

M.4.3 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.

M.4.3.1 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.

M.4.3.2 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.

M.4.3.3 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.

M.4.3.4 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.

M.4.3.5 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.

M.4.4 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 M-80 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 M-80: 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

b. Evaluation of Institutional Proposals of the M/P

The adoption and implementation of institutional proposals of the M/P is also recommendable and appropriate when assessed under the following strategic methods:

1) Regional SWM System for AMSS

Recommendation by the M/P to establish a regional SWM system for AMSS and with the active participation by the existing institutions with some organizational modifications is a viable and realistic proposal, which can be implemented without major resistance or restrictions.

2) Institutionalization Timing

The timing proposed in the M/P for the institutionalization of the components follows the downstream of SWM, but respecting such components as Nejapa S/L that is already institutionalized.

3) Organizational Changes

To ensure sustainability, optimization and supervision of cleansing in AMSS the M/P proposes the following organizational changes that are deemed as appropriate and necessary:

- Establish the SWM Execution Unit of OPAMSS.
- Set up and create the San Salvador Municipal Public Company of Urban Cleansing (EMAUSS).
- Strengthen and modernize the offices of public cleansing of the remaining 13 municipalities in AMSS, without including San Salvador municipality.
- Strengthen the Solid Waste Unit of the Department of Environmental Health of MSPAS for the supervision and control of hazardous medical SW generated at health establishments in AMSS.

4) Metropolitan Planning

The M/P recommends that T/S, S/L, haulage from T/S to S/L, the recovery of recyclable items and intermediate treatment have a metropolitan approach due to technical, operative, institutional, environmental, financial and cost-related reasons. Likewise, regarding the national policies for the management of hazardous medical SW, it is pertinent that MSPAS plans, sets up, supervises and controls such management in AMSS with a regional criterion along with all health establishments of MSPAS, ISSS and private ones that are operating in the area.

5) Participation by Private Sector

- The M/P proposes that participation by private sector be fostered in the construction, operation, maintenance and financing of the diverse SWM components in AMSS by means of contracts and concessions with solid waste service-rendering enterprises (SW-SRE), small enterprises, microenterprises and cooperatives.
- The M/P also promotes participation by private industries for the recovery and recycling of SW.

- Also, the M/P proposes incentives for the private sector to be in charge exclusively of compost processing and commercialization of organic waste from markets and parks in AMSS.
- Furthermore, the M/P fosters competitiveness among contractors and/or concessionaires, insists upon the regulation of the service quality being rendered and requires supervision of SW-SRE.

6) Contracts and Concessions

Participation by private sector in SWM entails bids, contracting out and concessions. Therefore, the M/P recommends and proposes guidelines to allow a full analysis, regulation and control of such legal compromises and formalities.

A relevant achievement of the present Study is the breakdown of the US\$18/ton price paid by the municipalities for the MIDES project. This breakdown of the S/L fee of Nejapa and other elements of MIDES project were particularly requested and proposed by JICA Study Team, and it is pleasant to know that such request was attained.

7) Supervision and Control

The M/P emphasizes that supervision and control of contracts and concessions be in charge of EMAUSS and the SWM Execution Unit of OPAMSS. The latter will allow municipalities with scarce financial resources to have a highly qualified supervision and control at a low cost, both for MIDES contract as well as for other metropolitan SWM contracts in which the municipalities take part.

Besides, it is also recommended that the cleansing departments of the remaining 13 municipalities institutionalize and strengthen their supervising and control of collection and sweeping contracts/concessions within their jurisdiction, be it lump sum or unit price ones.

Additionally, the M/P highlights the setting up of the SWM Execution Unit of OPAMSS and EMAUSS as entities that supervise and control currently executed metropolitan contracts such as MIDES, which will operate several years more. Since such MIDES contract is a unit price one with a minimum compulsory amount to be delivered at the S/L, it is urgent that supervision and control be organized and institutionalized in the way proposed by the M/P.

M.4.5 Social Evaluation

Social evaluation of the M/P is based on the criteria that follows, and summarized in Table M-81.

a. Improvement of Public Health

Health benefits are pursued through the following institutional proposals in the M/P:

- Public education program aimed at raising sanitary management of SW upon population.
- Separation of SW at the source and separate collection of recyclable items sought through in-house sanitary management, which prevents the proliferation of vectors at the source and improves the sanitary collection process.

- Total collection coverage to solve the issue of lack of service in low-income marginal areas.
- Construction of T/S(s) and optimization of collection and street sweeping services, which leads to the improvement of occupational health of public cleansing workers
- Separation at the source, separate collection, storage and sanitary trading of recyclable items that improves occupational health of former scavengers.
- Final disposal through sanitary landfills in the municipalities of Antiguo Cuscatlan, Cuscatancingo, San Martin and Tonacatepeque, which will improve public health in such municipalities.

b. Population's Well-being

The technological, operative and institutional proposals of the M/P for the separation of SW at the source, collection optimizing, construction of T/S(s) and sanitary landfills and institutionalization of a regional system for SWM will bring about the following benefits:

- Population will become aware of urban and environmental aspects through the public education program, and they will acknowledge their role as generators of solid wastes.
- Cleaner public roads and areas and protection of the landscape and natural sites.
- Regulation and control of dust and noise in T/S(s) and S/L(s) to prevents damages upon population nearby.

c. Employment and Working Conditions

- Separate collection of recyclable items, the construction of T/S(s), the sanitary landfills for Antiguo Cuscatlan, Cuscatancingo, San Martin and Tonacatepeque and haulage from T/S(s) to S/L(s) will constitute new sources of employment.
- The greater recyclable material coming from the separation at the generation source, the greater employment required for the haulage, storage, trading and processing of such recovered wastes.
- Progressive formalization of former scavengers and other workers will bring about benefits to a considerable informal sector.

d. Citizen Participation and Sustainability

- The educational program for the population and gradual separation of SW at the source will benefit citizens' participation, thus allowing a close relation with municipal authorities.
- Besides, the educational program will also promote the culture of payment for cleansing services, which in turn will make such services sustainable.
- Finally, the strict and transparent supervision and control of contracts will protect the population's interests, and people's confidence towards municipalities will also rise

Table M-81: 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

M.4.6 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.

M.4.6.1 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.

M.4.6.2 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.

M.4.6.3 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.

M.4.7 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 colons 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.

M.4.8 Phased Implementation Plan

M.4.8.1 Regional System

The proposed implementation plan of the Master Plan for Regional System is shown in below table.

Table M-82: Phased Implementation Plan for Regional System

		Phase I			Phase II			Phase III			
		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Transfer system	TS 1 (350 t/d)	FS, EIA	B/D, D/D	Con.	OP	OP	OP	OP	OP	OP	OP
	TS 2 (900 t/d)	FS	EIA, B/D	D/D, Con.	Con.	OP	OP	OP	OP	OP	OP
Intermediate treatment	S/P					FS, EIA	B/D, D/D	Con.	OP	OP	OP
	Incineration									Begin examine	
Landfill	MIDES Nejapa	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP
	Toacatepeque	FS, EIA	B/D, D/D	Con.	Con.	OP	OP	OP	OP	OP	OP
	New Espiga	Con.	Con.	OP	OP	OP	OP	OP	OP	OP	OP
Medical waste treatment	MIDES/Nejapa	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP
	Incinerator	FS, EIA	B/D, D/D	Con.	OP	OP	OP	OP	OP	OP	OP

Note: FS: feasibility study B/D: basic design EIA : environmental impact assessment
D/D : detailed design Con.: construction OP: operation

M.4.8.2 Individual Management System

The proposed implementation plan of the Master Plan for Regional System is shown in below tables.

Table M-83: Implementation Plan for Individual System (1)

		Step	Phase I			Phase II			Phase III			
			2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
SS	Discharge/ Storage	III										
		II										
		I										
	Collection	III										
		II										
		I										
	Haulage	III										
		II										
		I										
	Final disposal	III										
		II										
		I										
MJ	Discharge/ Storage	III										
		II										
		I										
	Collection	III										
		II										
		I										
	Haulage	III										
		II										
		I										
	Final disposal	III										
		II										
		I										

Table M-84: Implementation Plan for Individual System (2)

		Phase I			Phase II			Phase III					
		Step	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	
CD	Discharge/ Storage	III											
		II											
		I											
	Collection	III											
		II											
		I											
	Haulage	III											
		II											
		I											
	Final disposal	III											
		II											
		I											
CT	Discharge/ Storage	III											
		II											
		I											
	Collection	III											
		II											
		I											
	Haulage	III											
		II											
		I											
	Final disposal	III											
		II											
		I											
AY	Discharge/ Storage	III											
		II											
		I											
	Collection	III											
		II											
		I											
	Haulage	III											
		II											
		I											
	Final disposal	III											
		II											
		I											
SM	Discharge/ Storage	III											
		II											
		I											
	Collection	III											
		II											
		I											
	Haulage	III											
		II											
		I											
	Final disposal	III											
		II											
		I											

Table M-85: Implementation Plan for Individual System (3)

			Phase I			Phase II			Phase III			
		Step	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
ST	Discharge/ Storage	III										
		II										
		I										
	Collection	III										
		II										
		I										
	Haulage	III										
		II										
		I										
Final disposal	III											
	II											
	I											
AC	Discharge/ Storage	III										
		II										
		I										
	Collection	III										
		II										
		I										
	Haulage	III										
		II										
		I										
Final disposal	III											
	II											
	I											
SY	Discharge/ Storage	III										
		II										
		I										
	Collection	III										
		II										
		I										
	Haulage	III										
		II										
		I										
Final disposal	III											
	II											
	I											
IL	Discharge/ Storage	III										
		II										
		I										
	Collection	III										
		II										
		I										
	Haulage	III										
		II										
		I										
Final disposal	III											
	II											
	I											

Table M-86: Implementation Plan for Individual System (4)

		Phase I			Phase II			Phase III			
		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
	Step										
SMT	Collection	III									
		II									
		I									
	Haulage	III									
		II									
		I									
	Final disposal	III									
		II									
		I									
AP	Discharge/ Storage	III									
		II									
		I									
	Collection	III									
		II									
		I									
	Haulage	III									
		II									
		I									
Final disposal	III										
	II										
	I										
NJ	Discharge/ Storage	III									
		II									
		I									
	Collection	III									
		II									
		I									
	Haulage	III									
		II									
		I									
Final disposal	III										
	II										
	I										
TN	Discharge/ Storage	III									
		II									
		I									
	Collection	III									
		II									
		I									
	Haulage	III									
		II									
		I									
Final disposal	III										
	II										
	I										

M.5 Alternatives of the Regional System of Municipal SWM

The system shown in Figure M-34 is proposed in the M/P as the regional management system. With taking into account the status quo of municipal SWM in AMSS such as technical level and political situation, the regional system proposed by the M/P has become the optimum and most reasonable.

In this section, alternatives, which would possibly appear in case that some preconditions of the proposed system are changed, are examined aside from the M/P in order to contribute to the realization of appropriate municipal SWM in the Study Area in the future.

M.5.1 Present System and Proposed System

As Figure M-33 shows, the present system consists of:

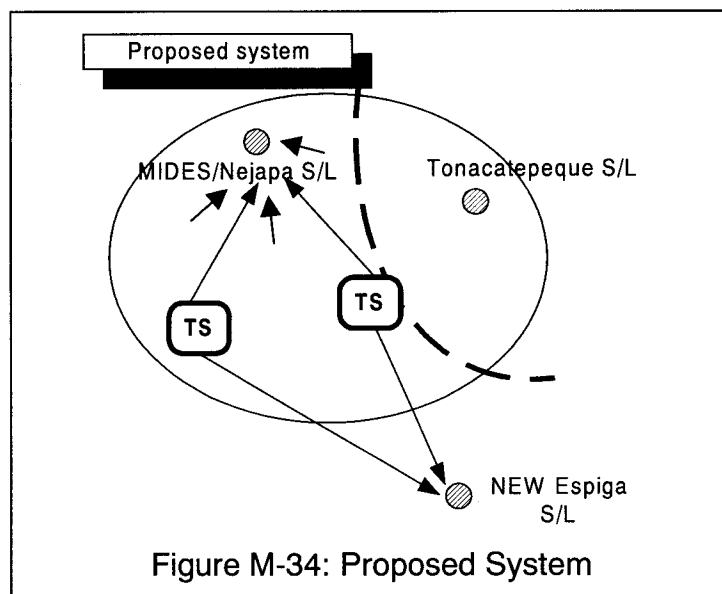
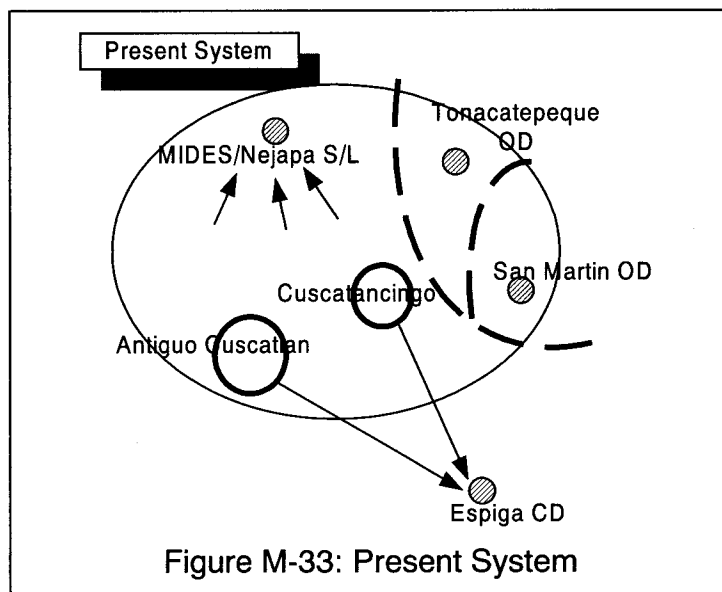
- one sanitary landfill
- one controlled dumping site
- two open dumping sites

Only MIDES/Nejapa S/L meets the final disposal standard of MARN having taken effect in June 2000. The 10 municipalities are disposing of their waste into it.

Direct transport to those final disposal sites is done by collection vehicles although the distances from the municipalities are various.

Hence, the M/P proposes the regional management system based on the following 2 principles:

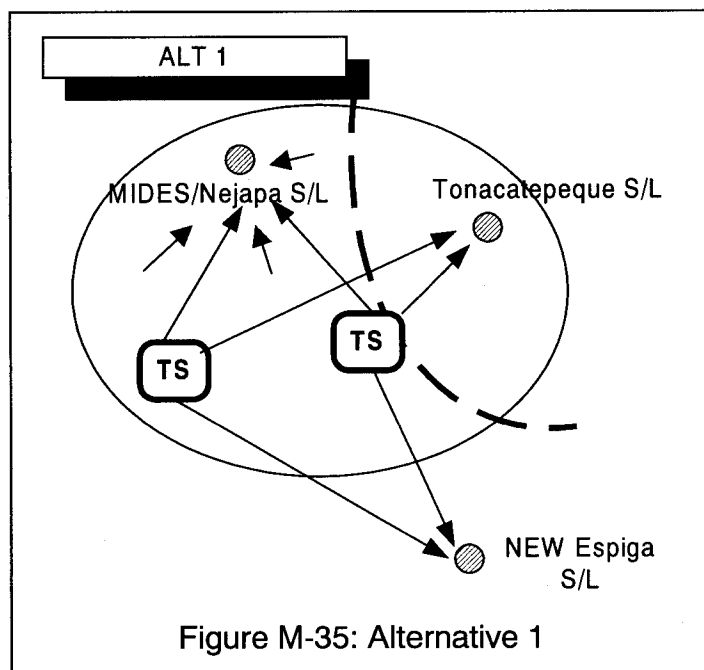
- to implement landfilling all the waste of 14 municipalities that meets the recently published environmental regulation, and
- to install transfer stations, to transport waste by tractor-trailers in stead of the distant direct transport of several municipalities, in order to raise the efficiency of collection/transport activities and to prolong service life of the collection vehicles.



M.5.2 Brief Outline of Alternatives

In complying with the above 2 principles of the M/P proposal, the following 4 alternatives could also become viable, if the circumstances change in the near future. Or, one of the following 4 alternatives can be carried out for a certain period of time due to for example, temporal closure of a landfill due to accident.

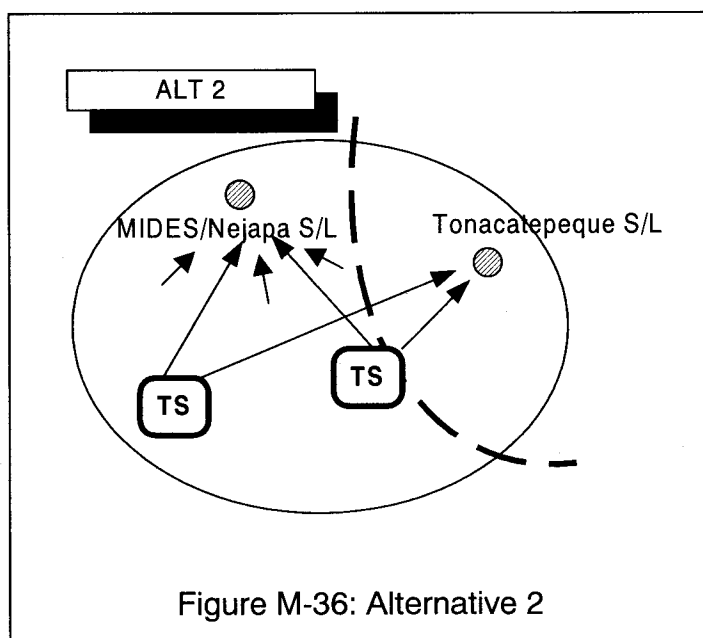
a. ALT 1



In this alternative, not only Tonacatepeque and San Martin but also other municipalities dispose of their waste in Tonacatepeque S/L. This alternative assures all the municipalities of sanitary landfilling even in the case that MIDES Nejapa S/L becomes not usable temporarily by any reason. Transport costs will vary depending on changed distances from respective municipalities or from the transfer stations. The disposal fee of Tonacatepeque S/L would be cheaper than that of MIDES Nejapa S/L, since US\$18.8/ton (inc. VAT) is estimated in case that a public company constructs and operates it

by having a loan of a low interest rate. However, the service life of the Tonacatepeque S/L will be shortened as it is not planed for the waste amount of several municipalities in AMSS.

b. ALT 2



This alternative is basically the same as ALT1, but does not use New ESPIGA S/L. Transport cost born by each municipality will be changed depending on distances from respective municipalities or from the transfer stations. The issues of disposal fee and the service life of Tonacatepeque S/L have the same discussions as ALT1.

c. ALT 3

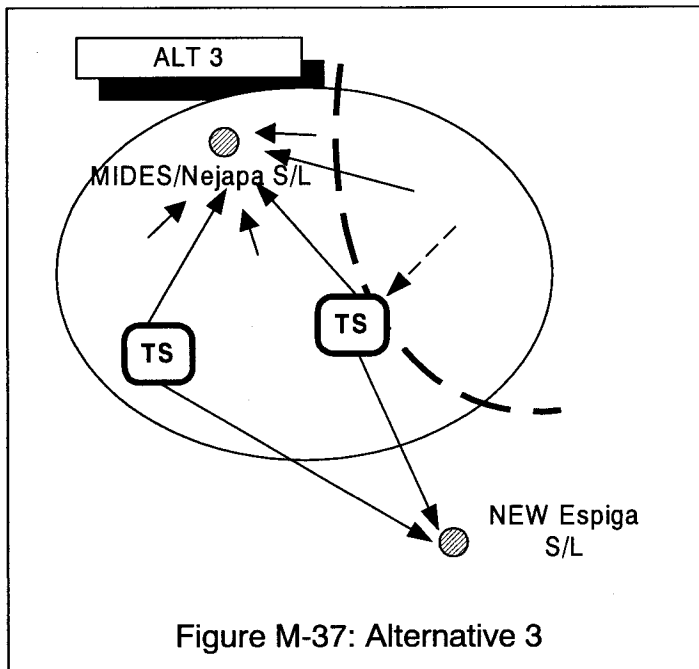


Figure M-37: Alternative 3

This alternative does not construct Tonacatepeque S/L, and increases financial cost burden of Tonacatepeque and San Martin municipalities than the regional system proposed by the M/P.

d. ALT 4

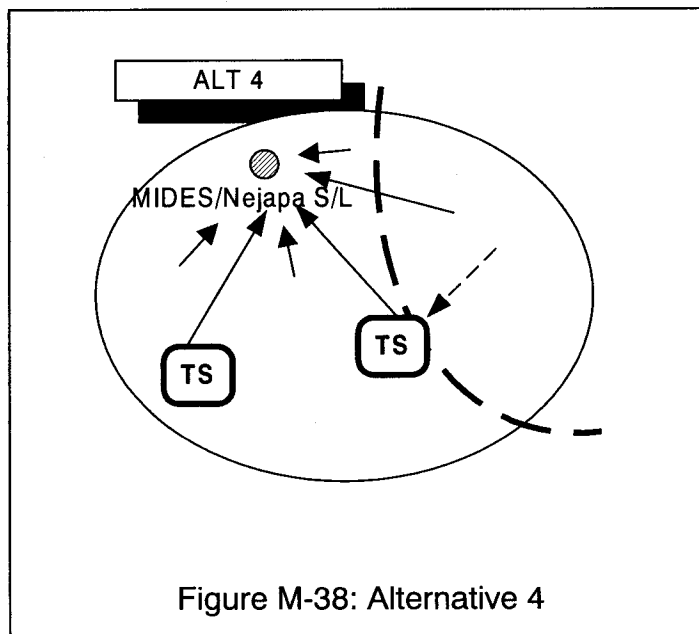


Figure M-38: Alternative 4

This alternative proposes that the all of 14 municipalities use MIDES Nejapa S/L. Changes in total transport costs for 12 municipalities would be insignificant. Meanwhile, costs increase for Tonacatepeque and San Martin municipalities will be considerable due to longer transport distance and higher tipping fee. It is, however, expected that this alternative may add more benefits of "economies of scale" in the final disposal management.

M.5.3 Comparison of Alternatives

Comparison of each alternative is shown in the following table.

Table M-87: Comparison of Alternatives

ALT	Transport distance	Landfill service life	Safety of system	Precondition
1	The transport distance from the west T/S to Tonacatepeque S/L will be lengthened.	The service life of Tonacatepeque S/L will become shorter than planned in the M/P.	High safety level is assured as there are three (3) disposal sites same as in the M/P.	Revision and improvement of MIDES contract (e.g., to change the minimum guarantee quantity). New agreement between Tonacatepeque S/L and its new participants
2	In altering the destination to Nejapa S/L, there are no significant changes in distance from 2 T/Ss. Altering the destination to Tonacatepeque S/L will increase the transport distance from the west T/S.	The service life of Tonacatepeque S/L will become shorter than planned in the M/P.	Safety level decreases compared with the M/P. But there would be least problem, as two (2) disposal sites are available.	Revision and improvement of MIDES contract (e.g., price down, to change the minimum guarantee quantity). New agreement between the two (2) municipalities (CT&AC) and MIDES S/L or Tonacatepeque S/L
3	Transport distances from Tonacatepeque and San Martin will be lengthened.	Not particular	Safety level decreases compared with the M/P. But there would be least problem, as two (2) disposal sites are available.	Revision and improvement of MIDES contract (e.g., price down, to change the minimum guarantee quantity). New agreement between the two (2) municipalities (TN&SMT) and MIDES S/L or New ESPIGA S/L
4	Transport distances from Tonacatepeque and San Martin will be lengthened.	Not particular	Safety of final disposal system decreases, as only one (1) disposal site is available.	Revision and improvement of MIDES contract (e.g., price down, to change the minimum guarantee quantity). New agreement between the four (4) municipalities (CT, AC, TN and SMT) and MIDES S/L

M.5.4 Conclusion

As a conclusion, in order to make any of the above four alternatives viable and enforceable, it is necessary to obtain a mechanism that allows the benefits/costs born or reduced by the alternatives (e.g., mainly by "economies of scale") be fairly distributed among the participating municipalities. Hence, in order to make the costs distribution among users clear, it is required that each service (T/S&T or landfilling) should be fairly paid respectively only by those who utilize the respective service in proportion to the amount handled.