

# Annex L

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## *Particulars for Master Plan Formulation*

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## **L Particulars for Master Plan Formulation**

### **L.1 Policy for Selection of an Optimum System**

14 municipalities are members of COAMSS/OPAMSS that has metropolitan approaches and collective collaboration among all members. However, each municipality has an independent autonomy in its administration and respective dimensions (such as population scale and financial dimensions) are diverse. Therefore, in order to select an optimum system for realizing a sustainable municipal SWM, ample and prudent consideration should be made over intrinsic characteristics of respective 14 municipalities.

Regional management of municipal SW could attain series of benefit when collective use SWM facilities are installed and operated, because such facilities could have merits of economy of scale than the cases that each municipality installs and operates respective facilities for individual use. On the other hand, it should be reminded that said regional management could have some problems and demerits. For example, since an organization in charge of regional management of municipal SW is a conglomerate of several autonomous municipalities, a decision making may require considerable time to attain consensus among all members, or sometimes it can not be reached to a decision.

Currently, 10 out of 14 municipalities in AMSS dispose their municipal waste at MIDES Nejapa landfill. As for remaining 4 municipalities, 2 municipalities use ESPIGA controlled dumping site and the other 2 municipalities dispose of at open dumping site within their jurisdiction.

It should be a matter of course that the selection of a final disposal alternative lies on discretion of respective autonomous municipalities. Meanwhile, "Special Regulation on Integral Solid Waste Management (Reglamento Especial sobre el Manejo Integral de los Desechos Sólidos) was published on 1st June 2000. Out of present final disposal sites that 14 municipalities use, a final disposal site that complies with this requirement is only MIDES Nejapa sanitary landfill that 10 municipalities use. Therefore, other 4 municipalities will be required to implement satisfactory final disposal of their municipal waste in order to comply with such environmental legislative requirements.

However, viewing financial capabilities of respective municipalities, the US\$18/ton tipping fee of MIDES should be very expensive. Which consequently would impose a significant financial burden on municipal finances that may possibly lead to municipal financial crisis. This implies serious questions that whether or not a "sustainable SWM" that being the goal of the Master Plan could be realized by respective 14 municipalities, from municipal financial aspects.

Meanwhile, the "environmental conservation" in municipal SWM is a very important mission as recently required from the national legislative proposition. And it can not be neglected.

Therefore, M/P should comprehend solutions for problems of such as:

- problems of costly tipping fee (namely MIDES Nejapa fee, etc.)

- environmental pollution problems by ESPIGA controlled dumping and open dumping by 2 municipalities.
- problems in performing tasks of resource conservation (e.g., separate discharge/collection).

## L.2 Technical System

### L.2.1 Technical Particulars to be Considered

#### L.2.1.1 Collection System

##### a. Separate Collection

Under the status quo, the primary target of collection system in AMSS should be to raise collection service coverage to 100%. The subsequent target after achieving 100% collection service coverage should be introduction of separate collection system that will aim at resource conservation and reduction of final disposal amount. In practice, followings are recommended for realizing the separate collection system:

- Municipalities that achieve the more than 85% coverage should then prepare for introducing the separate collection (e.g., examination and implementation of pilot projects for separate collection).
- When the service coverage exceeds 90%, the separate collection system should be gradually applied zone-by-zone (e.g., the separate collection coverage should be increased annually about 5% of municipal total.).

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.

Therefore, it is recommended the separation items of the initial separate collection system should be two (2) items: "recyclable" and "non-recyclable".

After realizing stable operation of this (2) items separate collection system, it should be examined that whether addition of another separate collection item (e.g., compostable) and/or split of this "recyclable" item into further sub-items become necessary or not, in observing the trends of recyclable materials market, social factors and background etc.

##### b. 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.

**Normal vehicle collection:** It only requires service providers to arrange their present vehicles to the same collection routes and to schedule the collection of respective items for specific days of a week. For the collection crew, it is also easy to simply unload the wastes at the transfer station. However, the generator should follow the rules of on what day what items should be handed in to the collection services.

**Point collection:** Item-wise containers should be located at the collection point. Generators should dispose the wastes into containers item by item. On the other hand, the **point collection** containers may easily invite many informal waste-pickers as they wish to recover materials by themselves. Therefore, locations that co-use container to be installed at should be carefully selected.

**Special vehicle collection:** Procurement of the special vehicles (with plural loading spaces) is necessary. Unloading (of plural items) at the transfer station will become complicated. On the other hand, there is no need to change the present collection schedule, and generators (although they should separate wastes into defined items) can hand all separate items to the collector on any day (unlike in the case of normal collection methods).

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.

### L.2.1.2 Haulage System

As examined in the previous section K.4.2, it is judged that to locate two (2) transfer stations (T/Ss): one in the eastern part of AMSS; and another in the western part of AMSS.

Accordingly, this M/P formulates a plan of haulage system that attempts to improve efficiency in collection and haulage works, by introducing a T/S system.

### L.2.1.3 Intermediate Processing System

Under the circumstances, it is judged that the necessity for introducing intermediate processing system in AMSS for municipal SWM is fairly small. Team’s observation is summarized as follows.

- As for compost, its market size is currently small and a market demand for compost products only exists in relatively short periods. Therefore, it is anticipated that if compost is produced substantially more than what is produced today, its limited marketability may result in price drop and surplus of compost product and further financial burdens for municipalities.
- There might be a justifiable reason to introduce a MIDES S/P for creating job opportunities for waste pickers. However, material recovery from mixed discharged waste has large limitation for resource conservation purposes. It is also doubtful whether S/P that recovers materials from mixed discharged waste has financial feasibility in maintaining the operation. Whereas if a S/P is fed with source separated recyclable materials, its efficiency will be much higher. Therefore, S/P that recovers materials from mixed discharged waste is not recommended.
- Incineration facilities are very expensive and also require technical capability for their operation and maintenance. It is judged that introduction of such intermediate processing system for present AMSS should be too early, in view of economical dimensions that municipalities has.

Reminding the above, this M/P will attempt to examine appropriate plans for introducing intermediate processing systems for AMSS.

#### **L.2.1.4 Final Disposal System**

Currently, 10 out of 14 municipalities in AMSS dispose their municipal waste at MIDES Nejapa landfill. As for remaining 4 municipalities, 2 municipalities use ESPIGA controlled dumping site and the other 2 municipalities dispose of at open dumping site within their jurisdiction.

It should be a matter of course that the selection of a final disposal alternative lies on discretion of respective autonomous municipalities. Meanwhile, "Special Regulation on Integral Solid Waste Management (Reglamento Especial sobre el Manejo Integral de los Desechos Sólidos) was published on 1st June 2000. Out of present final disposal sites that 14 municipalities use, a final disposal site that complies with this requirement is only MIDES Nejapa sanitary landfill that 10 municipalities use. Therefore, other 4 municipalities will be required to implement satisfactory final disposal of their municipal waste in order to comply with such environmental legislative requirements.

However, viewing financial capabilities of respective municipalities, the US\$18/ton tipping fee of MIDES should be very expensive. Which consequently would impose a significant financial burden on municipal finances that may possibly lead to municipal financial crisis. This implies serious questions that whether or not a "sustainable SWM" that being the goal of the Master Plan could be realized by respective 14 municipalities, from municipal financial aspects.

Accordingly, in order to attempt solutions for the above-mentioned problem, this M/P examines a sanitary landfill construction that complies with the national legislative requirement published on 1st June 2000<sup>1</sup>.

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<sup>1</sup> "Special Regulation on Integral Solid Waste Management (Reglamento Especial sobre el Manejo Integral de los Desechos Sólidos) was published on 1st June 2000.

## L.3 Institutional and Organizational System

### L.3.1 Institutional Particularities to be Taken into Account

#### a. Situation Expected in Year 2010

The current situation of SWM in AMSS and that expected in year 2010 is summarized in Table L-1.

The following issues should be considered in the present situation:

1. The collection of municipal SW (domestic, commercial, institutional) and public road sweeping are managed by the 14 municipalities of AMSS. This operation is directly executed with their own resources or by small scale contractors and concessionaires from the private sector.
2. There is no separation of municipal SW at the generating source.
3. The final disposal of 10 municipalities is contracted out to a private/public joint venture company (MIDES), 2 municipalities contract the final disposal service to a private company (ESPIGA), and two municipalities dispose of their waste at open dumping sites located in its own territory.
4. The separation of recyclable materials from SW is carried out by about 300 scavengers in Mariona site, Apopa. Likewise, the recycling industry of the private sector trades and processes these recyclable materials.
5. There are 3 small private plants that are processing compost.
6. The two electricity companies of San Salvador, both belonging to the private sector, are in charge of the following: collection of the cleansing fee in one municipality, the S/L fee collection in 6 municipalities, and the collection of both fees in 3 municipalities. Such collection is conducted efficiently.
7. The municipality of San Salvador is looking forward to transforming and modernizing the organizational structure of such entity, with the final stage concluding in year 2003. It is considered that, as the progressive ending of the process of decentralization and participation of third parties (*terciarizacion*), contractors and/or concessionaires from the private sector to run these services.



Table L-1: Current and Expected Situation in Year 2010 for SWM in AMSS

Elements	Current Situation (May 2000)	Expected Situation (December 2010)
SW generation at the source	<ul style="list-style-type: none"> <li>Separation is not conducted.</li> </ul>	<ul style="list-style-type: none"> <li>Separation of recyclable materials (30% of generating sources).</li> <li>100% Separation of organic wastes from markets and parks.</li> </ul>
Collection service	<ul style="list-style-type: none"> <li>Municipal and private collection.</li> <li>Total coverage (about 82%).</li> <li>On-route separation.</li> <li>Users pay variable cleansing fee to the municipality.</li> <li>Users pay directly to micro-enterprises with concession.</li> </ul>	<ul style="list-style-type: none"> <li>Municipal and private collection.</li> <li>Total coverage (100%).</li> <li>No on-route separation.</li> <li>Keep direct payment to concessionaires.</li> <li>Greater number of private participants and micro-enterprises duly regulated, supervised and controlled.</li> </ul>
Separate collection	<ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li>Total collection of recyclable material separated at the generation source, preferably by duly regulated and controlled recyclers and separators.</li> <li>Separate collection of organic material from markets and parks.</li> </ul>
Public road cleaning	<ul style="list-style-type: none"> <li>Municipal most of it.</li> <li>About 10% of what is received in final disposal comes from street sweeping.</li> </ul>	<ul style="list-style-type: none"> <li>Keep the estimation that about 10% from the disposed waste comes from street sweeping.</li> <li>Promote a greater participation by formal micro-enterprises for public cleansing.</li> </ul>
Transfer stations (T/S)	<ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li>Metropolitan transfer station(s) servicing for most municipalities. Management of and concession to private sectors, with a previous bid.</li> </ul>
Selection plant (S/P)	<ul style="list-style-type: none"> <li>None</li> <li>Approximately 300 scavengers are separating at Mariona former dumping site.</li> </ul>	<ul style="list-style-type: none"> <li>S/P for separate collection (i.e., separately collected recyclable materials are fed into the plant and materials are efficiently recovered item by item)</li> </ul>
Final haulage	<ul style="list-style-type: none"> <li>MIDES carries around 400 Ton/day from Mariona to Nejapa S/L (material rejected by the scavengers)</li> </ul>	<ul style="list-style-type: none"> <li>Contracted haulage (previous bid) to transport 100% of SW carried to transfer station(s) to S/L.</li> </ul>
Final disposal	<ul style="list-style-type: none"> <li>MIDES S/L in Nejapa (1000 Ton/day; 82% from the total generated).</li> <li>La Chuca, "Espiga" dumping site (70 Ton/day, 6%).</li> <li>San Martín dumping site (30 Ton/day, 2%).</li> <li>Tonacatepeque dumping site (20 Ton/day, 2%).</li> <li>Illegal dumping sites (8%)</li> </ul>	<ul style="list-style-type: none"> <li>Alternative 1: <ul style="list-style-type: none"> <li>Nejapa S/L</li> </ul> </li> <li>Alternative 2: <ul style="list-style-type: none"> <li>Nejapa S/L</li> <li>Other S/Ls</li> </ul> </li> </ul>
Composting and compost plants (C/P)	<ul style="list-style-type: none"> <li>3 private (C/P) process 16 Ton/day of organic components of SW.</li> <li>Production 1.3 Ton/day of compost in total.</li> </ul>	<ul style="list-style-type: none"> <li>Existing C/P(s) and new ones from the private sector, promoted and fostered by the municipalities and MARN will process the organic material from the markets, parks and green areas of AMSS.</li> <li>Need to pay attention to the market demand for compost products.</li> </ul>
Environmental and sanitary education	<ul style="list-style-type: none"> <li>Sporadic campaigns by the municipalities.</li> </ul>	<ul style="list-style-type: none"> <li>Permanent use coordinated by COAMSS/OPAMSS and among municipalities, MARN, MSPAS and MINED.</li> </ul>
Collection efficiency improvement	<ul style="list-style-type: none"> <li>There is no database, nor a system to monitor collection.</li> </ul>	<ul style="list-style-type: none"> <li>Use of database and utilization of the collection route improvement manual.</li> </ul>
Hazardous medical solid wastes	<ul style="list-style-type: none"> <li>In big hospitals, appropriate separation and intra-hospital management. In small hospitals, management is inefficient.</li> <li>Separated collection preferably by contract-out with a specialized private enterprise. Hospitals of MSPAS through direct operation.</li> <li>Autoclave treatment at Nejapa S/L.</li> </ul>	<ul style="list-style-type: none"> <li>Intra-hospital separation and specialized separate collection of 100% of the hazardous medical SW.</li> <li>100% reliable treatment.</li> <li>Plural alternatives of treatment: autoclave and incineration.</li> <li>Final disposal by contract-out with S/L, for disposal in special cells.</li> </ul>

The above states that the private sector is now taking an active role into SWM of AMSS, yet that participation is mostly informal and in other cases it requires of competition among those that render the service.

Transition from the current situation to the target year would have to be made phase-by-phase progressively.

**b. Metropolitan Area Formed by 14 Municipalities**

SWM institutionalization and organization in AMSS should take the following into account:

- The metropolitan area is formed by 14 autonomous municipalities.
- Few years after the peace was signed, although there are still some strong political differences that hinder the understanding and reaching of consensus in services such as the cleansing one, the cleansing service requires metropolitan focuses in most part of it.

**c. COAMSS/OPAMSS**

COAMSS/OPAMSS form the coordinating entity of the 14 municipalities. Their strengthening is important, even more where taking into account that the institutional proposal of the current study outlines the need of a SWM Supervision and Control Unit within the OPAMSS. Such unit would be in charge of consulting, training and supervising of the cleansing offices of the 13 municipalities, as well as of control and follow-up of bigger contracts and monitoring of the database.

**d. MIDES Contract**

As mentioned in previous chapters, in December 1997 COAMSS and CINTEC Internacional Inc. formed "MIDES, SEM de C.V." with its articles of incorporation, in order to design, construct and operate a new sanitary landfill, a transfer station, selection plant, compost facility and the closing of two dumping sites, as well as to execute education, awareness, management and integration programs.

The US\$18/Ton fee that MIDES charge to the municipalities encompasses the costs of all the parts mentioned in the above paragraph. It is necessary to break down the cost per ton of each item, in order to know the real fee per ton of the S/L. Several municipalities will directly carry the wastes collected to the S/L without passing by the T/S, which means that they should be paying only for the S/L fee. This will not be the case for those municipalities using the transfer station, which would have to pay the operation cost of the T/S plus the haulage cost from the T/S to the S/L, plus the S/L fee. Therefore, the US\$ 18/ton should be broken down in the following items:

- i) Transfer cost per ton in the T/S.
- ii) Compost cost per ton of SW processed in a C/P.
- iii) Selection and recovery cost per ton of SW that enters to a S/P.
- iv) Haulage cost per ton carried from a T/S to the S/L.
- v) S/L cost per ton.
- vi) Cost ascribed to education, awareness, integration and management programs.
- vii) Cost ascribed to the sanitary closing of two dumping sites.

It is quite probable that several municipalities will not be interested in participating in compost and recovery projects; therefore, it would not be fair to pay for a service not being rendered.

Besides, if the US\$18/Ton is attributed totally to the sanitary landfill, other proposals of final disposal that are normally expensive would, contradictorily, be more competitive than this sanitary landfill itself.

**e. Collection of Fees and Tariffs by Electricity Companies**

This is another particularity of SWM in AMSS. Yet, it is positive and with the adjustments that might be required, it should be maintained until target year 2010. Furthermore, all cleansing and sanitary landfill fees and tariffs in the 14 municipalities should be using this commercial collection system.

**f. Third-party Plan (*Terciarizacion*)**

The municipality of San Salvador, along with consulting by the firm Arthur Anderson, is working on the transformation of the current organizational structure of the municipality. This transformation, *terciarizacion*, has the following steps:

Phase I: To be executed between January 2000 to September of this year. It is aimed at the relocation of units; the creation of newer ones and decentralization of attention to the citizen.

Phase II: From September 2000 to March 2003. This phase includes the following: Unification and relocation of functions from diverse units; a new managerial structure; greater progress on decentralization; beginning of *terciarización*; and rationalization of human resources.

Phase III: From March 2003. This phase encompasses the following: definitive allocation of functions of each unit, progressive culmination of decentralization and *terciarizacion* processes, and separation of governmental bodies from the units related to services rendered to citizens.

The term "*terciarización*" means the operation of services by "third parties" by means of an autonomous body, a municipal public enterprise, a mixed economy corporation, a contractor, concessionaire, micro-enterprise or a group of entities.

The final stage of "*terciarización*" in phase III regarding SWM in the municipality of San Salvador shows the following separate organization (Figure L-1):

- Street cleansing and collection of solid waste should become one of the 4 sections in the Sub-department of Urban Services; i.e., a 5<sup>th</sup> level office.
- Some cleansing activities would be in charge directly of the districts.
- SWM planning in charge of the Modernization and Development Unit.
- Supervision and control of SWM by the Management Control Unit.
- SWM financial and commercial systems in charge of the Financial Sub-department with a municipal Treasury (only one and whole accounting).

- SWM database in charge of the Municipal sub-department of Organization and Systems.
- Contracts, concessions and supplies management by the Municipal sub-department of Contracts and General Services.
- SWM cadastre in charge of the Municipal sub-department of cadastre.
- Management of SWM staff in charge of the Sub-department of Human Resources.

The scenario above shows a separate, bureaucratic and thus slow management that would possibly not meet the needs of an speedy administration, dedicated exclusively for the most important service rendered by the municipality of San Salvador.

However, it is worth mentioning the following positive and effective proposals of the *terciarizacion* process:

- The gradual change of direct operation and execution activities to supervision and control functions.
- The focusing and will to transform the current collection service into an autonomous body or a public municipal enterprise.
- The participation of “third parties” (contractors, concessionaires, micro-enterprises and others) in SWM operations. The aforementioned does not mean the exclusiveness of operations by “third parties”, since the service, due to multiple reasons, will continue operating partially by direct administration in some of its components.
- The participation by “third parties” will also encourage competition, thus preventing the monopolies and allowing the investment by private sectors. This fact will ease capital financing by the municipality, specially for equipment replacement.
- Another progress of *terciarizacion* is the emphasis on the attention to citizen, decentralized specially at a district level, which will allow a greater community participation in SWM.

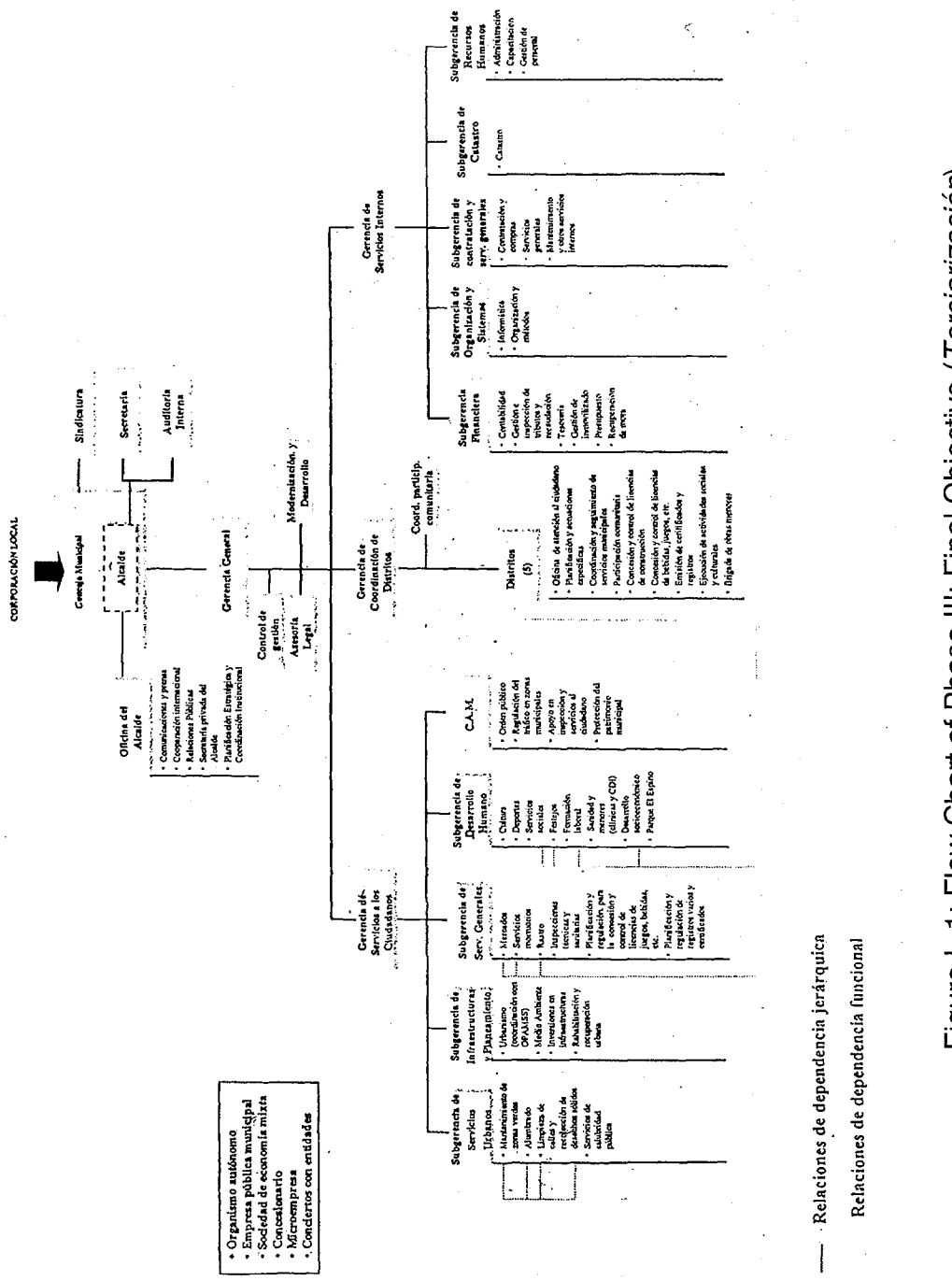


Figure L-1: Flow Chart of Phase III: Final Objective (Terciarización)

In summary, the above SWM scenario in the municipality of San Salvador from year 2004 is a proposal that outlines the “*terciarización*” and is currently under study.

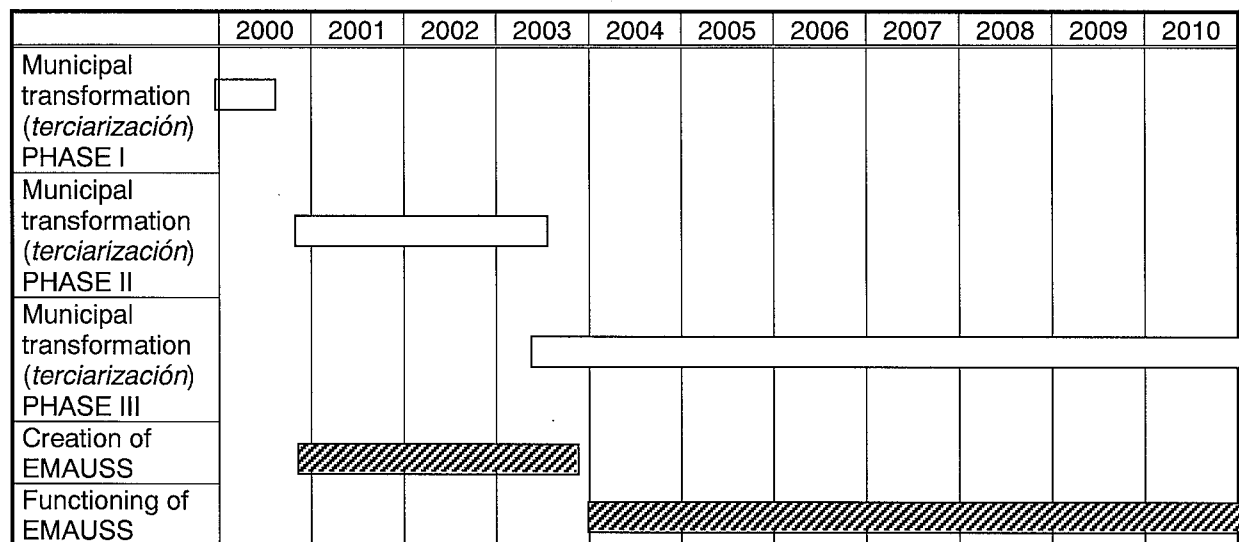


Figure L-2: Transformation Process (*terciarización*) of the Municipality of San Salvador and Creation of a San Salvador Municipal Public Company of Urban Cleansing (EMAUSS).

The alternative proposal of the Study Team for SWM in the municipality of San Salvador (not for the remaining 13 municipalities of AMSS) would be the formation of a Municipal Public Company of Urban Cleansing in charge of planning, operating managing, commercializing, financing, supervising and controlling SWM in the municipality of San Salvador.

Obviously, not the whole operation would be contracted out or granted to third parties; some parts would be directly operated by the Public Company for practical, technical and economic purposes. In consequence, the Public Company will have administrative, financial, commercial and technical autonomy.

Figure L-2 shows the *terciarización* timetable in which the cleansing service would be one of the 4 sections of the Sub-department of services, as well as the alternative of the formation and functioning of the of San Salvador Municipal Public Company of Urban Cleansing.

### L.3.2 Selection of institutional and organizational proposals

Taking into account the situation expected in year 2010 and the institutional and organizational peculiarities to be regarded in SWM of AMSS that were shown in section L.3.1, optimal deliberations for the institutional system are presented next.

#### L.3.2.1 Institutional approach of SWM elements in AMSS

Table L-2 outlines the approach for the management of the different elements involved in SWM of AMSS.

## **a. Metropolitan Approach**

### **a.1 Final Disposal**

Final disposal should have metropolitan approach by means of the sanitary landfill, which is the most economical solution in countries with land availability. In the AMSS the MIDES S/L in Nejapa is already working with a metropolitan approach, although its cost is arguable. But the operation of two or three new S/L would be recommended. It is stressed that the S/L meet the technical specifications and norms for this sanitary method of final disposal, but without including other additional procedures such as crushing, baling or other that might result in a higher S/L cost.

It is recommended that its execution and operation be by contract or concession.

### **a.2 Transfer Station**

- To study the feasibility of alternatives of transfer stations.
- Alternative 1: A financed construction by COAMSS and operated by a contract or concession.
- Alternative 2: Construction, financing and operation by contractors or concessionaires.

### **a.3 Haulage from T/S to S/L**

- Haulage contracted by public tender.
- Alternative: transfer in T/S and transport from T/S to S/L; if granted to the contractor through a public tender, cost cuts could be achieved.

### **a.4 Separation Plant**

It is very doubtful whether it is an optimum selection or not that the S/P be constructed and operated under the MIDES contract in the near future.

Since the separation of recyclable material will be fostered at the generation source during the period of the Master Plan (2001 - 2010), municipalities will have to implement gradually the separate collection of those recyclable wastes. Therefore, it is recommended that the "scavengers", organized into micro-enterprises or cooperatives, collect the separate wastes.

If the S/P contemplated under MIDES contract is ever constructed, it should have a smaller capacity, with an initial staff of no more than 300 scavengers and this figure should gradually decrease as the collection of recyclable wastes separated at the generation source progresses.

In that case, operation and maintenance of the S/P should be the responsibility of the separators (scavengers), regulated and supervised by the Execution Unit of SWM of OPAMSS.

Although the financing of the S/P comes from MIDES, it is recommended that the design and construction be conducted with a public tender, so as to reduce costs. It should not be forgotten that the construction costs of the S/P will be reflected upon the fees to be paid by the users. And, on the other hand, expecting "economic benefits" for the municipalities in the management of the S/P is illusory.

Besides, the municipalities will have to absorb the costs of transfer and transportation from the S/P to the S/L of the huge proportion of rejected material at the S/P, because the S/P proposed by MIDES is material recovery from mixed wastes collected.

Therefore, it should be recommendable that recyclable materials separately collected should be fed to the S/P that should be constructed at the appropriate time with the appropriate capacity for that.

#### **a.5 Compost Plant**

Compost processing must have a metropolitan approach. Currently there are three small private facilities that process around 16 Ton/day of organic wastes which meet the compost demand of AMSS.

The proposal would be in the sense that the existing and new C/P process the organic wastes from market and parks in AMSS in target year 2010, and in this way meeting the demand of the metropolitan market. The role of the municipalities will be the promotion of compost processing and commercialization by the private sector, providing incentives such as tax exemptions, delivery of separated organic wastes at the C/P, the guarantee of purchasing a portion of the compost produced and so on.

Something that should be highlighted is that COAMSS/OPAMSS and the municipalities must not directly manage, operate or finance the compost plant. This component must be run completely by the private sector.

#### **a.6 Special Programs**

The sanitary/environmental education program to promote the separation of recyclable wastes, as well as the route improvement manual for the optimization of collection has a metropolitan approach to be applied in each one of the 14 municipalities. Of course, their execution will be in charge of each municipality.

Planning and implementation of such metropolitan approach must be in charge of COAMSS/OPAMSS.

#### **b. Municipal Approach**

Each one of the 14 municipalities of AMSS has to plan, manage, operate (directly and by means of third parties) and finance SWM within their own municipality.

As for the operation, this basically means that the waste collection and cleansing of public roads and areas has to be executed at municipal level.

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

The collection of domestic, commercial and institutional SW, which has different service coverage in each of the 14 municipalities, will have to reach 100% of their population in target year 2010. This service may be operated directly by the municipal cleansing services, as well as by a contract or concession with small SW service-rendering enterprises (SW-SRE), or micro-enterprises and cooperatives.

For the collection improvement in AMSS, important elements will be the application of experience acquired by the cleansing staff of the different municipalities during the execution of the route improvement pilot projects in this current study, as well as the implementation of the guidelines in the Collection Route Optimization Manual to be provided by the Study Team.



## b.2 Collection of Recyclable SW Separated at the Generation Source

This will be conducted gradually from year 2002, beginning with the municipalities with a higher collection coverage, and where SW have a greater proportion of recyclable components (probably those higher income sectors). The greater recovery of recyclable products by separation at the generation source, the fewer amounts of recyclable wastes that reach the MIDES planned selection plant. The aforementioned allows the analysis of the following hypothesis:

- Looking forward to organizing the “scavengers” into cooperatives or micro-enterprises (activity in which some NGOs would make a significant contribution), so that they are in charge of the separate collection of recyclable material at the source. All the recovered material would go directly to the gathering centers of the cooperatives or micro-enterprises, with clear advantages over the sanitary, environmental and economic management of the process.
- The participation by these micro-enterprises or scavenger cooperatives in the separate collection of recyclable wastes would reduce total collection cost or partially, which could mean less expenditures for the municipalities.
- When the separate collection becomes popular in all part of AMSS, possibly around year 2008, a S/P for separate collection (i.e., separately collected recyclable materials are fed into the plant and materials are efficiently recovered item by item) will become necessary.

Table L-2: Institutional Approach of SWM Elements within AMSS

Approach	Elements	Bodies in charge
Metropolitan	<ul style="list-style-type: none"> <li>◆ Final disposal (S/L)</li> <li>◆ Transfer stations</li> <li>◆ Haulage from T/S to final disposal</li> <li>◆ Separation plant</li> <li>◆ Transportation of rejected material from S/P to S/L</li> <li>◆ Compost plant</li> <li>◆ Sanitary/environmental education program</li> <li>◆ Promotion to separate recyclable materials at the generation source</li> <li>◆ Optimization of collection (Manual of Route Improvement).</li> </ul>	COAMSS/OPAMSS
Municipal (in each municipality)	<ul style="list-style-type: none"> <li>◆ Collection of domestic SW.</li> <li>◆ Collection of commercial SW.</li> <li>◆ Collection of institutional SW.</li> <li>◆ Collection of separate recyclable materials.</li> <li>◆ Collection of organic composting SW.</li> <li>◆ Public road cleansing.</li> <li>◆ Sanitary/environmental education.</li> <li>◆ Promote separation at the source.</li> <li>◆ SWM Supervision and control within its municipality.</li> </ul>	14 respective municipalities
National (applicable in AMSS)	<ul style="list-style-type: none"> <li>◆ Management of hazardous medical SW generated in health establishments of MSPAS, ISSS and the private sector of AMSS:                             <ul style="list-style-type: none"> <li>– Separation at the source.</li> <li>– Separate collection.</li> <li>– Treatment.</li> <li>– Final disposal.</li> </ul> </li> </ul>	MSPAS

Currently, there is also collection of recyclable material by means of private collectors, as well as by the recycling industry itself.

### **b.3 Collection of Organic Composting SW**

When compost demand in AMSS increases, the private sector will increase by their own its production by means of the current plants or new C/P.

The role by the municipalities will be the promotion of this processing by the private sector through certain incentives. One of the incentives is the collection of organic SW separated at markets and parks and delivered directly to C/P of the private sector. Cost of such collection to be conducted by the municipalities with their own collection service or through a contractor will be absorbed by the municipalities.

### **b.4 Cleansing of Public Roads**

- Manual cleansing of public roads by direct municipal operation or by third parties (contractors and concessionaires).
- Mechanical cleansing of public roads by direct municipal operation or by private contractors.

### **b.5 Education and Community Promotion Programs**

With the metropolitan approach guidelines, educational material and the experience obtained from the pilot project of education and conducted during the study, the sanitary/environmental program for SWM will continue in every municipality. This program should have impact upon the elementary school level; separation of the recyclable material at the generation source and citizen awareness for an appropriate SWM.

### **b.6 Supervision and Control of SWM**

- For the municipality of San Salvador it is proposed that the existing Department of Environmental Sanitation stays in charge of this important function, transforming it into San Salvador Municipal Public Company of Urban Cleansing (EMAUSS).
- For the remaining 13 municipalities of AMSS, strengthening and organization of the SWM Unit at the OPAMSS is proposed, which would provide their support to each municipality, not only in the supervision and control of major contracts including the operation of the database, but also staff training and technical and legal consulting on SWM in each of the municipalities.

### **c. National Approach**

The management of hazardous medical SW generated in health establishments of MSPAS, ISSS and the private sector is regulated nationwide by MSPAS and MARN.

Therefore, control on handling of the hazardous medical wastes generated in AMSS correspond, institutionally speaking, to MSPAS and MARN, instead of the municipalities. Of course, coordination should exist between these institutions.

Such control and supervision encompasses the following stages in the management of such wastes:

- Separation at the source (health establishment).
- Separate collection and haulage.
- Special treatment.
- Final disposal.

Separation at the source will have to be made by qualified personnel and previously trained. Separate collection of these wastes is also special and regulated. This can be operated directly by their own staff, such as MSPAS is doing this currently or by contract with private sectors such as ISSS is also doing, as long as the contractors have authorized permission by MSPAS and MARN.

The treatment process for these hazardous wastes will also have to be authorized by MSPAS and MARN. However, the autoclave treatment currently conducted by CINTEC for these SW coming from health establishments of MSPAS and ISSS has no official authorization.

Regarding final disposal, it will also have to be regulated by MSPAS and MARN. Currently, SW treated in CINTEC autoclave are disposed of in the cells of MIDES S/L in Nejapa.

In terms of organization, supervision and control for the management of these hazardous medical SW should be in charge of a unit devoted exclusively to this function at a national level. This unit would be located within the Solid Waste Program of MSPAS' Environmental Health Department.

#### **L.3.2.2 Operation Methods Proposed for SWM in AMSS**

Table L-3 outlines the optimal operation methods suggested for SWM in AMSS, during the implementation process of the Master Plan.

The following comments and clarifications should be mentioned in this regard:

- Separation at the source would have to begin gradually in the municipalities with greater collection coverage, including high-income residential areas, as well as commercial and institutional establishments.
- Recyclable wastes currently separated in Mariona (Apopa) by scavengers come from SW generated and collected in high-income residential areas. Obviously, if such recyclable wastes are separated at the source and then collected separately, the amount of recyclable materials that actually reach Mariona or the future selection plant will be less every time.
- In SW collection, which is directly operated by the municipalities, workers are currently conducting separation during the time of collection. In order to revert this negative practice, which results in higher collection costs, the following measures are outlined:
  - Prevent this practice of the workers by efficiently controlling the time and motion of vehicles in the optimized collection routes, as well as during the transportation to a T/S or the S/L.
  - Inform those infringing workers to fulfill the aforementioned, otherwise the collection and haulage of SW in the areas compromised would be

granted to micro-enterprises or private sectors.

- The collection of separated recyclable wastes would rather be granted to micro-enterprises or cooperatives formed by Mariona scavengers or by those working in the future S/P, which would partially or totally absorb the collection costs if it is considered that they will benefit from the recyclable material collected. Some NGOs of AMSS with experience on this subject will have an important contribution upon the organization of these micro-enterprises and cooperatives of recyclable material separate collection.
- In those municipalities where collection is conducted directly by themselves with a frequency of 3 to 6 times a week, it is suggested that one of those days should be devoted for the collection of recyclable materials, leaving 2 to 5 times per week for the collection of mixed SW.
- The introduction of recyclable materials separated at the source should be gradual and it is possible that mistakes occur in the beginning, such as incorrect separation, taking the recyclable materials out in the wrong days and other failures, which will be corrected gradually with greater education and information to the community.
- Due to public health and pollution control purposes, total coverage of collection, the installation of transfer stations and sanitary landfills are priority elements of the Master Plan.
- Taking into account that the S/P will have quite a short and transitory life, its construction design should be simple and elemental and with a remarkably lower investment cost than that proposed in the MIDES project.
- Since it is proposed that operation and maintenance (O&M) of the S/P be in charge of scavengers, O&M issues and other issues require a previous arrangement with such scavengers, and the construction of the S/P would not begin until an agreement is reached.
- The construction of a C/P and compost processing correspond to the private sector. The role by COAMSS/OPAMSS and the municipalities is to promote the participation of such private sector, and proposing some incentives.

Table L-3: Optimal Operation Methods Proposed for SWM in AMSS

Elements	Operation Methods
<b>A.- Municipal Solid Waste</b>	
1. Separation at the source	<ul style="list-style-type: none"> <li>By the SW generators themselves in houses, commercial and institutional establishments, markets and others.</li> </ul>
2. Public road cleansing	<ul style="list-style-type: none"> <li>Direct operation by each of the 14 municipalities using their human and physical resources.</li> <li>Contracting out by the municipalities of micro-enterprises and individual enterprises for the cleansing of specific areas.</li> </ul>
3. Collection	<ul style="list-style-type: none"> <li>Direct operation by each of the 14 municipalities using their human and physical resources.</li> <li>Contracting out by the municipalities of micro-enterprises and individual enterprises for the cleansing of specific areas.</li> <li>Concession by the corresponding municipalities to micro-enterprises and/or cooperatives for the collection of specific areas</li> </ul>
4. Collection of separate recyclable materials	<ul style="list-style-type: none"> <li>Direct operation by each one of the municipalities.</li> <li>This collection should be preferably granted to recyclers, micro-enterprises or cooperatives integrated by scavengers.</li> </ul>
5. Transfer station(s) (T/S)	<ul style="list-style-type: none"> <li>Contract-out (previous public tender) by the municipalities to private sectors for the construction, operation, maintenance and financing of the transfer station(s). Payment could be set per ton transferred and the duration of the contract would depend on the amount invested.</li> </ul>
6. Transportation between T/S and sanitary landfill (S/L)	<ul style="list-style-type: none"> <li>Contract-out (previous public tender) by the municipalities for the transportation of SW from T/S to S/L. Payment could be set per ton carried.</li> </ul>
7. Selection plant (S/P)	<ul style="list-style-type: none"> <li>An exception only for social support to the scavengers displaced from the former Mariona dumping site; the municipalities will construct a SW selection plant with a maximum capacity of 200 Ton/day. Operation and maintenance of the S/P will be responsibility of the scavengers, who will be regulated and supervised by OPAMSS.</li> <li>Any new S/P will be constructed, operated, given maintenance and financed by those interested in this SW recovery process.</li> </ul>
8. Compost plant (C/P)	<ul style="list-style-type: none"> <li>Promote the construction, operation and maintenance of the C/P by the private sector, and commercialization of the compost produced, providing municipal incentives and/or insuring a partial purchase of the compost processed.</li> </ul>
9. Sanitary landfills (S/L)	<ul style="list-style-type: none"> <li>Contract-out (previous public tender) by the municipalities to private sectors for the construction, operation and maintenance of the S/L. Payment would be per ton disposed of.</li> </ul>
10. Sanitary-environmental education	<ul style="list-style-type: none"> <li>To be executed by each of the 14 municipalities within their own jurisdiction. However, the policies, programs, guides and activities will have a metropolitan approach supervised by COAMSS/OPAMSS.</li> </ul>
<b>B.- Hazardous Medical Solid Waste</b>	
1. Separation at the source	<ul style="list-style-type: none"> <li>By the Medical SW generators themselves in health establishments of MSPAS, ISSS and by the private sector of AMSS, with a previous training to the staff in charge of the separation.</li> </ul>
2. Separate collection	<ul style="list-style-type: none"> <li>Preferably by contract-out to private specialized and authorized enterprises to conduct this type of collection.</li> <li>Direct operation by MSPAS by using human resources (specially trained) and physical resources of their own.</li> </ul>
3. Treatment	<ul style="list-style-type: none"> <li>Contract-out and direct operation by the hospitals using authorized technology.</li> </ul>
4. Final disposal	<ul style="list-style-type: none"> <li>Contract-out to S/L for disposal in special cells.</li> </ul>

### L.3.2.3 Conditions for Contract-out and Concessions

It has already been explained in this study that the different elements of SWM can be directly operated by the municipalities or by third parties/contractors or concessionaires from the private sector.

The objectives of both sectors (municipal and private) regarding SWM are different: the municipal one is public health, protection against pollution and achieve citizen well-being; on the other hand, the private sector is looking forward to profits.

This contraposition between both objectives outlines advantages and disadvantages for each system, which are summarized in Table L-4. Both objectives should be compatible to allow both parties (municipalities and the private sector) reach their goals.

Table L-4: Advantages and disadvantages of direct and contracted operation of SWM

Method	Advantages	Disadvantages
Direct operation	<ul style="list-style-type: none"> <li>• Objectives:                             <ul style="list-style-type: none"> <li>◆ Public health.</li> <li>◆ Pollution-free environment.</li> <li>◆ Minimum cost of the service.</li> </ul> </li> <li>• Accepted by public.</li> <li>• Continuity of the service.</li> <li>• Easy response in emergencies.</li> </ul>	<ul style="list-style-type: none"> <li>• Low operative efficiency.</li> <li>• Administrative bureaucracy.</li> <li>• Permanent shortage of financial resources for investment and equipment replacement.</li> <li>• Administrative stiffness.</li> <li>• Difficult cost cuts due to absence of competition.</li> <li>• Political influence.</li> <li>• Doubtful sustainability.</li> <li>• Absence of management and cost indicators.</li> </ul>
Contractors and concessionaires	<ul style="list-style-type: none"> <li>• Financial availability for investments and equipment.</li> <li>• High operative efficiency.</li> <li>• Administrative and financial flexibility.</li> <li>• Absence of bureaucracy.</li> <li>• Less costs in order to be competitive.</li> <li>• No political influence.</li> </ul>	<ul style="list-style-type: none"> <li>• Main objective: profits.</li> <li>• No sanitary-environmental objectives.</li> <li>• The service rendered requires supervision and control.</li> <li>• Unfavorable opinion by public.</li> <li>• Social problems due to staff layoff.</li> <li>• Continuity of the service dependable to labor conflicts.</li> <li>• Possible deterioration of the workers' employment, salary, occupational health and safety conditions.</li> </ul>

The optimal operative system proposed is a mixed one: direct operation and contracted operation. This mixed system will allow competition, increase efficiency, reconcile objectives, insure the continuity of the services and will probably reduce costs regarding the collection and public road cleansing services.

For other elements of SWM (S/L, T/S, haulage from T/S to S/L), contract-out will undoubtedly be the most advantageous method as long as there is competition among contractors through public tenders, and the candidate enterprises have been qualified in advance. Bids are suggested to encompass the construction, operation, maintenance and financing of the component to be under bid, based on a project previously prepared by OPAMSS or the municipalities.

One problem pointed out by most of the Mayors is the deterioration of the collection equipment and the lack of resources to replace such equipment. This restriction

attached to the increase of coverage could be overcome with one of the following measures:

- In the short term: contract-out and concession of areas not covered by the service. The contractors must provide the collection vehicles.
- In the middle term: the municipalities must form a fund dedicated exclusively for equipment replacement and depreciation.

Prior to any public tender, the proponents will have to be qualified, so as to avoid the awarding to inefficient, inexperienced or insolvent companies.

The process recommended to be followed for contract-out and concessions is as follows:

**a. Contract-out**

- Technical study and analysis, even a draft project or project of the parts or elements to be contracted, prepared by OPAMSS or by the contracting municipalities. This includes the preparation of a base budget.
- Clear basis and terms of reference, prepared by OPAMSS or the municipalities, according to the complexity of the element to be contracted (metropolitan or municipal scope).
- Notice of public tender (depending on the magnitude of the contract).
- Qualification of the SW service-rendering enterprises (SW-SRE) that can participate in the bid.
- In minor contracts, small enterprises, micro-enterprises or cooperatives will have to be previously registered at OPAMSS.
- Designing of the elements or parts can be contracted by public tender among qualified professionals. The design contractors cannot participate in the execution of the project.
- The contract can include not only the construction, but the operation, maintenance and financing of the different elements or parts of the SWM system.
- Participation and competition among SW service-rendering enterprises (SW-SRE) should be fostered under criteria of: entrepreneurial and service rendering sustainability, efficiency, quality, continuity and service coverage, as well as under criteria of prevention of negative sanitary and environmental impacts.
- Economic proposals that are analyzed and broken down very in detail.
- Transparency of the contracts, with technical specifications, work timetable with defined time duration of work execution, duration of the contract, conditions for rendering the service in case of sanitary emergency or disasters, and the obligatory delivery of reports.

- Besides, the sanctions for breaches in the contract, guarantees and bonds offered by the parties to meet their obligations.

#### b. Concessions

Concessions are mostly awarded to the rendering of SW collection services, collection of recyclable wastes and public road and area cleansing.

The concession contracts include most of the requirements of the contract-out, and the following issues should be considered further:

- Study and analysis by OPAMSS or municipalities of the elements, zones or areas to be granted.
- In case of collection, the zones to be granted will have to adjust to the local jurisdictional, topographic features and accessibility conditions.
- For the concession contracts the following shall be clearly specified:
  - ◆ Nature of the concession or service.
  - ◆ The geographical boundary of the concession.
  - ◆ Duration of the concession.
  - ◆ In case of collection, structure of the fee according to the amount delivered by the users.
  - ◆ Define the maximum fee to be charged to low-income residents.
  - ◆ Intervention and abrogation of the concession.
  - ◆ Penalties and sanctions.
  - ◆ Insurance, guarantees and bonds.

#### L.3.2.4 Supervision and Control

Table L-5 shows the scheme proposed for supervision and control of SWM in AMSS.

Such supervision and control refer mainly to MIDES contract and other minor contracts and concessions.

Table L-5: Scheme of Supervision and Control for SWM in AMSS

Entity	Functions
OPAMSS SW Unit	<ul style="list-style-type: none"> <li>• Monitoring, supervision and control of MIDES contract for 9 municipalities, with the exception of San Salvador.</li> <li>• Monitoring, supervision and control of other metropolitan contracts and concessions for 13 municipalities, with the exception of San Salvador.</li> <li>• Public tender of metropolitan SWM elements.</li> </ul>
Municipality of San Salvador	<ul style="list-style-type: none"> <li>• Monitoring, supervision and control of MIDES contract with respect to the municipality of San Salvador.</li> <li>• Monitoring, supervision and control of other contracts and concessions for SWM within the municipality of San Salvador.</li> <li>• Public quotation and tender for SWM within the municipality of San Salvador.</li> </ul>
13 Municipalities of AMSS (excluding San Salvador municipality)	<ul style="list-style-type: none"> <li>• Coordinate and participate with OPAMSS in the monitoring of MIDES contract (in 9 municipalities: MJ, CD, AY, SM, ST, SY, IL, AP, NJ).</li> <li>• Monitoring, supervision and control of contracts and concessions for SWM within each of the 13 municipalities: MJ, CD, CT, AY, SM, ST, AC, SY, IL, SMT, AP, NJ, TN.</li> <li>• Bids and resources for SWMM within each of the 13 municipalities.</li> </ul>



### L.3.3 Social aspects

#### a. Social Restrictions

As stated in a previous chapter, the following social restrictions are identified, which should be considered for the implementation of the M/P.

- Marginal low-income areas without collection service. There is no information on the number of people, but it accounts for around 18% of the population in AMSS with no collection service, and distributed in almost all the municipalities of AMSS.
- Around 300 scavengers that are currently separating SW at Mariona in Apopa, in “La Espiga” dumping site at La Chuca, and the dumping sites of “San Martin No. 1” and “El Rosario” canton in Tonacatepeque.
- There are certain restrictions, although not critical, regarding the relationships with the municipal workers in the optimization of the collection services, street sweeping and equipment maintenance.

Table L-6 shows the proposals aimed at minimizing such restrictions.

Table L-6: Proposals to Minimize Social Restrictions

Social Restrictions	Objectives	Proposals, Strategies and Options
1. Low-income marginal areas with no collection service	<ul style="list-style-type: none"> <li>• 100% collection coverage in year 2010 in low-income marginal areas</li> </ul>	<ul style="list-style-type: none"> <li>• Promote and formalize small collection enterprises, micro-enterprises and cooperatives with the participation of NGOs</li> <li>• Grant these areas to micro-enterprises or cooperatives</li> <li>• Subsidized contracts with micro-enterprises in extreme poverty areas.</li> </ul>
	<ul style="list-style-type: none"> <li>• Promote the culture of payment in these marginal areas</li> </ul>	<ul style="list-style-type: none"> <li>• Structuring of the social fee</li> <li>• Commercialization by means of electricity bills</li> </ul>
2. Scavengers	<ul style="list-style-type: none"> <li>• Incorporation of scavengers to the formal system</li> </ul>	<ul style="list-style-type: none"> <li>• Create micro-enterprises and cooperatives for municipal SW collection, recyclable material collection, collection in marginal areas and street cleansing with former scavengers</li> </ul>
	<ul style="list-style-type: none"> <li>• Separate collection of recyclable materials</li> </ul>	<ul style="list-style-type: none"> <li>• Concession preferably to small former scavenger enterprises</li> </ul>
	<ul style="list-style-type: none"> <li>• Self sustainability of S/P</li> </ul>	<ul style="list-style-type: none"> <li>• Consensus with scavengers, prior to the construction and operation of the S/P</li> </ul>
3. Municipal workers of SWM	<ul style="list-style-type: none"> <li>• Optimize the collection, street cleansing and equipment maintenance services.</li> </ul>	<ul style="list-style-type: none"> <li>• Consensus</li> <li>• Training</li> <li>• Formation of collection micro-enterprises constituted by the municipal workers themselves</li> </ul>