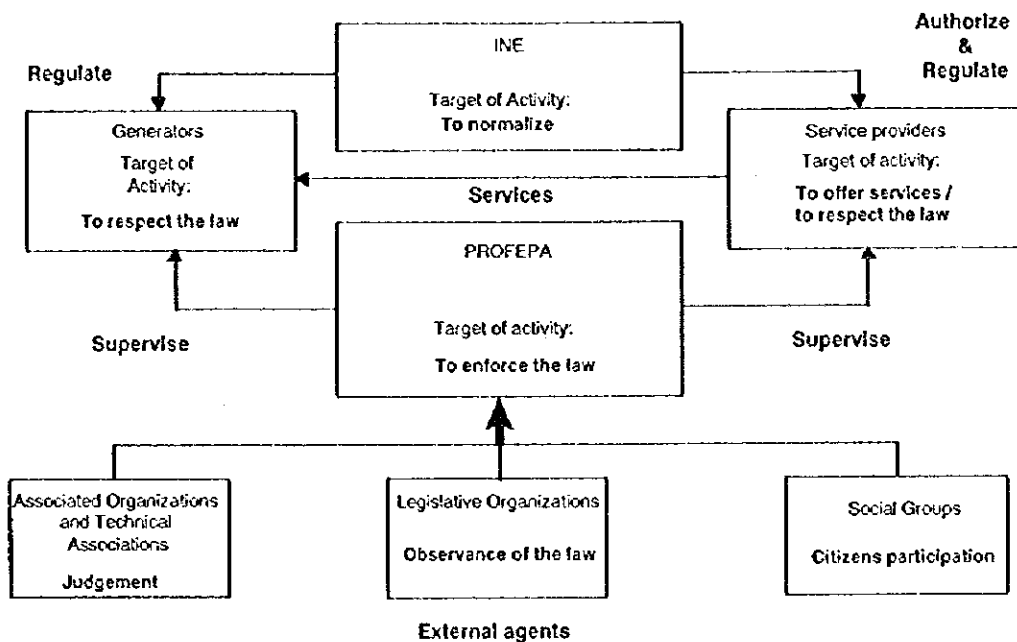


Figure C-10: Institutional Normative Scheme Regarding Hazardous Waste Control

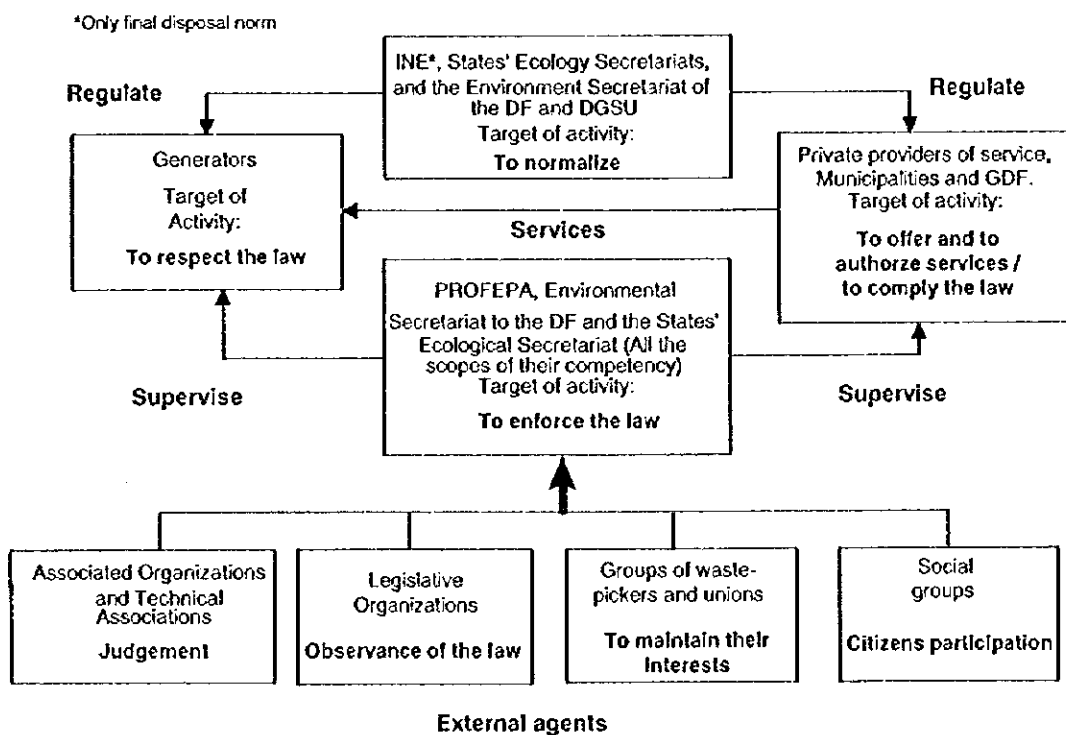


Figure C-11: Institutional Normative Scheme Regarding Municipal Waste Control

With regards to the **Federal District** exclusively (responsibilities related to operative and regulatory matters), it is convenient to point out that the obligations and powers are granted with the different regulatory instruments to the centralized areas of public administration of the District which have some function under their responsibility.

The **Statute of the Federal District Government**, published on the 22nd of April 1998 in the Official Gazette of the Federal District, establishes the following precepts:

**Article 115** The central organs of the Public Administration of the Federal District, in accordance with what the law defines, take charge of the attributions for *planning, organization, establishment of norms, control, assessment and operation* related to:

- Provision or concession of public services of *general coverage* in the city, as well as those which have the *characteristics* referred in the following fraction;
- Provision of public services and planning and execution of works which have *impacts on more than one delegations and require high technical specialty* in accordance with the classifications made in applicable precepts.
- Definition of participation systems for **Delegations** regarding the provision of public services of *general characteristics*, such as water supply, drainage, waste water treatment, *waste collection in primary roads*, public transportation, and public security.
- In general, administration functions, planning and execution of works, provision of public services, with attention to the public in general, government actions which are realized or are related to *the whole city or which might have impact on more than one delegation*.

**Article 116** The attributions referred to in the previous article, as well as those with technical-operative characteristics **could be assigned to decentralized organs other than Delegations**, with the purpose of achieving an efficient, prompt and timely administration which should be based on principles of simplicity, transparency and rationality; in accordance with internal regulations referred to in Article 88 of this Statute.

**Article 117** The **Delegations** of the Federal District will have powers within their respective jurisdictions, on matters such as governance, administration, legal affairs, works, services, social, economic, sports activities and others indicated in the **Organic Law for Public Administration of the Federal District**; as well as those which are assigned to them to fulfill their functions through an agreement with the head of the government. The attributions will have to meet the following basis:

- Provision of public services and execution of works, taking into account the *particularity* of each Delegation and paying attention to guidelines on the *integration of the city*;

- Participation with other delegations in coordination systems for the provision of services and execution of works whenever they exceed the corresponding jurisdiction, in accordance with norms established by the head of the Federal District Government for those purposes;
- Expression of opinions in terms of what the laws determine regarding concession of public services which might have some effect on the Delegation;
- Issue and revocation of licenses, permits and authorizations in accordance with what is established by laws and regulations;
- Undertaking, in general terms, of administrative functions, provision of public services and works which can be executed or have an effect on *more than one delegation*;
- Preservation of environment and ecological balance.

Furthermore, it should also be pointed out that Article 113 establishes that it is responsibility of Delegates to periodically see around within their jurisdiction with the purpose of verifying the manner and conditions under which the services are being provided. Similarly, Article 118 points out that the development and welfare of the Federal District *should be able to preserve the environment and ecological balance.*

However, the Organic Law of Public Administration from the Federal District establishes the following:

**Article 32** The Delegations of the Federal District are committed to the following.

- XXII. To render the Cleansing Service in the form of Sweeping of common areas, secondary roads and other public roads, as well as the collection of solid wastes.

The Environmental Law of the Federal District which was approved by the Legislative Assembly of the DF and published on the official paper (Diario Oficial) of the Federation on the 9th of July 1996, regarding the control of municipal solid waste and the provision of services for that type of waste, establishes the following:

**Article 15** It is a competency of the Secretariat (of Environment of the DF) to:

- XIV. Prevent and control soil pollution, as well as that derived from the generation and management of waste which is not reserved to the Federation in coordination with the **General Direction for Urban Services (DGSU)**;
- XV. Establish or authorize the installation of *sites which are destined to waste management* which is not reserved to the Federation; as well as to propose the elaboration of *precepts* which regulate its *management* by paying due attention to official norms in coordination with the DGSU;
- XVI. Evaluate environmental impacts and risk and, according to circumstances, issue an authorization for works or activities

(public or private) which might affect the environment. Also to supervise to ensure that related directives are satisfied (*for the cases that are not assigned to the Federation for example, the case of non-hazardous waste disposal*);

- XXII. Prevent and control pollution originated by noise, vibrations, thermal energy, light, and odors at the source within the competency of the Federal District;
- XXIII. Observe and enforce official norms during the provision of public services which include those related to water supply, drainage and sewage, wastewater treatment and reuse, rainwater conservation, *cleansing, markets and the Central Markets*, cemeteries, slaughterhouses, local traffic and transportation in coordination with other concerned authorities;
- XXVIII. Regulate, prevent and control the *environmentally risky activities* which are not reserved to the Federation;
- XXX. Participate with the Federation in the analysis, approval and application of prevention and control programs for *accidents* which are derived from the execution of high risk activities to the environment in the Federal District.
- XXXI. Participate, within its jurisdiction, in the regulation and application of urgent measures which are required to protect the environment integrity whenever *accidents, leaks or spills* of materials or waste take place.

**Article 16** The Federal District will participate along the lines stated in the Political Constitution of United Mexican States and Statute of Federal District Government in the planning and execution of coordinated actions with the Federation, States and Municipalities in the *bordering co-urbanized zones* of Mexico City, *regarding the protection of environment*, preservation and restoration of the ecological balance. For this purpose, agreements can be subscribed to create a corresponding **Commission** which can serve for meetings and participation from all sides, paying attention to the governing laws.

**Article 18** Through the Commission, the following will be established:

- I. Basis to sign agreements within the Commission which would define the *territorial and operational scopes* regarding the *execution and operation of works, provision of services* or execution of activities stated in Article 16.

**Article 93** Regarding waste and official norms, the persons are compelled to:

- I. Prevent its generation;
- II. Minimize generation of waste which can not be prevented;
- III. Recycle or reuse the generated waste;

IV. Treat them prior to their final disposal whenever they can not be recycled or reused with the objective of reducing their hazardous level and volume; and

V. Provide final disposal to treated waste.

**Article 94** It is assumed, unless proven to be contrary, that those responsible for any damage or negative effect caused by waste are:

- Waste owners who manage wastes, while wastes are under their custody or responsibility; and
- The GDF Public Administration for the non-hazardous waste collected by the cleansing service.

**Article 95** It is prohibited to dump or dispose of waste on *public roads*; similarly, it is forbidden to burn them or any other material in the open air.

**Article 96** It is prohibited to dispose of in the *drainage and sewage networks* or *receiving bodies* of the Federal District, materials, wastes or sludge from wastewater treatment or to discharge wastewater directly or by dissolution, dilution, dragging or filtration that might pollute water.

**Article 128** Without spoiling any precept stated in this law regarding risk researches, the persons who undertake hazardous activities, which are not reserved to the Federation, should pay attention to control, preventive and corrective measures which are established by the Official Norms or enacted by the relevant authority according to the Civil Protection Law for the Federal District, in addition to other applicable precepts. This should be *done to prevent and to control accidents* which could affect the integrity of persons or the environment.

A Coordination Agreement between the Federal Executive, Mexico State, Department of the Federal District and Semi-governmental Organizations in the energy sector was published on the 17th of September of 1996. As a result, a Metropolitan Environmental Commission (CAM) was created.

This Commission is "*a coordinating organ to plan and to execute activities in the bordering co-urbanized area with the DF in order to protect the environment and preserve and restore the ecological equilibrium*".

Among their functions, two of them deal directly with wastes:

- IX. To agree and to coordinate the adoption of joint activities which pay attention to the problems of co-urbanized areas such as waste collection, treatment and final disposal.
- XI. To prepare and to propose the Metropolitan Environmental Program, as well as the Metropolitan Program for Waste.

Finally, the Decree which reforms the Internal Regulation of the Federal District Public Administration (published in the Official Paper of the Federation on the 1st of

December 1997) states the following authority for the DGSU in Article 33, regarding *municipal solid waste*.

- To establish, in coordination with relevant authorities, criteria and technical norms for solid waste *minimization, collection, transfer, treatment and final disposal* activities; additionally, to restore polluted sites, as well as to establish solid waste *recycling and treatment* systems;
- To undertake studies, projects and the construction, conservation and maintenance of *infrastructure works* for SWM, i.e. transfer stations, selection and re-utilization plants, as well as *final disposal sites*;
- To organize and to undertake solid waste *treatment and final disposal*, as well as the *operation of transfer stations*; and
- To receive new works which require urban services and that are executed by other offices, administrative units and decentralized organs of the Federal District.

#### C.5.1.2 Involved Entities

Articles described above suggest the participation of several Organizations and Institutions from the Public, Private, Social sectors, from the normative perspective, as shown in Figure C-10 and Figure C-11.

The Government Statute of the Federal District (approved by the Representatives Assembly in 1989) stated that such services as below are involved:

- I. Public roads street sweeping;
- II. Solid waste collection; and
- III. The design, instrumentation and operation of storage, haulage, reuse, treatment, and final disposal systems for those wastes.

The operation of transfer, treatment and final disposal systems is DGSU's responsibility. In coordination with the political delegations, DGSU is responsible for the execution of primary road network cleansing and the collection of waste accumulated in public roads.

Particularly, the **Political Delegations** are responsible for providing household waste collection service, and secondary and local roads cleansing.

From the all stated above, - regarding management of municipal solid waste which does not have hazardous characteristics as they are established in the Environmental Regulatory Framework on hazardous solid waste - it is clear that the power to normalize the final disposal of such waste is exercised by SEMARNAP through the National Institute of Ecology (INE) which is the organization in charge of defining the corresponding Mexican Official Norms (NOM).

Now, the **Secretariat of Environment** and the DGSU (both of them are within the GDF), as well as the Federative entities of the Mexican Republic are responsible for the norms related to the management of those wastes (excluding their final disposal), within their scope of competency.

The administrative regulation of municipal SW, including their final disposal, is the responsibility of the State Governments, and in the case of Federal District the **Secretariat of Environmental and the DGSU** are responsible for it.

The authorization of all different activities related to the *management* of those wastes in the Mexican Republic is the responsibility of the **Municipal Governments**; meanwhile, in the Federal District, this responsibility is shared by different entities as shown below:

- Waste collection to the **Political Delegations**.
- Waste transfer and treatment to the **DGSU**.
- The establishment of final disposal sites to the **Secretariat of Environment** in conjunction with the **DGSU**.

As the most important member of the Metropolitan Zone of the Mexico Valley, the DF participates and holds the first presidency of the **Metropolitan Environmental Commission (CAM)** which was created in September, 1996.

The **permanent** members of the Commission are the head of SEMARNAP and the Governors of the DF and the State of Mexico. The **temporary** members are the heads of the Secretariats of the Federal Government and the organizations which are part of this Commission.

The **Internal Regulation** of CAM was published on the 9th of July 1997; it states its organization and operation.

The supreme organ is the **Plenary Session (Pleno)** of the Commission which is formed by permanent members and temporary members (each one within their competency) which have the right to express their ideas and to vote.

It is within the competency of the President to appoint the head of the **Technical Secretariat**, which is the internal executive organization of the Commission, and appoints the **Coordinators of the Task Groups (TGs) (*Grupos de Trabajo*)** which are the technical organizations in charge of the specific affair of the Commission. The TGs are formed by the same number of representatives as the permanent members; temporary members can participate with a right to voice their opinions and to vote whenever the issue concerns them. One of the permanent TGs is "*V. soil and subsoil quality and waste management*".

The other organization which is part of the Commission is the **Advisory Council (*Consejo Consultivo*)** which can be invited by the head of the Technical Secretariat to participate in the Plenary Session and the Secretariat meeting, and has a right to voice its opinion but cannot vote. This Council is formed by representatives of the scientific community and of the social, political, public and private sectors.

Ordinary meetings of the Plenary Session of the Commission should take place, at least, every 4 months; those of the Technical Secretariat, every 3 months. It is assumed that it takes a relatively long time for issues to proceed to the Commission. Their functions are mainly to coordinate and to guide the bordering co-urbanized units with the DF. Functions IX and XI, mentioned previously, explicitly refer to waste; these functions have the purpose of *undertaking joint activities to pay attention*



to the co-urbanized area regarding waste collection, treatment and final disposal, as well as the proposal for a Metropolitan Program of Waste.

Apart from the CAM, an agreement was signed in 1998 between the GDF and the State of Mexico in order to establish a commission for the management of solid wastes in the metropolitan area.

Finally, the competency of the Secretariat of Works and Services regarding the control of non-hazardous municipal solid waste is summarized as follows.

The Secretariat of Works and Services is the section of the DF empowered to plan, to organize, to normalize and to control the execution of works and the provision or concession of public services which can have inter-delegation or multi-delegation impacts, or require high technical specialty that corresponds to urban development and installation, which should not be within the competency of other Secretariats or Political Delegations. It also has the responsibility to construct, to maintain and to operate, either directly or through private sector, the public works within their competency.

Regarding solid waste, it is a responsibility of the Secretariat, through DGSU, to operate the transfer, treatment, and final disposal systems. It also regulate the management of these wastes in a joint effort with the Secretariat of Environment, sharing the responsibility to normalize the management of these wastes (except final disposal) as well as the authorization for final disposal sites. It is also empowered to authorize the treatment and transfer services for such wastes.

Concerning the Political Delegations, with respect to municipal SWM, it is their competency to provide waste collection service, local and secondary avenues cleansing, and sweeping of public areas (in accordance with the Cleansing Regulation - Reglamento de Limpieza - enacted in 1989). Similarly, according to the Federal District Statute, delegations have authority to express opinion on public services concessions which affect their territory, as well as to issue and revoke licenses, permits and authorizations according to what laws and regulations establish.

All the stated above implies that the participants' functions are well defined concerning hazardous waste management. Perhaps the only area where competencies are not very clear is regarding the regulation for municipal waste final disposal, given that there are some sectors of the society which believe that the regulation for this aspect applies only to state governments. This ambiguity of competencies does not have basis, because LGEEPA in article 137 establishes clearly that *it is federal competency to define the Mexican official norms on everything concerning municipal solid waste final disposal*. Furthermore, in cases where final disposal of these wastes may cause some effect on the environment, as it happens in almost all final disposal sites, it is responsibility of SEMARNAP through its empowered organization to take care of the situation.

Concerning municipal solid waste in the states, it is very clear that it corresponds to state governments to normalize and to regulate this aspect, meanwhile it is a responsibility of the municipalities to issue the corresponding authorization.

In the case of the Federal District, the situation is more complex, taking into account that several entities within the government participate in the process; these entities

deal with from the establishment of the norms to the operation of the systems, as it is shown in the following table:

Table C-39: Competencies for Municipal SWM in the DF

COMPETENCIES ACTIVITIES	WHO NORMALIZES	WHO REGULATES	WHO AUTHORIZES	WHO OPERATES	WHO SUPERVISES
SWEEPING AND CLEANSING	SMA DGSU	SMA DGSU	DELEG. DGSU	DELEG. DGSU	SMA
COLLECTION	SMA DGSU	SMA DGSU	DELEG. DGSU	DELEG. DGSU	SMA
TRANSFER	SMA DGSU	SMA DGSU	DGSU	DGSU	SMA
TREATMENT	SMA DGSU	SMA DGSU	DGSU	DGSU	SMA
FINAL DISPOSAL	INE	SMA DGSU	SMA DGSU	DGSU	SMA PROFEPA

SMA: Environmental Secretariat of the GDF.  
DGSU: General Direction for Urban Services of the Works and Services Secretariat of the GDF  
INE: National Institute of Ecology, SEMARNAP.  
DELEG.: Political Delegations of the DF.  
PROFEPA: Office of the Federal Prosecution For the Environment Protection, SEMARNAP.

The management of municipal solid wastes in Mexico city involves, in addition to traditional sweeping, collection and final disposal stages, transfer and treatment (segregation of recyclable products) of wastes. In almost all management stages, apart from the traditional procedures applied to almost the same criteria used in the world, there exists an informal process that is not officially recognized by the responsible authorities, while this system is somehow accepted, although sometimes its activities are regarded as irregular.

Among the most remarkable informal procedures of this type, it is worth to mention the following:

- The *waste-picking on routes* is an informal activity that takes place during the collection of wastes; this activity is not only accepted by the authorities from the delegations that are responsible for collection service, but in some cases it is regarded as a labor reward to compensate the salaries of payroll and informal workers or as an "accepted" gain or benefit. This activity includes segregating materials on the collection routes, which have a determined price at the market and can be easily identified, because their separation is not very difficult. Some of the separation items are: glass bottles, aluminum cans, cardboard, PET bottles. The revenues from selling of these materials is used to grant a king of a salary to the volunteers, as well as to supplement the driver's and their assistants' salaries, who are registered on the delegation's payroll.
- On the other hand, there exists an unofficial mechanism by means of which the users of the system "pay" for the rendered service to the collection staff as a "tip", which is negotiated between the users and the collection unit drivers per service. When a special service is carried out, e.g., gardening material, construction debris and old furniture, the tip may be three-fold.

- The sweeping personnel, specially in zones where are many commercial stores and service companies, or high-income residential zones, apart from the tasks they are assigned to, also carry out *door-to-door waste collection* of their own accord (this is not a compulsory order) and they charge for this job. This activity, which is normally carried out after they finished their normal tour, is somehow additional to the normal collection service, because within a certain point of the collection vehicle route, they bring their load with advance payment of a predetermined amount. This situation in theory makes the service costly, as the collection cost must now include costs of the work by the sweeper.

The tip that the user gives to the collector is distributed between the sweeper and the collection vehicle staff.

- On the other hand, the productive activities in the S/Ps are carried out by waste-pickers groups, regardless of the fact that they are not yet legally formalized and have not yet reached an agreement with the GDF in that sense. Within these plants there are people that are not formally employed by anybody, but they are in turn "informal employees" of the group "leader", in each plant.
- The same informal function is also found at the Santa Catarina landfill, where waste-picking is the privilege of a group that in fact manages the site. This group has an historical background, through the agreement between the former DDF (now GDF) and the Santa Fe dumping site waste-pickers, along with other sites that were closed. In order to compensate the waste-pickers, the government constructed the Santa Catarina S/P and entrusted the exploitation of wastes in the plant, together with other benefits.

The informal chain also reaches the recyclable material purchasers, as the following table shows.

Table C-40: Informal Relations

Participants Characteristics of the relations	Those who separate at the collection (1)	Middlemen who acquire and sell recyclable materials (2)	Those who separate at the S/Ps (3)	Corporatives who acquire the materials (4)
Activity target	To increase their income.	To protect interests of large corporatives.  To pay as less as possible.	To achieve a maximum amount of material recovery with the least cost and the minimal economic burden.	To control prices of recyclable materials.
Field of activity	All municipal waste generators, specially commerce and services.	Public and private collection vehicles.	Waste coming from the areas with the highest percentage of recyclable materials.	Waste generated in all Mexico city.
Relations with other participants which they interact	Necessary and in good terms with (2).  They tolerate (3) in potential and permanent conflict.  Scarce and occasionally of the commercial type with (4).	Necessary and in good terms with (1).  Weakened and in some competition with (3).  Close and in good terms with (4).  Some gathering centers (centros de acopio) have the support of the corporative sector.	They tolerate (1) in potential and permanent conflict.  Weakened and in some competition with (2).  With an ample commercial relation with (4).	Scarce and occasionally of the commercial type with (1).  Close and in good terms with (2).  Some gathering centers (centros de acopio) are backed by them.  With an ample commercial relation with (3).
Relations with the responsible institutions for urban cleansing services	Their activity is tolerated, although not officially recognized by the GDF.	Not existing.	Their activity is supported officially and economically.	Not existing.

### C.5.1.3 Recent Facts

During the period on which the studies for the Master Plan are being made, the GDF is developing activities in two different fields, which will have an important impact on the SWM System.

The first aspect is aimed at the creation of a **Metropolitan Commission for the Management of Wastes**, which is not related to the CAM. Final disposal of wastes from the DF and from other municipalities consisting the ZMVM is one of the objectives of this commission.

The second aspect is what has now resulted in a recent agreement reached between the GDF and Section I of the Unique Labor Union of the GDF.

### C.5.2 SWM Organizational System

This system is shown in the following graphs.

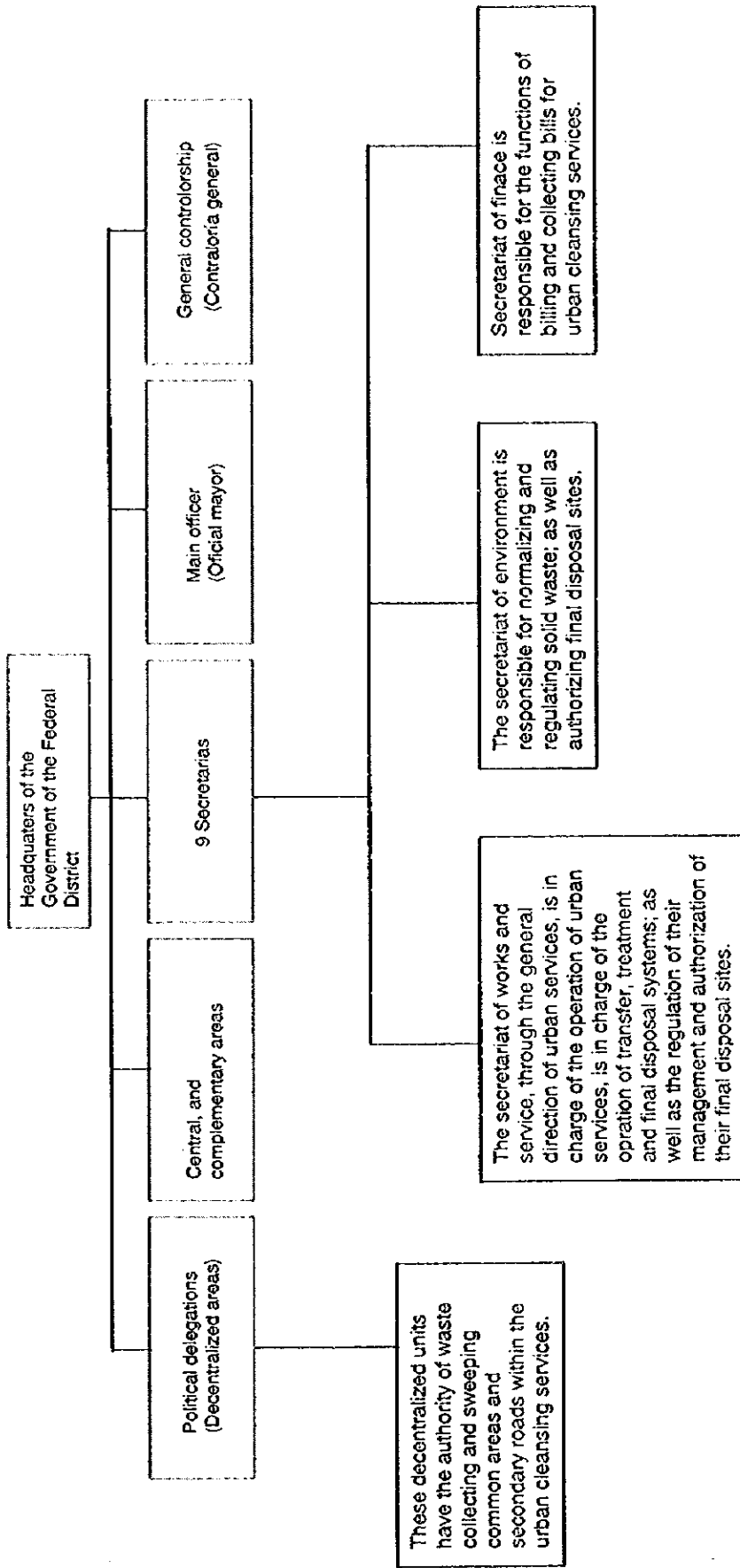


Figure C-12: Organic Structure of GDF, Showing the Offices Responsible for SWM

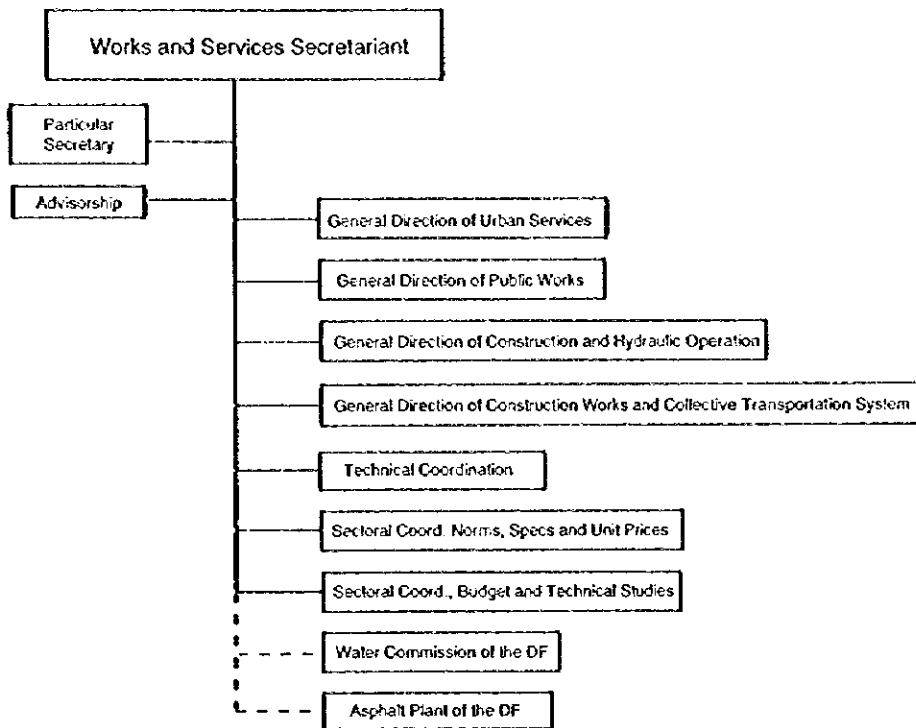


Figure C-13: Organic Structure of Secretariat of Works and Services

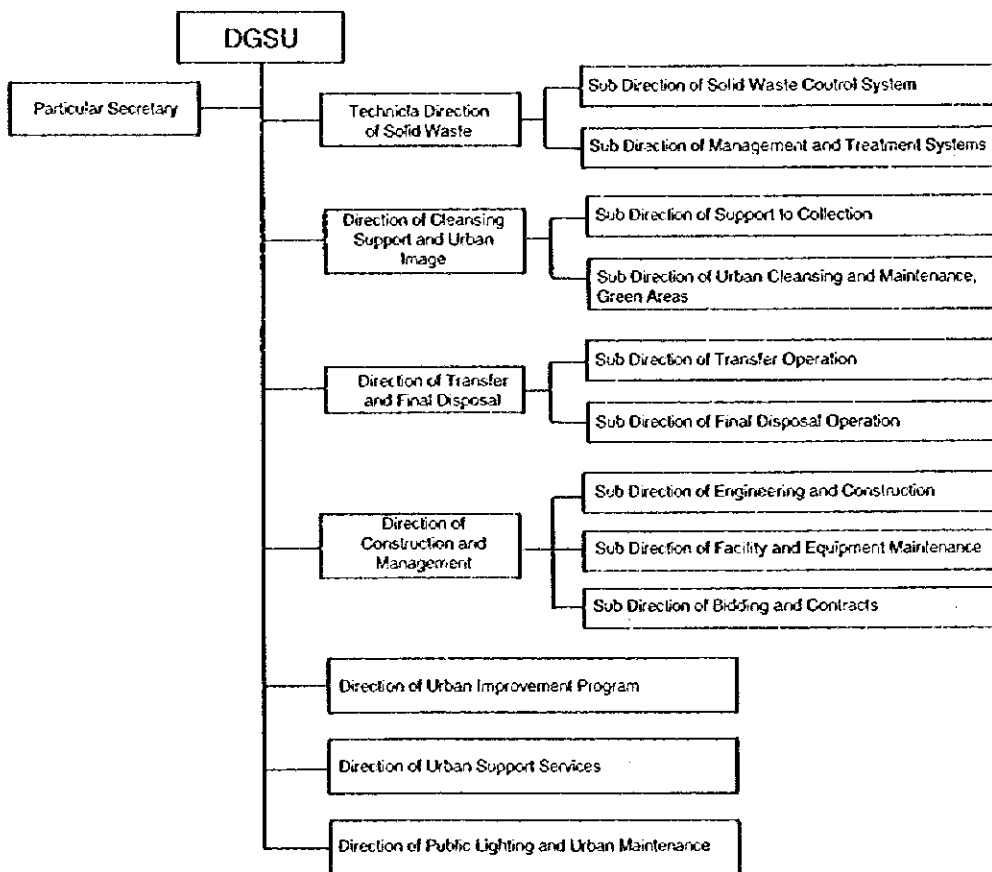


Figure C-14: Organic Structure of DGSU

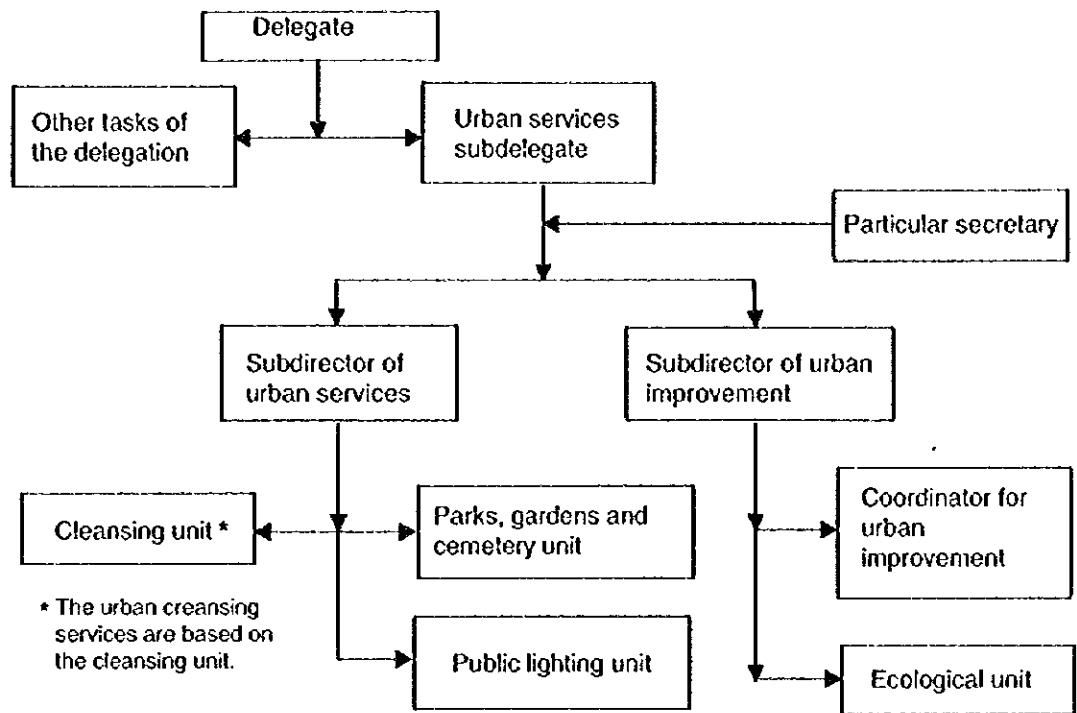


Figure C-15: Delegations Structure: Example - Benito Juarez Delegation

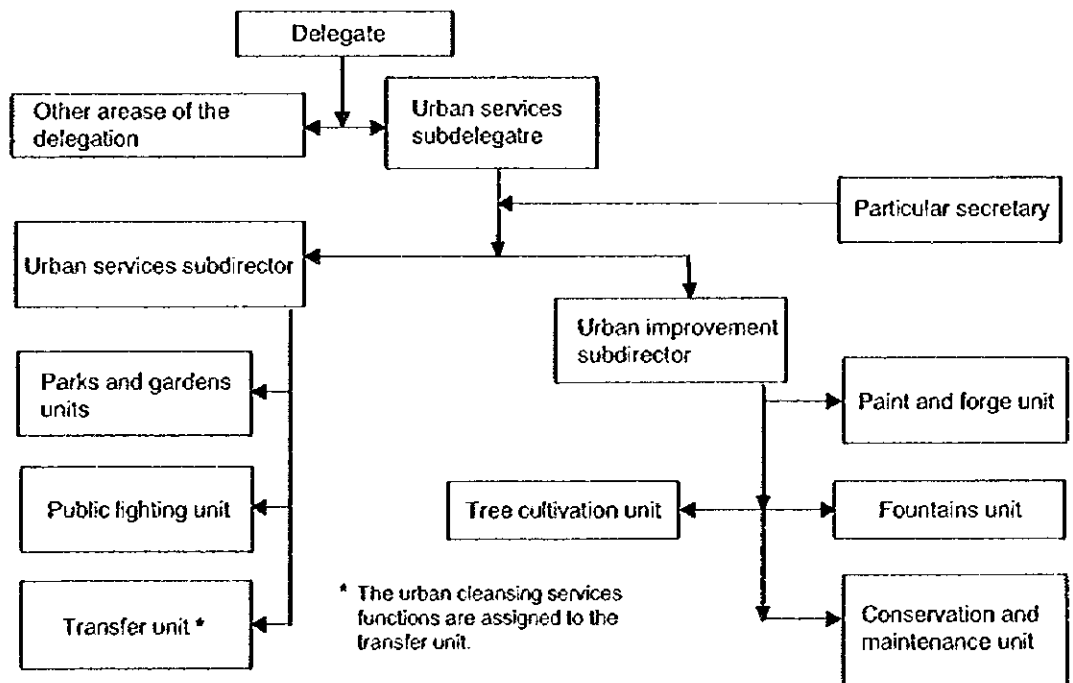
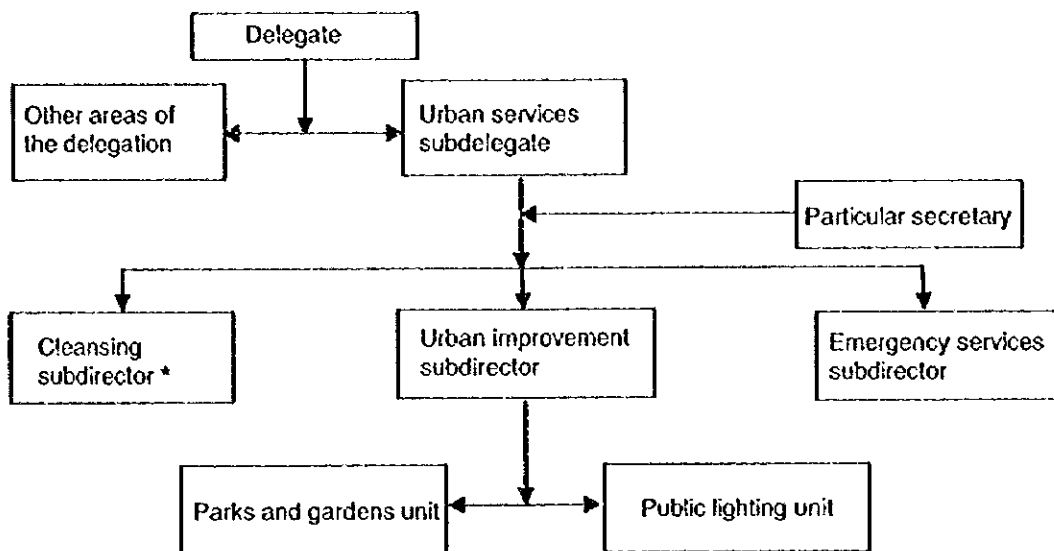
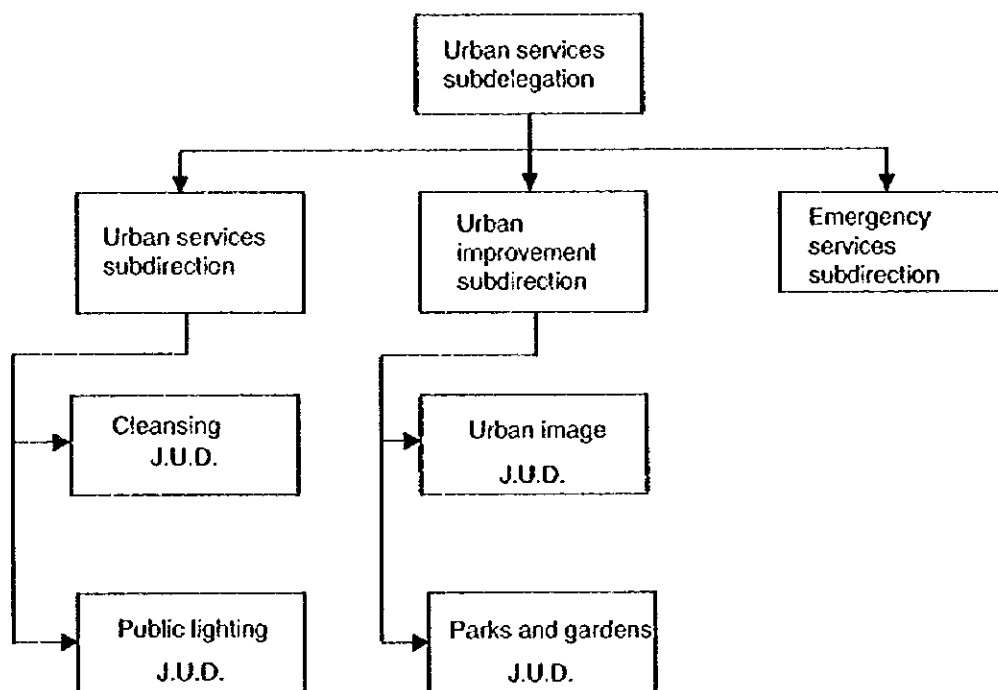


Figure C-16: Delegations Structure: Example - Cuauhtemoc Delegation



\* The cleansing unit is in charge of the areas and functions corresponding of the urban cleansing services.

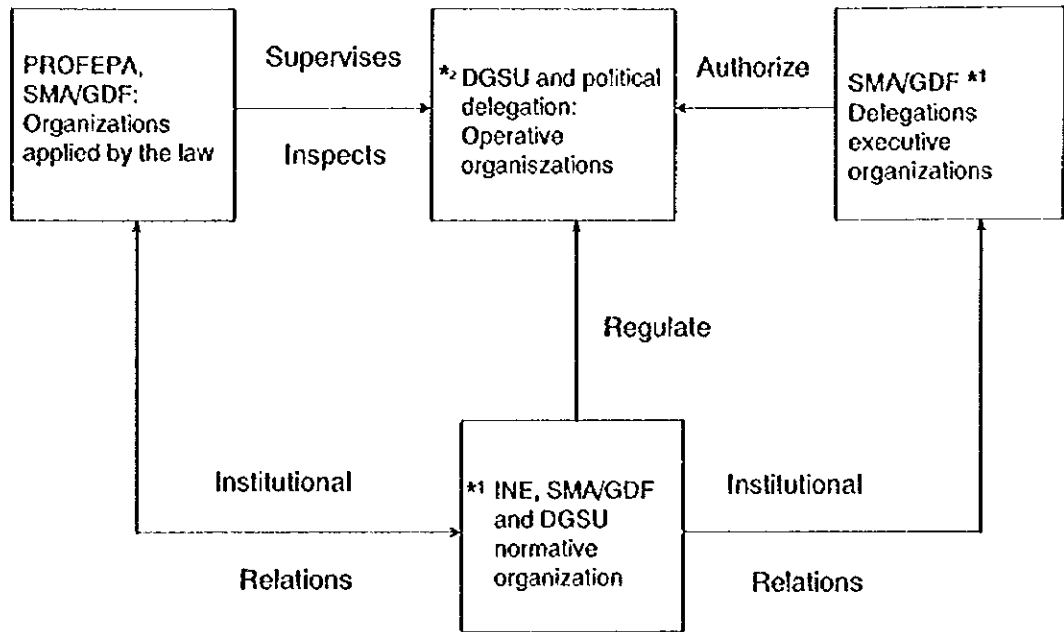
Figure C-17: Delegations Structure: Example - Miguel Hidalgo Delegation



Note: J.U.D.: Jefatura Unidad Departamental  
(Departmental Unit Head)

Figure C-18: Delegations Structure: Example - Alvaro Obregón Delegation





\*1 Only in the part of final disposal  
\*2 Only final disposal, treatment and transfer

Figure C-19: Functional Structure of Municipal SWM in the DF

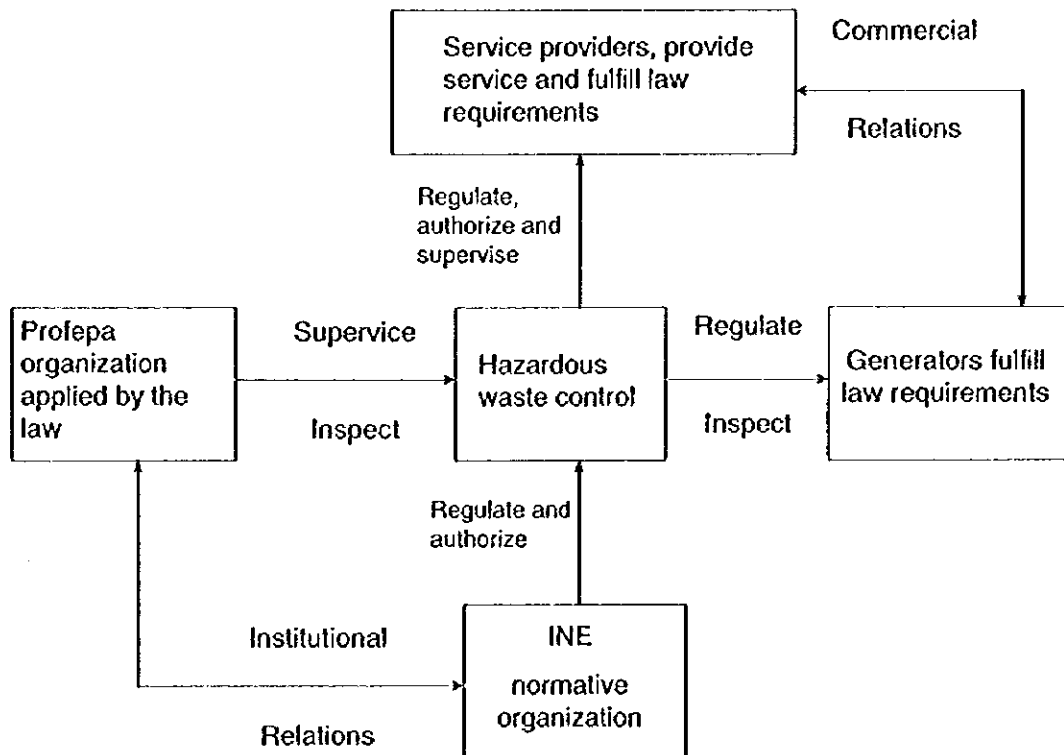
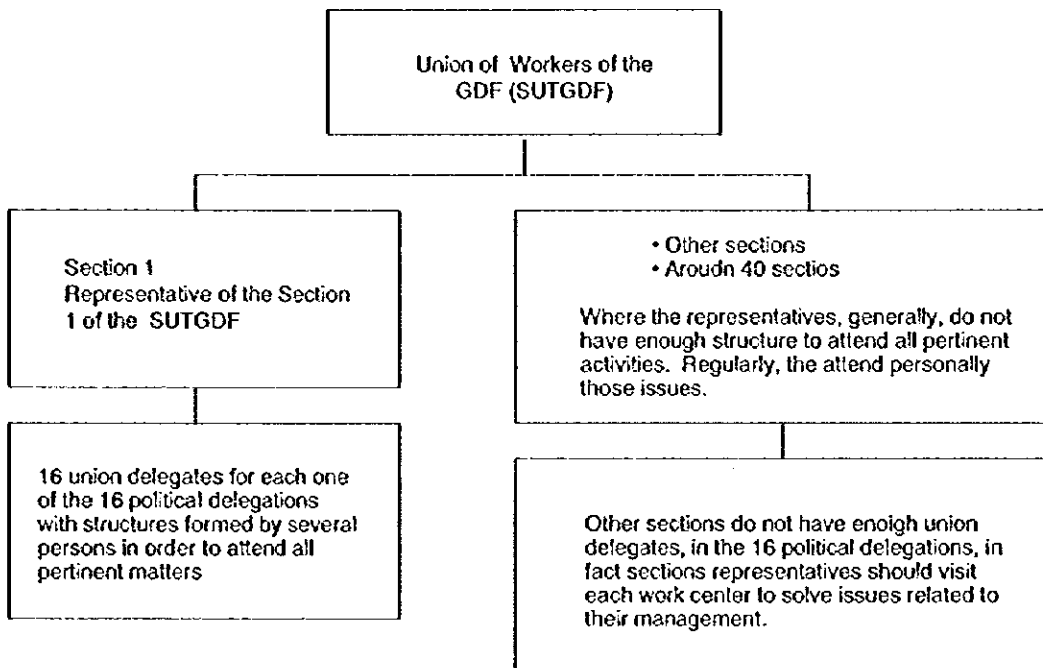


Figure C-20: Functional Structure of Hazardous SWM in the DF



Note:  
In the DGSU, there is no representative union coming from Section 1 of SUTGDF, because for the most part, based on personnel (which has union support) is assigned to sections No.5, No. 10 (ECOLOGY), and No. 9 (public works), but mainly to No.8 (Public Lighting).

Figure C-21: Summarized Structure of the Unique Labor Union in the DF Emphasizing on Section No. 1

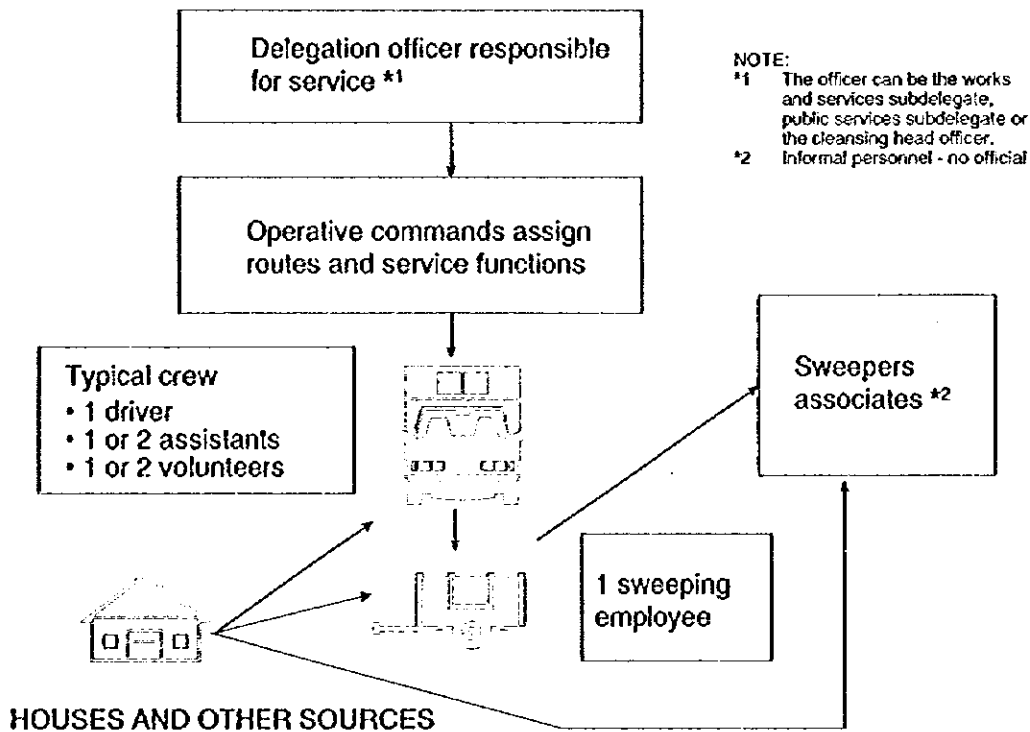


Figure C-22: Simplified Functional Structure of Solid Waste Collection Service

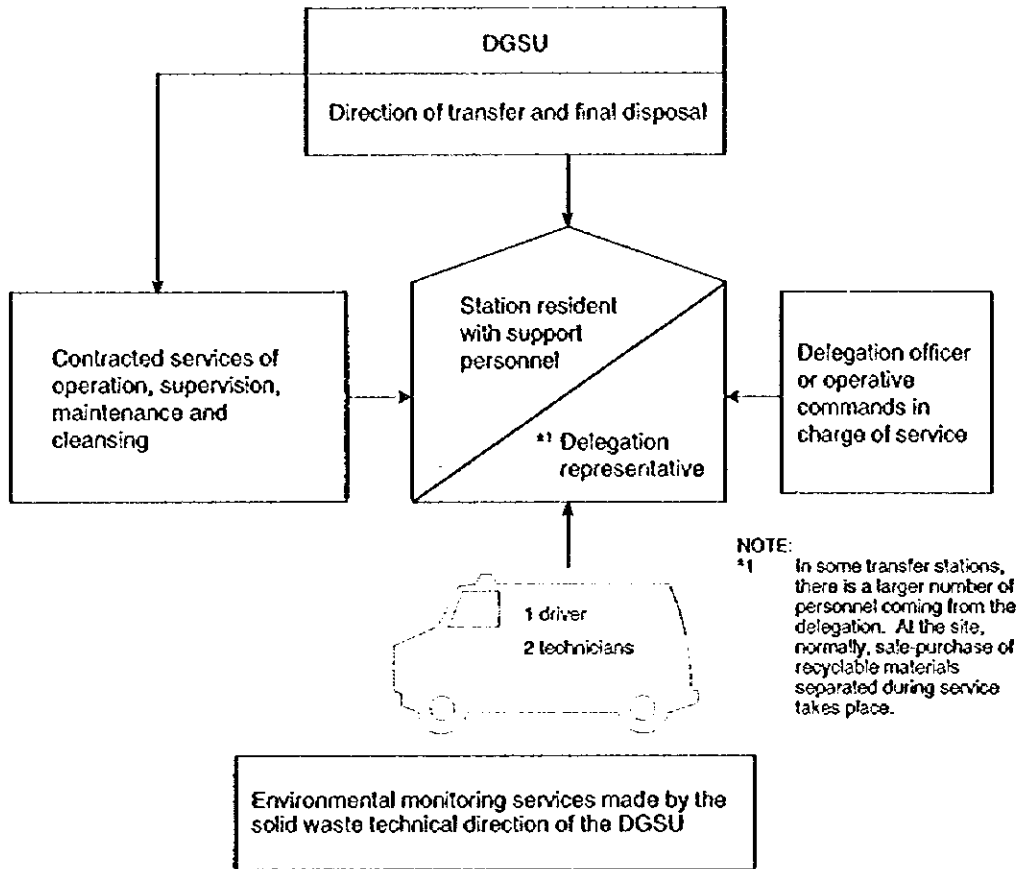


Figure C-23: Simplified Functional Structure of a Transfer Station

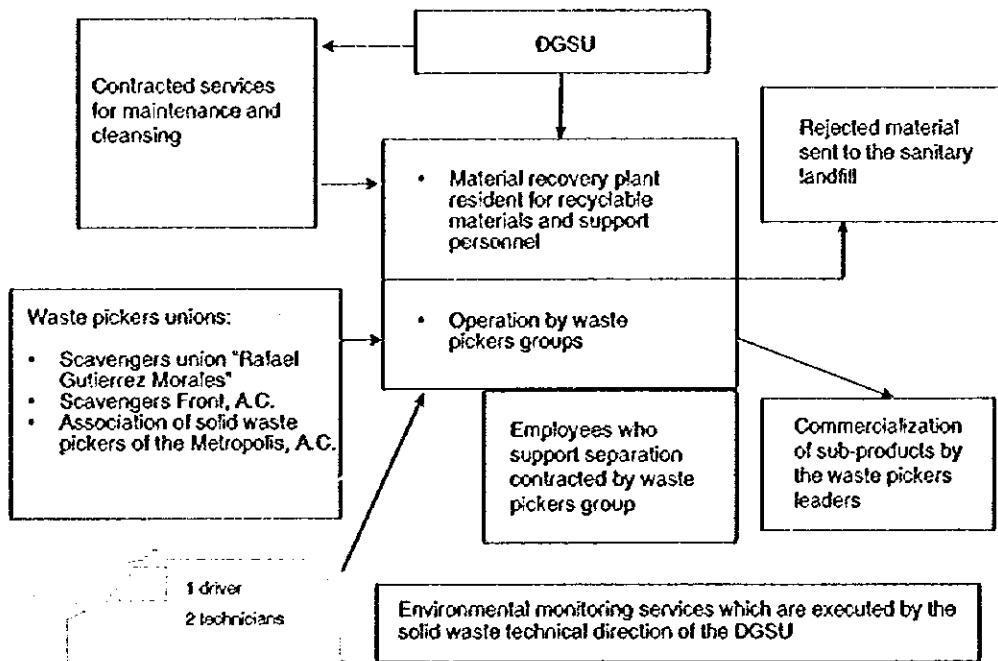


Figure C-24: Simplified Functional Structure of a S/P

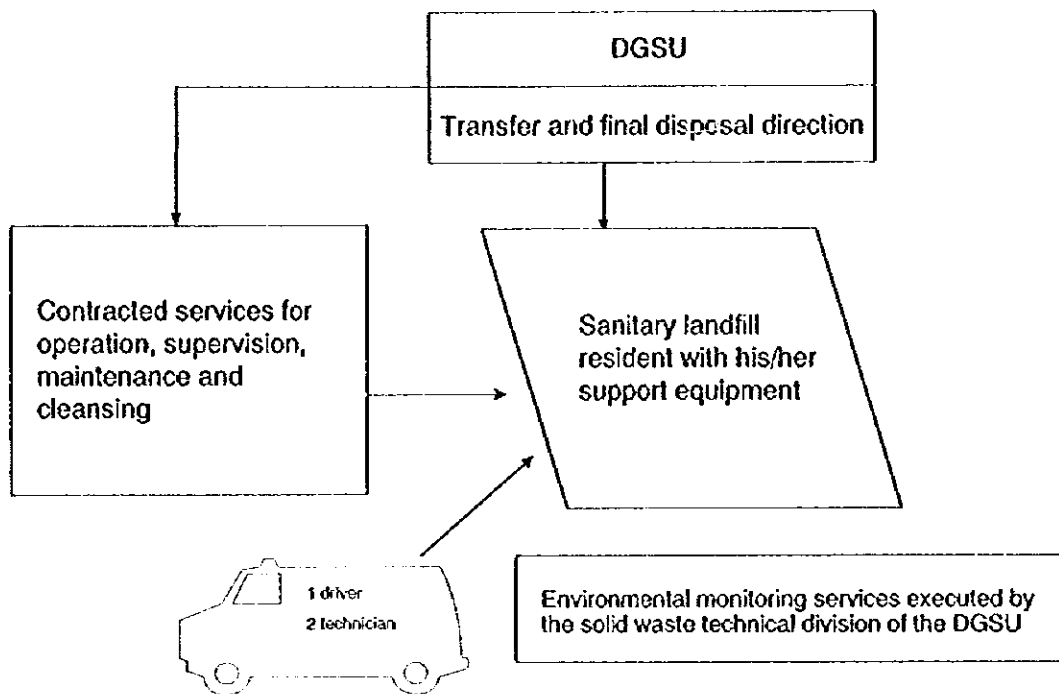


Figure C-25: Simplified Functional Structure of Bordo Poniente Sanitary Landfill

### C.5.3 Financial System

#### C.5.3.1 Financing Scheme

The Secretariat of Finance and Public Credit (SHCP, HACIENDA) is responsible for developing federal budget, while ensuring that investment priorities are reflected in the budgets of federal agencies, whereas the National Development Bank for Public Works and Services (BANOBRAS) functions as the major source of finance for municipal solid waste investment and technical assistance. Financial resources under the auspices of international lending agencies, inter alia, the World Bank (WB), the Inter-American Development Bank (IDB), and International Fund for Agricultural Development (IFAD), and bi-lateral aid agencies are coordinated by SHCP and distributed, in line with the National Operative Program (AOP), to each of project implementing agencies through BANOBRAS, SEDESOL, the Infrastructure Fund (FINFRA, a trust body incorporated in BANOBRAS), and Nacional Financiera (NAFIN, government-owned National Development Agency). Fiscal transactions take place through the use of fiscal resources directly channeled by SHCP to SEDESOL, SEMARNAP, and the states and municipalities in a bid to finance the "Unique Development Agreements" prepared by the State Planning Committees (COPLADES) and the Municipal Planning Committees (COPLADEMUN).

Besides, BANOBRAS' own resources are destined to the states and municipalities to carry out specific projects in villages with less than 100,000 inhabitants. Likewise, some resources are channeled to finance private concessionaires of the urban solid waste services, while the possibility to extend these resources to some waste generators, such as hospitals, is being studied.

### C.5.3.2 Financial Issues of SWM, and Accounting and Reporting System in DF

In line with increasing demand by the population and rising financial, and social costs and management complications associated with a large corps of field workers, solid waste management (SWM), in large cities like DF in particular, became one of the major and most urgent items on the political agenda of administrations. While the extent and quality of solid waste services vary by city, most are affected, by and large, by common issues that include: (i) weak institutions at the federal, DF, state and local levels, (ii) limited availability of fiscal resources at each of the administrative levels and professional staff equipped with adequate technical, managerial backgrounds and experiences, (iii) little or no sense of cost recovery for sustainable operation and reinvestment, and (iv) material recycling by individuals and families with the inefficiencies caused during the collection and final disposal processes.

SWM represents a substantial cost component of the finances of local governments, where in DF which consuming around 5 percent of the 1998 budget. Of many reasons attributed to this weighty portion in public finance, one would be the large workforce employed in the service, usually two to four times larger than required, as well as the need to rapidly replace and maintain a big fleet of collection vehicles having been used over the long period of time. Provided that the concept of cost accounting is introduced and the social costs in the form of "tips" and "fincas" being accounted for in a bid to ascertain the indicative cost of SWM currently in place in DF, it would be much higher than what is assumed in the 1998 analysis of US\$ 27 per ton<sup>2</sup>. This "high cost" service would further be aggravated by the limited mechanism of cost recovery by DF<sup>3</sup> and deterioration of fair distribution of services among all the levels of inhabitants in the area. The detailed examination of the cost will be shown in Section C.6.5.

### C.5.3.3 Financial Reporting System

The public and the government are concerned that the funds raised by taxes, fees and charges levied by governments have been used efficiently and effectively for the purposes intended. Provided that these revenues have been used for capital investment, public interest would be again concerned with the extent of their use and allocation among priorities. With this in view, the emphasis on cost concept rather than revenue of fixed assets would be more appropriate in the public sector, whereas the thrust of commercial activities in the private sector is upon revenue or profitability and overall strength of entities.

In Mexico, and many others alike, a paucity of accountability at state and municipality government levels has led to a less-managed public information system and somewhat critical public and government regarding the level of stewardship and responsibility attributed to DF, state, and municipality governments.

<sup>2</sup> Source: PAHO, *ibid.*, 1998, chapter 5

<sup>3</sup> Effective of 1995, DF charges with garbage of more than 200 kg a day received on collection and at the sites of transfer and final disposal. By PAHO analysis, the revenues received by the Treasury Office at DF government were around US\$ 12,000 and US\$ 4,000 in 1996 and 1996, respectively.

#### **C.5.3.4 Public Accounting**

As the economy is being globalized and a huge amount of goods and monetary transactions go borderless, it becomes evident that the financial information contained in enterprise financial statements be relevant to decision-making needs of participants in competitive markets, and that such documents be comparable and reliable. In Mexico where its economy has kept growing substantially, or by and large, and markets continued to expand domestically and internationally, the government efforts in setting and enforcing consistent accounting standards as well as in enhancing the quality and reputation of the accounting profession fell, to some extent, short, which could be attributed to the legal framework currently in place.

In general, the accounting and reporting system currently used by local governments and public service undertakings does not permit the most effective monitoring or performance because of lack of a management accounting system based on cost centers and work activities. It would be rendered as a simple example that due to the lack of balance sheet and fund-flow statement in the financial statements, "personnel cost" in the profit-loss statement lumps together technical and administrative personnel, so that even this gross but important distinction can not easily be made. Alternatively speaking, accounting and financial reporting for the entity is, in principle, a cash accounting system. By definition, revenue is recognized only when cash is received and expenses solely at the time cash is paid in this system. Viewed in this light, the present accounting and reporting system is quite inadequate for management to financially manipulate the large quantities/value of assets and a number of money transactions. Furthermore, the system can not provide a basis for costing and pricing of services particularly when the implication of depreciation of fixed assets are little considered.

Meanwhile, accounting and financial reporting system currently used by DGSU and other administrative branches under DF government is, in principle, a cash accounting system which records income (state government budget) and expenditures only when cash is received and dispensed from the special account opened at the Mexican banks. There are four kinds of accounts in place to manage and report the large quantities/value of assets and a number of money transactions of each project transactions, *vis-à-vis*, Cash Account (cash transaction), Store Account (quantity account), Dead Stock Account (inventories and other non-durable current assets), and Machinery and Equipment Account (fixed assets). The implication of depreciation of fixed assets is little considered.

With the issuance of Letter of Credit (L/C) to Banco de México by Secretary for Treasury and Controller, annual expenditures are confined to the maximum amount what Budget Allotment Letter defines. By way of curtailing annual expenditures of each scheme/project as the foregoing, there is no budget balances at the end of fiscal year which are carried forward as opening balances of the following year.

#### **C.5.3.5 Comparison with U.S. Accounting Standards**

As previously noted, accounting standards in Mexico is somewhat weak as compared to that in, for instance, the US. While Financial Statements of corporations in Mexico are prepared under Mexican generally accepted accounting principles ("Mexican GAAP"), this differs in some significant respects from United States GAAP. Also,

accounting guidelines of the Commission of National Banking and Securities (CNBV) for Mexican financial institutions vary from Mexican GAAP for other corporations. Of this, the salient features of difference between the CNBV guidelines and US GAAP are in the treatment of (i) loan loss provisions, (ii) interest income on loans and restructured debts, (iii) investment in subsidiaries and affiliates, (iv) repurchase agreements, (v) revaluation of fixed assets, (vi) goodwill and acquisition, (vii) pension costs, (viii) extraordinary items, (ix) earning per share, and (x) disclosure of the areas (financial statements). Summarized below are some of the major issues of the above.<sup>4</sup>

**Loan Loss Provision:** In Mexico, general loan loss provisions are required to be provided, based on a classification of at least 80 percent of the loan portfolio. The loan portfolio and related accrued interest is also required to be classified quarterly, and the provision is adjusted by applying certain provisioning percentages to the various credit risk classification. Under US GAAP, an allowance for possible loan loss is provided based on management's estimate of the losses inherent in the loan portfolio. Specific reserves are provided after consideration of a borrower's financial condition and the estimated fair value of the underlying collateral. General reserves are provided in the wake of considering factors, vis-à-vis, the economy in lending areas, delinquency statistics and trends, past loss experience, and estimated future loss experience.

**Interest Income on Loan:** While both principles allow interest on loans to be accrued and credited to income based on the principal amount outstanding, interest continues to accrue on all performing loans and the unpaid interest is included within the loan classification and rating system for determining the amount of loss provisions in Mexico. Under the US GAAP, the accrual of interest on all loans is discontinued when in the opinion of management, there is an indication of insolvency of borrowers to meet payment as they become due.

**Loan Fees:** CNBV's permits the recognition of all loan fees as income when received, whereas under USGAAP, loan fees, less the direct cost of originating the loan, are deferred and amortized to income over the life of the related loan by the interest method.

**Troubled Debt Restructuring:** In Mexico, accounting practices don't address the accounting treatment for restructured loans, where these loans are not treated differently from other loans. Under US GAAP, recognition as interest income of unpaid accrued interest which are due at the time of restructuring may be limited, while depending on the terms of the restructuring. Recognition of cash receipts that are received after the restructuring may also be limited.

**Revaluation of Fixed Assets:** CNBV's accounting practices require that land and property be revalued and carried at appraised value annually. Increases in the valuation amount in association with inflation are recorded as a revaluation surplus, a component of owners' equity. Depreciation is recorded only on the historical cost amount. Alternatively, Financial Statements prepared in the US are not adjusted for inflation. Real estate is stated at cost less accumulated depreciation. US GAAP

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<sup>4</sup> World Bank, *Financial Sector Restructuring Program*, May 1995

prohibits the write-up of fixed assets to market value, except the revaluation of assets and liabilities of acquired entities under the purchase method of accounting.

**Earning per Share:** An earning per share (EPS) presentation is not required in Mexico, while US GAAP requires public entities to report EPS based on the weighted average number of common shares outstanding during the period and additional common shares assumed to be outstanding to reflect the dilutive effect of common stock equivalents and all other potentially dilutive securities.

### **C.5.3.6 Public Accounting Principles**

Accounting is a means by which people interested in this regard can measure, evaluate and follow up the entity's financial situation; therefore, its aim is to provide useful, reliable and clear information for decision-making. Likewise, this purpose is divided into three objectives, according to the Statement of Concepts No. 1 of the Financial Accounting Standard Board (FASB):

1. To provide useful information to the current and future investors and creditors and for other users that have to make rational investment and credit decisions,
2. To prepare information that help the users to determine the amounts, the opportunity and uncertainty of cash inflow projects related to the channeling of investments within the enterprise, and
3. To inform on the economic resources of an enterprise, the rights on them and the effect of the transactions and events that may change the allocation of said resources and the rights on them.

In order to define accounting, it is necessary to acknowledge that it is a recording system for operations; it evolved towards a group of methods, techniques and principles. Additionally, it has also been defined as an art, a technique and as a science.

The Mexican Institute of Public Accountants (Instituto Mexicano de Contadores Publicos, A.C., IMCP), in its bulletin A-1, "Basic Financial Accounting Theory Scheme", defines it as follows:

"Financial accounting is a technique used to produce quantitative information in a systematic and structural manner, which is expressed in monetary units, of the transactions of an economic entity and of certain identifiable and quantifiable economic events that affect them, in order to facilitate people to make decisions as regards to said economic entity".

Accounting Terminology Bulletin of the American Institute of Certified Public Accountants defines it that "Accounting is the art of recording, classifying and summarizing in monetary terms all the financial transactions and events, at least partially, and the interpretation of their results" It is also defined in such way that "Accounting is the language of the businesses, but there are several types of businesses and these accounting systems must be customized to them". With this in view, the accounting types for different use would pertain to :

- i. Industrial Accounting



- ii. Commercial Accounting
- iii. Services Accounting
- iv. Government Accounting

In order to establish the proper conceptualization of the governmental accounting system, the main elements that are important for Public administration must be taken into consideration.

The functions of the Secretariat of Finance and Public Credit (SHPC) are the regulation of the concepts that integrate budgetary, economic, programming and financial statements, so as to provide a sound basis for accountants and to people interested in it, among others. Said functions are granted to it in article 84 of the Code on Budget, Accounting and Federal Public Expenditure, which reads:

**Art. 84-** Recording of transactions and the preparation of financial reports in the entities will be conducted according to the governmental, general and specific accounting principles, as well as to the laws and instructions established by the Secretariat of Finance and Public Credit.

## C.6 Assessment of the Present Condition and Confirmation of Key Issues

### C.6.1 Technical System

#### C.6.1.1 Discharge<sup>5</sup> and Storage System

Mixed storage and mixed discharge are the dominant practices in the present systems. However, in order to promote "recycling activities" and "final disposal amount reduction" as key elements for resource conservation, "source separation" of wastes becomes indispensable. On the other hand in the present situation, there is no specific regulation nor guideline for this purpose oriented waste containers. Waste generators (general public and institutions) are independently use their recipients such as dust bin and plastic bag.

"Source separation" requires: people's conscience and dedication; strict observance of discharge manners; changes in discharge/storage containers; and so forth. Therefore, it takes long time to popularize the "source separation" practices until it becomes as a prevalent custom. The pilot program (Programa de Separación de Residuos Sólidos), that the DGSU implemented in 1996 for some public institutions and public housing units, attained the generators' cooperation in "source separation" into three items. It successfully achieved the separation ration of 88% on average. It might imply a high possibility of disseminating the "source separation" widespread in those types of institutions and housing units, with success.

Table C-41: Results of Separate Collection Experiment

Name of institutions	Separation ratio(%)	Period
Public apartment houses (Unidad Habitacional)	88	January-Sept. 98
Building 1 of GDF	92	January-Sept. 98
Governor building (Edificio Virreinal)	93	January-Sept. 98
DGSU office	91	January-Sept. 98
Public Safety Department office building (Edificio Principal de la Secretaria de Seguridad Publica)	86	January-Sept. 98
CDC (Centro de Desarrollo Infantil-Metro)	100	January-Sept. 98
Average value (6 sites)	92	January-Sept. 98
7 CDCs (average value)	78	August-Sept. 98

Source: DGSU

Demonstration, education and guidance, regarding "source separation", to the generators in those institutions and housing units should be easier than to the general public. Observance of established discharge manners could be more uniform and stricter by the former than by the latter. Therefore, when introduction of a "source separation" program to the general public is planned:

- First, pilot projects should be similarly implemented to the general public.

<sup>5</sup> Discharge is the internal disposal of wastes after the generation of waste and separation of recyclable materials. For the generator, discharges waste is known as rejected wastes.

- Second, results of the pilot projects should be analyzed to plan the introduction scheme.  
and then
- The introduction scheme should be carefully planned and meticulously implemented with detailed components.

### **C.6.1.2 Collection and Haulage System**

#### **a. Collection System**

Mixed discharged municipal wastes are collected by the present "mixed collection" system. Collection of municipal wastes is the responsibility of respective delegations. There are many places and occasions in which collection time and frequency are far from constant.

Total collection vehicles in 16 delegations are 2,011. 1,087 vehicles out of them have been used for the service more than 15 years after their purchase (The oldest in the list was purchased in 1965). Therefore, their breakdown frequency is very high and the recurrent costs on maintenance and repairs are significant.

Average trips made by the workable collection vehicles (1,434 vehicles) are about 1.7 trip/day. 10 delegations are with figures of average trips per day lower than this figure. (Table C-8)

Such low work efficiency of vehicles will be attributable to the following:

- many vehicles are older and damaged in most parts, therefore the breakdown frequency is high; and
- waste-picking (material recovery) is practiced by vehicle crews on the collection routes, therefore, much time are spent on waste-picking than waste loading or vehicle movement.

For the future case of introducing "source separation" and "separate collection" instead of present "mixed discharge" and "mixed collection", it is required to review such aspects as, collection methods, types of collection vehicles, and so on.

#### **b. Transfer Station**

Incoming and outgoing wastes volumes at transfer stations are not measured but only estimated from nominal capacities of vehicles/trailers and their numbers. Therefore, the transfer station management in line with those estimated volumes has a serious self-limitation that is only within the reach of estimation. Therefore, as soon as possible, a weighbridge should be installed in every transfer station in order to manage it with realistic figures of volumes recorded.

Recording of incoming and outgoing wastes volumes, and operation and maintenance of respective transfer stations are contracted out to private sectors. Management reports of respective stations, submitted by the private sectors to the DGSU and/or delegations, presently do not have a standard report format. Report formats are different from each other and therefore, total monitoring and management of transfer stations are very difficult and require significant amount of laborious examination. At least from today, a single common format for data compilation (of

incoming/outgoing amounts, O&M expenses, etc.) should be established and utilized in order to manage, review and improve the transfer station operations.

### **c. Transportation System**

Transportation are all contracted out to private sector. The contracted service is paid based on the established rates of load weight and regulated distance (the distance from a transfer station to an S/P or a final disposal site is fixed, according to which distance the service is paid, not to the actual distance transported).

Real-time control is employed for operation of trailers through the GPS apparatus. However, since actual load weight is not measured (only estimated), management of transportation efficiency is only in a range of estimation.

## **C.6.1.3 Processing, Treatment and Recycling System**

### **a. Incineration**

From 1990 to 1992, a pilot incineration plant for municipal SW was operated with effluent gas treatment facilities. However, required incineration performance was not obtained from the plant. The failure was mainly attributable to the fact that the plant was not designed to suit to the waste composition in Mexico, which calorific value is in a low range of 1,200 kcal/kg.

When in future an incineration plant is installed, it is required to clear the 1997 established emission norms (NOM-ECOL/95). Consequently, significantly expensive emission treatment facilities (such as wet-type absorption and bag-filter facilities) are needed to be equipped.

### **b. Composting**

The failure of the composting facility, which had been operated by the delegation Gustavo A. Madero since 1974 and was dismantled in 1993, might be attributable to management problems that:

- The compost was not easily commercialized because of impurities (such as glass and plastics) mixed in them.
- Low production performance of the plant was due to financial shortage of the delegation for operation and maintenance.
- Meanwhile, the technical problem of the compost product quality should be mainly because mixed municipal wastes were fed to composting processes.

Therefore, when in future a composting plant is installed, it is required to introduce and practice "source separation" and "separate collection" of organic wastes, in order not to repeat the same mistake.

### **c. Selection Plant (S/P)**

First of all, the problem of the very low material recovery rate of the S/Ps is due to feeding mixed municipal wastes. In addition to that, the problem of present operation practices is very excessive waste feeding into the recovery lines:

- Waste layer thickness on sorting lines, a major determinant of selection efficiency, is as thick as 40 cm to 50 cm. Therefore, workers are unable to

visually identify materials to be targeted in the initial moment, and have to stir and open the waste layer by hands. Consequently they lose more time for picking materials.

- Velocity of the sorting line conveyors is as fast as about 20 meter/min. Together with the above effect, the material recovery efficiency is lowered further.

The original design of S/Ps specified the optimum operation particulars as: 8 to 14 meter/min. conveyor velocity; 20 cm waste layer thickness; and 0.35 to 0.40 kg/liter weight volume ratio. However, compliance with these design particulars did not enable to keep promises of wastes input amounts (to S/Ps) with the ex-scavengers groups. Consequently conveyor velocity became about 20 meter/min and waste layer thickness about 50 cm thick respectively.

Hence, if in the future wastes input amount in the S/Ps is decreased, working condition on sorting lines will be improved and material recovery efficiency will be raised.

Besides, the Santa Catarina S/P is not equipped with a weighbridge, which is the problem of not understanding the precise incoming/outgoing wastes flow.

#### **C.6.1.4 Final Disposal System**

The Bordo Poniente final disposal site employs a bottom impermeable liner (HDPE, 1.0 mm thick) and devises to minimize the landfill working face. It practically realizes a sanitary landfill and therefore, operational problems are very few.

The Santa Catarina final disposal site, although having a wider landfill working face, complies with measures of sanitary landfill such as: biogas removal, final soil cover with vegetation soil layer, and leachate collection lines (partial). In practice, technical problems are few. On the other hand, present about 5 ha working face plays a role of material recovery places of waste-pickers, which is an open air, therefore, it invites vectors of flies and mosquitoes and offensive odors.

##### **a. Service Life of Landfill Site**

The municipal SW final disposal sites presently in service in DF are Santa Catarina and Bordo Poniente "Etapa IV". The Santa Catarina site is expected to be closed soon due to the very limited remaining capacity. The Bordo Poniente "Etapa IV" is estimated to serve until January or February 2001. Therefore, sites for new final disposal need to be assured soon.

Although the landfill elevation of Bordo Poniente "Etapa IV" is presently regulated up to 8 meters height under an agreement with the CNA, if this agreement is revised to allow further landfilling up to 32 meters elevation, by paying specific technical attention to the geological conditions, additional landfill capacity of about 33,000,000m<sup>3</sup> could be assured.

This restriction comes from several geotechnical studies carried out since the landfill started to be operated, which concluded that the 8 meters height restriction was necessary in order to protect the structures and functions of the Gran Canal nearby. Therefore, in order to revise this restriction and to secure an additional landfill

capacity of about 33,000,000m<sup>3</sup>, prudential and meticulous geological examination should be performed to prove its technical viability.

On the other hand, the additional 33,000,000m<sup>3</sup> landfill will correspond to 6.5 years services, and it could not cover the services until the M/P target year 2010. Therefore, apart from the Bordo Poniente Etapa IV vertical expansion project, a new future final disposal site needs to be secured.

## **b. Leachate Management**

### **b.1 Leachate Collection**

Although the presently operated Bordo Poniente Etapa IV landfill employs HDPE impermeable bottom liners, a leachate collection facility is not yet installed. Therefore, leachate inside the buried wastes layer is not sufficiently drained but is seeping out at cells' slope bottom on to earth-excavated roadside ditches or on to roads. The roadside leachate seepage is partially collected by cistern trucks, however its majority is infiltrating into the ground as a consequence, although the landfill is provided with bottom impermeable liners.

In order to prevent this phenomenon, leachate collection lines should be installed in the landfill layers to facilitate drainage of leachate to opt its management.

### **b.2 Leachate Treatment and Disposal**

Current limited leachate treatment by the DGSU is by: (i) physical-chemical treatment; and (ii) evaporation pond, both of which are in the Bordo Poniente area. The former requires substantially high operation and maintenance costs, and the latter sometimes suffers from over flowing of leachate from the pond.

Average annual precipitation in Mexico city is about 600 mm/year, meanwhile annual evapotranspiration reaches about 1,800 mm/year, which is about four times as much as precipitation. In general, a major factor of leachate generation is the precipitation. Where in Mexico city the evapotranspiration as high as four times of precipitation might optimize leachate circulation inside the landfill site as a cost-effective leachate treatment method, which is especially applicable to Bordo Poniente (leachate spraying on the landfill surface).

## **C.6.2 Institutional System**

### **C.6.2.1 Scope of Competency**

The Federation consists of all the federative entities which include the 31 States and the DF. The legislation is derived from the Political Constitution of the Mexican United States which rules all over the nation.

However, under the federal regulations, the States are independent to elaborate their own laws and to regulate themselves. The DF has the same hierarchic level as any other State, similarly to its own three powers: executive, legislative and judiciary. Nonetheless, attention should be paid to some characteristics of the DF that it is the nation's capital and it is where the Mexican Government resides.

The administrative political units in the States are the municipalities. The municipalities create their own legal regulations, but paying attention to what the

federal and state laws establish. The municipalities have broad autonomy inside its own territory on issues that correspond to their jurisdiction and on cases for which they are not controlled by the federal and state laws.

The DF is divided into 16 administrative units (**Political Delegations**) which have functions restricted by what is established on the GDF's regulations. However, these units will become autonomous; the extent of this autonomy should be established by the DF's legislation. This situation will initiate with the elections of the Federation's president and the Governor of the DF in the year 2000. The person in charge of the executive office in the Delegations will also be elected by citizens election at the same time.

The ZMVM or ZMCM is not an administrative nor political entity, but a co-urbanized area which consists of the DF and some municipalities in the State of Mexico. For coordination purposes, they jointly undertake plans, projects and integrated actions.

The municipalities co-urbanized with and adjacent to the DF were the objective of the coordination agreement signed among the DDF (currently GDF), the Government of the State of Mexico (which acted as a representative of the municipalities), and the Federal Government and semi-governmental Organizations too. As a result, an **Environmental Metropolitan Commission (CAM)** was created which has coordinating and orientation functions for plans, projects and joint actions related to the regional environment.

#### **C.6.2.2 Legislation, Agreements and Public Entities Involved**

Apart from the legal facts shown in the section C.5.1, the following should be considered relevant to SWM in Mexico:

##### **a. Federal Scope:**

- General Law for Ecological Balance and Environmental Protection (LGEEPA) which was published on 13th December 1996 (latest modification).
- LGEEPA Regulation, regarding wastes, 25th November 1998.
- Agreement to Use the Area of Lago Texcoco project, November 1992.

##### **b. Metropolitan Scope:**

- Coordination Agreement which creates the Metropolitan Environmental Commission, September 12th 1996.
- Internal Regulation for the Metropolitan Environmental Commission, July 9th 1997.

##### **c. Federal District Scope:**

- DF Government Statute, published in the Official Gazette of the Federation on April 22nd 1998.
- Internal Regulation for the DF Public Administration, January 1st 1997.
- Organic Law of Public Administration of the DF, published in the Official Gazette of the Federation on 23rd December 1997.
- DF Environmental Law, published in the Official Gazette of the Federation on January 1st, 1997.

- Regulation for the Cleansing Service in the DF, published in the Official Gazette of the Federation on July 27th, 1989 (approved by the Representatives Assembly).
- The DF Financial Code (latest modification on January 5th, 1998).
- Law of Revenue and Budget of Expenditure for the DF (annual).

**d. Federal Scope**

Within the Federal Scope, the following jurisdictions are established:

1. The Federation, through SEMARNAP, elaborates Mexican Official Norms (NOM). More specifically, those norms deal with the site, design, construction and operation of facilities which will be used for final disposal of MSW.
2. The Federation, having the specific organ SEMARNAP, directly or through the Ecology National Institute (INE) regulates and controls activities related to hazardous waste (starting with the generation and ending with the final disposal).
3. The federation regulates and controls activities which are considered to be of high environmental risk.

Meanwhile,

4. Regulation of non-hazardous SW (including final disposal) belongs to the competency of States (also being extensive to the DF).
5. Authorization of function for SWM systems (including final disposal) belongs to the competency of municipalities and the DF.
6. Application of legal measures related to the prevention and control of effects on the environment caused by SWM belongs to the competency of municipalities (also being extensive to the DF).

What is specially interesting for DF is the agreement signed between the former DDF with the National Water Commission (CNA) by means of which the DF was authorized to use 1,000 hectares located in a Federal Area where the Texcoco Lake project is being developed. This authorization allows the DF to use the facilities to treat and dispose of non-hazardous waste.

**e. Metropolitan Scope**

Within the Metropolitan scope, the Environmental Metropolitan Commission (CAM) should coordinate planning, project and execution of joint actions by the entities involved (municipalities and the DF). Furthermore, it should elaborate and propose a Metropolitan Program for Waste.