

7.5 Evaluation of the Master Plan

7.5.1 Technical Evaluation

The M/P proposes the following as the regional system:

- Transfer stations and trailer transport;
- A selection plant;
- Tonacatepeque sanitary landfill; and
- Medical waste incineration plant.

Meanwhile, the following are proposed for the individual municipal SWM system:

- Stepwise introduction of separate collection;
- Collection service coverage expansion; and
- implementation of final disposal at sanitary landfills.

a. Regional System

a.1 Transfer Stations and Trailer Transport (T/S&T)

The T/S&T is the system that wastes collected by collection vehicles are transferred to large-size trailers and the trailers carry the waste to respective destination. It is judged that this T/S&T system is quite conventional technology and therefore is enforceable in AMSS based on the technologies currently available in the country and/or by procuring some technical inputs from foreign countries at competitive prices.

However, attentions should be paid that it is the first experience for El Salvador to implement said system for municipal SW transfer. Therefore, careful planning in this respect becomes necessary. The M/P proposes that the 350ton/day T/S with trailer transport should firstly be constructed and operated in year 2004 and its experiences should be utilized for the succeeding construction and operation of the larger T/S (900ton/day capacity) from the succeeding year 2005.

Meanwhile, it is also judged that El Salvador reserves sufficient technical background to implement reliable O&M activities based on their own efforts. Accordingly, it is judged that construction, operation and maintenance of the T/S&T system is feasible from technical viewpoints.

a.2 Selection plant (S/P)

The principal objective of selection plant (S/P) is to realize "resource conservation", which is one of the M/P goals, by achieving high efficiency in the material recovery activities. Therefore, the Study proposes the recycling system (system of S/P for separate collection) which aims a high ratio of resource recovery, whose technical system concept is different from that of the S/P proposed by MIDES.

The Study's proposal supported by international experiences and trends suggests that present recycling practices that collection workers and/or waste pickers recover recyclable from mixed wastes would gradually reduce and in return "resource

recovery from separate collection” would gradually increase, especially when economies are growing. Therefore, the M/P disagrees to the introduction of S/P in the near future fed with mixed waste that MIDES proposes. The M/P proposes the construction and operation of the S/P around year 2008 when all 14 municipalities introduce the separate collection activities.

The S/P that the M/P proposes consists of facilities such as feeding conveyor, magnetic separator, hand-sorting conveyor etc. that could be constructed operated and maintained based on the locally available technical supports and by some technical inputs procured internationally at competitive prices. The technologies required for this S/P are prevalent and conventional.

a.3 Tonacatepeque Final Disposal Site

As the “Special Regulation on Integral Solid Waste Management (Reglamento Especial sobre el Manejo Integral de los Desechos Sólidos)” was published on 1st June 2000, it becomes necessary to have final disposal sites that comply with this regulation. MIDES Nejapa final disposal site was constructed in 1999 and has already been operated in AMSS. Therefore, it is judged that technical requirements for the Tonacatepeque final disposal site can be fulfilled by the technologies experienced and reserved by the Salvadorans together with some technical inputs from foreign countries.

As for O&M aspects of the sanitary landfill, it is judged that the Salvadorans are capable of operating and maintaining S/L by themselves by referring current O&M of MIDES Nejapa S/L and/or foreign S/L cases.

a.4 Medical Waste Incinerator

Construction, operation and maintenance of medical waste incinerator requires considerably high technologies that are unfortunately absent in El Salvador. Therefore, it is necessary for its construction operation and maintenance to import international technologies.

Accordingly, the M/P proposes to have three years period of preparation: namely the period for the Salvadoran authority to examine and investigate how to procure said technologies at competitive prices and have those technologies take root in the country. The M/P consequently recommends start the medical waste incinerator operation from year 2004.

b. Individual System

b.1 Discharge and Storage System

As for the discharge and storage system, the M/P proposes stepwise improvement of:

- step 1 “improvement of hygienic condition of discharge areas”;
- step 2 “implementation of pilot projects for separate collection”; and
- step 3 “implementation of separate collection”.

In view of technical requirements, it is judged that the steps can be attained by the technical practices prevalent in AMSS. Plans to implement in a stepwise manner would be considered important.

b.2 Collection

The basic principle of the M/P for the collection component is: to improve the collection works efficiency based on the current technologies; and the surplus collection capacity gained from this improvement should be forwarded to expand the collection services.

This collection efficiency improvement is achievable by the Salvadoran efforts, if the "Manual for the Collection Route Optimization" produced by the Study is actually utilized in their route improvement practices.

b.3 Final Disposal

A final disposal site that already complies with the recent environmental regulation is the MIDES Nejapa S/L that 10 municipalities are its users. Meanwhile, it is known that the municipalities of Cuscatancingo and Antiguo Cuscatlan are going to use the New ESPIGA S/L that is supposed to be constructed in the near future. Hence, the Study carried out the conceptual design and cost estimate of the Tonacatepeque Sanitary Landfill, in responding such request made by OPAMSS/COAMSS, which is to be used by the municipalities of Tonacatepeque and San Martin.

When these new two S/Ls are constructed in the near future, AMSS will have 3 regional S/Ls in total that comply the environmental regulation. It consequently will contribute the environmental conservation in AMSS. Furthermore, it will raise the technical safety factor of final disposal management in AMSS than can be fully cope with the emergency and accident occasions.

7.5.2 Financial Evaluation

7.5.2.1 The Financial Evaluation Method

Financial alternatives are Case 1, 2 and 3 as mentioned before. Table 7-17 shows conditions of each cases. Table 7-18 shows costs required for each component of the regional system. Besides the regional system, there is the individual system. Therefore, financial evaluation should consider both systems. A method adapted for the financial evaluation was: first, financial internal rate of returns (FIRR) of the regional system with M/P and without M/P were calculated for evaluating its feasibility, then financial feasibility of the individual system was considered by adding costs for the regional system according to amount of waste transported and disposed on costs for the individual system of respective municipalities. Also, increase of fee collection rate, increase of revenue with population growth, introduction of fee system charged by waste quantity and increase of fee were taken into account. Table 7-19 shows evaluation indices

Table 7-17: Conditions of Respective Financing Alternatives

| | Case 1 | Case 2 | Case 3 |
|----------------------|----------------------|-------------------------------------------|-----------------------------|
| Execution body | OPAMSS/COAMSS direct | Public enterprise | Private enterprise |
| Debt security | 0 % | 15.5% | 15.5% |
| Interest rate | 8.1 % | 1.7 % | 10.75 % |
| Corporation tax | 0% | 25% | 25% |
| Capital | 0% | 20% of capital investment | |
| Required achievement | FIRR>8.1% | Profit rate (profit after tax/revenue)>5% | Return on own capital>13.5% |

Table 7-18: Unit Costs based on the Respective Financing Conditions

| | | Case 1 | Case 2 | Case 3 |
|------------------------------------------|----------------|--------|--------|--------|
| Transfer station and Transport | | | | |
| Transfer station #1 and Transport | | | | |
| Required unit cost (US\$/ton) | inc. VAT (13%) | - | 7.3 | 9.6 |
| | exc. VAT(13%) | 7.0 | 6.5 | 8.5 |
| Transfer station #2 and Transport | | | | |
| Required unit cost (US\$/ton) | inc. VAT (13%) | - | 6.2 | 7.8 |
| | exc. VAT(13%) | 5.8 | 5.5 | 6.9 |
| Landfill (Tonacatepeque landfill) | | | | |
| Required unit cost (US\$/ton) | inc. VAT (13%) | - | 18.8 | 31.0 |
| | exc. VAT(13%) | 20.2 | 16.6 | 27.4 |
| Selection Plant | | | | |
| Required unit cost (US\$/ton) | inc. VAT (13%) | - | 28.9 | 41.0 |
| | exc. VAT(13%) | 27.2 | 25.6 | 36.3 |
| Medical Waste Incineration | | | | |
| Required unit cost (US\$/ton) | inc. VAT (13%) | - | 371.0 | 530.0 |
| | exc. VAT(13%) | 390.0 | 328.3 | 469.0 |

Table 7-19: Financial Evaluation Method for MP

| | Regional System | Individual System |
|-------------------|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| Evaluation period | 2001 to 2010 | |
| Evaluation index | Total cost with MP < Total cost without MP (FIRR>8.1%*) | Total balance > 0 |
| Impact indicators | | <ul style="list-style-type: none"> • Share of SWM burden to Total Budget in 2010 • Burden on Citizen's income |

Note: * London Inter Bank Offered Rate (LIBOR)+1%; Prime rate of BiD for El Salvador

7.5.2.2 Financial Evaluation of Regional Management System

a. Conditions for Financial Evaluation

The regional system in the M/P proposes projects of transfer stations (T/S), Tonacatepeque S/L, selection plant (S/P) and medical waste incineration (MWI).

Meanwhile, the M/P also recommends institutional improvement that OPAMSS should create Execution Unit of SWM of OPAMSS (UE-OPAMSS) for supporting all 14 municipalities in database management of weighbridge/revenue/expenditure/users, etc.

In view of the above, revenue and expenditure of the regional projects are assumed as summarized in the table below for "with M/P" and "without M/P".

Table 7-20: Revenue and Expenditure for Financial Evaluation of Regional Management System

| | | With MP | Without MP |
|-------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Revenue | | SWM service fee remains the same. Fee collection efficiency remains the same. Revenue of domestic waste fee increases in proportion to the population increase. Revenue of non-domestic waste fee increases in proportion to the GRDP growth rate. | |
| Expenditure | Regional | Investment expenditures* <ul style="list-style-type: none"> • T/Ss • Tonacatepeque S/L • S/P • MWI O&M costs <ul style="list-style-type: none"> • T/Ss • Tonacatepeque S/L • S/P • MWI • UE-OPAMSS | — |
| | Individual | Investment expenditures* Total municipal investment costs for procurement of collection vehicles, containers etc. O&M Sum of O&M costs for other than the costs incurred for participating the regional projects | Investment expenditures* Total municipal investment costs for procurement of collection vehicles, containers etc. for the case of "without MP" O&M Sum of O&M costs for the case of "without MP" |

Note: * Investment costs is estimated to be necessary for purchasing vehicles and heavy equipment every 7 years as their service life is estimated as 7 years.
Projects periods are estimated that T/Ss be 20 years, S/L be 18 years, S/P be 15 years, and MWI be 15years. Residual book values of projects are appropriated for negative figures of costs in year 2011.

b. Revenue

Revenue till the year 2010 is calculated as shown below, based on the assumptions summarized in the table above.

Table 7-21: Revenue Plan for Financial Evaluation of Regional Management System

Unit : 1,000 colones

| | 1999 | 2003 | 2006 | 2010 |
|--------------------|---------|---------|---------|---------|
| San Salvador | 96,839 | 114,418 | 126,390 | 140,272 |
| Mejicanos | 7,152 | 10,071 | 10,732 | 11,455 |
| Delgado | 3,906 | 5,654 | 6,055 | 6,505 |
| Cuscatancingo | 2,100 | 2,462 | 2,718 | 3,043 |
| Ayutuxtepeque | 1,321 | 1,967 | 2,211 | 2,523 |
| San Marcos | 2,394 | 3,075 | 3,317 | 3,604 |
| Nueva San Salvador | 16,110 | 20,870 | 23,553 | 27,112 |
| Antiguo Cuscatlan | 3,191 | 3,930 | 4,552 | 5,435 |
| Soyapango | 13,194 | 17,673 | 18,781 | 20,446 |
| Ilopango | 5,357 | 7,994 | 8,685 | 9,529 |
| San Martin | 1,553 | 1,994 | 2,309 | 2,742 |
| Apopa | 3,981 | 6,097 | 6,775 | 7,650 |
| Nejapa | 250 | 286 | 309 | 332 |
| Tonacatepeque | 276 | 325 | 359 | 401 |
| Total | 157,624 | 196,816 | 216,746 | 241,049 |

c. Expenditure

In order to calculate expenditures of respective municipalities for the cases of "with M/P" and "without M/P", the table below shows user municipalities of respective "with M/P" projects, and relevant conditions assumed for the case of "without M/P".

Table 7-22: Estimate Condition

| | With Master Plan | | | | | | Without Master Plan | | | |
|--------------------|------------------|-------|--------|----------------|------------|---------------|---------------------|----------------|------------|-----|
| | Transport | | | Final Disposal | | | Transport | Final Disposal | | |
| | T/S 1 | T/S 2 | Direct | MIDES/Nejapa | New Espiga | Tonacatapeque | Direct | MIDES/Nejapa | New Espiga | S/L |
| San Salvador | X | X | | X | | | X | X | | |
| Mejicanos | | X | | X | | | X | X | | |
| Delgado | | | X | X | | | X | X | | |
| Cuscatancingo | | X | | | X | | X | | X | |
| Ayutuxtepeque | | | X | X | | | X | X | | |
| San Marcos | | X | | X | | | X | X | | |
| Nueva San Salvador | X | | | X | | | X | X | | |
| Antiguo Cuscatlan | X | | | | X | | X | | X | |
| Soyapango | | X | | X | | | X | X | | |
| Ilopango | | X | | X | | | X | X | | |
| San Martin | | | X | | | X | X | | | X |
| Apopa | | | X | X | | | X | X | | |
| Nejapa | | | X | X | | | X | X | | |
| Tonacatapeque | | | X | | | X | X | | | X |

Expenditures calculated for both cases of "with M/P" and "without M/P", based on the conditions given above, are summarized in the table below.

Table 7-23: Expenditure for Cases of "With M/P" and "Without M/P"

Unit : million colones

| | | Phase I | Phase II | Phase III | Salvaged value | Total | |
|------------|------------|------------|----------|-----------|----------------|--------|---------|
| With MP | Regional | Investment | 67.1 | 49.2 | 16.2 | -76.1 | 56.4 |
| | | O&M | 2.1 | 29.1 | 54.1 | 0 | 85.3 |
| | Individual | Investment | 104.9 | 10.5 | 116.2 | -92.8 | 138.8 |
| | | O&M | 508.9 | 525.8 | 742.0 | 0 | 1,776.7 |
| | Total | | 683.0 | 614.6 | 928.5 | -168.9 | 2,057.2 |
| Without MP | Investment | | 146.6 | 8.4 | 163.9 | -121.2 | 197.7 |
| | O&M | | 522.9 | 586.0 | 846.2 | 0 | 1,955.1 |
| | Total | | 669.5 | 594.2 | 1,010.1 | -121.2 | 2,152.8 |

It shows that the total expenditure of "with M/P" case becomes less than the expenditure of "without M/P".

d. Financial Analysis

Financial analysis is attempted for the revenues and expenditures in respective years till 2010 of "with M/P" case. It gives the financial internal rate of return about 7%.

The result of the financial analysis herewith suggests that concrete measures of expenditure reduction and/or revenue increase should be enforced in order to realize the sustainable municipal SWM with respect to financial viewpoint. The practical measures for financial improvement such as follows are required:

- **revenue increase:** such as fee collection efficiency improvement, application of specific duty system (fee rate proportional to waste amount) for the large commercial/institutions waste.
- **expenditure reduction:** such as lowering the prices of payment to MIDES; lowering the CAESS/DELSUR commission rate; and

7.5.2.3 Financial Evaluation of Individual Management System

a. Conditions for Financial Evaluation of Individual Management System

In order to carry out the individual municipalities' financial evaluation, costs for utilizing the regional projects should be internalized as individual municipal expenditure respectively. Accordingly, financial evaluation of individual municipalities is carried out with the conditions summarized below.

Table 7-24: Costs for Utilizing Regional Projects for Respective Municipalities

| | | Unit Costs | Remarks |
|-------------------------|----------------|---------------------------------------|----------------------------------------------------------------------------|
| Transfer Station | TS 1 (350 t/d) | US\$ 7.0/ton | In proportion to deposited amount (from year 2004) |
| | TS 2 (900 t/d) | US\$ 5.8/ton | Ditto above (from year 2005) |
| Intermediate treatment | S/P | USE 27.2/ton | In proportion to amount of recyclable materials deposited (from year 2008) |
| Landfill | MIDES Nejapa | US\$ 20.43/ton (US\$ 18/ton + VAT) | In proportion to amount deposited (from year 2001) |
| | Tonacatepeque | US\$ 20.2/ton | Ditto above (from year 2005) |
| | New Espiga | US\$ 20.2/ton | Ditto above (from year 2004) |
| Medical waste treatment | MIDES Nejapa | US\$ 200/ton+VAT | These costs are not reflected for municipal expenditures. |
| | Incinerator | US\$ 390/ton | |

In addition to the expenditures estimated based on the above unit rates, an indirect expenditure for operating the Execution Unit of OPAMSS is estimated to be about US\$ 80,000/year in total and is proportionally distributed for respective municipalities as their indirect costs.

b. Base Case for Financial Evaluation

With the same revenue assumptions employed for the financial evaluation of the regional management system as listed below, the total balance (revenue and expenditure) till year 2010 is calculated for respective municipalities and summarized in the table below for the cases of "without M/P" and "with M/P":

- SWM service fee remains the same.
- Fee collection efficiency remains the same.
- Revenue of domestic waste fee increases in proportion to the population increase.

- Revenue of non-domestic waste fee increases in proportion to the GRDP growth rate.

Table 7-25: Comparison of Total Balance until 2010

Unit: 1000 colon

| | Original balance without MP | Balance improvement with MP |
|--------------------|-----------------------------|-----------------------------|
| San Salvador | 68,047 | 121,217 |
| Mejicanos | -21,600 | -17,179 |
| Delgado | -1,293 | 355 |
| Cuscatancingo | -28,468 | -22,047 |
| Ayutuxtepeque | 3,454 | 3,713 |
| San Marcos | -29,162 | -21,931 |
| Nueva San Salvador | 42,550 | 73,368 |
| Antiguo Cuscatlan | -45,131 | -37,872 |
| Soyapango | -60,448 | -39,668 |
| Ilopango | 647 | 8,750 |
| San Martin | -4,879 | -5,962 |
| Apopa | -9,158 | -7,241 |
| Nejapa | -5,384 | -5,449 |
| Tonacatepeque | -19,823 | -19,607 |

The case of “with M/P” improves total balance till year 2010 of almost all municipalities in AMSS.

As for the San Martin municipality, its total balance turns out worse for the case of “with M/P”. This is mainly due to collection/transport costs increase in the “with M/P” case, since the final disposal site in the M/P is located more distant than the present open dumping site. However, if the scenario of participating the MIDES Nejapa S/L were adopted, as its transport distance to MIDES site becomes far more longer than that of the “with M/P” case, the cost increase for the San Martin becomes much more outstanding.

Therefore, “with M/P” is recommended for the San Martin municipality too.

Table 7-26: Comparison of Total Balance until 2010 in San Martin and Tonacatepeque for the Cases of “With M/P” and “To Participate MIDES S/L”

Unit: 1000 colones

| | With M/P | MIDES Nejapa |
|---------------|----------|--------------|
| San Martin | -5,962 | -11,147 |
| Tonacatepeque | -19,607 | -23,450 |

c. Revenue Improvement Measures

In assuming the stepwise revenue improvement by adopting the following measures, the total balance from 2001 to 2010 will be calculated below.

1. **Measure-1: Stepwise Fee Collection Efficiency Improvement:** Fee collection efficiency will be gradually raised up to 90% in year 2010 by adopting the joint billing with electricity charges both for cleansing fee and landfill fee (it assumes that joint billing starts at year 2003).

Table 7-27: Total Balance Improvement by Adopting Measures-1 (joint-billing with electricity and fee collection rate increase)

| | Total Balance | Burden to Municipal Budget | | Average SWM fees (cleansing fee + landfill fee) | Burden on Citizen's Income |
|--------------------|---------------|----------------------------|-------------|-------------------------------------------------|----------------------------|
| | Year | 2001 - 2010 | 2001 - 2010 | 2010 | 2010 |
| | Unit | 1,000 colones | % | % | Colon/month/ household |
| San Salvador | 180,526 | 0.0 | 0.0 | 45.8 | 0.47 |
| Mejicanos | 8,160 | 0.0 | 5.0 | 18.8 | 0.26 |
| Delgado | 9,441 | 0.0 | 2.4 | 11.9 | 0.22 |
| Cuscatancingo | -18,397 | 10.2 | 16.6 | 8.1 | 0.17 |
| Ayutuxtepeque | 7,392 | 0.0 | 0.0 | 21.5 | 0.41 |
| San Marcos | -13,400 | 9.0 | 14.3 | 13.4 | 0.21 |
| Nueva San Salvador | 93,594 | 0.0 | 0.0 | 28.5 | 0.35 |
| Antiguo Cuscatlan | -32,633 | 11.0 | 9.9 | 24.9 | 0.20 |
| Soyapango | -9,795 | 1.7 | 10.9 | 18.7 | 0.26 |
| Ilopango | 17,869 | 0.0 | 5.7 | 17.6 | 0.34 |
| San Martin | -2,320 | 2.5 | 19.7 | 9.7 | 0.33 |
| Apopa | 1,606 | 0.0 | 9.3 | 10.4 | 0.26 |
| Nejapa | -3,665 | 2.7 | 6.9 | 8.5 | 0.23 |
| Tonacatepeque | -18,076 | 21.7 | 37.0 | 4.1 | 0.13 |

Measure-2: Application of Specific Duty System: A specific duty system (fee rate proportion to waste amount) will be applied for commercial/institutions waste from year 2002. Assuming that 50% of such waste is from large dischargers, the fee rate for such dischargers is to cover the direct costs of collection/transport services and the landfill tipping fee.

Table 7-28: Total Balance Improvement by Adopting Measures-2 (specific duty on large dischargers)

| | Total Balance | Burden to Municipal Budget | | Average SWM fees (cleansing fee + landfill fee) | Burden on Citizen's Income |
|--------------------|---------------|----------------------------|-------------|-------------------------------------------------|----------------------------|
| | Year | 2001 – 2010 | 2001 – 2010 | 2010 | 2010 |
| Unit | 1000 colones | % | % | Colon/month/ household | % |
| Delgado | 14,375 | 0.0 | 0.4 | 11.9 | 0.22 |
| Cuscatancingo | -15,195 | 8.4 | 15.1 | 8.1 | 0.17 |
| Ayutuxtepeque | 8,732 | 0.0 | 0.0 | 21.5 | 0.41 |
| San Marcos | -10,192 | 6.9 | 12.2 | 13.4 | 0.21 |
| Nueva San Salvador | 100,813 | 0.0 | 0.0 | 28.5 | 0.35 |
| Antiguo Cuscatlan | -24,457 | 9.3 | 8.1 | 24.9 | 0.20 |
| Soyapango | 8,886 | 0.0 | 7.5 | 18.7 | 0.26 |
| San Martin | 503 | 0.0 | 11.1 | 9.7 | 0.33 |
| Apopa | 6,347 | 0.0 | 6.6 | 10.4 | 0.26 |
| Nejapa | -3,416 | 2.5 | 6.8 | 8.5 | 0.23 |
| Tonacatepeque | -16,474 | 19.8 | 34.6 | 4.1 | 0.13 |

Note: The tariff of non-domestic waste has already changed to reflect the waste weight in San Salvador, Nueva San Salvador, and Soyapango.

d. Additional Measure of Raising SWM Fees

Even after adopting both **Measure-1** and **Measure-2**, 5 municipalities of Cuscatancingo, San Marcos, Antiguo Cuscatlan, Nejapa and Tonacatepeque cannot have the total balance (2001 to 2010) positive.

Therefore, revenue improvement by raising the SWM fee is examined herewith for those 5 municipalities.

d.1 Minimum Increase of Fees

The minimum fee increase necessary to make the total balance just a little positive is calculated herewith, assuming that the fee increase will be made in year 2006.

It turns out: 88% increase (or make fee about 1.9 times of the present rate) for Cuscatancingo; 82% increase (or 1.8 times) for San Marcos; 90% increase (or 1.9 times) for Antiguo Cuscatlan; 127% increase (or 2.3 times) for Nejapa; and 552% increase (or 6.5 times) for Tonacatepeque.

The table below shows the calculation summary with impact indicators.

Table 7-29: Price Increase Rate and Total Balance until Year 2010

| Year | Increase rate of Cleansing tax | Total Balance (a little positive) | | Burden to Municipal Budget | Average SWM fees (cleansing fee + landfill fee) | Burden on Citizen's Income |
|-------------------|--------------------------------------|--------------------------------------|-------------|----------------------------------|----------------------------------------------------------|----------------------------------|
| | | 2006 | 2001 - 2010 | | | |
| Unit | % | 1,000 colones | % | % | Colon/month/ household | % |
| Cuscatancingo | 88 % | 101 | 0.0 | 0.0 | 15.3 | 0.33 |
| San Marcos | 82 % | 38 | 0.0 | 0.0 | 18.9 | 0.29 |
| Antiguo Cuscatlan | 90 % | 289 | 0.0 | 0.0 | 47.2 | 0.38 |
| Nejapa | 127 % | 7 | 0.0 | 3.2 | 19.4 | 0.52 |
| Tonacatepeque | 552 % | 20 | 0.0 | 0.0 | 26.9 | 0.82 |

d.2 Burden on Citizen's Income

As the consequence of the above examination, increased fees will account for **0.29% to 0.82%** burden on income for respective 5 municipalities' citizen.

The proportion of citizen's burden for SWM fees varies depending on the economic situation of respective countries or cities. As a general reference, an example¹³ of middle income countries with GDP per capita of about US\$1,950 is given in the table below.

Table 7-30: Representative Costs of Municipal SWM in Middle Income Countries and Percentage on Citizen's Income

| SWM cost components | Percentage on Citizen's Income (%) |
|---------------------|------------------------------------|
| Collection | 0.5 to 1.1 |
| Public cleansing | 0.1 to 0.2 |
| Disposal | 0.05 to 0.2 |
| Transfer | 0.1 to 0.2 |
| Total | 0.75 to 1.7 |

The above table shows a range of **0.75% to 1.7%** as the burden on citizen's income.

Comparing the two tables above, the heaviest citizen's burden among the 5 municipalities that is the one of Tonacatepeque municipality being about **0.82%** is in this range. Accordingly, it will be judged that the fee increase rate examined above will be affordable for the citizens of the 5 municipalities.

Meanwhile, it is strongly anticipated that, if the fee is suddenly raised to 6.5 times of present one, citizen's rejection will be obviously extreme. Therefore, it is necessary to adopt stepwise fee increase.

e. In Cases of Other Financing Conditions

The sections above have attempted financial analysis based on the financing condition of Case-1. If the actual financing condition changes, the total balance and

¹³ Conceptual Issues and Experiences in Developing Countries, December 1991, Sandora Cointreau-Levine.

share of SWM burden to municipal budget for respective municipalities also changes. Hence just as a reference, the tables below show total balance and share of SWM burden to municipal budget for respective cases of financing conditions.

Table 7-31: Total Balance in Cases of Other Financing Conditions

Unit : 1,000 colones

| Year | Case 1 | Case 2 (inc. VAT) | Case 3 (inc. VAT) |
|--------------------|-------------|-------------------|-------------------|
| | 2001 – 2010 | 2001 – 2010 | 2001 – 2010 |
| San Salvador | 180,526 | 177,016 | 159,783 |
| Mejicanos | 8,160 | 7,507 | 4,878 |
| Delgado | 14,375 | 14,374 | 14,366 |
| Cuscatancingo | -15,195 | -14,269 | -23,899 |
| Ayutuxtepeque | 8,732 | 8,732 | 8,729 |
| San Marcos | -10,192 | -10,466 | -11,556 |
| Nueva San Salvador | 100,813 | 100,179 | 95,323 |
| Antiguo Cuscatlan | -27,457 | -24,817 | -41,931 |
| Soyapango | 8,886 | 7,703 | 2,939 |
| Ilopango | 17,869 | 17,491 | 15,979 |
| San Martin | 503 | 1,321 | -4,924 |
| Apopa | 6,347 | 6,345 | 6,332 |
| Nejapa | -3,416 | -3,416 | -3,417 |
| Tonacatepeque | -16,474 | -15,688 | -26,406 |

Note: Total balance improved after adopting Measure-1 and Measure-2 is compared for respective 3 cases of financing conditions.

Table 7-32: Share of SWM Burden to Municipal Budget in Cases of Other Financing Conditions

Unit : (%)

| Year | Case 1 | | Case 2 (inc. VAT) | | Case 3 (inc. VAT) | |
|--------------------|-----------------------------------------|------|-----------------------------------------|------|-----------------------------------------|------|
| | Share of SWM burden to Municipal Budget | | Share of SWM burden to Municipal Budget | | Share of SWM burden to Municipal Budget | |
| | 2001 – 2010 | 2010 | 2001 – 2010 | 2010 | 2001 – 2010 | 2010 |
| San Salvador | 0 | 0 | 0 | 0 | 0 | 0.3 |
| Mejicanos | 0 | 5 | 0 | 5.4 | 0 | 7.2 |
| Delgado | 0 | 0.4 | 0 | 0.4 | 0 | 0.5 |
| Cuscatancingo | 8.4 | 15.1 | 7.9 | 14.5 | 13.2 | 20.6 |
| Ayutuxtepeque | 0 | 0 | 0 | 0 | 0 | 0 |
| San Marcos | 6.9 | 12.2 | 7.1 | 12.5 | 7.8 | 13.6 |
| Nueva San Salvador | 0 | 0 | 0 | 0 | 0 | 0 |
| Antiguo Cuscatlan | 9.3 | 8.1 | 8.4 | 7.1 | 14.2 | 13.6 |
| Soyapango | 0 | 7.5 | 0 | 7.8 | 0 | 9.1 |
| Ilopango | 0 | 5.7 | 0 | 6 | 0 | 7.2 |
| San Martin | 0 | 11.1 | 0 | 14.7 | 5.3 | 24.2 |
| Apopa | 0 | 6.6 | 0 | 6.8 | 0 | 6.8 |
| Nejapa | 2.5 | 6.8 | 2.5 | 6.8 | 2.5 | 6.8 |
| Tonacatepeque | 19.8 | 34.6 | 18.9 | 33.4 | 31.7 | 36.5 |

Note: Share of SWM burden to municipal budget after adopting Measure-1 and Measure-2 is compared for respective 3 cases of financing conditions.

7.5.3 Economic Evaluation

Generally, urban environment improvement projects are likely to improve only a part of urban environment components, such as urban structure, solid waste management, water supply and sewerage that are complicatedly related each other. This Study deals with a part of the urban environment, i.e., solid waste management. It is difficult to quantify benefits caused by implementation of M/P in view of characteristic of the urban environment. In case of conducting quantitative analysis of the benefits by force, results would be arbitrarily, in other words, the results would largely be different depending on persons who conduct the analysis. However, from qualitative viewpoint of "Environment Improvement," everybody can consent to the direction toward improvement, even though individual views are different. Therefore, the Study avoided the quantitative analysis that has above mentioned difficulties, then, only applied the qualitative analysis. The results of the qualitative analysis are shown below.

7.5.3.1 Improvement of Collection/Transport Efficiency

By implementing the project of transfer stations and trailer transport (T/S&T), efficiency of collection and transport activities will be improved. It will reduce the total number of waste collection vehicles, and total fuel consumption in the collection/transport system in AMSS. Hence its economic benefit is evident, and will also contribute for an environmental benefit of lessening global warming.

7.5.3.2 Expansion of Service Coverage

Cleansing service coverage will be expanded by realizing measures recommended in the M/P (e.g., container collection, micro-enterprises, etc.). Consequently, sanitary urban or semi-urban conditions in AMSS will be extended and it will offer health benefits for citizens.

7.5.3.3 Improvement of Local and Regional Environment

In executing appropriate final disposal at such as the New ESPIGA S/L and the Tonacatepeque S/L, local environment near these S/Ls and the total regional environment of AMSS will be improved. It turns out benefits of the national economy.

7.5.3.4 Promotion of Recycling

Recycling activities will be promoted and activated by introducing: separate collection system; environmental campaign and programs; selection plant etc. This consequently will enable the resource conservation, its rational use, and protection of natural environment.

7.5.3.5 Plans for Competitive Services

This M/P emphasizes institutional measures to consolidate competitive services in SWM by facilitating private sector participation, appropriate contract administration etc. under competition principles. As its results, SWM services will have to become efficient, dynamic and cost-effective. It will in due course turn out benefits of the national economy.

7.5.4 Institutional Evaluation

a. Institutional Evaluation of the M/P in Line with Objectives

Institutionalization of the different components of the M/P must be analyzed and assessed according to the seeking of objectives and goals by the M/P:

- **Promote the citizens' well-being and public health**, including the welfare of the workers related with SWM activities.
- **Implement sustainable and thus cost-effective SWM** from the technological, institutional, administrative and financial optimization and improvements.
- **Contribute to environmental conservation**, through proposals aimed at reducing the generation of SW; reuse and recycling of SW recovered, and operation of the diverse SWM components (collection, transfer, haulage, treatment, final disposal) without polluting the environment.

Table 7-33 summarizes this institutional evaluation in accordance with objectives and components. It is confirmed that the institutional proposals by the M/P are aimed at complying with the objectives and goals of such M/P.

Table 7-33: Institutional Evaluation of M/P in line with Objectives and Components

| Component | Population well-being | SWM sustainability | Environmental conservation |
|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Separation at the source | <ul style="list-style-type: none"> Allows the reduction of SW with community participation Sanitary in-house management | <ul style="list-style-type: none"> Costs are neither borne by municipalities nor users Community participation ensures sustainability | <ul style="list-style-type: none"> Material recovery Reduction of the amount of SW that reach S/L |
| Collection service | <ul style="list-style-type: none"> Increase service coverage to 100% Prevents proliferation of vectors Education program for sanitary management of SW | <ul style="list-style-type: none"> With the inclusion of EMAUSS the collection service in San Salvador becomes optimized and sustainable Likewise, with the institutional strengthening of the collection service of the remaining 13 municipalities | <ul style="list-style-type: none"> Effective supervision by EMAUSS and cleansing service of the 13 municipalities Degradation of the environment and public roads is prevented |
| Separate collection | <ul style="list-style-type: none"> Citizen participation for the recovery of SW is institutionalized In-house sanitary management of SW Raising of sanitary/environmental culture | <ul style="list-style-type: none"> Possibility to cut costs and ease sustainability with formal participation by former scavengers Reduction of SW to be deposited at S/L(s) | <ul style="list-style-type: none"> Recovery of recyclable material Reduce generation of SW Foster the recycling industry |
| Cleansing of public roads | <ul style="list-style-type: none"> Prevent proliferation of noxious fauna Cleaner public roads through supervision and control | <ul style="list-style-type: none"> Institutionalization and greater formal participation by SW-SRC and micro-enterprises Increase of employment | <ul style="list-style-type: none"> Effective supervision of cleansing that protects the environment |
| T/S and haulage | <ul style="list-style-type: none"> Sanitary SWM Prevent proliferation of vectors | <ul style="list-style-type: none"> Cost reduction Greater private participation Increase of employment | <ul style="list-style-type: none"> Prevent separation of SW during haulage Effective institutionalization of supervision and control |
| S/L(s) | <ul style="list-style-type: none"> Prevent proliferation of vectors Supervision for the operation of S/L(s) becomes institutionalized | <ul style="list-style-type: none"> Formal supervision and control of S/L(s) by OPAMSS and EMAUSS becomes institutionalized By reviewing costs it is confirmed that the S/L is the least expensive final disposal method of SW | <ul style="list-style-type: none"> Effective supervision that prevents the pollution of aquifers, burning of SW, furious odors, and at the same time protects landscape |
| Management of hazardous medical SW | <ul style="list-style-type: none"> The staff's health who handle these SW is protected, as well as the population's | <ul style="list-style-type: none"> Responsibility by MSPAS for the supervision and control of these SW is outlined Responsibility of managing these wastes is by the generators is defined (MSPAS, ISSS and private health establishments) Greater participation by private sector | <ul style="list-style-type: none"> Transport that does not affect the environment Treatment and final disposal authorized and controlled by MSPAS and MARN |

7.5.5 Social Evaluation

Social evaluation of the M/P is based on the criteria that follows, and summarized in Table 7-34.

Table 7-34: Summary of Social Evaluation of the M/P

| Components | Public health | Environmental well-being | Employment | Sustainability |
|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Separation at the source | <ul style="list-style-type: none"> In-house sanitary management | <ul style="list-style-type: none"> Reduction, reuse and recycling of SW Raise environmental education | <ul style="list-style-type: none"> Employment is not affected | <ul style="list-style-type: none"> Permanent participation by community |
| Separate collection | <ul style="list-style-type: none"> Sanitary management improves Delivery is arranged | <ul style="list-style-type: none"> Prevents "scavenging" during collection | <ul style="list-style-type: none"> Employment increases Former scavengers are formalized | <ul style="list-style-type: none"> Trading of recyclable items is eased |
| Collection in low-income marginal areas | <ul style="list-style-type: none"> Sanitary improvement in low-income marginal areas Prevents proliferation of vectors | <ul style="list-style-type: none"> Environmental conditions improved 100% collection coverage is achieved | <ul style="list-style-type: none"> Employment increases Former scavengers are formalized | <ul style="list-style-type: none"> Participation by community itself Culture of payment is promoted |
| Separation and processing of recyclable SW | <ul style="list-style-type: none"> Sanitary management of SW Prevents proliferation of noxious fauna | <ul style="list-style-type: none"> Environmental education is raised Reduction of SW reaching S/L | <ul style="list-style-type: none"> Employment increases Former scavengers are formalized | <ul style="list-style-type: none"> Recycling increases Greater participation by private sector |
| Optimization of SWM within municipalities | <ul style="list-style-type: none"> Sanitary management benefits population and workers Risk of accidents decrease | <ul style="list-style-type: none"> More orderly and safer process Optimized collection Environmental education is raised | <ul style="list-style-type: none"> Employment in private sector increases Training of workers | <ul style="list-style-type: none"> Greater citizen participation ensures sustainability Fluent correlation between municipality/community |
| T/S(s) & haulage | <ul style="list-style-type: none"> Occupational health improves Sanitary management of the process | <ul style="list-style-type: none"> Reduce traffic jams Orderly, clean and efficient process | <ul style="list-style-type: none"> Possible increase of employment Labor conditions improve | <ul style="list-style-type: none"> Greater participation by private sector Image of collection service improves |
| Final disposal | <ul style="list-style-type: none"> Sanitary management of SW in Nejapa S/L and new S/L proposed | <ul style="list-style-type: none"> Prevent aquifer pollution due to leachate Burning of wastes is prevented Landscape is protected | <ul style="list-style-type: none"> Employment increases Former scavengers are formalized | <ul style="list-style-type: none"> Greater participation by private sector Image of collection service increases |
| Management of hazardous medical SW | <ul style="list-style-type: none"> Public health improves Workers' health is protected | <ul style="list-style-type: none"> Risks due to contamination by hazardous SW is avoided | <ul style="list-style-type: none"> Possible increase of employment Staff is trained and occupational health is protected | <ul style="list-style-type: none"> Greater participation by private sector MSPAS responsibility upon hazardous medical SW is confirmed |

7.5.6 Environmental Evaluation

Environmental benefits of the M/P comprise such as:

- Sanitary conditions of waste discharge areas through the improved discharge and storage manners (container use, citizen participation, etc.);
- Separate discharge and collection of recyclable materials for resources conservation;
- Improvement of urban environment by SWM services expansion; and
- Groundwater and soil pollution prevention by facilitating sanitary landfills.

7.5.6.1 Discharge and Storage

Currently, a number of discharge areas have unhygienic conditions such that wastes are scattered. The M/P proposed plans to improve those conditions by such as appropriate assignment of containers, examination of corresponding collection frequencies, public participation etc.

On the other hand, gradual introduction of separate discharge and collection is also proposed for recovering recyclable materials.

In so doing, it is deemed that M/P contributes environmental improvement in the contexts of enlarging hygienic conditions and resource conservation in AMSS.

7.5.6.2 Collection

Most collection routes in AMSS other than those in San Salvador municipality have usually been decided based on the empirical judgement of collection vehicle drivers. Those practices may sometimes solve local intricacies, however, they generally result in the lesser productivity in total than what could normally be achievable by technical objective assessment measures of route planning.

In order to resolve this issue, the Study conducted pilot projects of route improvement and produced the Manual for Collection Route Improvement (see Annex R). Collection works efficiency will be surely improved, if this manual is actually utilized in the route improvement practices by respective municipal officers patiently.

This collection efficiency improvement will contribute reduction of no-service areas in AMSS, accordingly deterioration of the urban environment related with municipal SWM will be lessened.

7.5.6.3 Final Disposal

The environmental legislation published June 2000 requires that the final disposal site for municipal wastes should be sanitary landfills.

Immediate compliance with this regulation will impose considerable financial burdens on municipalities. However, the M/P proposed solutions to meet the regulation's requirement and to implement sustainable SWM for 14 municipalities. Solutions are such as: fee collection efficiency improvement, administrative improvements, etc.

As a consequence, in maintaining the sustainable municipal SWM, environmental deterioration of soil/groundwater contamination by municipal waste disposal will be mitigated.

7.5.7 Overall Evaluation

In this section, the viability of the M/P for the SWM in the AMSS has been assessed from the point of technical, financial, economical, institutional, social and environmental views.

Technically, it was judged that the M/P be appropriate and its goals be attainable, taking into account of the current technical level of SWM in AMSS and availability of foreign technological inputs.

Financially, it was verified that the total expenditure (2001 to 2010) of “with M/P” is lesser than that of “without M/P”, namely M/P will reduce about 96million colones financial burden of 14 municipalities. However, in order to attain the sustainable SWM that the M/P aims, it is necessary for all 14 municipalities to improve SWM fee collection efficiency and to apply specific duty system for large waste dischargers. And in addition several municipalities are required to raise the SWM fee rates, which are considered to be affordable for respective municipal citizens.

Economically, the M/P is evaluated from the viewpoint of national economy benefits, which confirmed the necessity of implementing the M/P and its benefits.

The M/P proposed institutional building that improves the functioning of present institutions and it is judged to be enforceable and beneficial to a great length.

In view of social aspects, the M/P is deemed to be socially acceptable and enforceable.

Environmentally, it is appreciated that the implementation of M/P projects mitigates the environmental contamination and deterioration. At the same time it promotes resources conservation.

Accordingly it is concluded that the execution of the M/P is judged to be viable and appropriate for SWM in the AMSS.

8 Conclusions and Recommendations

8.1 Conclusions

This Study covers 14 municipalities in the San Salvador Metropolitan Area (AMSS) that constitute the COAMSS/OPAMSS. Whereas dimensions of respective municipalities such as population, municipal budget are diverse, for example the average household income ranges from Tonacatepeque’s 32,000 colones/household/year to San Salvador’s 150,000 colones/household/year. Municipal financial capability for SWM services also widely different among 14 municipalities, accordingly SWM service coverage also differs among them from only about 52% coverage to 95% coverage.

In face of diversely different status quo of respective municipalities, the M/P attempted to sort out outstanding problems into “metropolitan focus” issues and “individual municipal focus” issues, and accordingly formulated workable plans and projects in order to solve respective issues.

With respect to environmental requirements, since the Special Regulation on Integral Solid Waste Management (Reglamento Especial sobre el Manejo Integral de los Desechos Sólidos) was published on 1st June 2000, its compliance becomes necessary in formulating the M/P. Namely, it is required for final disposal sites to equip impermeable liner, to drain and treat leachate and to implement sanitary landfill.

As for the status quo of the collection and transport, municipalities whose final disposal site is at distant place carry out direct transport by collection vehicles. Which consequently lowers efficiency of collection/transport activities and shortens the service life of the vehicles. Furthermore, collection routes are mostly decided by

drivers' experience. Namely they are not technically assessed. Hence, generally speaking, it resulted in low efficiency of cleansing activities in AMSS.

Great majority of collection vehicles working in AMSS is what donated by Japanese government in 1989 and 1996 whose service lives are ending in a near future. As the El Salvador makes stable economic growth recently, it will not be expected that another Japanese donation of vehicles take place. Therefore, it is required that the Salvadoran side by themselves should procure collection vehicles to replace old ones by their own efforts.

Hurdles necessary to get over such as compliance with the newly published environmental legislation and self-procurement of collection vehicles would have to be considered as a proof that El Salvador is growing to a middle income country. Therefore, it still more requires self-help efforts by the Salvadoran authorities and officials concerned with SWM services and citizens, in order to continue advancing and solve these problems.

Under such circumstances, the Study analyzes the current situation of SWM in 14 municipalities in AMSS and formulated the M/P that aims to:

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

Now, it is awaited to solve a set of problems by executing the SWM services in line with the M/P (namely to execute plans and implement projects proposed in the M/P).

In view of the financial aspects, to expand service coverage and to implement sanitary landfill will inevitably increase the cost burden of municipalities even though series of improvement in cleansing works efficiency takes place. However, if fee collection efficiency is raised and the specific duty system is applied for large dischargers, several municipalities can make the total balance (2001-2010) of SWM revenue/expenditure positive. On the other hand some municipalities are required to raise the fees to be paid by dischargers in addition to the above measures in order to make the total balance (2001-2010) of SWM revenue/expenditure not negative.

As a consequence, if the M/P is implemented, in realizing efficient collection and transport by operating T/S&T, in solving the problems of vehicle replacement and sanitary landfills, total saving of 96million colones expenditure can be made during 2001 to 2010 as a whole (i.e. 14 municipalities).

Apart from financial aspects, Salvadoran side should accomplish important missions such as technical institutional and administrative strengthening. In practice, human resource development and administrative consolidation for SWM (not only individual municipal consolidation but also collective improvement through UE-COAMSS) now become indispensable.

El Salvador, having steady growth of its economy, now can not expect the grant-aid scheme of Japanese government. However, technical cooperation scheme of Japanese government (e.g., dispatch of JICA expert) or of other international agencies are available to support the above mentioned missions such as human resource development.

8.2 Recommendations

8.2.1 Compilation and Utilization of Data

It is recommended that data and information regarding such as “waste stream” should be systematically be measured, compiled and utilized every year in order to follow and verify what are assumed and planned in the M/P. Such compiled data and information will be extremely important to review and modify the M/P when in future it becomes necessary. At the same time, annual trends in respective SWM particulars can then be actually understood. Such data will possibly suggest a key for upgrading the SWM system of the AMSS.

8.2.2 Collection Route Improvement

Collection routes in most municipalities are decided based on the empirical judgement of collection vehicle drivers or they are not reviewed carefully. Therefore, under-capacity or over-capacity waste loading is usual and chronic in AMSS. It consequently introduces lowered collection efficiency and service life shortened by unnecessary breakdowns of collection vehicles (mainly by overload).

The Study’s pilot project of collection route improvement verified that the efficiency of collection works can be improved by appropriate vehicle allocation that should be brought out by collection route improvement practices. Since the Study produced the Manual for Collection Route Improvement, this should like to be utilized fully for such improvement practices by respective municipal officers by themselves.

8.2.3 Transfer Stations and Trailer Transport

All 14 municipalities currently carry out the direct transport by collection vehicle that is for a fairly long distance for many municipalities. It is recommended to have T/S and trailer transport system in order to realize efficient collection and transport activities and to prolong the service life of collection vehicles. Transfer stations should be localized at optimum locations to attain the cost-effective SWM activities and environmental benefits.

8.2.4 Administration of SWM Services

The Study recommends institutional improvement measures for the administration of SWM service. It recommends for the San Salvador municipality to create the San Salvador Municipal Public Company of Urban Cleansing (EMAUSS), in order to provide SWM services that are more competitive and efficient.

The Study also proposes that Execution Unit of SWM of OPAMSS (UE-OPAMMS) in order to support other 13 municipalities in technical and administrative improvement of respective SWM services.

8.2.5 Independent Accounting

All municipalities other than San Salvador municipality do not make clear distinction between SWM accounting and other accountings of municipality. Therefore, the revenue/expenditure balance of SWM services remains unclear and its feedback to operational activity improvement does not take place. In order to execute

sustainable and competitive SWM services, it is recommended that accounting of SWM services should make independent of the municipal general accounting.

8.2.6 SWM Fees Collection

It is appreciable that the current joint billing of SWM fees with electricity charge for households is an effective collection system, however, it is anticipated that reasonable fee rates are not charged for large commercial/institutions dischargers.

In order to realize the sustainable SWM services, it is necessary to establish and facilitate such a fee structure and collection system that fee fairly corresponding as a consideration of the service provided is to be charged and collected.

Therefore, it is recommended to improve the fee collection efficiency for household users and to apply the specific duty system (fee in proportion to waste quantity) for large-scale dischargers.

8.2.7 Implementation of the Master Plan

This development study (The Study on Regional Solid Waste Management for San Salvador Metropolitan Area in the Republic of El Salvador), under the JICA's technical cooperation program, will be finalized and ended when the Final Report of the Study is submitted to the Salvadoran side around November 2000. The solid waste management M/P is to be implemented by the Salvadoran side. If the M/P is not implemented, it means that all time and resources devoted to the study result in vain. Furthermore, benefits such as "promotions of citizens' well-being and public health", "implementation of sustainable SWM" and "contribution to environmental conservation" expected in the M/P will not be attained. Therefore, the study team strongly recommends that the M/P and its plans and projects should be implemented.

From now, it is necessary for the Salvadoran side to procure technical and financial resources etc. in order to implement the M/P. The M/P is formulated in due consideration of the Salvadoran's technical capability and financial affordability for the SWM, therefore, they can be considered to be ready for implementation.

In order to avoid this study suffering from an unproductive ending of non-implementation of the M/P, efforts should be made by the Salvadoran side to create such circumstances that the plans and projects recommended in the M/P can be continuously followed and promoted. In practice, it is recommended that the Salvadoran side should make a request of technical cooperation to JICA and/or other international cooperation agency for the follow-up and implementation of M/P projects.