Chapter 5

Setting up Planning Frameworks for the Master Plan

5 Setting up Planning Frameworks for the Master Plan

5.1 Scope of Planning Frameworks for the Master Plan

According to the relevant legislation in Mexico, the responsibility of the collection of municipal waste rests with the delegations, which correspondingly carry out the actual works of waste collection.

Considering the facts that the DGSU is in a position to supervise and assist those delegations regarding waste collection and that this M/P is the one for SWM by the DGSU, the M/P should focus on SWM components incumbent on the DGSU.

On the other hand, the GDF and the Section 1 signed an agreement in July 1998 that the Section 1 would withdraw its waste collection service from primary schools, parks and markets in early 1999. Further, each delegation was appointed as a responsible body to manage the waste collection service for those institutions, or hereafter "Sub-System", which will operate independently of the conventional collection system of Section 1 (Figure 5-1).

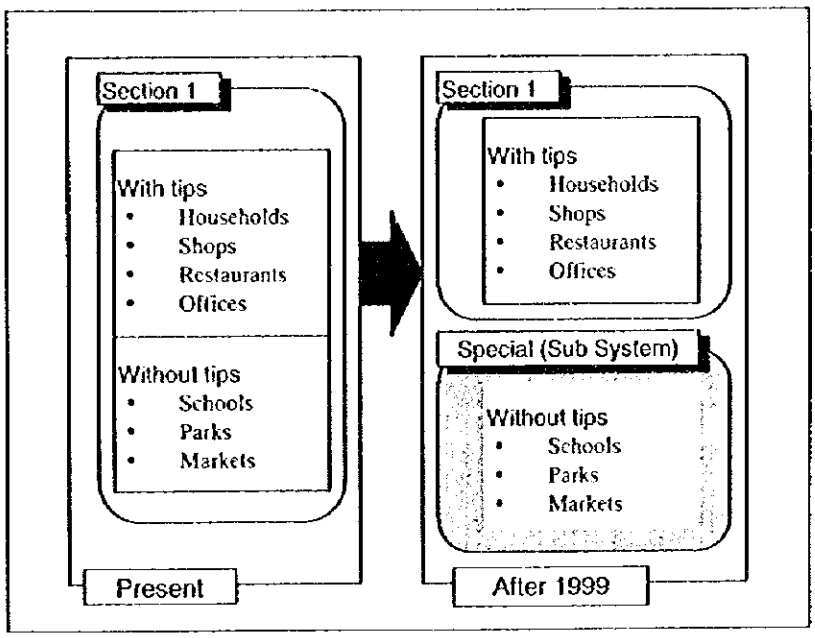


Figure 5-1: Change in the Collection System

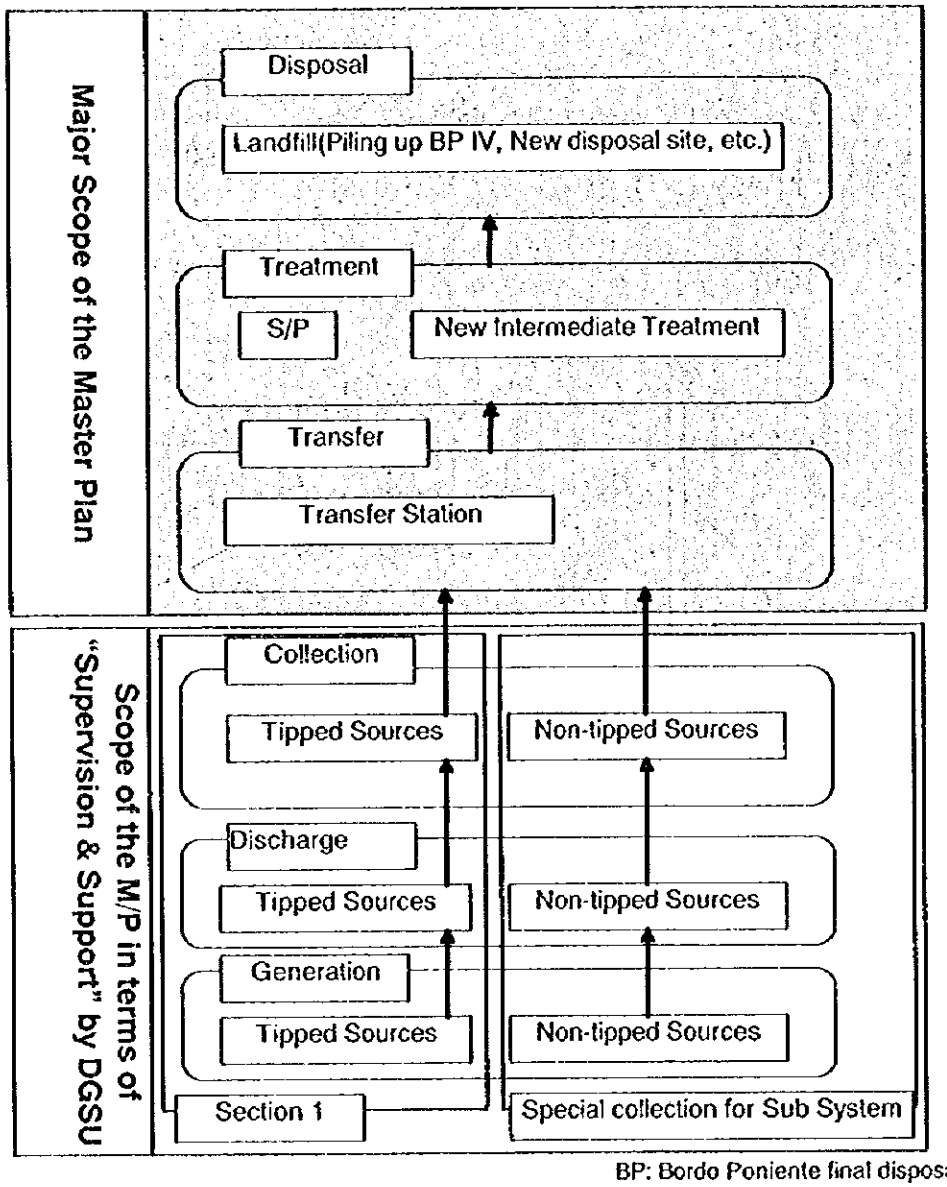
As a result, a new type of waste collection, sub-system, is to be established in SWM of the GDF, which allows unrestricted suggestions on the collection method irrelevant to the issues of Section 1.

What the delegations are in charge of will not be explored deeply since the M/P should be prepared for the municipal SWM by the DGSU. The introduction of source separation and separate collection is, however, inevitable taking into account the fact that the GDF's SWM is required to achieve the following.

- Waste minimization to cope with the limited capacity of the final disposal site, and
- Promotion of recycling in order to efficiently utilize natural resources and save the environment.

Therefore, the M/P will not formulate a plan of source separation and separate collection at the delegation level. Instead, it attempts to give a picture of how the waste discharge and collection system should be and examine what steps should be taken by the DGSU for this purpose. Besides, the regional use of the final disposal site involving the State of Mexico will be considered in respect of the future shortage of the final disposal site for the GDF.

Consequently, the major study scope field of the M/P is defined as shown in Figure 5-2.



BP: Bordo Poniente final disposal site

Figure 5-2 :Scope of the M/P

5.2 Goals, Targets and Strategies

5.2.1 Goals and Targets Year

a. Goals

The principal goal of the Master Plan is to establish a sound Solid Waste Management System by the target year 2010 in Mexico City, where the population and major economic activities of the country are centered.

The Master Plan aims to:

- **promote the citizens' well-being;**
- **implement sustainable SWM; and**
- **contribute to environmental conservation.**

The goals in practice of the Master Plan are as follows:

1. The improvement of public health and the reduction of health hazards in and around the city will be a primary task of the SWM, in order to promote the citizens' well-being.
2. As sustainable SWM services is required as the duty and mandate of the GDF, the GDF should expedite:
   - cost-effective SWM from technical improvement;
   - cost-effective SWM from institutional/legislative improvement; and
   - cost-effective SWM administration by GDF.
3. As the environmental conservation through SWM is today's requirement, the GDF should expedite the following:
   - public should be encouraged to be more environmentally aware of waste minimization.
   - environmental conservation through "reduction", "recycling" and "recovery" of waste should be promoted by the GDF; and
   - SW treatment and disposal facilities should be operated not to pollute the environment.

In other words, for example, well-being of citizens will be indirectly achieved by providing cost-effective SWM services to the citizens, meanwhile, a "beneficiary-pays-principle (under which recipients pay for the services)" has to take root in the citizens' value. These will improve the cost-consciousness of the citizens and induce "waste minimization at source" by each citizen, and it consequently will also contribute to the environmental conservation.

4. Meanwhile, as part of the goal of the M/P (citizens' well-being), well-being of all those who work for SWM should also be reminded in the formulation of the M/P.

b. Targets

In accordance with the S/W of the Study, the target year for master plan is set up as follows:

Master Plan: Year 2010

5.2.2 Examination of the Master Plan Framework

a. Basic Alternatives

The three alternatives shown in Table 5-1 were examined in series of discussion between the team and counterpart to establish the M/P framework.

Table 5-1: Basic Alternatives for the M/P

	Purpose	Basic concept	Outline	Result
ALT 1	Social welfare for ex pepenadores	No change	No change in present situation.	No improvement
ALT 2	Financial benefit	Cost saving	Closure of the S/Ps	• DGSU will save operation and maintenance cost for the S/Ps. • Increased landfill amount.
ALT 3	Material recovery, resources conservation and reduction of disposal amount	Improvement of recovery efficiency	Improvement of waste input condition of the S/Ps. • Improvement of input waste quality (by introducing "source separation" and "separate collection" systems). • Reduced input amount Improvement of recovered material market system • Storage mechanism to adjust supply to demand in the market.	• Material recovery and resources conservation. • Reduction of disposal amount

Alternative 1 does not involve any changes or improvement in the current system.

Alternative 2 aims to financial benefit not by investing into the construction of new facilities but by closing the S/Ps, which do not make any revenue of the GDF at an expense of about 100,000,000 pesos (1997)[1]. On the other hand, this alternative will encounter such problems as below:

- Social problems of unemployed S/P workers.
- Increased waste disposal amount.
- No resource conservation.

Therefore, Alternative 2 is not acceptable.

[1] Cost in 1997 amounted to 107,718,000 pesos according to *Costos de los Servicios Urbanos* (DGSU, 1997).

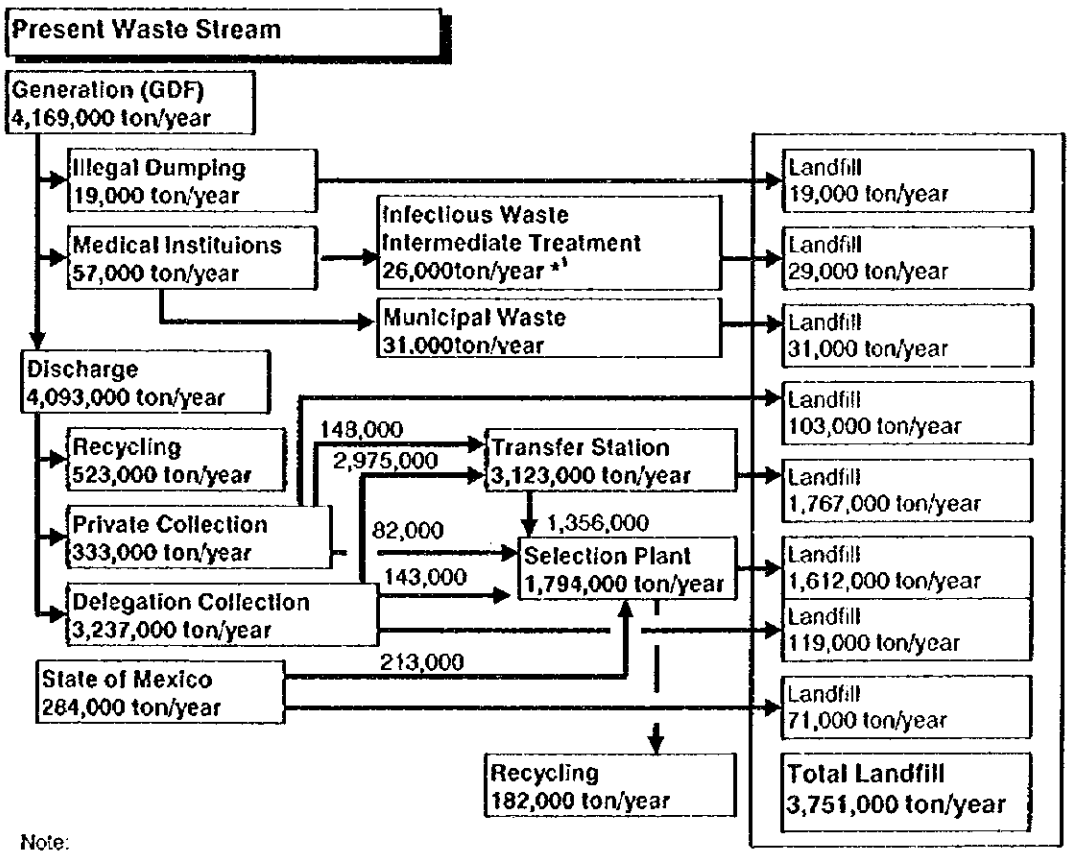
Alternative 3 has to be associated with changes in waste discharge, collection and transportation systems, but will reduce the waste disposal amount and render the SWM of Mexico City more sustainable.

Taking the goals of the M/P described in the previous section into account, the framework of the M/P (i.e. the SWM Outline in the target year 2010) should be formulated in line with Alternative 3.

b. Basic Concept

b.1 Discharge System

Figure 5-3 illustrates the present waste stream, in which materials are recycled at the generation source, in the process of mixed waste collection and in the S/Ps. Although it is estimated that potentially recyclable materials account for 37% of the total waste generation, material recovery rates are only about 14% in the collection process and 4% in the S/Ps of the total generation.



Note:
*1: Increase of 3,000 ton/year due to the treatment agents.

Figure 5-3: Present Waste Stream

Sustainable SWM requires the promotion of material recovery and the minimization of waste amount to be disposed of. These, in turn, inevitably necessitate separate waste discharge at source and separate collection.

Nevertheless, separation of waste at source indicates additional burden on the waste generators, who are currently paying tips for collection service. Therefore, it is necessary to progressively carry out environmental education for the waste generators so that they will appreciate its importance for the environment such as resource conservation and adapt themselves to separate discharge.

Meanwhile, the special collection of the sub-system is going to start in 1999 for such places as markets, primary schools, parks and housing complexes of institutions through the sub-system. The success of separate discharge is highly anticipated in the sub-system since these waste generators are:

- not paying tips for waste collection at present, and
- some of those which have cooperated the separate discharge and collection program by the DGSU since 1996 and achieved 92% separation rate in 1998, thus supposed to be ready for separate discharge.

It follows that separate discharge is to be introduced step by step into the sub-system aiming at 100% separation rate in 2004 in the M/P.

On the other hand, "source separation" program is to be introduced in later years to the generators whose waste collection services are currently provided by the delegations more gradually with due attention by making use of experience gained in the sub-system aiming at 50% separation rate by 2010.

The separate discharge and collection program in the M/P is presented in Figure 5-4.

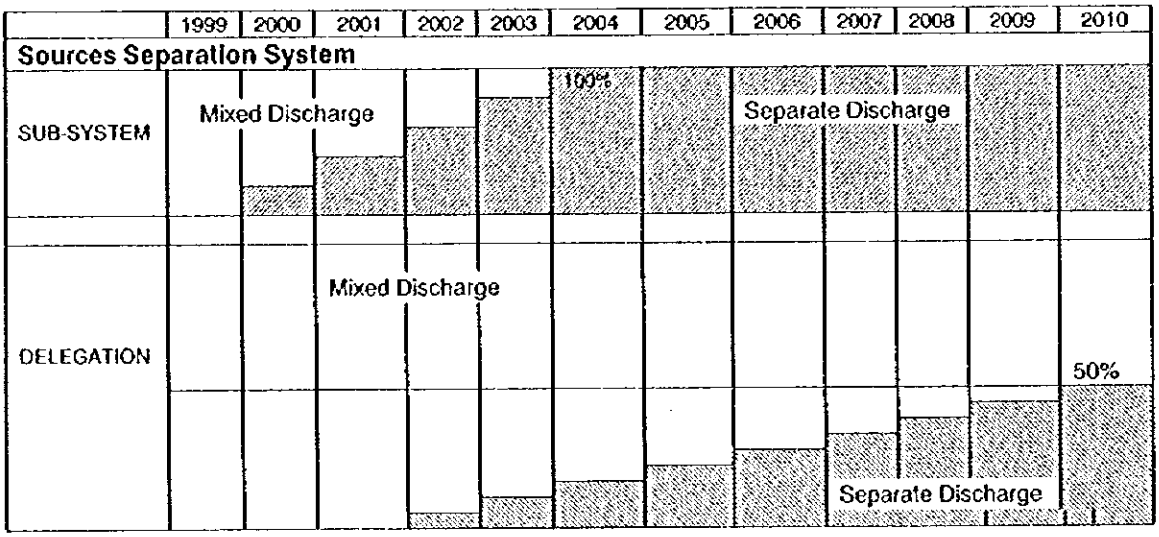


Figure 5-4: Separate Discharge and Collection Program

b.2 Treatment and Disposal System

The sub-system will involve the Central Market (*Central de Abasto*) and public markets, which generate a great amount of organic wastes. On the assumption of separate waste discharge, a practicable treatment of organic waste will have to be introduced.

Regarding the S/Ps, in order to raise the material recovery rate, measures to efficiently recover materials from mixed wastes and/or separately discharged recyclable wastes will be figured out in the M/P.

b.3 Target Year for Feasibility Study

The year 2004 is set as the target year for the F/S, when separate :discharge rate in the sub-system will reach 100%.

5.2.3 Targets and Strategies

a. Target Figures

In order to achieve the principal goals, the target figures for the major components that constitute SWM were set as indicated in the table below.

Table 5-2: Target Figures for the SWM System

		Present (1997/98)	F/S (2004)	M/P (2010)
Generation Amount (ton/year)		4,169,000	4,302,000	4,430,000
Source Separation	Sub-system	0(%)	100(%)	100(%)
	Delegation	0(%)	14.5(%)	50(%)
Separate Collection	Sub-system	0(%)	100(%)	100(%)
	Delegation	0(%)	14.5(%)	50(%)
Separated Waste S/P Input Amount	Sub-system	0	247,000 (ton/year)	253,000(ton/year)
	Delegation	0	191,000(ton/year)	591,000(ton/year)
New Intermediate Treatment	Sub-system	0(%)	100(%)	100(%)
	Delegation	-	-	-
Final Disposal Amount (ton/year)	Sub-system	0	302,000	308,000
	Delegation	3,407,000	2,738,000	2,624,000
	Medical Institution	60,000	61,000	62,000
	State of Mexico	284,000	284,000	284,000
	Total	3,751,000	3,385,000	3,278,000

b. Strategies

Strategic actions to achieve the goals and targets should be, in practice, introduced step by step toward the target year 2010. Therefore, it is recommended to divide the period up to the target year into three phases, as shown in Table 5-3, Table 5-4, Table 5-5 and Table 5-6.

- **Phase 1:** **Short term improvement (1999 to 2001)**
- **Phase 2:** **Medium term improvement (2002 to 2004)**
- **Phase 3:** **Long term improvement (2005 to 2010)**

Table 5-3: Recommended Alternative for the Strategies in Phase 1 for the Master Plan (1999-2001)

	Technical Aspects		Institutional Aspects	
	Sub-system	**Delegation**	**Sub-system**	**Delegation**
Discharge/Storage	• Promoting public awareness of separate discharge (3 items) through environmental education . • Implementation of a pilot project of source separation (3 items). • Phased introduction of source separation (3 items).	• Preparation and implementation of a pilot project of source separation (2 items).	• Preparation of the Code for the Solid Waste Management at the Sources • Implementation of the Code	
Collection	• Implementation of a pilot project of separate waste collection (3 items). • Phased introduction of separate waste collection (3 items).	• Formulation of a M/P for separate collection (2 items) in each delegation.	• Contract out to Private Sector	• Examine conditions for institutionalizing Section 1 into Private entities
TS & Tr.	• Installation of weighbridges for every station. • Utilization of a single common format for data compilation. • Establishment of a transport monitoring and control system (for 3 flows)[1] based on accurate incoming/outgoing weight measurement.		• Contract out	
S/P	• Experiment of operation modification (by reducing input amount reduction and lowering lines velocity) to incorporate an objective of quantity oriented picking, although the present objective may be sustained and more important. • Experiment of "storage system" for recovered materials to cope with market prices fluctuation.		• Examination of Concession (Examine conditions for institutionalizing Ex-pepenadores Groups into Cooperatives)	
NIT[2]	• Design and construction.		• Investment by the DGSU • Establishment of quality standards for the product **1st Priority Financing**	
Final Disposal.	• Establishment of leachate collection and re-circulation system in the Bordo Poniente "Etapa IV". • Vertical expansion at the Bordo Poniente "Etapa IV". • Design and construction of a new landfill site.		• Investment by the DGSU for BP-IV and BP-V **1st Priority Financing**	

Note: This Table shows alternatives proposed by the JICA team which will be subject to further examination by the GDF.

1) 3 flows refer to waste flows from the transfer stations to the S/Ps, from the transfer stations to the final disposal sites, and from the S/Ps to the final disposal sites.

2) NIT: New Intermediate Treatment

Table 5-4: Recommended Alternative for the Strategies in Phase 2 for the Master Plan (2002-2004)

	Technical Aspects		Institutional Aspects	
	Sub-system	**Delegation**	**Sub-system**	**Delegation**
Discharge/Storage	• Promoting public awareness of separate discharge (3 items) through environmental education. • Phased introduction of source separation (3 items) aiming at 100% coverage in 2004.	• Promoting public awareness of separate discharge (2 items) through environmental education . • Phased introduction of source separation (2 items).	--------	• Implementation of the Code for the Solid Waste Management at the Source
Collection	• Establishment of separate collection methods (3 items). • Phased introduction of separate collection (3 items).	• Phased introduction of separate collection (2 items).	• Contract out to Private Sector (Preparation of Concession and Permission)	• Preparation of Concession/Permission (Formalize the Section 1 as private entities with necessary funding) **2nd Priority Financing**
			• Preparation of the criteria to fix the tariffs* and subsidies	
TS&T	• Utilization of the transport monitoring and control system (for 5 flows[1]) based on the accurate incoming/outgoing weight measuring • Efficient transport allocation by the monitoring and control system		• Contract out	
S/P	• Implementation of operation control (input amount control and lines velocity control) with 2 objectives of: (a) revenue oriented picking; and (b) quantitative picking, and (a) may be less important than (b). • Establishment of "storage system" for recovered materials to cope with market prices fluctuation, in view of experiment results.		• Preparation of Concession (Formalize the Ex-pepenadores Group as Cooperatives with necessary funding) **2nd Priority Financing** • To negotiate the implementation of improvements at the S/P conditioned at the institutionalization of ex - pepenadores as cooperatives or another appropriate juridical form	
NIT	• Starting operation of the new facility.		Examination of four options: A. Status quo (DGSU) A1. DGSU direct operation A2. Contract out operation B. Parastatal C. Concession and preparation for B or C if it is chosen.	
Final Disposal	• Starting operation of the new facility.		Examination of three options: A. Status quo (DGSU) A1. DGSU direct operation A2. Contract out operation B. Parastatal and preparation for B if it is chosen.	

Note: This table shows alternatives proposed by the JICA team which will be subject to further examination by the GDF.

* Tariff: Price of the service that the citizen pays to the concessionaire

1) 5 flows refer to additional waste flows from the transfer stations to the NIT and from the NIT to the final disposal sites, and current 3 flows.

Table 5-5: Recommended Alternative for the Strategies in Phase 3 for the Master Plan (2005-2010)

	Technical Aspects		Institutional Aspects	
	Sub-system	**Delegation**	**Sub-system**	**Delegation**
Discharge/Storage	• Continuation of promoting public awareness of separate discharge (3 items) through environmental education. • Maintaining 100% coverage on source separation (3 items)	• Promoting public awareness of separate discharge (2 items) through environmental education. • Further introduction of source separation (2 items) aiming at 50% coverage in 2010.	------	-------
Collection	• Maintenance and/or improvement of the separate collection methods (3 items).	• Further introduction of separate collection (2 items).	• Concession/Permission to Private Entities	• Start Concession /Permission
			• To approve and monitor the tariffs*	
TS & T	• Utilization of the transport monitoring and control system (for 5 flows)[1] based on the accurate incoming/outgoing weight measurement. • Efficient transport allocation by the monitoring and control system.		• Contract out	
S/P	• Implementation of operation control (input amount control and lines velocity control) with the major objective of "quantity oriented picking". • Utilization of the optimum "storage system" for recovered materials to cope with market prices fluctuation.		• Concession	
NIT	• Operation and maintenance of the new facility.		One of the four options: A. Status quo (DGSU) A1. DGSU direct operation A2. Contract out operation B. Parastatal C. Concession and preparation for B or C if it is chosen.	
Final Disposal	• Operation and maintenance of the new facility.		Three options: A. Status quo (DGSU) A1. DGSU direct operation A2. Contract out operation B. Parastatal and preparation for B if it is chosen.	
Special Considerations: • Regional use of the future final disposal sites • Examination of wastes volume reduction technologies (such as incineration)				

Note: This table shows alternatives proposed by the JICA team which will be subject to further examination by the GDF.

* Tariff: Price of the service that the citizen pays to the concessionaire

1) 5 flows refer to additional waste flows from the transfer stations to the NIT and from the NIT to the final disposal sites, and current 3 flows.

Table 5-6: Institutionalization Alternative for the M/P

	Waste Flow	Institutionalization Flow	Phase 1 1999 - 2001	Phase 2 2002 - 2004	Phase 3 2005 - 2010	 2011 -
Sub-system		↓	Contract out to Private Entities	(Preparation of Concession) Contract out to Private Entities	Concession to Private Entities	Concession to Private Entities
Collection	↓		Examination of Concession (Examine conditions for institutionalizing Section 1 into private entities)	Preparation of Concession/Permission (Formalize the Section 1 as private entities with necessary funding) **2nd Priority Financing**	Start Concession and Permission to Private entities	Concession and Permission
S/Ps	↓		Examination of Concession (Examine conditions for institutionalizing Ex-pepenadores Grous into Cooperatives)	Preparation of Concession (Formalize the Ex-pepenadores Groups as Cooperatives with necessary funding) **2nd Priority Financing**	Concession	Concession
T/Ss and Transport	↓	↑	Contract out	Contract out	Contract out	Contract out
NIT	↓	↑	Investment by the DGSU **1st Priority Financing**	A1. DGSU direct operation or A2. Operation contracted out by DGSU. Examination of four options: A. Status quo (DGSU) either A1. or A2., B. Parastatal, and C. Concession and preparation for B or C if it is chosen.	A1, A2, B or C.	A1, A2, B or C.
Final Disposal		↑	Investment by the DGSU **1st Priority Financing**	A1. DGSU direct operation or A2. Operation contracted out by DGSU. Examination of three options: A. Status quo (DGSU) either A1. or A2., and B. Parastatal and preparation for B if it is chosen.	A1, A2, or B	A1, A2, or B

Note: This table shows alternatives proposed by the JICA team which will be subject to further examination by the GDF.

5.3 Forecast of Future Waste Amount and Composition

5.3.1 Population Forecast

In order to forecast the amount and composition of wastes which the DF has to deal with in coming years, population in the DF was estimated.

Estimated population for 2010, the target year of the M/P, in the DF and the delegations is as seen in Table 5-7.

Table 5-7: Population and Population Density in the DF by Delegation

Delegation	Area (ha)	2010	
		Population (persons)	Population Density (persons/ha)
Alvaro Obregon	8,586	731,600	85.21
Azcapotzalco	3,451	455,100	131.87
Benito Juarez	2,750	390,200	141.89
Coyoacan	5,540	755,100	136.30
Cuajimalpa	7,700	184,500	23.96
Cuauhtemoc	3,309	561,400	169.66
Gustavo A.Madero	8,700	1,234,300	141.87
Iztacalco	2,306	431,800	187.25
Iztapalapa	11,940	1,867,100	156.37
M.Contreras	7,004	244,600	34.92
Miguel Hidalgo	4,764	383,300	80.46
Milpa Alta	27,820	91,200	3.28
Tlahuac	9,300	326,600	35.12
Tlalpan	31,200	684,000	21.92
V.Carranza	3,442	488,900	142.04
Xochimilco	12,740	375,900	29.51
Total DF	150,552	9,205,600	61.15

5.3.2 Assumptions for Waste Amount Forecast

Waste amount which is to be covered by the waste stream of the DF was forecasted.

Assumptions for the waste amount forecast are as follows.

- Waste generation units for sectors were as shown in the results of study on waste generation amount by the DGSU in 1997.
- Future waste amount from households was obtained from the waste generation units and projected population shown above.
- The increase in numbers of establishments (such as offices, market and hotels), their employees and/or other related parameters was obtained by assuming that it is proportional to the population growth from 1997 to 2010, and used to estimate the future waste generation from those establishments.
- The waste amount from the municipalities was assumed to be proportional to their population. As for the future waste stream, all whose waste were supposed

to be simply disposed of at the final disposal site of the DF since the introduction of source separation in those municipalities is very unlikely.

5.3.3 Waste Composition

The DGSU has conducted a detailed waste composition survey. The figures resulted from this survey were presumed to be fairly constant during the concerned period and employed in this study.

Table 5-8 gives the classification of waste composition adopted by the DGSU, and also the present study. It should be noted that waste marked with "R" is regarded as recyclable, while the letter "O" represents organic waste.

Table 5-8: Waste Composition

	Subproductos		
	1	Abatelenguas	Spatula
	2	Algodon	Cotton
R	3	Carton	Cardboard
	4	Cuero	Leather
	5	Envase de Carton	Paper container
O	6	Fibra Dura Vegetal	Vegetable fiber
R	7	Fibra Sintetica	Synthetic fiber
	8	Gasa	Gauze
O	9	Hueso	Bone
R	10	Hule	Vinyl
	11	Jeringa Desechable	Disposable syringe
R	12	Lata	Cans
	13	Loza y Ceramica	Ceramics
	14	Madera	Wood
	15	Material de Construccion	Construction waste
R	16	Material Ferroso	Metal
R	17	Material No Ferroso	Nonferrous metal
R	18	Papel Bond	Paper
R	19	Papel Periodico	News paper
	20	Papel Sanitario	Toilet paper
	21	Panal Desechable	Deposable diaper
	22	Placas Radiologicas	X-ray film
R	23	Plastico de Pelicula	Plastic film
R	24	Plastico Rigido	Hard plastic
	25	Poliuretano	Polyurethane
	26	Poliuretano Expandido	Foamed polyurethane
O	27	Residuo Alimenticio	Food waste
O	28	Residuo de Jardineria	Garden waste
	29	Toallas Sanitarias	Sanitary napkin
	30	Trapo	Rags
	31	Vendas	Bandage
R	32	Vidrio de Color	Color glass
R	33	Vdrio Transparente	Transparent glass
	34	Residuo Fino	Fine fraction
	35	Otros	Others

In the sub-system, waste separation into three categories, namely recyclable, organic and the other wastes, will be applied. On the other hand, waste separation into two categories, recyclables and the other wastes including organic wastes, will be employed to wastes collected by the delegations. The former is hereafter called "type 3", the latter "type 2", while the current practice is called "type 1". This is summarized in Table 5-9.

Table 5-9: Source Separation Types

	Outline	Categories of Separation
Type 1	Wastes discharged and collected without separation.	None
Type 2	Wastes separated into two when discharged and collected.	Recyclable Others
Type 3	Wastes separated into three when discharged and collected.	Organic Recyclable Others

5.3.4 Future Waste Stream

The waste amount of each component in the future waste stream was considered for three alternatives (see Table 5-10).

Table 5-10: Alternatives Formulation

Alternative 1	No change in present waste stream
Alternative 2	The S/Ps are closed.
Alternative 3	Source separation partly introduced.

a. Alternative 1

Alternative 1 is a scenario where the present practice will persist. Figure 5-5 presents the waste stream in 2010 for Alternative 1. As this figure shows, waste generation amount in the DF will be 12,136 ton/day, representing 6.5% increase compared to the 1997 level, and waste transported from the municipalities of the State of Mexico will be 777 ton/day. From the total of these, 2,048 tons/day will be recycled per day. Wastes of 10,871 ton/day are to be dispose of at the final disposal site.

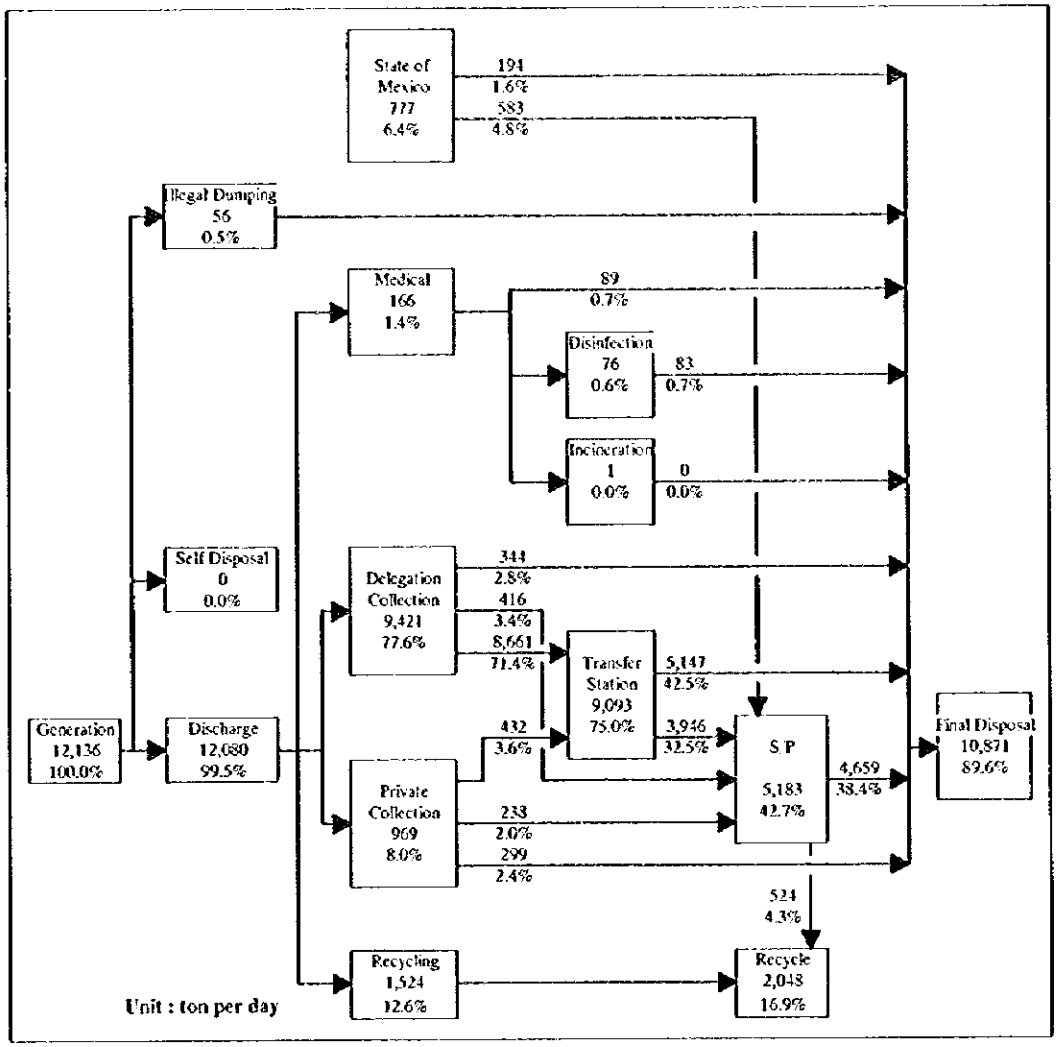


Figure 5-5: Waste Stream in 2010 (Alternative 1)

b. Alternative 2

In Alternative 2, all the current S/Ps are to be closed by 2010. Figure 5-6 presents the waste stream in 2010 for Alternative 2. The amount of generated wastes is same as Alternative 1, but the recyclable materials are not recovered as in the case of Alternative 1 due to the closure of the S/Ps. Accordingly, more wastes has to be disposed of at the final disposal site.

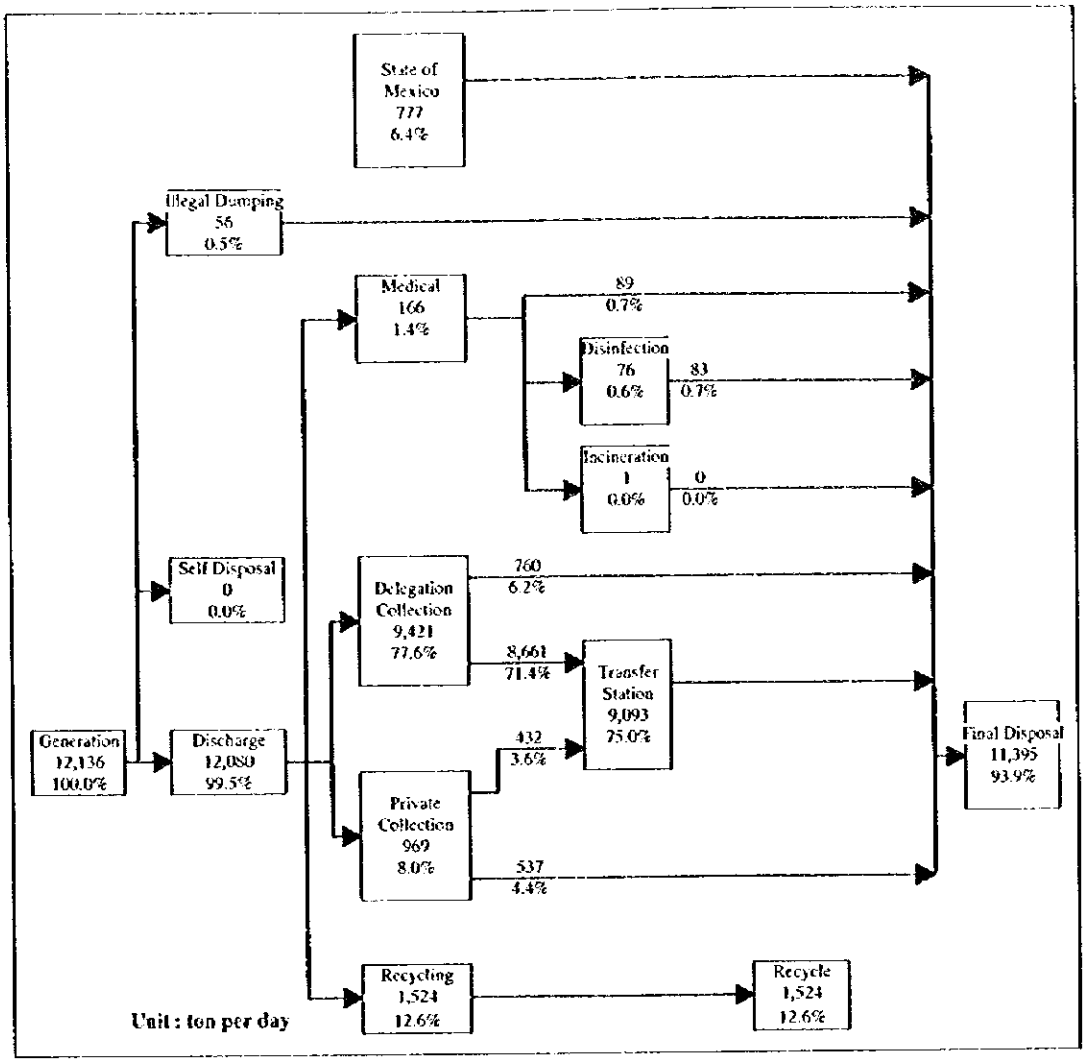


Figure 5-6: Waste Stream in 2010 (Alternative 2)

c. Alternative 3

In Alternative 3, it is supposed that the sub-system is introduced to public facilities such as schools and markets which are to be excluded from the delegation's collection. As already mentioned, the sub-system will employ source separation of type 3 shown in Table 5-9. Regarding the other wastes, which the delegations continue to collect, type 2 separation will be employed for half of those wastes.

The facilities to be covered by the sub-system will be the following.

- Housing complex of institutions.
- Markets (including the Central Market (*Central de Abasto*)).
- Primary schools.
- Institutions.
- Green areas (such as parks and cemeteries).

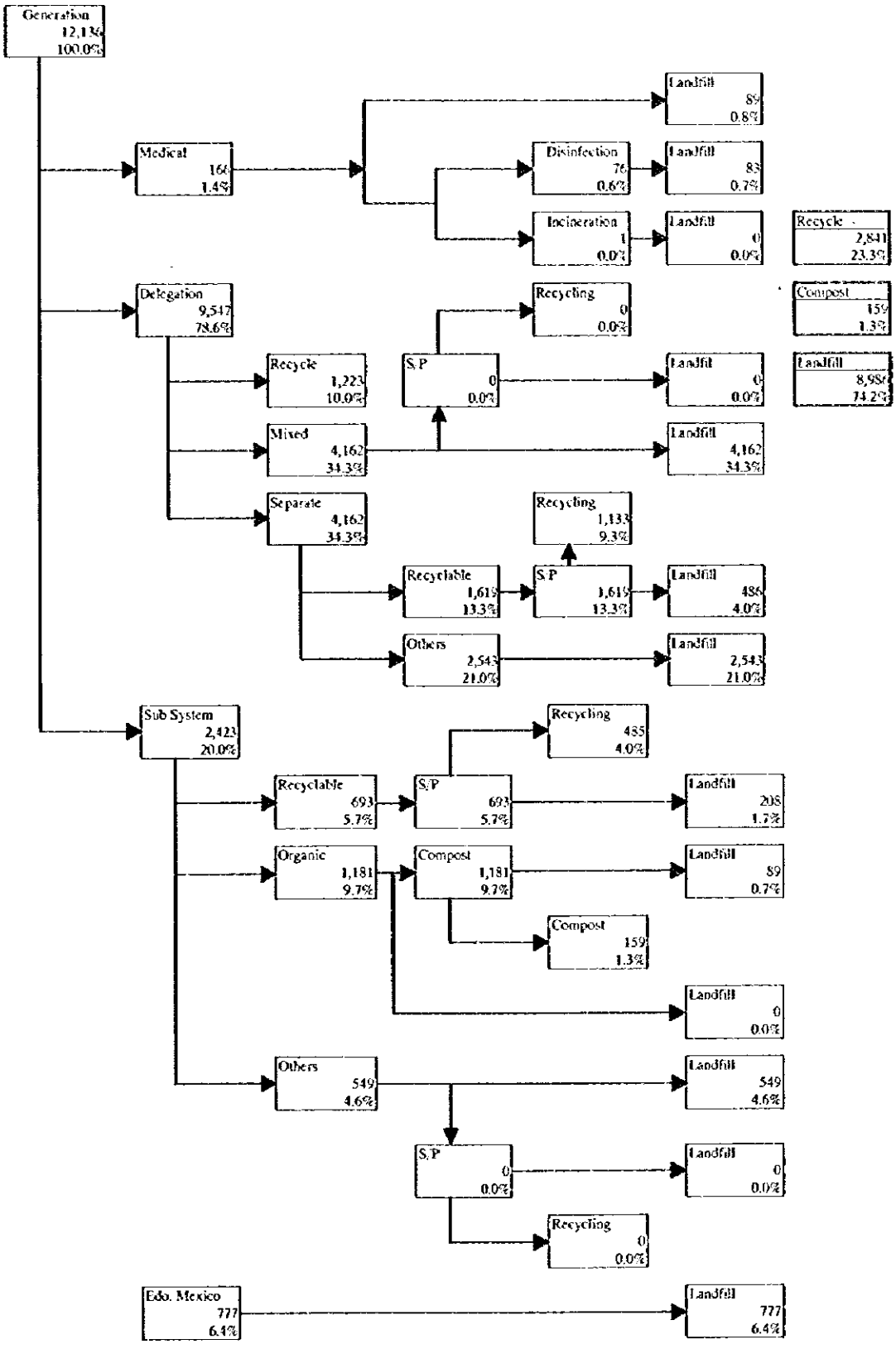


Figure 5-7: Waste Stream in 2010 (Alternative 3)

5.4 Other Pre-Conditions

5.4.1 Affordability Analysis – Fund Available and Fund Affordable

This section is prepared to primarily analyze the size of investment outlays *of avail* for DGSU during the Master Plan period of 1999 through 2010, while the two alternatives being set forth herewith, notably, (i) the private sector resources NOT being incorporated in the public accounting, and (ii) those being. This part definitely delineates the difference in size of the pecuniary resources available to the public work undertaking in line with the both ways of funds flow as defined above. Sequential to the hypothetical framework in placing the size of funds available to DF, the ascertainment of funds *affordable* to the agency is considered, while assuming the funds in the form of (i) equity-own funds, (ii) loan-equity mix, and (iii) loan-equity-grant mix in exchange of funds available to DGSU in the years that come. The analysis numerically elucidates the size of investment(s) possible for DGSU to carry out with its financial endowments now and on, and the impact of project implementation on the flow of funds attributed to the current DF government.

5.4.2 Available Funds

Estimation of available fund for DGSU is made on the two assumptive alternatives, vis-à-vis, (i) without Beneficiaries' Contribution ("*tips*" and "*fincas*") being incorporated in public accounting, thereby no new money for reinvestment from the private sector except that currently being paid by large dumping customers, and (ii) with Beneficiaries' Contribution ("*tips*" and "*fincas*") possibly being incorporated in public accounting, a proportion of which will be mobilized for partial fulfillment of investment lag in the sub-sector.

a. Willingness to Pay

Figures applied in the analysis of the results of POS include the percentage share of "voluntary payers" in, and the amount and intervals of tips paid by households, respectively with 81 percent of the total and 7.0 pesos per household per week. Provided that the average income of household in Mexico in 1996 reveals P. 25,776 per annum[2], or US$ 3,391.6 equivalent as per 1996 quotation of P.7.6 per US$, coupled with P.7.0 per week of presumably taken "bid price" of people on the marginal unit of supply of waste disposal, people's willingness to pay (*WTP*) for the public service in concern in 1998 worked out around one percent of their income[3]. While considering that household income in Mexico City is considerably higher than that of Mexico as a whole, people's *WTP* for waste management in Mexico City is notably lower than those in the major cities in Asian region where *WTP* ranging around 2 percent of income[4].

[2] Source: INEGI, *El Ingreso y el Gasto Publico en Mexico*, 1997, p. 29
[3] Household income in 1998 is assumed to be P.33,776, or US$ 3,711.6 (P.9.1/US$), with the inflation rates of 17 percent and 12 percent in respective of 1997 and 1998 in view.
[4] Source: The World Bank Technical assistance to Indonesia, Institutiotnalization of Integrated Urban Development, 1995, p. 9

b. Estimation of Available Fund, Mortgage for Expedient Borrowing

Solid waste management (SWM) services are becoming one of the major and urgent items on the agenda of federal and local officials in due course of increased demand by the population, rising economic and social costs and management complications associated with a large work force. The concerned sub-sector investment requires amounts of capital and other scarce resources of the country, it is imperative that investments be economized with the financial and economic returns at maximum, while striving for social conflicts and political friction at minimum. Alternatively, essential to the proper planning is the allocation of scarce resources to its best advantage. The framework, the model configuration, and the assumptive parameters in use for the analysis is set forth *vide infra*.

b.1 Assumptions and Model Configuration

Basic Assumptions for Model Configuration

The following financial framework in brief with model configurations and assumptive parameters readily presents the possible fund raised for the Mexico City for which a paucity of affordable credit in the formal sector is considered to be one of the serious constraints to upgrade the efficiency of urban sanitation services.

Table 5-11: Key Socioeconomic and Financial Indicators and Assumptive Parameters

Gross Domestic Products, 1997	US$ 402.5 billion
Real GDP/GRP Growth per annum	5.0 percent in average
Gross Regional Products, DF, 1997	US$ 93 billion
Average Household Earning Nation-wide, 1998	P. 33,776 per annum
Annual Growth of Beneficiary contribution	3.0 percent in real terms
Elasticity of Contribution Increase with regard to Growth	0.6
Annual Population Growth	0.59 percent in average
DGSU Budget for SWM in 1998	P. 987 million, (excl. Delegation)
Real Growth Rate of DGSU Budget for SWM	-0.5 percent
Benchmark Investment Target in SWM	0.05 percent in terms of GDP
Social Discount Rate	7.9 percent
Master Plan Duration	12 years (1999 -- 2010)

i. Sources and Uses of Funds -- Two Alternatives

As a guiding principle for the analysis herewith and on, the two interrelated ways of fund mobilization in the economy are considered as reiteratively noted above, vis-à-vis, (i) funds from all or part of the sources possibly involved (Federal, External Assistance, DF, Delegation, and the private sector) would be engaged and utilized in processing of SWM through the public channel, namely, DGSU, and (ii) private sector resource currently in place as "*tips*" and "*fincas*" will be stashed in the hands of collectors directly from beneficiaries in service areas. Foreign aid funds would implicitly be incorporated in state fund, if any, in the form of sub-loan, equity investment and grant to DF government in the forthcoming analysis. Presumably, no external private funds in conjunction with any private sector partnership projects (BOT, BOO, contract out, and so forth) are in sight.

ii. Capital Accumulation

The capital accumulation and investment outlay lasts for 12 years in the SWM sub-sector concerned, while commencing in 1999 up to the year 2010. It is assumed that there is no change in correlation of the variables involved with the passage of time.

iii. Resource Mobilization from Private Sector

As defined in (ii) above, *tips* and *fincas*, both broadly defined as a kind of tariff, or fees donated from households and entities, respectively, will accrue during collection and transfer in SWM processing. In this connection, the alternatives are made whether or not the funds collected are utilized through the public channel in support of self-reliance and financially sound management of the SWM service undertaking in DF.

iv. Elasticity (Sensitivity)

Elasticity of fund supply with regard to real GDP growth would presumably be set at a certain level, for instance 0.6, in analysis. Nonetheless, there is no supply elasticity assumed herewith.

Model Configuration

Considering the analytical framework by and large, the following model configuration is set out to draw the possible size of funds available for capital investment and recurrent works with the associated numerical parameters. To be noted that not all the pieces as articulated below are in use for the current analysis, largely due to paucity of time and numerical information of avail and of reliance. A bird's eye view illustrating model configuration and assumptive parameters is provided in Table 5-12 and Table 5-13, as attached.

Table 5-12: Model Configuration and Assumptive Parameters (1)

Key Parameters

Policy Target (Bdgt Allocation for the Solid Waste Subsector)	
MC SWM Alloc (Fm Fed)	0.05% of Investment Outlay
MC SWM Alloc (Fm DF)	0.1% of GRP
External Assistance	0.01% of the total public investment outlays
Real GDP Growth	4.0% per annum
Population Growth	0.59% per annum
FX Quotation	9.1 P/US$
Devaluation	0.0% in FY200: 0.0% in FY2015
Share of Devt Bdgt	10.0% of DGSU SWM Budget
Share of non-committal funds	70.0% of DGSU SWM Development Budget
Household Ratio	70.0% of the total population
# of Entities	300,000 in MCity 1998
WTP (for Solid Waste service)	0.5% of income
Beneficiary Contrn	2.9 P. million/yr, 1998 (PAHO Report)
Annual Real Increase in BenContn	3.0% per annum
Ben Contn (Agg.HH *tips*, '98)	324 US$ million
Ben Contn (Agg.*Fincas*, '98)	1,036 US$ million
Ben Contn (Agg.Current, '98)	2.9 P. million/yr, 1998 (PAHO Report)
Social Discount Rate	6.6%
Inflation *vide infra*	0.0% per annum
Nominal rate	12.0% per annum
Nominal GR of DF Bdgt 95-98	24.7%
Av Inflation 95-97	31.6%
Real GR of DF Bdgt, SWM	-2.9%
Buffer Coefficient	0.8

Key Economic Indicators

	$ million	P. million	
GDP ('97)	402,500	3,260,250	(Ref:WB)
GNP ('97)	NA		
Gov Rev ('97)	90,173	730,400	(Ref:BdeMexico)
Gov Exp ('97)	92,840	752,000	(Ref:BdeMexico)
DF GRP ('93)	22,938	71,465	(Ref:Censo Industrial, Comercial y servicios, 94, INEGI)
DF GRP (est.,'97)	93,000	846,300	
DF Secretariat Exps ('98)	2,833	25,784	(Ref:Official Gaceta)
DF Expenses ('98)	4,678	42,576	(Ref:Official Gaceta)
Del Budget ('98)	818	6,630	(Ref:Official Gaceta)
DF SWM Bdgt ('98)	109	988	(Ref:DGSU)
Del SWM Bdgt ('98)	63	573	(Ref:DGSU)
Av Earning/pc/yr (Mexico,'96)	3,392	25,776	(Ref:Ignacio y Cassio, '97,p.29)
Av Earning/yr (MCity,'96)	30		
Av Earng/yr (Mexico,'98)	3,712	33,777	
Min Wage/day,Mexico,'98	3.32	30.2	National Average - P.27.99/day
GDP p.c (Mexico,$,1997)	4,091	33,137	Ref:Mexican Bulletine of Statistical Information
GRP p.c (DF,est.,1997)	12,169	98,607	
XR (P/$) 1998	9.1		
XR (P/$) 1997	8.1		
XR (P/$) 1996	7.6		
Inflation (93-95)	8.0%		
Inflation 1998	12.0%		
Inflation 1997	17.0%		
Population, mil, 1998	8.6		
Interest Rate (cetes, '97)	23.6%		
Fed Inv Plan for SWM	NA		
DF Inv Plan for SWM	NA		
DF Debt, agg (as of 98)	109,373	12,019	(Ref:Official Gaceta)
DF Ecological Preservation('98	23,323	2,563	(Ref:Official Gaceta)

Alternative 1: No Tips/Fincas Mobilized in Formal Sector, Contribution of Large-Scale Waste Generators Currently in Place

#	Year	Inflation per annum	Real GDP Growth	Population Growth	GDP (US$, mil)	Population	Federal: Target SWM (US$, mil)	Federal: MC SWM Dev Alloc (US$, mil)	External: MC SWM Dev Alloc (US$, mil)	DF: GRP (US$, mil)	DF: Target SWM (US$, mil)	DF: MC SWM Dev Alloc (US$, mil)	Delegacion: MC SWM Dev Alloc (US$, mil)	WTP: HH tips (US$, mil)	WTP: Entities Fincas (US$, mil)	Beneficiary Contrn Dev Alloc (US$, mil)	Total (US$, mil)	Accumulated Balance (US$, mil)
	1997				402,500	8,567,135												
	1998	0.0%	4.0%	4.00%	418,600	8,617,681				93,000	93.0	7.6	4.4			0.32		
1	1999	0.0%	4.0%	0.59%	435,344	8,668,525				96,720	96.7	7.42	4.27			0.33	7.7	7.7
2	2000	0.0%	4.0%	0.59%	452,758	8,719,670				100,589	100.6	7.25	4.15			0.34	7.6	15.3
3	2001	0.0%	4.0%	0.59%	470,868	8,771,116				104,612	104.6	7.08	4.03			0.35	7.4	22.8
4	2002	0.0%	4.0%	0.59%	489,703	8,822,865				108,797	108.8	6.91	3.91			0.36	7.3	30.0
5	2003	0.0%	4.0%	0.59%	509,291	8,874,920				113,149	113.1	6.75	3.79			0.37	7.1	37.1
6	2004	0.0%	4.0%	0.59%	529,663	8,927,282				117,675	117.7	6.59	3.68			0.38	7.0	44.1
7	2005	0.0%	4.0%	0.59%	550,849	8,979,953				122,382	122.4	6.44	3.58			0.39	6.8	50.9
8	2006	0.0%	4.0%	0.59%	572,883	9,032,935				127,277	127.3	6.28	3.47			0.40	6.7	57.6
9	2007	0.0%	4.0%	0.59%	595,798	9,086,229				132,368	132.4	6.14	3.37			0.42	6.6	64.2
10	2008	0.0%	4.0%	0.59%	619,630	9,139,838				137,663	137.7	5.99	3.27			0.43	6.4	70.6
11	2009	0.0%	4.0%	0.59%	644,415	9,193,763				143,169	143.2	5.85	3.17			0.44	6.3	76.9
12	2010	0.0%	4.0%	0.59%	670,192	9,248,006				148,896	148.9	5.71	3.08			0.45	6.2	83.1
Total 1999 - 2010			83.1 US$ million					0.00	0.00		1,453.3	78.4	43.8	0.0	0.0	4.66	83.07	
Present Value, 1998			39 US$ million															
Annualized Fund			4.8 US$ million															

Table 5-13: Model Configuration and Assumptive Parameters (2)

Key Parameters

Policy Target (Bdgt Allocation for the Solid Waste Subsector)		
MC SWM Alloc (Fm Fed)	0.05%	of Investment Outlay
MC SWM Alloc (Fm DF)	0.1%	of GRP
External Assistance	0.0%	of the total public investment outlays
Real GDP Growth	4.0%	per annum
Population Growth	0.59%	per annum
FX Quotation	9.1	P/US$
Devaluation	0.0%	in FY200 0.0% in FY2015
Share of Devt Bdgt	10.0%	of DGSU SWM Budget
Share of non-committal funds	70.0%	of DGSU SWM Development Budget
Household Ratio	70%	of the total population
# of Entities	350,000	in MCity 1998
WTP (for Solid Waste service)	0.5%	of income
Beneficiary Contrn	2.9	P. million/yr, 1998 (PAHO Report)
Annual Real Increase in BenContn	3.0%	per annum
Ben Contn (Agg.HH *tip*, '98)	325.52	US$ million
Ben Contn (Agg.*Fincas* , '98)	1,035.71	US$ million
Ben Contn (Agg.Current, '98)	2.9	P. million/yr, 1998
Social Discount Rate	6.6%	
Inflation *vide Infra*	0%	per annum
Nominal case	12%	per annum
Nominal GR of DF Bdgt 95-98	28.7%	
Av Inflation 95-97	31.6%	
Real GR of DF Bdgt, SWM	-2.9%	
Buffer Coefficient	0.8	

Key Economic Indicators

	$ million	P. million	
GDP ('97)	402,500	3,260,250	(Ref:WB)
GNP ('97)			
Gov Rev ('97)	90,173	730,400	(Ref:BdeMexico)
Gov Exp ('97)	92,840	752,000	(Ref:BdeMexico)
DF GRP ('93)	22,938	71,465	(Ref:Censo Industrial, Comercial y servicios, 94, INEGI)
DF GRP (est.,'98)	93,000	866,300	
DF Secretariat Exps ('98)	2,835	25,784	(Ref:Oficial Gaceta)
DF Expenses ('98)	4,678	42,574	(Ref:Oficial Gaceta)
Del Budget ('98)	818	6,630	(Ref:Oficial Gaceta)
DF SWM Bdgt ('98)	109	987.9	(Ref:DGSU)
Del SWM Bdgt ('98)	63	572.5	(Ref:DGSU)
Av Earning/pa/yr (Mexico,'96)	3,392	25,776	(Ref:Ingresos y Gasto, 97,p.29)
Av Earning/yr (MCity,'96)	30	0.00118	
Av Earng/yr (Mexico,'98)	3,712	33,777	
Min Wage/day,MCity,'98	3.32	30.2	National Average - P.27.99/day
GDP p.c (Mexico,$,1997)	4,091	33,137	Ref:Mexican Bulletine of Statistical Information
GRP p.c (DF,est.,1997)	12,149	98,407	
XR (P/$) 1998	9.1		
XR (P/$) 1997	8.1		
XR (P/$) 1996	7.6		
Inflation (93-95)	8.0%		
Inflation 1998	12.0%		
Inflation 1997	17.0%		
Population, mil, 1998	8.6		
Interest Rate (*cetes*,'97)	23.6%		
Fed Inv Plan for SWM	NA		
DF Inv Plan for SWM	NA		
DF Debt, agg (as of '98)	109,373	12,019	(Ref:Oficial Gaceta)
DF Ecological Preservation('98)	23,323	2,563	(Ref:Oficial Gaceta)

Alternative 2: With Private Resources Mobilized in Formal Sector (Tips, Fincas included in the LR)

#	Year	Inflation per annum	Real GDP Growth	Population Growth	GDP	Population	Federal Target Transfer	Federal MC SWM Dev Alloc	External MC SWM Dev Alloc	DF GRP	DF Target SWM	DF MC SWM Dev Alloc	Delegacion MC SWM Dev Alloc	WTP HH *Tips*	WTP Entities *Fincas*	Beneficiary Contn Dev Alloc	Total	Accumulated Balance
P. million/yr, 1998 (PAHO Report)					(US$, mil)		(US$, mil)	(US$, mil)	(US$, mil)	(US$, mil)	(US$, mil)	(US$, mil)	(US$, mil)	(US$, mil)	(US$, mil)	(US$, mil)	(US$, mil)	(US$, mil)
	1997				402,500	8,567,135								30				
	1998	0.0%	4.0%	0.59%	418,600	8,617,681	0			93,000	93.00	7.6	4.4	22.6	72.5	0.32		
1	1999	0.0%	4.0%	0.59%	435,344	8,668,525				96,720	96.7	7.4	4.3	23.3	74.7	0.33	105.7	105.7
2	2000	0.0%	4.0%	0.59%	452,758	8,719,670				100,589	100.6	7.2	4.2	24.0	76.9	0.34	108.5	214.3
3	2001	0.0%	4.0%	0.59%	470,868	8,771,116				104,612	104.6	7.1	4.1	24.7	79.2	0.35	111.4	325.7
4	2002	0.0%	4.0%	0.59%	489,703	8,822,865				108,797	108.8	6.9	4.0	25.5	81.6	0.36	114.4	440.0
5	2003	0.0%	4.0%	0.59%	509,291	8,874,920				113,149	113.1	6.7	3.9	26.3	84.0	0.37	117.4	557.4
6	2004	0.0%	4.0%	0.59%	529,663	8,927,282				117,675	117.7	6.6	3.8	27.0	86.6	0.38	120.6	678.0
7	2005	0.0%	4.0%	0.59%	550,849	8,979,953				122,382	122.4	6.4	3.7	27.9	89.2	0.39	123.8	801.9
8	2006	0.0%	4.0%	0.59%	572,883	9,032,935				127,277	127.3	6.3	3.6	28.7	91.8	0.40	127.2	929.1
9	2007	0.0%	4.0%	0.59%	595,798	9,086,229				132,368	132.4	6.1	3.6	29.5	94.6	0.42	130.7	1,059.8
10	2008	0.0%	4.0%	0.59%	619,630	9,139,838				137,663	137.7	6.0	3.5	30.4	97.4	0.43	134.3	1,194.1
11	2009	0.0%	4.0%	0.59%	644,415	9,193,763				143,169	143.2	5.9	3.4	31.3	100.4	0.44	138.0	1,332.1
12	2010	0.0%	4.0%	0.59%	670,192	9,248,006				148,896	148.9	5.7	3.3	32.3	103.4	0.45	141.8	1,473.9
Total 1999 - 2010			1,473.9	US$ million				0.00			1,453.3	78.4	45.4	331.0	1,059.8	4.66	1473.90	
AF Present Value, 1998			688.4	US$ million														
Annualized Fund			84.6	US$ million														

c. Fund Available for Prospective Project

In line with the model configuration and indicative parameters as articulated above and in the table, the total *funds available* in the case of Alternative I (without private sector contribution except large-scale dumping beneficiaries), within the time-slice of 12 years, is temporarily estimated at P. 756.2 million (equivalent to US$ 83.1 million as per 1998 price) up to the year 2010, of which 5.6 percent of fund emanates from the private sector source. Meanwhile in the case of Alternative II (with private sector fund reincorporated in public finance), the present value of fund available in aggregate hypothetically worked out P.13,412.5 million, or equivalent to US$ 1,473.9 million as per 1998 quotation, of which 94.7 percent come from the private sector. In terms of the annual fund allocation for the planning period, the levelized amounts for the alternative one and two will reach US$ 4.8 million and US$ 84.6 million, respectively.

Meanwhile, it should be noted that these chunks of cash during the aforementioned period does NOT mean the fund in hand of DF for investments in 1999. This is the amount that would be accumulated over the 12 years and would be understood in analogy as a kind of mortgage for possible credit.

5.4.2.1 Fund Affordable and Impact on DF Finance

a. Model Configuration, Tool and Parameters

In anticipation of the DF Government's further commitment to urban environmental management at a higher level, the need for external financing at an early point in time is pressing. In carrying out a further analysis to give hands with whatever the DF administration might require to commission the preparation of the prospective solid waste management project (the Project) in 1999, *fund affordable* for DF government and the Project as well is estimated in lieu of the available funds above. In view of nature of the fund estimated in due course of analysis, the subsequent financing model and the estimates will present an indicative measurement of loan credibility and budget for the prospective project confining to the limited size, design and procurement. In facilitating the perusal of the analysis herewith, the estimates are categorized in a three-way financing plan, vis-à-vis, (i) Own Fund, (ii) Equity-Loan mix, and (iii) Equity-Loan-Grant mix, in the two alternatives of credit lines, notably, (a) International lending institution, and (b) Bi-lateral lending agency.

The size of public investment projects depends on the availability of affordable funds (how much money you have in the chest for free use in 1999?) and its loan credibility (how much you could borrow now for what you would accumulate and retain in currency by the year 2010?). With this in view, the analysis will be initiated by instituting the overall account on the size of project in the three alternatives of financing plans. The underlying conditions of equity-loan mix and equity-loan-grant mix in financing plan are 25-75 and 17-50-33 in shares out of the total amount, respectively, while considering the views of and comments on the most likelihoodness of possibility of combination from officials concerned at DF and international lending institutions. The case has also been looked into where collateral fund (three quarters of equity-loan mix) be split into loan and grant. To this end, the numerical combination worked out around 30-45-25. Subsequently, the prospective repayment plans and annuitized debt services associated with each of the financing

plans are simulated to measure the financial impacts on the DF finance. The benchmarked policy target for investments in SWM has been assumed specifically that 0.05 percent of GDP be earmark to SWM in Mexico City, of which 10 percent be allocated to development budget. Further, 70 percent of DF development budget is presumed to be non-committal fund for new projects. The model configuration and assumptions are set forth in an immediately following part in a bid to draw the indicative funds affordable for the Project.

To be noted that the issue of direct contribution of the private sector to DF account through possible payments of tariff/user's charge to the administration (Alternative II) is NOT sorted out herewith, except that of the payments currently in place by large-scale beneficiaries, with due recognition of cultural and mental background of people in the way of pecuniary compensation for public services.

Underlying Assumptions

Financial Terms

Indicative financial terms and conditions as specified above is summarized in a Table 5-14 below.

Table 5-14: Indicative Financial Terms and Conditions by Source of Funds

	Foreign Cost Portion		Local Cost Portion	
	Multi-Lateral	Bi-Lateral	Multi-Lateral	Bi-Lateral
Financing Coverage (%)	100	100	100	100
Loan Period (years)	20	30	20	30
Grace Period (years)	5	10	5	10
Loan Repayment Period (years)	15	20	15	20
Interest Rate (%)	7.5	2.6	24.9	24.9

Equity-Loan, Equity-Loan-Grant Mixes

As initially indicated in the preceding paragraphs, investment requirements of the prospective project are assumed to be financed by (i) own fund (equity), (ii) equity plus loans through the national development bank (BANOBRAS) with the central government as guarantor, or (iii) equity, loan plus fiscal transfers from the central government to DF government.

b. Findings

Maximal Sizes of Investments in SWM

In the context of the foregoing, and with an annuity of around P. 43.7 million (equivalent to US$ 4.8 million), the maximunds (maximum values) of investment projects for each of the alternative financing are figured out at US$ 7.1 million (Own Fund), US$ 28.2 million (Loan-Equity mix), and US$ 42.3 million (Loan-Equity-Grant mix, where grant is assumed to be an accretion to equity-loan mix). Provided that grant covers part of loan-equity mix, the combination connected with equity-loan-grant mix remains at US$ 28.2 million (Loan-Equity mix), without any surprise. A summary Table 5-15 is given below.

Table 5-15: Conditional Maximunds by Type of Combination of Financing Source

Mix-Finance Sources	Maximunds	Combination
Own Fund	P. 64.6 million (US$ 7.1 mil)	100-0
Equity–Loan	P. 256.6 million (US$ 28.2 mil)	25-75
Equity-Loan-Grant (accretion)	P. 384.9 million (US 42.3 mil)	17-50-33
Equity-Loan-Grant (part of loan)	P. 256.6 million (US$ 28.2 mil)	30-45-25

Chapter 6

Particulars to be Considered in the Master Plan Formulation

6 Particulars to be Considered in the Master Plan Formulation

The municipal SWM in the DF, providing services to about 8.7 million people and dealing about 11,000 tons of generated wastes daily, complies with fundamental prerequisites such as keeping the city clean and implementing the sanitary landfill with impermeable liner in order not to pollute the environment. In other words, the GDF has achieved a considerable integration in its municipal SWM, in spite of the difficulties brought by its enormous coverage of the SWM. Today, a firm and large-scale system for SWM has already established in order to keep maintaining this integration. Therefore, in formulating the M/P, special attentions shall be paid to the following:

1. Respecting the established management in the existing system, improvement measures should be formulated in the M/P.
2. The municipal SWM system in the M/P should, aiming at the promotion of resource conservation, be put in force to reduce the final disposal amounts.
3. The systems in the M/P should be cost-effective.

6.1 Technical Particulars to be Considered

6.1.1 Discharge and Storage System

a. Separation Items

The success in shifting the generators' behavior from mixed waste discharge to source separation largely depends on morals and devotion of themselves. Namely, **the fewer** the separation **items** are, **the higher** possibility of **success** they may have in the source separation.

From 1996, the DGSU is being carried out a pilot program of three items source separation in some public institutions and housing units, in which totally about 8,500 people are cooperated. 92% source separation was achieved on average in 1998.

In view of this result, the source separation items in the sub-system is proposed to be **three items** (organic, recyclable, and others).

The above pilot project might possibly have gained a good devotion of rules observance from generators, since they were public institutions and housing units where the collective cooperation were easily expected, and in turn unanimously responded to the project.

On the other hand, the collection services by the delegations are provided for individual generators, whose laborious commitments in source separation are difficult to seek. Since it is anticipated that the same three items source separation (as the pilot project) can not be easily achieved by generators in the delegation services, it is proposed to employ the simplest separation items (i.e., **two categories** (recyclable, and others)) for the source separation in the delegation services.

Table 6-1: Source Separation Item

System	Separation type	Waste category
Sub-system	3 items separation	organic, recyclable, and others
Delegation	2 items separation	recyclable, and others

Actual compositions in respective item-categories (i.e., organic, recyclable, and others) are set out as shown in Table 6-2, with referring to the definitions applied in the waste amount and composition survey[1] realized by the DGSU in 1996.

Table 6-2: Definition of Item Categories to be Separated

For Sub-system	For Delegation	Category	Composition
Organic	Others	Organic	Vegetable fiber
			Bone
			Food waste
			Garden waste
Recyclable	Recyclable	Recyclable	Cardboard
			Synthetic fiber
			Vinyl
			Cans
			Metal
			Nonferrous metal
			Paper
			Newspaper
			Plastic film
			Hard plastic
			Color glass
			Transparent glass
Others	Others	Others	Absorbent cotton
			Cotton
			Leather
			Paper container
			Gauze
			Disposable syringe
			Ceramics
			Wood
			Construction waste
Others	Others	Others	Toilet paper
			Disposable diaper
			Radiation treatment goods
			Polyurethane
			Foamed polyurethane
			Sanitary napkin
			Rags
			Bandage
			Fine fraction
			Others

[1] ESTUDIO DE ACTUALIZACION DE LOS INDICADORES CUALITAIVOS Y CUANTITVOS DE LOS RESIDOUS SOLIDOS GENERADOS EN DOMICILIO, EN LA CIUDAD MEXICO, 1996, DGSU/DTDS

6.1.2 Collection and Haulage System

a. Separate Collection Methods

Collection methods for separately discharged wastes comprise such as:

- **Normal vehicle collection:** Collection vehicles of single loading space are employed in this collection. Respective collection for each item is performed on different days of a week. (i.e., a vehicle, assigned in a fixed route, collects one "source separate" item on (a) specific day(s) of a week, and another item on another (other) day(s) of a week). Generators should: separate wastes into the defined items; hand in only one item on a day of a week; and rest items should be stored in his/her place until the collection of that item takes place on another day of a week.
- **Point collection:** Plural containers are installed (one container for one "separate" item) at a designated collection point. Generators should: separate wastes into the defined items; carry them to the collection point and dispose them of respectively into the assigned container.
- **Special vehicle collection:** A special collection vehicle with plural loading spaces is employed in the collection. The vehicle can collect plural items at the same time. Generators should only separate wastes into the defined items, and can hand them in to the service on every collection day.

In view of an advantage of utilizing the existing collection system (i.e., maximum use of current resources and cost saving), **normal vehicle collection** appears to be most recommended as a separate collection method in the M/P. Meanwhile, as for the separate collection for markets, in which limited in number of major generators are put together, **point collection** could be recommended, if the collection point can be managed as part of market facilities.

b. Haulage System

b.1 Transfer Station

Currently waste visual inspections are carried out at the transfer stations, in order to determine the optimum waste destination (S/P or final disposal site) for respective incoming wastes. Therefore, even in a case where separate collection is implemented in the future, it is judged that present system of transfer stations can cope with the change.

b.2 Transportation

Separate transport by which wastes are transported: from station to S/P, from station to final disposal, and from S/P to final disposal. Therefore, it is judged that present system can be adapted to the future transportation system in which mixed waste and separate waste are to be transported independently.

6.1.3 Intermediate Treatment System

a. Recycling Facility

Three manual sorting S/Ps are currently operated in the GDF's municipal SWM system. Manual sorting in general is the optimum solution for the selection plants (S/Ps), where abundant cheap labor force is available. Manual sorting methods have an advantage over mechanical sorting methods in selection preciseness.

Therefore, it is judged that the M/P basically should examine options for efficient utilization of existing S/Ps, and will not propose options of new facilities.

b. Volume Reduction Facility

Alternatives aimed at final disposal volume reduction will include: incineration; sorting; and composting. Incineration can significantly contribute to volume reduction, but requires considerably huge investment, operation and maintenance costs. Furthermore, it necessitates a set of technical and technological integrity in facilities' operation and maintenance.

The above should be considered as key elements of justifying volume reduction facilities in the M/P formulation.

As the GDF is operating three S/Ps, the examination of volume reduction facilities, in formulating the M/P, will be limited to incineration and composting.

b.1 Composting

The delegation Gustavo A. Madera had owned a municipal SW composting plant operated until 1993. The facility was shut down and dismantled mainly because mixed municipal wastes input to the facility deteriorated compost quality. It is required that, in order to prevent this failure, a composting facility should be fed with selected organic wastes.

b.2 Incineration

The GDF operated the 100 ton/day capacity incineration plant as a pilot project from 1990 to 1992. The plant operation has been suspended due to a set of problems ranging from a poor functional design to high O&M costs of the plant. What was learnt from the pilot operation was that municipal wastes in the DF are generally such wastes that can technically be incinerated with least auxiliary fuel by a modern incinerator. However, such a modern incinerator, which could comply with the updated emission norms, will be incredibly expensive, even though its volume reduction effect is highly appreciated. Therefore, incineration facilities can not be recommended in the M/P.

6.1.4 Final Disposal System

The Bordo Poniente Etapa IV final disposal site, employing an impermeable liner in its bottom, is performing sanitary landfill operations. Its management is judged to be very satisfactory, except for the management of leachate treatment. Therefore, it is considered that an additional improvement of leachate management to the current final disposal system will satisfy the technical norms imposed in Mexico.

6.2 Particulars of Social Aspect

Human, family, professional, ex-scavengers groups, union, institutional attitudes and relations between participants in the solid waste management system are deeply influenced by culture, values and perceptions of all the different components of the urban society. Consequently, any technical or operative proposal should include the social and cultural factor within the context where it wants to be applied.

For the DF case, the new proposals of the M/P for solid waste management should respond the following social criteria:

1. **Identification of local specific characteristics**

   Identification of the DF's diversity and specific characteristics, leaving room for local solutions. Classic or rigid models which are applicable or already applied to other cities should not necessarily be imposed.

2. **Harmonization**

   An open attitude among the participants of the SWM system which can lead to negotiation, consensus and social harmonization as the main strategy to advance on new innovative proposals.

3. **Education**

   An educational component which can make service recipients (who receive the service) and the GDF come together with the purpose of improving their communication. It will also try to improve the attitude of "just throw away" to "responsible to his/her waste". This will be done by means of introducing a will to separate and reduce the solid waste generated; and encouraging more responsibility toward the health and environment, it should initiate in the short term.

4. **Worker Promotion**

   The Socio-economic improvement of informal workers should be aimed at. For this study, this previous statement implies that the informal personnel (volunteers) which work in sweeping and collecting waste should be incorporated to the formal sector. This action will lead to an improvement of their socio-economical conditions. This criteria does not mean that the GDF will take care of this personnel, but new and modern proposals should be concerted to achieve formality for majority of this personnel by the year 2010.

5. **Training**

   More training should be provided for persons in charge and workers in general within the GDF cleansing services and private contractors which participate on SWM in the short and medium term.

6. **Participation and Sustainability**

   More participation from the civil society in planning new functional and operative proposals; in addition, and social and community sustainability for such proposals should be promoted. It should be initiated in the short term.

7. Cost for Society

These proposals should not mean a higher cost for the society in the DF.

8. Supervision and Control

Supervision and control (for the fulfillment of legal arrangements or contracts which would protect the interest of population in general, GDF, and workers) should be strict and transparent.

Consequently, the social factor is related in a complex manner with the other components of the Master Plan. Education is indispensable and can not be neglected for cleansing and hygiene to achieve a situation where residents or solid waste generators cooperate with the GDF authorities.

6.3 Institutional Particulars to be Considered

6.3.1 Institutional Particulars to be Considered

a. Introduction

The current situation of SWM and the expected one in year 2010 are generally summarized in the following table.

Table 6-3: Current status and Expected Future for the SWMS

Components	Status Quo (Dec. 1998)	Desired Status (Dec. 2010)
Source of Wastes	• Separation: not carried out	• Segregation: recyclable/organic/others (100% in the sub-system; recyclable/others (50% in the delegation system)
Specialized Sub-system	• Bids for contracting out	• Granted: collection, processing and sale of recyclable products; collection and composting or organic matter; collection or rejected ones; transfer and transportation. • Authorized: collection, processing and sale or disposal of construction wastes, non-hazardous industrial wastes; collection, treatment and final disposal of medical wastes.
Ordinary Domestic Collection	• Managed by the delegations, strong presence of Section 1 • Charge-free according to the law, paid as tips and *fincas* • Sweepers also carry out this service • A great number of "volunteers" • Scavenging on streets and in-route • Poor sanitary conditions	• Collection granted to enterprises and/or collectors organized into skilled institutions (OW). • A service with laws and direct payments to the concessionaire • Scavenging prohibited, as well as "volunteers"
Street Sweeping	• DGSU: inter-delegational roads; illegal dumping sites • Delegations: everything other than by DGSU • Sweepers also carry out domestic collection	• Delegations carry out all the service • Sweepers employed for sweeping
Collection of Recyclable Products	• Aleatory, by the private sector and pepenadores	• Granted to an enterprise and/or current workers organized in OW

Components	Status Quo (Dec. 1998)	Desired Status (Dec. 2010)
Separation Plants (S/P)	• Operation and maintenance by DGSU • Administration by DGSU, with interference from unions • Exploitation and sale by the unions and their leaders • "Informal" workers	• Granted or permitted to workers and leaders, organized in skilled institutions • Evolution to Processing Plants to add value to the product • Shared charges and costs
Transfer Stations and Final Transportation	• Operation and maintenance by DGSU and its contractors • Administration by DGSU, with interference by the delegation, Section 1 and unions • Short-term contracts	• Granted to a private or parastatal enterprise • Long-term contracts, whenever necessary
Composting Plant	• There exists equipment that has not been operated since the beginning of the 90's in a unit of the DGSU	• Granted to a private or parastatal enterprise if nobody seems to be interested in it • Obligatory acquisition of the production by GDF • Controlled quality
Sanitary Landfill (SL)	• B. Poniente SL: DGSU in charge of the whole • Santa Catarina SL: operation and maintenance by DGSU, administered and exploited by the union • A historical and latent conflict	• B. Poniente SL only • Granted to a parastatal enterprise • Optionally, direct administration by DGSU, contracting long-term services
DGSU	• It rules, supervises and executes the SWMS	• It rules and supervises the SWMS; occasionally, it executes

The following points must be remembered for the current situation:

1. Sanitary Landfill are managed by the DGSU and operated by the contracted parties.
2. TS are administered by the DGSU but with the participation of the delegation where they are located and with Section 1 and they are operated by the parties contracted by the DGSU. Transportation from the TS is somehow controlled by the interests of the Ex-scavengers Groups that use the S/P.
3. The equipment of S/P is managed, operated and controlled by the DGSU and its contracted parties, whereas the production and commercialization of recyclable products is managed by the Ex-scavengers Groups and their leaders.
4. Domestic collection and street sweeping are managed by the delegations, which provide the equipment and maintenance with the participation of Section 1; they are operated by the syndicated employees and their "volunteers" and temporary workers.
5. Private collection does not require an official authorization and is restricted to medical, non-hazardous industrial and construction wastes.
6. Waste generators pay spontaneous tips and *fincas* to the collectors (sweepers included) for the service rendered, whereas the Cleansing Code establishes that the collection of wastes from generators of up to 200 kg/day is charge-free.
7. Labor legislation applicable to the public service favors and strengthens syndicated workers and weakens temporary ones.
8. The legislation to contract services brings as a consequence short-term, restrictive and anti-economic contracts.

The diversity in institutional and informal factors found in some components of SWM suggests the *concession* as an economically feasible and non-shocking solution in political terms. In other components of the SWM, the concession appears again as a good solution, yet inevitably shocking.

The transition from the current status towards the future would be made progressively, integrating into the SWMS informal personnel and entities that are currently accepted and that work efficiently. The specialized sub-system that will kick off in 1999 will foster regulation and monitoring actions, and at the same time will test and upgrade the proposals of the Master Plan.

6.3.2 Discussion on Stakeholders in "Recyclable" Materials

The following components integrated are considered for the discussion:

- management of the wastes at the source.
- collection.
- separation of recyclable products.
- processing of recyclable products.
- sale of recyclable products.

The **management at the source** would be guided by a Code (which would also inform the citizen on all the stages of SWM) and would be implemented gradually with a help of pilot programs. These programs would be planned and monitored by the SOS/DGSU.

The **collection** and transportation to the middle and/or final destiny would be divided into the Delegation System and the Specialized Sub-system, in accordance with the agreement signed between the GDF and Section 1 of the Unique Syndicate of Workers of the Federal District.

The institutionalization plans that the Sub-system will start and to be concluded in the medium term. On the other hand, the Delegation System will be started institutionalizing in the long term, oriented and stimulated by the results of the Sub-system.

The pre-established objective is to minimize the wastes to be transported to the final disposal, through the utilization of recyclable and compostable products, and the separation at the source. For that purpose, five specialized flows in the sub-system would be implemented, the domestic waste flow being the main one.

The separation plant (S/P) is part of a whole system that requires further analysis, which is shown next.

A S/P and its evolved form as a **processing plant (P/P)** for recyclable products could be productive units of an attractive industry but that depends excessively on the purchasing market -which is in turn conditioned to the prices (generally low) of raw materials and energy, as well as to the fiscal levying system.

This dependency increases with the difficulty of: storing recyclable products (dirty and bulky ones); the numerous labor (that requires payments without any delay, including the social charges); and the low profitability that does not justify a high working capital.

As a general rule, an industrial activity in which the social interest is more important than the economic one, requires investments without any return and operational subsidy -unless the social and tax burdens corresponding the labor should not be paid and at the same time its productivity must be kept at a high level.

The two last conditions suggest that SP should be operated by **organizations of workers (OW)**, which are foreseen in Art. 25 of the federal Constitution as *cooperative associations or social solidarity associations*. However, it should be mentioned that establishment of cooperatives has not succeeded historically in Mexico.

The dirtiness, the low market value and the difficulty to store the recyclable products separated in a plant that receives *mixed wastes* furthermore, the high costs for more than 90% of the mass received to discharge, reload and transport it to the landfill-suggest the validity of the separation of wastes at the source, followed by a differentiated collection, classification and reduction in volume of recyclable products.

When this activity develops, the S/P would require changes to evolve to PP, which would process the clean recyclable products with more appropriate technologies every time to add values on these secondary raw materials.

The flow of recyclable products separated at the source would like to go through **gathering centers** and **processing plants**, so that they can reach the market with value to maintain the flow and obtain some profits. The feasibility of this purpose

depends on the institutionalization of the labor and the flow as a consequence, and the manner to achieve it.

Current S/Ps should like to be integrated into this flow, until the end of their useful span, gradually turning into PP. In this manner, the staff who already have experience in the management of wastes would be used and then the facilities would be utilized efficiently.

The gathering system required for the recyclable product flow must be compatible with the vehicle that transports them.

To utilize the existing conventional collection vehicles is proposed in this Master Plan for the collection of recyclable materials.

Two factors present in the market should not be forgotten:

- recyclable product traders that keep their own gathering centers, are drawing the attention of pepenadores, sweepers and collectors to buy "their" recyclable products;
- tax laws, which grant tax exemptions to the trade of recyclable products, require conditions that are difficult to be fulfilled by the small seller.

The traders mentioned above would not be bothered by the GDF, yet they would be affected by the organized collection system being proposed - as well as the big buyers and their associations, which would cause an increase in the prices, *in a basic and superficial evaluation, without taking into account the advantages of a regular market assisted by the government and of clean recyclable products, maybe previously processed.*

As regard to the tax levying, the GDF should stimulate in real terms the activities that lead to recycling, as well as requesting the same thing to other governmental bodies. A basic and realistic stimulation is to grant a zero rate to the taxes of such activities, which would bring as a result of positive effects in the sales and the information on the market.

6.3.3 Discussion on Improvement of Informal and Voluntary People

Another component for the discussion is the *informal waste collection system*, known herewith as the Delegation System.

Due to the competency shown throughout the years in the domestic collection and street sweeping and the **culture of direct payment for the service rendered**, the workers in charge of this service should have the priority in the concession of the ordinary domestic collection service.

The concession would be the juridical instrument chosen due to the productivity and the greater political independence of private entities in comparison with public entities, and specially for two basic reasons:

- the existing culture of the *direct payment for the service rendered* presupposes the popular acceptance and success of the payment to the *concessionaire*, rather than any form of payment to the *Public Power*;

- the features mentioned for the collection and pre-processing of recyclable products recommend the *autonomous* work, thus granted, for these activities.

6.3.4 Analysis of the Institutional Alternatives

The analysis of the institutional alternatives will be conducted for each component group in the following order, in response to the strategies on institutionalization (from the downstream components):

- Sanitary Landfill.
- Composting Plant.
- Transfer Stations and Transport.
- Selection Plant.
- Delegation Collection (Sub-system).
- Delegation Collection (By Section 1).
- Inter-Delegation Collection.

6.3.4.1 The Sanitary Landfill

Final disposal would be made at the sanitary landfill (SL) of Bordo Poniente "Etapa IV", alternating with "Etapa V" when each stage has been implemented.

The situation to locate the SL in the lake Texcoco area is sensitive and is subject to restrictions and audits by federal entities and by the GDF, and occasionally by authorities from the state of Mexico. The use of the land owned by the National Water Commission (CNA) was authorized under the commitment of the GDF to carry out work, monitoring and maintenance tasks in the long term. The alternation in the uses of areas IV and V would be a technical decision made according to the features of the soil.

For such reason, the DGSU will have a continuous presence at the site, reason why it would not be very interested to give concession of the construction of infrastructure, operation and maintenance of SL to a private enterprise, and contracting out such services would be convenient.

On the other hand, these conditions suggest that the concessions are similarly attractive as the referred contracts to private enterprises.

The institutional alternatives induce the analysis of two options:

- **SL.1** - To keep the direct administration by the GDF through the SOS/DGSU and **to operate SL through long-term contracts.**
- **SL.2** - To create a **parastatal entity** linked to the SOS to manage and operate the SL; either directly or not.

The advantages and disadvantages of a parastatal entity directly managing the SL are obtained from the legal precepts. In the current case of the SL, it could be said that the superiority of a parastatal entity is not that much in the case of the management of a SL, where there exists no commercial or industrial activity, and the high, intrinsic indirect costs are not diluted in such a small body.

Meanwhile, this superiority would become unquestionable in case that same parastatal entity -as a **decentralized body**- is granted the **SL and the compost plant.**

6.3.4.2 The Composting Plant

The composting plant is a production unit of a scarcely attractive industry, due to the difficulty to sell the product or until the potential consumers are correctly oriented and convinced of the need for compost.

As long as it is industry, the CP is part of a waste flow, therefore it is characterized as an "institutional service entity" (Federal Law of Parastatal Companies, Art. 31), and it is also clear that it is not a simple urban cleaning activity.

There is a lack of financial and administrative autonomy for a direct public administration entity to manage and direct a self-sustainable industrial enterprise; therefore, the following alternatives should be studied:

- **CP.1** - Concession of the manufacturing and sale of compost to a private entity.
- **CP.2** - Establishment of a parastatal entity associated to the SOS for that purpose.
- **CP.3** - Establishment of a mixed public and private capital company.

The **first option** would be favorable for the development of the technology of production and use of compost, since the commercialization of the product would determine the survival of this enterprise, which at the same time would not require public investment.

To make this enterprise more appealing, the GDF would guarantee the consumption of a considerable amount of the product, as well as the optional joint concession of the collection of products to be composted in the sub-system.

In view of a possibility that private entities do not show interest in the composting plant, the **second alternative** would appear to be better than the *direct administration* by the GDF from the industrial aspect of this enterprise for the following reasons:

- capacity to set its own entrepreneurial policy and the prices for the private market.
- free management of the revenues generated by its economic activity.
- own property which would be allowed for financial transactions.
- administrative authority and the obligatory internal control and auditing, which leads to a correct assessment of its performance.
- its own identity and minor political interference.
- competition to fix the salaries and fringe benefits, as well as to enter collective and individual contracts that will regulate the labor relations of the entity with its workers (Art. 63 and 64 of the Organic Law).

The autonomy degree of a parastatal entity in the Federal District has improved considerably due to the Organic Law for Public Administration for the Federal District, particularly in regard to the administration of staff and salaries, which are very sensitive items that are mentioned in this Study.

Another critical item is the acquisition of goods and the contracting of services. In this regard, the same code for the direct administration is kept, but the existence of

internal control and external surveillance, as well as their higher ranked than a Direction allow the parastatal entities to manage this critical topic with more autonomy.

The intrinsic cost of a parastatal administration is high, due to the fact that its autonomy requires internal and external surveillance bodies, a board of directors, accounting systems, juridical consulting and management of human, financial and material resources similar to those in a Secretariat (which dilutes its costs among several bodies). However, costs can be cut down with greater productivity of the resources applied due to its autonomy and the minor political interference. Therefore, the advantages of a parastatal entity increase proportionally with the resources involved, the commercial relations and its productive activities.

The appropriate parastatal modality would be a **decentralized body (DC)**, since the land would be owned by the GDF only and the main purpose for it would be to render a public service instead of making profits. The trust, which would be a supporting or temporary body of the government would not be an appropriate modality and it would like to be discarded.

The third option would make a private entrepreneur trust to begin such enterprise, specially as regards to the consumption of the product. The GDF would integrate its portion of capital with equipment it already has and the land for the facility, thus reducing the investment in currency. The most difficult thing would be to accept a minority participation, either the GDF or a private entrepreneur, which turns this alternative as unfeasible. A *parastatal entity* would be created if a **majority state participation entity** were formed, yet its entrepreneurial activities would be restricted as a **DC**, and there would be certain commitments with the private partner.

6.3.4.3 Transfer Stations and Transportation

Transfer stations (TS) represent the middle destiny of the wastes collected and constitute a single body along with the transportation to the final destination. This fact justifies the single administration of the transfer station with the transportation in each delegation.

On the other hand, S/Ps receive half of the wastes collected and also constitute a single body along with the transportation to the final destiny, however, joint administration for them would not be feasible due to the particularities that is discussed in the next section.

If it is considered that the features of a TS and transportation by truck as regards to equipment and materials, as well as to the technologies and professional training are considerably opposite, the option to manage separately the TS and transportation can then be chosen. Both services will have to be supported with direct payments by the collecting entities, since they constitute the final part of the collection service.

The institutional forms selected for the analysis were the following:

- **TS.1** - Direct administration by the SOS/DGSU.
- **TS.2** - Indirect administration by a parastatal entity.
- **TS.3** - Private administration under a concession.

The **direct administration** would not certainly eliminate the costs and inconvenient administrative processes of the simultaneous performance of the DGSU: the delegation and the syndicates in the TS, apart from the interference of Ex-scavengers Groups in the transportation. It would be very difficult to set fair prices to receive the wastes brought by the collecting concessionaires, with the risk of politically influenced prices. As a positive aspect, it can be pointed out that the SOS/DGSU already have the operative facilities and the required elements for their maintenance.

The **parastatal administration** would provide new and stronger personality to TS, with the capacity to mitigate the inconveniences mentioned before. The 13 TS would represent a considerable economy of scale to cut down the indirect costs of the entity. Transfer of the assets to the entity would be very easy, and their main positive and negative aspects as an institution were mentioned in the two previous sections.

The parastatal entity, instituted as a DC, would be granted the **concession** by the GDF to render the public service and with the obligation to maintain, renew and expand the facilities and acquire equipment whenever required. The options of integrating both the TS and transportation as one component would depend on the economic study to calculate the investment and costs, even more than operational resources, which could be contracted out to private enterprises during long periods.

The **private administration** could result in lower costs, and also an advantage for the user under the conditions set forth for the **concession** as the modality suggested above. The GDF would be released from a massive investment when the renovation of the fleet were necessary, as well as from financial burdens and from the multiple administrative interference in TS and in the final transportation.

6.3.4.4 Recyclable Product Separation Plants (S/P)

The exploitation of S/P *themselves* could be granted by the GDF as a **temporary revocable administrative permission** or as a **concession**, according to the legislation. In both instances, all operation/maintenance costs would be born by the beneficiary and extensions of such instruments could be allowed if what constructed become as the GDF property.

The beneficiary entity would have to be legally empowered to exercise the inherent industrial and commercial activities of a S/P, which would require the appropriate institutionalization of the workers and Ex-scavengers Groups, since they would be the obvious candidates for the concession.

The *permission* authorizes the use of the good for any lawful purpose, whereas the *concession* allows the use of it to render a *public service.*

Consequently, the concession could be the *unique* and more appropriate instrument to grant, for example, the *joint* exploitation of a S/P and of collection of recyclable products.

6.3.4.5 Delegation Collection (Sub-system by Private Sector)

a. Collection of Markets and Central de Abasto Wastes

Being restricted business and with permanent governmental presence, and due to the necessity to separate the organic wastes to carry them to the composting plant, a

concession has more advantages than the *authorization*, since there does not exist demand for several offerers whose competition in prices would certainly decrease the quality of the services.

The **concession** would set the conditions and the terms for it -which would have to be compatible with the useful span of equipment to be employed (between 5 and 7 years approximately).

6.3.4.6 Delegation Collection (By Section 1)

a. Collection of Domestic Recyclable Products

Due to the reasons discussed in the section F.3.3 of the Annex F, this flow could be operated under a **concession** by integrating the *collection* with *Gathering Centers* (GC). *Gathering Points* (GP) would be included in specific *Collection Zones for Recyclable Products* (CZRP), which would use the labor intensive alternative.

Each delegation would have its GC, preferably located in the land for the TS and providing service to one or more CZRP, according to their potential for recyclable products. The concession for a CZRP would be granted to a cooperative, and recyclable products would be stored in the GC.

GPs would be supporting units for non-motorized pickers of that cooperative and would be included in the same concession -granted by the Governor of the DF-, the delegation being a *Supporting Body*.

Meanwhile, the GC would be granted to the cooperative(s) associated to the same delegation, yet the *Supporting Body* would be the SOS/DGSU, since the GC would be part of a group that would end with the sale of recyclable products and could be integrated in commercial terms with SP/PP (besides, the GC would be preferably located in the TS, which are administered by the SOS/DGSU).

The GC would allow the autonomy of collectors, since they would negotiate the sale of the materials or the integration with SP/PP.

b. Collection of Ordinary Domestic Solid Wastes

As discussed in the section F.3.3 of the Annex F, the **concession** could be the means to be awarded with the collection of these wastes under the following *modalities*:

- equipment supplied by the concessionaire.
- equipment supplied by the concessionaire and the GDF.

or

- equipment supplied by the GDF only.

The first modality would be utilized for bids among *enterprises*, whereas the other two would be to favor *cooperatives* and/or another institution in which the current collectors would be organized.

In the concessions, the delegations would act as *Supporting Bodies*.

c. Collection of Public Solid Wastes

If it is considered that there exists a great number of sweepers employed and syndicated, who could not be re-allocated in other sectors of the GDF or dismissed, an

unfeasible option would be to continue the *street cleaning service* by means of a **direct administration**, represented by the **delegations**.

The *removal* of public wastes, including those from *illegal dumping sites* and from *main roads*, would also be carried out by the delegations -which would become in this manner totally responsible of the local cleaning. This proposal might imply the appropriate modification of the Cleaning Code.

Regardless of any assumption, these operations could be **contracted out** to diverse enterprises, with/without furnishing the equipment.

6.3.4.7 Inter-Delegation Collection

a. Collection of Medical Wastes and Similar Ones

A private collection-treatment-transportation system of pathological and biological-infectious wastes (PBIW) to the sanitary landfill has been already implemented, which was fostered by an agreement reached between the GDF and the Health Service Institute of the DF and the contracting of this service by the hospital network from the GDF, ISSSTE (Institute of Security and Social Service for State Workers) and PEMEX (Mexican Oil Company).

In order to expand the proper management of the diverse types of medical wastes and similar ones to all the generators (hospitals, laboratories, and so forth), the market should be stimulated by applying the concerned laws and by granting a corresponding **authorization title** to those enterprises legally and technically authorized.

This management is characterized as an *inter-delegation specialized activity*, reason why it would be supervised by the central administration of the SOS/DGSU, which would establish the conditions for the authorization and the term for the required periodical renovation of it.

The classification and technical management of medical wastes has a federal code, and the GDF is responsible for regulating the obligations of generators and those who render the service.

b. Collection of Industrial Non-Hazardous Wastes

As in the previous section and with the same objective, the *inter-delegation specialized activity* for the collection-processing-disposal of this type of wastes would be regulated, being carried out by private enterprises authorized by the SOS/DGSU.

The **authorization title** would set the conditions and the required renewal period. There are two important requirements for environmental sanitation: (a) wastes could be carried to an authorized processing plant, where rejected products would go to the sanitary landfill, yet they could not be discharged -previously or later- at a transfer station, due to safety reasons; (b) the control would be conducted through the responsibility or **declaration** by the generator that there are no hazardous wastes in the load to be delivered. Hazardous wastes are under the federal jurisdiction.

It should be pointed out that the *monitored authorization* allows the market open to stimulate investment and technological contributions, which would be more useful for the generating-paying industry than a concession regime, which requires control in prices and the presence of the government, sometimes with political interference.

c. Collection of Wastes from Civil Constructions

This type of industrial waste does not require the aforementioned *declaration* and can be carried to a TS from the moment at which the separation of its hazardous contents is carried out at the source, commonly in demolition sites.

This flow, including a processing plant if possible, would be also an *inter-delegation specialized private activity*, **authorized** through a **title** granted by the SOS/DGSU to those enterprises empowered and under the conditions and the renovation term accorded. The processing of these wastes tends to be an attractive economic activity, as construction material for public and private use is produced.

6.3.5 Synthesis of the Institutional Consideration Proposed

	Phase 1 (1999-2001)	Phase 2 (2002-2004)	Phase 3 (2005-2010)
Source	Code, rules Educational program with Environmental and Education Departments; separation of wastes Evaluation of sub-system	Educational program with Environmental and Education Departments; separation of wastes	Educational program with Environmental and Education Departments; separation of wastes
Sub-system	Code, rules Contracting out collection services	Code, rules, revision, complete Audit and supervise services Organize DGSU and services, train staff Promote private interests for industrial and construction wastes Grant collection service of waste from markets and Central de Abasto, institutions and housing complexes	Audit authorized services Audit and supervise granted services
Collection of recycl. Products	Code, rules Alternative study for granting services, possible effects, strategies for harmonization Survey of acceptable institutional Modalities for Ex-scavengers Groups and collectors	Organize and operate consultation to institutionalize workers Develop harmonization with recognized and emerging leaders, looking forward to allowing workers for future concessions	Begin concessions Audit and supervise granted services Keep consulting for institutionalization of workers
Ordinary collection	Code, rules Alternative study for granting the services, possible effects, strategies for harmonization Survey of acceptable institutional Modalities for Section 1, collectors and volunteers	Organize and operate consultation to institutionalize workers Develop harmonization with recognized and emerging leaders, looking forward to allowing workers for future concessions	Begin concessions Audit and supervise granted services
SP/PP	Alternative study for granting the services, permissions for SP and related services, possible effects, strategies for harmonization Survey of acceptable institutional Modalities for Ex-scavengers Groups	Organize and operate consultation to institutionalize workers Develop harmonization with recognized and emerging leaders, looking forward to allowing Ex-scavengers Groups for future concessions or permissions	Begin concessions Audit and supervise services
TS and Final Trans.	To choose the best option TS2 or TS3 Prepare the corresponding laws and codes	Implementation, according to the option TS2: constitution, securing resources, organization, staff,	Functioning TS2: contracts, investments

	Phase 1 (1999-2001)	Phase 2 (2002-2004)	Phase 3 (2005-2010)
		functioning, prices, contracts for services, investments TS3: regulate, bid, functioning, monitoring	TS3: monitoring
Compost Plant	Choose the best option: CP1 or CP2 CP1: legislate, bid, construct, implement CP2: constitution, securing resources, organization, staff, investment, construction, implementation	Implementation, according to the option: CP1: monitoring, purchase the compost CP2: functioning	CP1: monitoring, purchase the compost CP2: functioning
SL	Choose best option: SL1 or SL2 SL1: contract out long term services SL2: constitute, securing resources, organization, personnel SL1 or SL2. Operation of Etapa IV, construction of Etapa V	SLl 1or SL2: to operate Etapa V	SL1 or SL2: operation of Etapa IV and V, alternatively