

7.5 Financial Scheme for SWM Improvement

The solid waste collection and disposal are the services to be provided by the Local Authorities in Sri Lanka. This function, however, is not well performed by the Local Authorities due to several reasons such as the shortage of financial resources and lack of implementation capability. While the improvement of SWM services will be further required to cope with rapid urbanization in the future, the current Local Authorities' fiscal system may not allow their initiatives to improve SWM services. In this Chapter, financial scheme will be developed that supports Local Authorities to implement self-sustainable SWM program with initial financial assistance from the central government.

7.5.1 Estimation of Loan Demand for the SWM Projects

The prototype SWM projects were hypothetically formulated for the cost estimates, taking the conditions in Sri Lanka into account. By using the various valuable data obtained through the Study, the prototype SWM project cost was estimated. The details can be referred to Supporting Report Chapter K.

7.5.1.1 Current Price Level

The current various price level are summarised in the following tables.

Table 7-6: Current market price of construction materials and consumables.

Item No	Description	Unit	Rate (Rs)
1	Basic Construction Materials		
	Cement (Bag)	Per bag	460
	Course Aggregate (0-40mm)	Cum	1,500
	Rubble	Cum	1,230
	Sand (River or Mining)	Cum	1,390
	Ready mixed concrete (Fck 200kg/cm ² or equivalent)	Cum	8,600
	Reinforcement Bar	Tonne	84,000
	Mild Steel	Tonne	76,800
	High Tensile Steel	Tonne	80,000
	Timber (Hard Wood for Structure)	Ton or Cum	35,000
	Premixed Asphalt	Ton	3,840
	Concrete Pipe (D=150mm)	M	660
	Concrete Pipe (D=300mm)	M	720
	Concrete Pipe (D=450mm)	M	900
	Perforate Concrete Pipe (D=150mm)	M	1,980
	Perforate Concrete Pipe (D=300mm)	M	2,160
	Perforate Concrete Pipe (D=450mm)	M	3,000
2	Consumables		
	Gasoline	Litter	55
	Diesel oil	Litter	35
	Hydraulic Oil	Litter	130
	Engine Oil	Litter	125

Note: All prices were surveyed by JICA Study Team on August 2003

Table 7-7: Current market prices of several services

Item No	Description	Unit	Rate (Rs)
1	Personal Cost		
	Manager	Man/Month	35,000
	Engineer	Man/Month	28,750
	Supervisor	Man/Month	25,000
	Machinery Operator	Man/Month	18,000
	Mechanic	Man/Month	15,000
	Collection Worker	Man/Month	10,000
Watchman	Man/Month	10,000	
2	Machinery Rental Cost (with operator)		
	Lorry (10ton)	No/day	11,520
	Lorry (8ton)	No/day	9,600
	Lorry (4ton)	No/day	7,200
	Lorry (2ton)	No/day	6,240
	Case Machine (JCB)	No/day	11,520
	Excavator (Bucket capacity 0.1 m3)	No/day	6,240
	Excavator (Bucket capacity 0.4 m3)	No/day	11,420
	Excavator (Bucket capacity 0.7 m3)	No/day	18,240
	Bulldozer (Class D4)	No/day	12,960
	Bulldozer (Class D6)	No/day	24,000
	Tractor	No/day	2,400
	Vibration Compactor (Handy type)	No/day	2,500
	Vibration Compactor (Machine weight 2 to 4 ton)	No/day	9,600
	Vibration Compactor (Machine weight 10 ton)	No/day	14,600

Note: All prices are surveyed by JICA Study Team on August 2003

Personal costs are included in the cost, such as Employee's pension, workman's insurance and other expenses related to the works.

Table 7-8: Equipment cost for storage and discharge of waste

Item No	Description	Unit	Rate (Rs)	Estimated Lifetime (Year)
1	Collection Item			
	Street Litter bin (Basket type)	No	1,500	2 ~ 3
	Street Litter Bin (Fixed half dram type)	No	1,300	2 ~ 3
	Street Litter Bin (movable half dram type)	No	1,700	2 ~ 3
	Litter Bin (Concrete type)	No	900	4 ~ 5
	Plastic Bucket (30 litter)	No	370	N/A
	Plastic Bucket (40 litter)	No	490	N/A
	Plastic Bucket (50 litter)	No	500	N/A
	Plastic Basket Litter Bin (20 litter)	No	90	N/A
	Plastic Basket Litter Bin (30 litter)	No	130	N/A
Plastic Basket Litter Bin (50 litter)	No	495	N/A	
2	Disposal Item			
	Plastic Bag (Medium)	Pcs	3	N/A
	Plastic Bag (Large)	Pcs	4	N/A

Note: All prices are surveyed by JICA Study Team on August 2003

Table 7-9: Estimated Equipment cost for collection and transport of waste

Item No	Description	Machinery cost (Rs)	O&M Cost (per year)			Estimated Life Time (Year)	Specification
			Repairing	Fuel, oil	Operator		
1	Tractor	1,200,000	200,000	600,000	150,000	6~8	4ton(Japan)
	Trailer (Open type)	200,000	50,000	N/A	N/A	3~4	
	Trailer (with cover type)	250,000	70,000	N/A	N/A	3~4	
	Compactor track	7,000,000	400,000	800,000	180,000	8~10	
	Skipper track	2,600,000	300,000	800,000	180,000	8~10	
	Skip container	300,000	50,000	N/A	N/A	3~4	
	Lorry	1,900,000	200,000	600,000	150,000	8~10	
	Lorry	2,700,000	300,000	600,000	150,000	8~10	
	Dumper Lorry	2,500,000	400,000	1,800,000	200,000	6~8	
	Bulldozer	6,800,000	600,000	1,200,000	220,000	8~10	
	Case Machine	4,800,000	400,000	1,200,000	220,000	10~15	
Excavator	7,800,000	700,000	1,800,000	220,000	7~8	Bucket Capacity 0.7m3	

Note: All prices are surveyed by JICA Study Team on September 2003

All of machinery costs are brand-new price in Sri Lanka.

7.5.1.2 Aptness of Initial and O&M cost against Capacity of landfill

Figure 7-2 shows aptness of initial and O&M cost against carrying in waste.

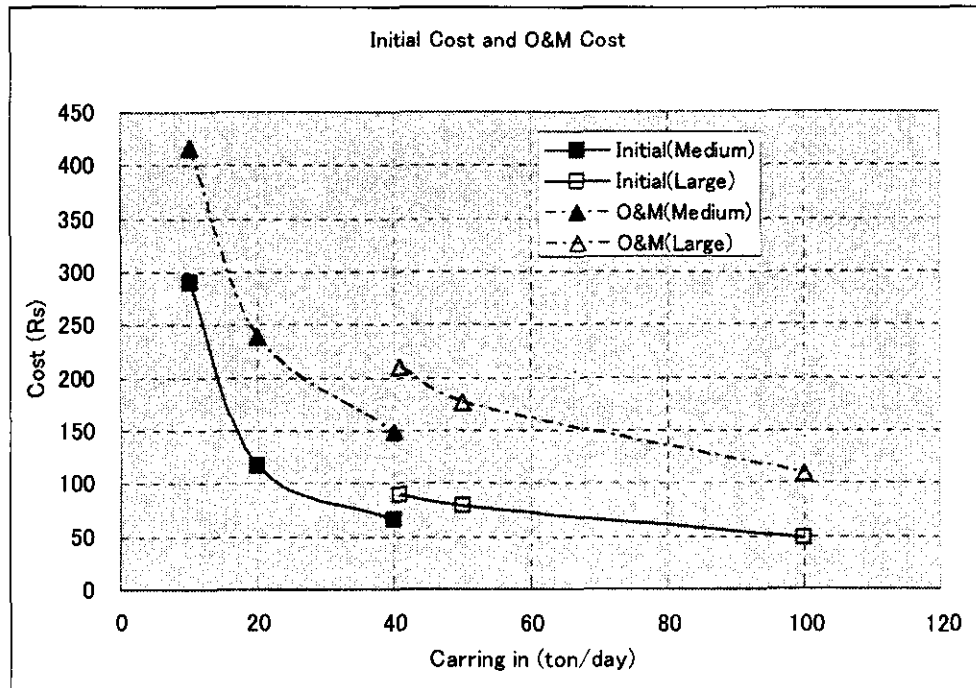


Figure 7-2: Initial cost against Generation

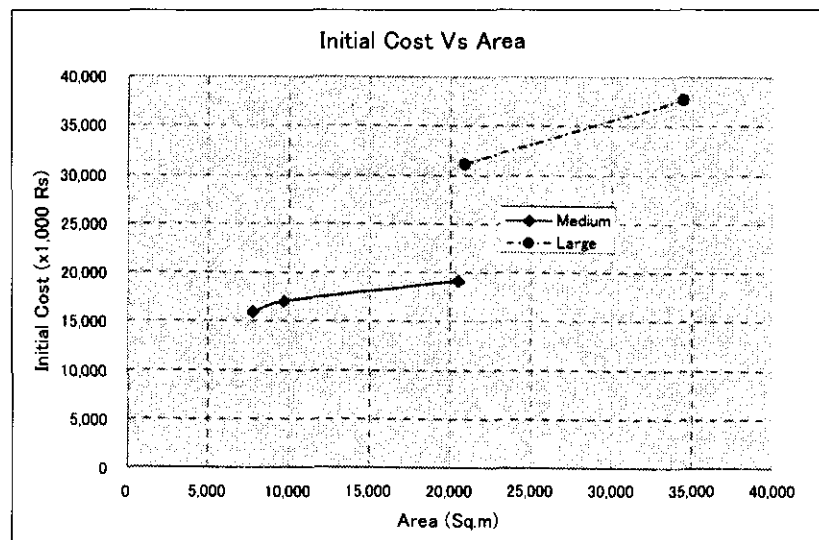


Figure 7-3: Initial cost VS Landfill area

According to Figure 7-2 and Figure 7-3, when increasing of carrying in waste, the total cost is decreasing. Initial cost is increasing pro rata with project area. It is not depending on volume of carrying in waste. Therefore initial cost ratio is depending of height of received waste.

O&M cost is related with amount of carrying in waste, however it is almost constant with carrying in volume up to 40 ton/day. This means the same party will be able to operate up to 40ton/day over the volume 40 ton/day another operation party will be required.

7.5.1.3 Reasonable Cost Range

Figure 7-4 summarises reasonable capital cost range for SWM project.

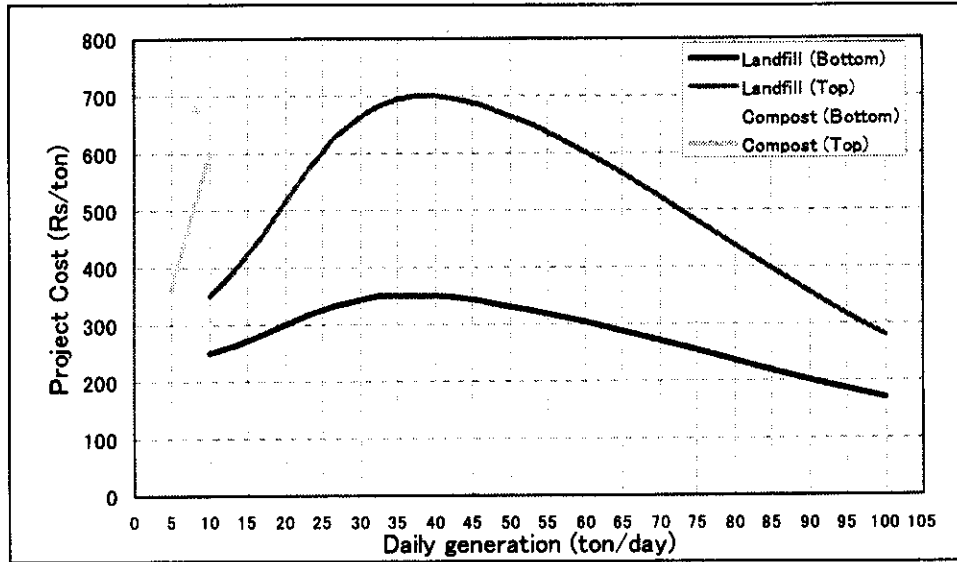


Figure 7-4: Project Cost Range

7.5.1.4 Questionnaire Survey for Loan Demand

The Study conducted the questionnaire survey for 75 local authorities out of 311 in total for predicting the required loan demand for the SWM projects. 75 LAs surveyed consisted of all 18 municipal councils, all 37 urban councils and 20 Pradeshiya Sabha which are largest in terms of population. However, the Study team received replies from 35 LAs by 10th Oct. 2003. All LAs replied expressed strong interest of executing projects for the improvement of solid waste management issues.

As mentioned earlier, suitable sanitary landfill type is categorized based on daily waste generation. Daily waste generation shall be calculated by formula as below;

$$DWG = (\text{Population}) \times (\text{Daily rate of waste})$$

Where:

DWG: Daily waste generation (ton/day)

Population: Persons

Daily rate of waste: 0.80 kg/day.person

Also the required capacity of sanitary landfill site shall be calculated by formula as below;

$$RQC = (DWG) \times (\text{Life time}) \times (\text{coefficient})$$

Where : Population (Persons)

Daily rate of waste = 0.80 kg/day

Life time = 20 years

Coefficient = 1.2 Total volume of waste (1.0) + covering soil (0.2)

Initial cost for sanitary landfill shall be estimated based on DWG and RQC from Figure 12-1 and compost system shall be estimated from Table 12-3. The result is summarised in Table 7-10.

Table 7-10: Estimate initial investment cost for sanitary landfill in local authorities

ID	Name	Category	Population	Weight of waste Rate of Waste (ton/day) (0.8kg/person.day)	Weight of waste (ton/year)	Weight of waste in 20years (ton)	Required Current Capacity (Cum)	Suitable Type of SWM Project	Estimated Initial Investment Cost	
									Ra/ton	Amount
1	Negombo Municipal Council	MC	158,237	127	46,355	927,100	1,310,000	Landfill (Large)	50	46,355,000
2	Kandy Municipal Council	MC	140,000	112	40,880	817,600	1,150,000	Landfill (Large)	50	40,880,000
3	Kalmunai Municipal Council	MC	99,316	79	28,835	576,700	810,000	Landfill (Large)	60	34,602,000
4	Galle Municipal Council	MC	84,099	87	24,455	489,100	690,000	Landfill (Large)	88	33,259,000
5	Batticaloa Municipal Council	MC	83,101	66	24,090	481,800	680,000	Landfill (Large)	69	33,244,000
6	Jeffna Municipal Council	MC	80,563	84	23,360	467,200	660,000	Landfill (Large)	70	32,704,000
7	Kurunegala Municipal Council	MC	26,391	21	7,865	153,300	220,000	Landfill (Medium)	117	17,936,000
8	Dehiwala- Mt. Lavinia Municipal Council	MC	209,787	168	61,320	1,226,400	1,730,000	Landfill (Large)	50	61,320,000
9	Matale Municipal Council	MC	38,000	30	10,950	219,000	310,000	Landfill (Medium)	81	17,739,000
10	Maharagama Pradeshiya Sabha	PS	180,112	144	52,560	1,051,200	1,480,000	Landfill (Large)	50	52,560,000
11	Wattala Pradeshiya Sabha	PS	180,000	128	46,720	934,400	1,320,000	Landfill (Large)	50	46,720,000
12	Attanagalla Pradeshiya Sabha	PS	154,358	123	44,895	897,900	1,270,000	Landfill (Large)	50	44,895,000
13	Katana Pradeshiya Sabha	PS	149,734	120	43,800	876,000	1,240,000	Landfill (Large)	50	43,800,000
14	Mahara Kadawata Pradeshiya Sabha	PS	104,708	84	30,660	613,200	870,000	Landfill (Large)	54	33,113,000
15	Seethawaka Pradeshiya Sabha	PS	112,531	90	32,850	657,000	930,000	Landfill (Large)	52	34,184,000
16	Ambilipitiya Pradeshiya Sabha	PS	138,431	111	40,515	810,300	1,140,000	Landfill (Large)	50	40,515,000
17	Kelaniya Pradeshiya Sabha	PS	104,708	84	30,660	613,200	870,000	Landfill (Large)	54	33,113,000
18	Kattankudy Urban Council	UC	36,801	29	10,585	211,700	300,000	Landfill (Medium)	82	17,359,000
19	Panadura Urban Council	UC	33,432	27	9,855	197,100	280,000	Landfill (Medium)	90	17,739,000
20	Peliyagoda Urban Council	UC	31,880	26	9,490	189,800	270,000	Landfill (Medium)	90	17,082,000
21	Hikkaduwa Urban Council	UC	27,500	22	8,030	160,600	230,000	Landfill (Medium)	101	16,221,000
22	Gampola Urban Council	UC	24,283	19	6,935	138,700	200,000	Landfill (Medium)	120	16,644,000
23	Chilaw urban Council	UC	24,105	19	6,935	138,700	200,000	Landfill (Medium)	120	16,644,000
24	Weligama Urban Council	UC	21,783	17	6,205	124,100	180,000	Landfill (Medium)	180	22,338,000
25	Point Pedro Urban Council	UC	20,545	16	5,840	116,800	160,000	Landfill (Medium)	240	28,032,000
26	Velrettiturai Urban Council	UC	18,000	14	5,110	102,200	140,000	Compost Plant		2,000,000
27	Balangoda Urban Council	UC	14,982	12	4,380	87,600	120,000	Compost Plant		1,500,000
28	Nawalapitiya urban council	UC	13,533	11	4,015	80,300	110,000	Compost Plant		1,200,000
29	Talawakelle-Lindula urban Council	UC	12,500	10	3,650	73,000	100,000	Compost Plant		1,000,000
30	Hambantota Urban Council	UC	11,213	9	3,285	65,700	90,000	Compost Plant		1,000,000
31	Horana Urban Council	UC	10,099	8	2,920	58,400	80,000	Compost Plant		1,000,000
32	Haputale urban Council	UC	8,862	7	2,555	51,100	70,000	Compost Plant		1,000,000
33	Minuwangoda Urban Council	UC	7,658	6	2,190	43,800	60,000	Compost Plant		1,000,000
34	Bandarawela Urban Council	UC	7,318	6	2,190	43,800	60,000	Compost Plant		1,000,000
35	Hatton-Dikoya urban Council	UC	n/a							
Total			2,348,370	1,878	684,740	13,894,800	19,330,000			809,678,000

Total demand of initial investment cost for 35 local authorities can be estimated about Rs 809million.

7.5.1.5 Potential Projects

All 35 LAs replied expressed the strong interest of the establishment of the proper disposal system project. The Study team visited some of these LAs and confirmed the necessities of the all projects which are shown in Table 7-11.

Table 7-11: Waste Disposal Projects to be Expected

	Type of project	Local Authority	Province
1	Landfill site improvement project	Kurunegala MC	North-western province
2	Disposal system project	Matale MC	Central province
3	Disposal system project	Badulla MC	Uva province
4	Disposal system improvement project	Kotikawatta Mulleriyawa PS	Western province
5	Sanitary landfill project	Sitawaka UC	Sabaragamuwa
6	Disposal system project	Ratapura MC	
7	Disposal system project	Galle MC	Southern province

7.5.2 Model Project and Medium Term Funding Requirement

A Model Project is designed to estimate financial burden on Local Authorities. As the Model Project is only for grasping fiscal impact to Local Authorities, simplified project is designed based on the pilot projects implemented under this study and the Prototype Project appeared in early chapter of this report. The medium term funding requirement for solid waste management improvement in secondary cities is also estimated by using the Model Project and the results of questionnaire survey on Local Authorities.

7.5.2.1 The Model Project and Its Cost

The volume of solid waste can be reasonably estimated based on the population and economic activities. The incremental cost for improved services, however, depends on the current service level and associated expenditure, because all Local Authorities have already undertaken solid waste collection and disposal to some extent. Explained below is the Model Project for a city with the population of 50,000. The initial investment cost with contingencies is Rs. 30,000,000 and annual operation and maintenance cost is Rs. 15,000,000. The initial cost is for Landfill Site Development with one unit of Bulldozer, and for Tractors with Trailer for collection and transport. A half of the required Tractor/Trailer cost is included as initial investment, assuming that the Authority already has a half of them for on-going services. With another assumption that the Authority is spending Rs 10,000,000 annually for on-going solid waste related services, the incremental burden on the Authority is arrived by deducting current expenditure from the total cost.

- Population : 50,000
- Volume of Solid Waste : 40ton/day (15,000ton/year)
- Current Expenditure for SWM : Rs. 10,000,000/year
- Investment and O&M Cost under New Project:

Table 7-12: Initial Investment Cost for Model Project

Item	Cost (Rs.)	Lifetime (Yr)	Remarks
1. Landfill for Disposal			
1.1 Landfill Site Dev.	13,000,000	20	Capacity: 300,000 tons
1.2 Bulldozer	7,000,000	7	D4 Class 1 unit
2. Collection			
2.1 Tractor/Trailer	7,500,000	7	Unit cost: Rs. 1,500,000 Requirement: 10 units Existing: 5 units; New: 5
3. Contingency	2,500,000		
TOTAL	30,000,000		

Note: JICA Study Team Estimates

Table 7-13: Annual Operation and Maintenance Cost

Item	Cost (Rs.)	Remarks
1. Disposal at Landfill Site	3,000,000	Rs. 200/ton (manpower, material, operation and maintenance)
2. Collection and Transport	12,000,000	Rs. 800/ton (collection and sweeping; manpower, material, operation and maintenance)
TOTAL	15,000,000	

Note: JICA Study Team Estimates

7.5.2.2 Medium Term Funding Requirement

The pace of urbanization of Sri Lanka is relatively slow in Asia Region. But, it is surely accelerated in the future if the industrialization and expansion of service sector are taken place as the Government so expects. Among total 300 Local Authorities, about 10%, say 30 LAs, might require the modernized solid waste management system urgently. In this case, total investment cost would be around Rs. one billion. It is not necessary to start all projects immediately, but the first 30 Local Authorities might commence the project within next five years, as the number of cities which requires new investment increases with the pace of urbanization in Sri Lanka.

7.5.3 Financial Scheme

The Financial Scheme proposed in this Chapter, is the system for the LAs to implement SWM project with their own initiatives and plans, and with the financial support from the Central Government.

7.5.3.1 The Principles

The Financial Scheme is designed and operated with the following principles:

- The Scheme is to provide financial support from the Central Government to LAs to carry out solid waste management improvement projects.
- The support under the Financial Scheme covers a part of the initial investment costs.
- The mode of financial support is both grant and low-interest loan. The share of grant and loan is determined based on the affordability and financial strength of the LAs.
- The LAs, who apply to the Scheme, have to allocate a part of the initial investment costs, at least for the land acquisition and compensation, and develop and implement the revenue enhancement measures to generate necessary funds for recurrent expenditure and debt service for the loan.

7.5.3.2 Management of Financial Scheme

The operating entity of the Financial Scheme is the Central Government. The Ministry of Home Affairs, Provincial Councils and Local Government (MOHAPCLG) assumes control and full responsibility of this Scheme. Under the guidance of the MOHAPCLG, the proposed NSWMSC

will be functioning as the secretariat of the Scheme. The relevant authorities' roles and functions are as follows;

- **MOHAPDLG:** The Ministry assumes overall responsibility of the Scheme. The decision on granting assistance to LAs is jointly made with the Ministry of Finance and the Ministry of Policy Development and Implementation. The secretarial work is done at NSWMSC.
- **NSWMSC:** NSWMSC is established in the MOHAPCLG, and provides the comprehensive support to LAs who is planning and implementing the SWM projects. The support in technical and engineering aspects is the main function of NSWMSC. Consultation for revenue enhancement of LAs is also provided in cooperation with the SLILG. For the Financial Scheme, NSWMSC will have the functions for appraising the technical and financial feasibility. The appraisal of financial aspects is done with the financial institutions.
- **Financial Institution(s):** The Financial Institution administers the disbursement and repayment of the loan component. At the appraisal stage of the project, the Financial Institution will prepare the financial appraisal documents. The candidates for the Financial Institution are the Local Loan Development Fund (LLDF), Development Banks, and Commercial Banks.
- **Local Authorities:** The Local Authorities prepare the implementation plan of the project. The implementation plan includes, but not limited to, the Long Term SWM Plan, Project Implementation Plan, and Financial Plan including Revenue Enhancement Program. The LAs may utilize the resources and support of NSWMSC, if required.

7.5.3.3 The Financial Scheme

The proposed Financial Scheme for Solid Waste Management Improvement Project is designed as follows;

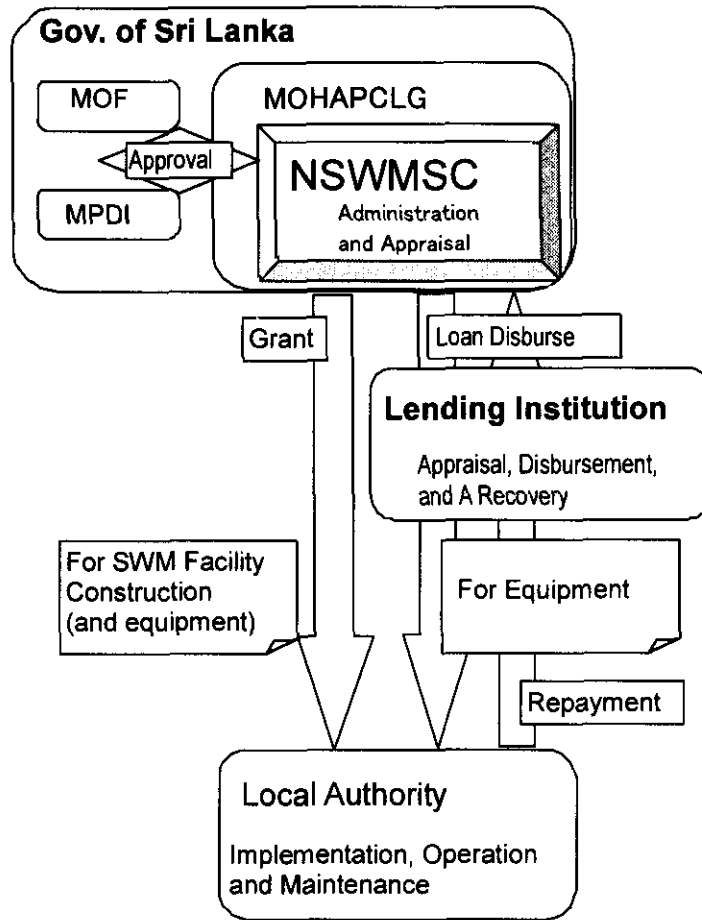


Figure 7-5: Financial Scheme for SWM Improvement Project

Under the Financial Scheme, the Central Government shares the burden for initial investment in the form of grant and low-interest loan. The true cost for the Central Government depends on the ratio of grant and loan, and the terms of the loan. In order to reduce the burden of the Central Government to the extent possible, and in view of sustainability of the project undertaken by the Local Authorities, it is recommended that the cost for the equipment which requires re-investment periodically, be provided in the form of the loan. The loan may be extended again for renewal of equipment, if the repayment is completed. In the Model Project, the ratio of grant and loan is one to one. This ratio may vary depending on the affordability of the Local Authorities. If weakness is observed in affordability, part of the equipment may also be covered with the grant from the Central Government¹. The repayment of the loan is within seven years, taking into account the renewal of equipment. The interest rate of the loan is recommended to reduce to 4% per annum, from the current interest rate of 6.5% provided for the same purpose by LLDF, considering the declining trend of interest rate in Sri Lanka.

¹ In case of water supply project in rural areas, 80% of the total investment is covered with the grant of Central Government.

7.5.3.4 Source of Fund

The projects are implemented with the subsidies from the Central Government. The Central Government is required to appropriate the fund in the Budget. The fiscal condition, however, does not easily allow the addition of Rs. one billion, and may require additional issue of Government Bond. Funding in local market becomes another heavy burden to the Central Government Budget. On the other hand, the Project objectives are to improve environment and sanitary conditions, and to strengthening Local Authorities capacity, for which major donors place the high priorities of their assistance. The donors may favourably consider providing assistance to the project of this nature. For the Government, grant assistance may be the best solution. In case the grant assistance is not available, alternative may be to obtain concessional loan from the donors such as the World Bank, ADB, or from the JBIC².

7.5.4 Sustainability of the Project

In this section, financial calculation is made to estimate the additional expenditure of the project, and to test the financial sustainability. The following assumptions are used for this purpose;

- Landfill Site Construction : Rs. 13,000,000 (Grant)
- Equipment : Rs. 14,500,000 (Loan, 4%p.a., 7 years repayment)
[Annual Debt Service: Rs. 2,400,000]
- Operation and Maintenance : Rs. 15,000,000/year
[Incremental Expenditure: Rs. 5,000,000]

Figure 7-6 indicates the project cost stream. In the first year, the investment for landfill site and equipment is included in addition to the operation and maintenance. In the eighth year, the cost for renewal of equipment is added.

Of the total expenditure of the above, the effect of reducing burden of Local Authority by mobilizing grant and loan is shown in Figure 7-7. Of the total initial investment, the cost for landfill site construction is provided as a grant. Thus, it is deducted from the expenditure of the Local Authority. The cost for equipment is also deducted from initial expenditure as it is covered with the loan, and distributed to seven years as the repayment of principal and interest of the loan. As a result, the real cash-flow of the Local Authority is the annual expenditure of Rs. 2,400,000 for initial investment.

The cash-flow of the Project is shown in Figure 7-8. Annual expenditure of this Local Authority will be Rs. 17,400,000, consisting of Rs. 15,000,000 for operation and maintenance, and Rs. 2,400,000 for debt services. Assuming that this Local Authority has been spending Rs.

² In case of JBIC ODA loan, the project may be qualified for preferential term; interest rate of 0.75% and 40 years repayment, under the category of Waste Treatment.

10,000,000 annually for on-going solid waste management services, the additional expenditure of improved services would be Rs. 7,400,000.

What would be the impact of this additional expenditure on fiscal operation of this Local Authority? The revenue collected by the Local Authorities of seven Pilot Municipalities under this study is around Rs. 1,000 per capita. Suppose the population of this Model Project Municipality is 50,000, the generated total revenue would be in the range of Rs. 50,000,000. The additional cost to be born for the implementation of the Model Project is Rs. 7,400,000, which is about 15% of the total revenue, or equal to Rs. 150 per capita. Since present level of revenue collection by the Local Authorities is far below the adequate level, revenue enhancement of 15% would be in the quite feasible range. The willingness to pay for improved solid waste management services, which was surveyed in this study, shows an encouraging result. The willingness to pay is about Rs. 1,000 per family per year, which is enough to cover the required Rs. 150 per person. IF appropriate revenue enhancement measures are taken, the proposed Financial Scheme would be concluded as a feasible and sustainable option for the Local Authorities.

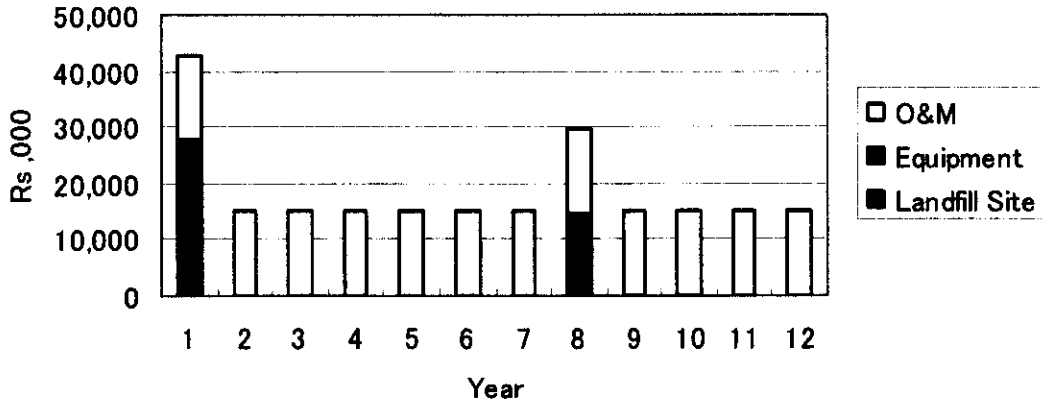


Figure 7-6: Total Expenditure of Model Project

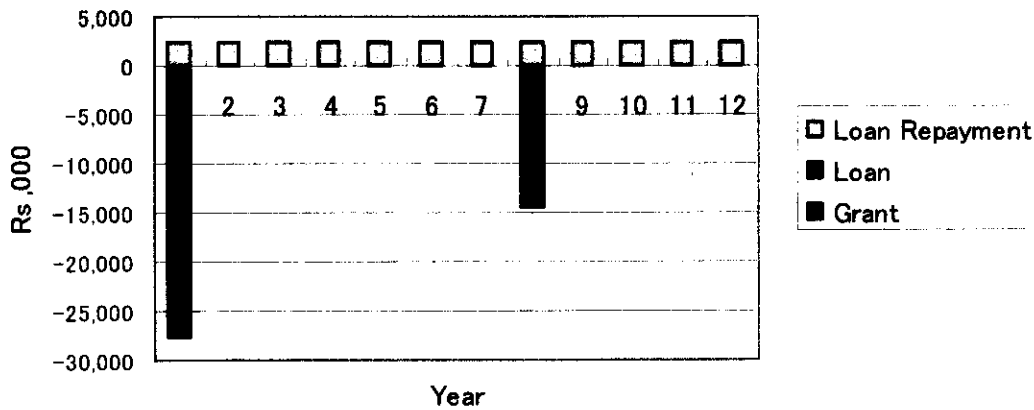


Figure 7-7: Effect of Grant and Loan under the Financial Scheme

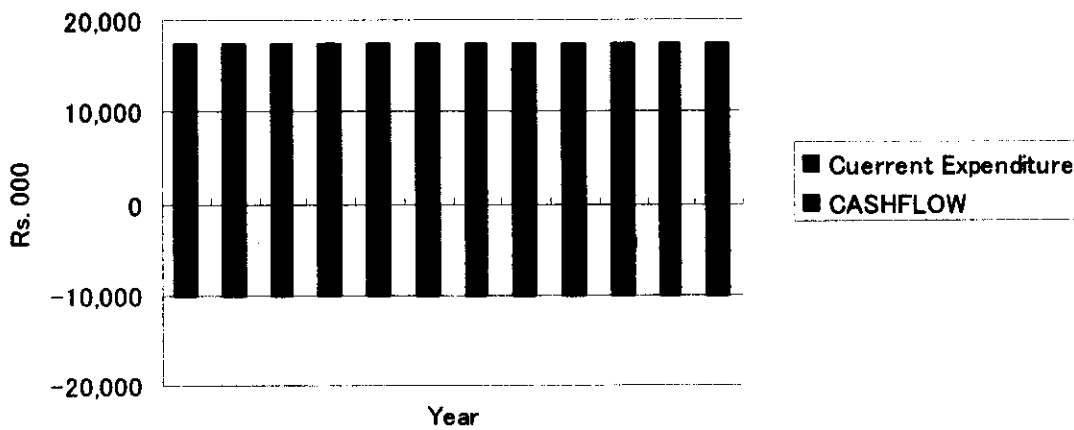


Figure 7-8: Cash-flow for Local Authority

7.5.5 Preconditions for Financial Scheme

In order to maintain the efficiency and sustainability of the project, it is important to seek the commitment for better SWM services from the participating Local Authorities. The following are the conditions to the participating Local Authorities and the Central Government as well.

- The Local Authority prepares the Long Term Solid Waste Management Plan associated with the implementation project of the Project.
- The Local Authority develops revenue enhancement measures, and obtains approval of these measures at the Council in the course of budget process.
- The Local Authority secures the fund for land acquisition and compensation for the Project in the annual budget, and obtains the Council approval for the same.
- The Local Authority prepares the full accounts for SWM services to understand the cost of solid waste management services, and makes the same available to the public.
- The Local Authority carries a study of subcontracting the work to private sector for efficiency improvement, and implements it to the extent possible.
- The Central Government encourages the Local Authorities initiatives for revenue enhancement, and strengthen the programs of the Support Center and SLILG for Local Authorities capacity development.

The Financial Scheme proposed here is a model to implement a project with own revenue enhancement, and with the support from the Central Government. In this context, it is worth to note that the project is not only for the better solid waste management, but also for better management in Local Authorities in general. It may be concluded that the project process is an important exercise to strengthen the governance mechanism in the Local Authorities.

7.6 Implementation Schedule

Figure 7-9 shows the draft implementation schedule for the two projects, NSWMSC project and strengthening local loan system for SWM project, to be implemented by the Central Government. The schedule should be carefully reviewed by the Central Government prior to the implementation.

	Year	1st	2nd	3rd	4th	5th
NSWMSC Project						
1 Establishment of MSWMSC		—————				
2 SWM Training of officers in NSWMSC		—————				
3 Establishment of Training Course for SWM Officers		—————				
4 Seminar on SWM administration		—————				
5 Seminar for SWM practioners working in LAs		—————				
6 Seminar for NGOs and private campanies		▲	▲	▲	▲	▲
7 Technical assistance to LAs for the formulation of SWM project		—————				
8 Acquisition and disemmination of basic SWM data		—————				
9 Establishment of Quality Check System for Compost		—————				
Strengthening Local Loan System for SWM Project						
		—————				

Figure 7-9: Implementation Schedule

7.7 Social Consideration

7.7.1 Equitable Evaluation of Traditional Recyclers

Traditional recyclers are not equitably evaluated in Sri Lankan society although they contribute to the society through doing recycling business. In addition, some of new initiative of separate collection system introduced for promotion of recycling by LAs often deprives the business chance from them and then affect the entire recycling system. In order to promote the recycling, LAs should evaluate their activities rightly and assist them prior to the direct involvement LAs.

7.7.2 Arrangement of Safety Net for Cleansing Workers

The required number of cleansing workers is highly likely to decrease by the improvement of waste collection efficiency in line with the new policy introduced for SWM work to give priority to the work efficiency. However, the job opportunities other than cleansing work for cleansing workers, Tamil workers in particular, are very limited. Therefore, the alternative job opportunities of cleansing work, e.g. drain cleansing and gardening work, has to be arranged for them as safety net.

7.7.3 Impact by Private Sector Participation

a. Supervision Against Hardening Working Condition

The introduction of private sector participation policy harden the market competition. It likely to decrease the payment for workers and the cost for safety tools. Stringent supervision is therefore required to supervise private contractors in order to protect workers from deterioration of the employment and working condition.

b. Prevention of Monopoly and Oligopoly of Contract

The promotion of the private sector participation policy for the waste collection work and the final disposal work tends to lead to monopoly or oligopoly. If it is the case, the client such as LA lose the effective control means because losing alternative means. Therefore, the following measures should be taken as prevention measures.

Waste collection work

To make a collection contract area small so that many micro-enterprises can participate in a tender.

Waste treatment and final disposal

The client shall own these facilities. In this case, if the contractor deviate from the contract conditions and they ignore the client's instruction, the client can keep the alternative even though kicking it out.

c. Social Consideration for Neighbourhoods During Planning

Negative impacts to neighbourhoods can't be eliminated, even though the best technology is adopted for a waste treatment plant or the final disposal. Therefore, neighbourhoods response to the project as a form of NIMBY³. In order to execute the project under such difficult condition, building the consensus of neighbourhoods toward the project is essential. LAs have to answer to the citizens' following questions for that purpose.

- a) Why is such capacity of the facility required?
- b) Why is the facility constructed here?
- c) Assurance of negative environmental impacts to be controlled within permissible limits
- d) Payment of equitable compensation.

³ Not In My Back Yard. People don't want an undesirable activity or building near their home, even though they understand its necessity.

Chapter 8 Recommendations

8.1 Implementation of the National Strategies for SWM

8.1.1 National Strategies for SWM

In Sri Lanka, almost all the LAs are suffering from improper SWM practices and have not been able to find proper solutions by themselves. In order to improve SWM in the country, the Government of Sri Lanka established the National Policy for Solid Waste Management (NPSWM) and adopted the National Strategy for Solid Waste Management (NSSWM) in May 2000. The main strategies are as follows:

- The generation of waste is avoided and reduced at each generation source as much as possible.
- The waste generated after the attempt of waste reduction is reused or recycled as much as possible.
- Only after the effort of waste reduction, reuse or recycling, waste is properly collected, treated, and finally disposed of in an environmentally sound manner.

By the implementation of the NSSWM, the country will establish SWM that enables socio-economic development consistent with environmental preservation. The governments have established coordinating committees at the National, Provincial and Local Authority level in order to implement the strategy. However, the committees are not functioning well mainly due to lack of permanent staff and office facilities.

In order to find a way out of the present difficulty and smoothly implement the strategy, the Team recommends the central government to conduct the following improvement issues:

8.1.2 Early Establishment of a National SWM Support Centre (NSWMSC)

LAs will not be able to improve their SWM by themselves in accordance with the NSSWM if the central government only sets up the SWM policy and only notifies it to the LAs. In order to ensure the LAs actually implement the strategy, it is quite important to have a government institution to consult with the LAs regarding their problems in SWM and give technical assistance.

The Study team recommends the central government to urgently establish the National Support Centre for the Improvement of SWM (NSWMSC) in LAs. It is desirable to have this kind of centre in every province. Taking into consideration the very limited financial situation of the country, however, it can only realistically be established under the MOHAPCLG.

The relationship between the NSWMSC and the National, Provincial and LA Level Coordinating Committees for the Implementation of the NSSWM is presented in the figure.

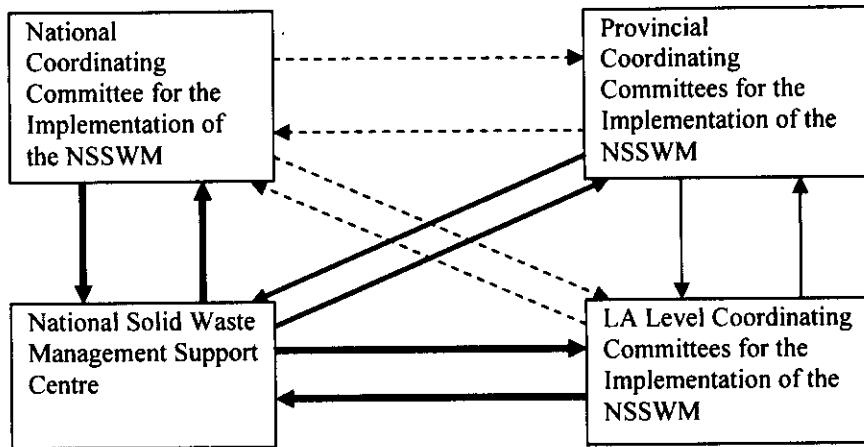


Figure 8-1: Relationship between NSWMSC and National, Provincial and LA Level Coordinating Committees for the Implementation of the NSSWM

As shown in the figure, the Centre (NSWMSC) will function as a core body for the actual implementation of the National Strategy.

8.1.3 Strengthening of Provincial and LA Level Coordinating Committees for the Implementation of the NSSWM

In order to implement the NSSWM, Provincial and LA Level Coordinating Committees have been established. However, they do not function well as with at the national level committee. The early establishment of the National Solid Waste Management Supporting Centre is needed for those coordinating committees to function. When the Centre is established, the central government shall order the PCs and LAs to strengthen their coordinating committees. At the same time the Centre will establish a close relationship with the committees and strengthen their functions. Among them it is important to assist LAs in formulating their Action Plans for the improvement of SWM.

8.1.4 Preparation of Implementation Plans for the NSSWM

The NSSWM established the policy for the improvement of SWM in the country. In order to implement the strategy, the central government needs to provide plans and guidelines on how to implement each component of the strategy, for instance how to raise the recycling rate. The Team, therefore, presents the government with some recommendations for how to realise the strategy below.

8.2 Establishment of a Financial Base for SWM

8.2.1 Establishment of a Financial Base for SWM in LAs

SWM works provide people with a sanitary environment, which is a basic human need. The proper execution of SWM, therefore, has to be provided by LAs regardless of the financial feasibility. However, because of the extremely tight financial conditions of the central government at present, it appears to be difficult to seek subsidies from it. Therefore, the government shall instruct LAs to secure their own financial sources by taking the following measures:

- a) To reduce the cost by improving the efficiency of existing resources owned by LAs.
- b) To make current SWM works more efficient through public cooperation such as the introduction of bell collection, and reduce current SWM costs and save some budget
- c) To contract current SWM works out to the private sector, and reduce SWM costs and save some budget
- d) To increase the revenue from assessment tax, trade licenses, etc.
- e) LAs provide residents with only basic services and should charge for special services, which also contributes to waste reduction
- f) To develop a clear, separate accounting system for MSWM and identify each unit cost in order to implement the above-mentioned measures. For this purpose, the central government shall provide a manual for MSWM cost management.

8.2.2 Implementation of the Project for Strengthening the Local Loan System for Facilitating SWM Projects of LAs

Even if the measures mentioned in the previous section are implemented by LAs, it takes a considerable amount of time to save sufficient money for them to construct facilities and procure equipment. Taking the current financial capabilities of the 311 LAs in the country into consideration, it is quite difficult for most of them to invest a considerable amount of money for SWM facilities and equipment without any financial support system. Especially regarding the provision of money for the construction of sanitary landfills, it is difficult for even the seven model towns to maintain such investment though it is proposed in their MGTPs. On the other hand, the demand for financing money for the construction of SWM facilities and the procurement of equipment is predicted to increase day by day since tourism will soon be booming due to the cease fire between the government and LTTE.

Therefore, the local loan system for SWM projects should be strengthened.

Proposed amount of fund: Rs 1 billion

Proposed interest: Less than 4% per year

8.2.3 Promotion of the Improvement of SWM by Financial Scheme

A financial scheme should be provided to LAs in return for the implementation of a formulated long term plan, revenue increase measure, cost reduction measure, management improvement plan, public education plan, building social acceptability plan, public awareness plan, etc. in order to improve the SWM works.

8.2.4 Subsidy to SWM Projects

With economic growth, waste issues will surely become more serious. As for considering how to cope with this problem, private sector participation is absolutely necessary; however, what the private sector can contribute has to be limited because SWM work is a public service. Therefore, LAs still play an active role in the SWM works even though the private sector is involved. On this point, SWM works should be regarded as the same as infrastructure such as roads, water supply, sewage facilities, etc.

At present, grants are given to water supply projects. In order to cope with the increasing seriousness of waste problems, it is necessary to establish a similar grant scheme for the SWM works, SWM facilities in particular.

8.2.5 Establishment of Incentive Mechanism in Subsidy to LAs Towards Cost Reduction

In the present system, the subsidy amount to an LA is based on the salary amount of the LA. If the labour cost is reduced by the improvement of waste collection efficiency with public cooperation, the subsidy amount to the LA decreases. Therefore, LAs have no incentive to reduce costs, the labour cost in particular. This present mechanism discourages LAs from reducing costs by improving work efficiency. In order to create an incentive for LAs to reduce costs by improving work efficiency, the subsidy mechanism has to be changed so that the subsidy does not decrease with a reduction in costs. The saved budget can be spent for other purposes to be determined by the LAs. A block grant, for example, can be a better option.

8.3 Strengthening of the Administrative Capability for SWM

8.3.1 Strengthening of the Administrative Capability of PCs

Though the government of Sri Lanka is implementing its decentralisation policy, the administrative capability of PCs and LAs is very weak. PCs in particular depend on the central government not only for financial aspects but also human resources due to their recent establishment in 1988 as an administrative body between the central government and LAs. Accordingly, the roles of PCs in SWM administration are very limited, with the exception of the Central Province. Since LAs in the country are extremely weak, it is very difficult for each LA to plan, construct and operate a proper SWM facility, especially a sanitary landfill. The need for the construction and operation of inter-municipal SWM facilities will increase year by year, especially in urbanised LAs. In order to establish an inter-municipal SWM system, the role of PCs, which will be to take initiative and coordinate LAs for the location of inter-municipal SWM facilities, is quite important. The central government shall provide support and instruction as follows to strengthen PCs' capabilities to carry out their role in the administration of SWM.

- Provide support to strengthen the function of the coordinating committees at the Provincial level to implement the NSSWM
- Provide support in the formulation of a plan for the establishment of an inter-municipal SWM system at the PC level
- Instruct PCs to coordinate with the NSWMSC

8.3.2 Establishment of a Principle to dispose of MSW within the Juridical Areas of LAs

Many LAs in the country are facing extreme difficulty in siting urban sanitation facilities like landfills due to the very limited juridical areas of LAs. Especially the situation of urbanised MCs and UCs is more serious and they have many disputes with their citizens regarding the construction of SWM facilities, especially landfills. To solve these problems the central government shall take the following measures:

- a) Instruct LAs to establish a principle to dispose of municipal SW within their juridical areas
- b) Require LAs to include the location and plan of urban sanitation facilities like landfills in their urban development plans. Instruct LAs that are not able to locate the facilities within their juridical areas, to establish an inter-municipal SWM system in coordination with PC and LAs.

- c) Establish the siting of urban sanitation facilities as a condition for up-grading a UC to a MC or a PS to a UC
- d) Instruct LAs to formulate a long-term SWM plan and improve their SWM in accordance with the plan

8.3.3 Instruction to LAs of Importance of Landfill Site Acquisition

A landfill, which is a final disposal site, is indispensable in establishing sound SWM in an LA. Neither the central government nor the LAs understand this principle. Therefore, they mistakenly believe that the construction and operation of recycling facilities like composting plants and bio-gas plants can solve SWM disposal problems. There is no LA in the world that establishes its SWM without a final disposal site. Even if an LA makes every effort towards the 3Rs, a landfill is required for proper SWM.

With full understanding of the above, the central government shall instruct LAs to secure their final disposal sites as described below.

- a) No landfill can be constructed without securing consensus of neighbouring communities. To get the consensus of people, LAs shall spend a considerable amount of time and efforts.
- b) To obtain consensus from neighbouring communities, LAs are required to provide some compensation to them or their community. The government shall instruct LAs to secure this compensation for them.
- c) Transparent and public-involved policy making and planning shall be established.
- d) In order to acquire trust from people, LAs shall conduct sanitary landfill operation at current landfills to the extent possible

8.3.4 Promotion of Private Participation into SWM Service

The government of Sri Lanka is promoting private participation into SWM service. The private participation into SWM service is promoted by the following purposes:

- To follow the Government policy to reduce the number of public sector employees
- To achieve more efficient and cost effective services
- To access to more sophisticated management, technical competence and financing
- To obtain cost effective designs, construction and operation of SWM facilities

However, SWM is a basic public service to maintain sanitation and preserve the urban environment, and the service shall cover all citizens in an LA. Therefore, a certain level of performance shall be achieved. With careful attention paid to the very weak capability of LAs in

every aspect, the central government shall establish guidelines for private participation in SWM services considering the following aspects. The LAs shall promote private participation in SWM services in accordance with the guidelines.

- The service performance and costs of the private contractor's work shall be contested and monitored by the LAs to encourage the contractor to maintain high service standards and low costs
- Open and transparent competitive bidding and pricing of the contracted services in order to lower SWM costs
- The contractor shall be accountable to the LAs and customers
- The customers' satisfaction level has to influence the service charges that can be levied on the customers
- The contractor shall be fined for not meeting the contract performance specifications
- Auditing of the contractor's account by an accredited independent auditing firm to ensure transparency and avoid corrupt practices

8.3.5 Acquisition of Public Cooperation

The 3Rs (Reduce, Reuse and Recycle), the main strategy of the NSSWM, will not be realised simply by formulating relevant legislation, developing the system and constructing the required facilities. What is most required for the realisation of the 3Rs, is the co-operation of the public. The type of public co-operation required, however, is one that is long-lived and steady. Consequently, much is expected from the resident education and information programs. Though such resident education and information programs are mainly conducted by LAs, the central government shall continuously support such activities. The pilot projects done in the study were the first step toward gaining public co-operation. The Team recommends the central government to support LAs in conducting education programs utilising several tools prepared by the study.

8.3.6 Strengthening of Educating and Training Functions on SWM

Many LAs suffer from lack of trained human resources in both technical aspects and management. The central government shall provide opportunities for education and training in SWM to as many stakeholders as possible in order to promote the 3Rs and implement proper disposal. Though PCs and LAs shall conduct various educational activities and training for the stakeholders in SWM, the Team recommends the central government to provide such opportunities by utilising existing organisations as shown in the table below.

Table 8-1: Proposed Education and Training Programs on SWM to be done by the Central Government

Training	Executing Organisation	Target Stakeholders
1) Education for SWM Officers	NIPHS	SWM officers and PHI of PCs and LAs
2) Seminar on SWM administration for administrators	SLILG	Council members and high rank administrators of PCs and LAs
3) Training for SWM practitioners	SLILG	SWM staffs working in PCs and LAs
4) Seminar for NGO and SWM companies	SLILG	NGO, private SWM companies, etc.

As for the item 1. Training for SWM Officers, the trainees, who passed the examination to be held at the end of training, shall be given a certificate of a qualified SWM officer. In order to set up this training the central government shall establish a qualification system for SWM officers and order LA to have a qualified SWM officer for its waste management.

8.4 Implementation of the 3Rs and Proper Disposal

8.4.1 Establishment of PPP

The establishment of the Polluter (waste discharger) Pay Principle (PPP) in the country is indispensable to conducting the 3Rs and securing the proper disposal of waste discharged after the 3Rs. In Sri Lanka the PPP has been regulated for hazardous waste (HW) dischargers, but not for non-HW and municipal solid waste (MSW). Since LAs are responsible for MSWM and the cost of its management is covered by the municipal budget, i.e. tax, the dischargers are not encouraged to conduct the 3Rs due to lack of economic incentive to reduce the amount of waste discharged.

Many LAs in Japan have recently introduced a waste collection fee system in order to promote waste reduction. Though the system slightly differs from each LA, the tariffs charged in the fee collection systems are based on the amount of waste discharged.

The Team recommends the central government to quickly establish the PPP for MSW as described below to implement the national strategy.

- To instruct the LAs to introduce a waste service fee system to facilitate waste reduction. For the implementation, the LAs shall take a phased approach and the first step will be the introduction of tipping fees for composting plants and landfills, and a waste collection fee for dischargers of large amounts of waste such as business enterprises.
- The Team concludes the main disposal method of solid waste in Sri Lanka will be landfills in the future, at least this decade. In the case of landfill disposal, plastic waste

hinders the proper disposal of SW, especially in terms of landfill operation and use of completed landfill. A very effective way to solve this problem is to promote the use of bio-degradable plastics. However, the very high price of bio-degradable plastics is a major barrier for its promotion. It is, therefore, recommended to establish a system to impose a certain cost for environmental pollution on users of non-biodegradable plastics.

8.4.2 Promotion of Reuse and Recycling

In the above section, recommendations for waste reduction aspect of the 3Rs, the main policy of the Strategy, are presented. In this section the Team makes recommendations to the central government on the promotion of reuse and recycling.

The Study identified that conventional reuse and recycling systems are established and are very active in the private sector. In terms of reuse and recycling systems, what the central government should do first is to maintain and preserve existing systems as much as possible. The next step shall be promotion of the recycling of bio-degradable organic wastes such as kitchen waste and grass/woods, which account for more than 65 % of MSW weight-wise. The third step, as a future issue, would be the promotion of reusable/recyclable products and the introduction of extended producer responsibility (EPR), which developed countries are very anxious to do today. In this section, the Team recommends methods for promoting MSW composting to the central government.

8.4.3 Promotion of MSW Composting

In Sri Lanka, many LAs are promoting the composting of MSW. Though there are a few success cases, in most cases composting of MSW is hardly successful. Based on past experiences, the Team recommends the central government to take the measures described below in order to promote the composting of MSW.

First, all concerned people in SWM should understand that a certain treatment cost is required for the operation of a MSW composting plant in addition to the income from compost (product) sales. The treatment cost should be covered by the reduction of the final disposal cost (amount). For the promotion of MSW composting, therefore, the government should enforce and instruct LAs to stop open dumping operation and implement sanitary landfill, and make them understand a certain amount of money is required for the proper treatment/disposal of MSW.

In second the government should take the following measures to raise demands of compost from MSW:

- 1) Conduct a market study of compost made from MSW and establish a database that provides information on the demand and supply of compost to both users and suppliers

- 2) Develop a certificate system for MSW compost that guarantees its quality to users as shown in the figure below
- 3) Set up reference laboratories by using the existing ones in universities, etc. in order to issue the certificate of the quality

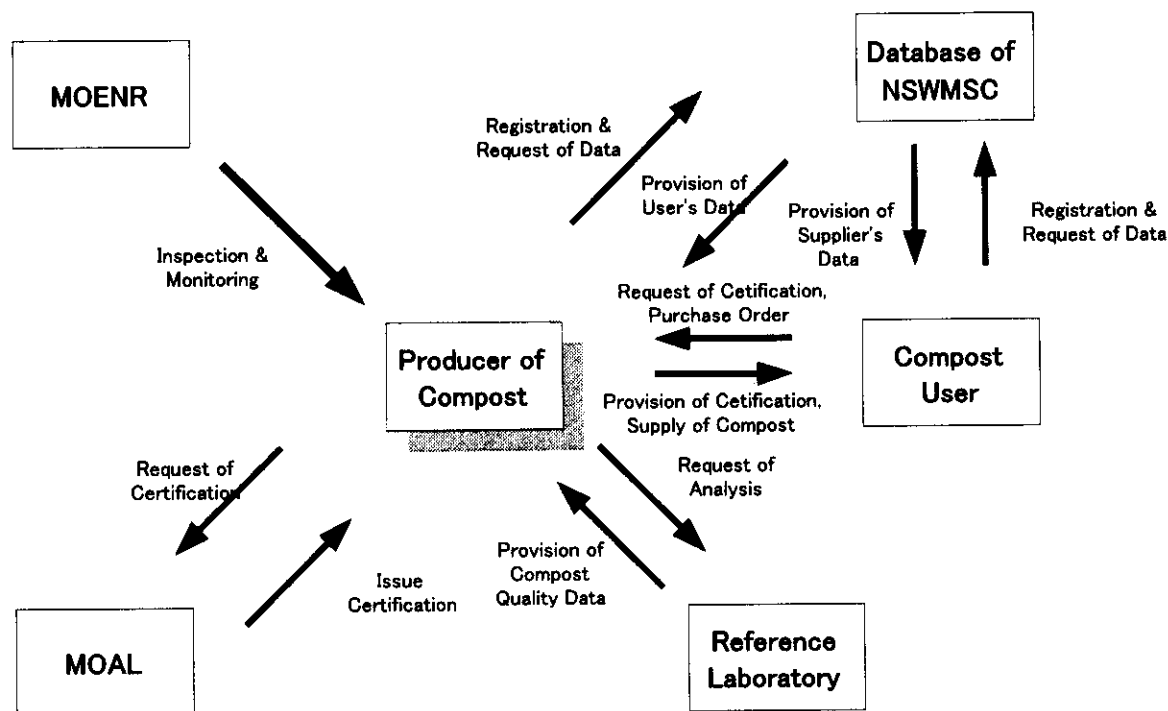


Figure 8-2: Certification System of Compost Quality from MSW

8.4.4 Strengthening of Enforcing and Monitoring Capability for SWM in LAs by Public Participation

It is necessary to strengthen monitoring and enforcement functions for improper disposal in order to facilitate the implementation of the national strategies by LAs, especially the proper disposal of SW. It is an urgent need to establish a monitoring and enforcement system for improper landfills that are under dispute in court. In principle, the CEA under the MOENR should be responsible for this. It is, however, difficult for the CEA to take full responsibility by itself. Considering the very weak capabilities of LAs on SWM, it is essential to establish a monitoring and enforcement system, which puts continuous pressure on LAs to implement proper disposal. In order to establish the monitoring and enforcement system for improper landfill operation, the Team recommends the CEA to instruct LAs to set up monitoring committees consisting of the following members:

- Local residents
- Interested NGOs
- Relevant authorities
- Staff and council members in the local authority

8.4.5 Preparation of Guidelines and Standards for SWM

The policies, strategies and legal provisions for SWM currently in place in Sri Lanka provide the necessary basis for action leading to effective and sustainable improvement in the sector. In particular for HWM, Guidelines for the Implementation of HWM Regulations have been published. As for MSWM, only a national strategy has been announced by the government. The CEA in collaboration with other relevant central government organisations shall establish the following guidelines and standards on MSWM to implement the strategies:

- Guidelines for the implementation of the strategy (NSSWM)
- Standards for the planning, design and operation of SWM facilities including sanitary landfills
- Guidelines for private sector participation including tender and contract procedure with a private firm

8.5 Social Actions

The following social actions should be taken to minimise the negative social impacts to be associated with the implementation of the SWM improvement plan.

- a) Eliminating bias to cleansing workers and traditional recyclers and to socially equitably evaluate them.
- b) To provide cleansing workers to be reduced with another job opportunities as a safety net as the very limited job opportunity for them
- c) Prevention from worsening workers' employment conditions to be brought with the introduction of market competition mechanism, and ignorance of environmental protection by contractors and price rise to be lead by the monopoly and oligopoly.
- d) Public participation into the preparation process of the SWM action plan

8.6 Development of a HWM System

8.6.1 Definition of HW

In Sri Lanka, solid waste is categorized into the following three groups:

- a) Municipal solid waste;
- b) Health-care waste; and
- c) Hazardous waste.

Hazardous waste (HW) is further divided into three categories:

- Hazardous health-care waste (HHCW) and highly HHCW;
- Industrial HW; and

- Domestic HW.

This section presents some recommendations on HWM in accordance with the above three categories of HW.

8.6.2 Hazardous and Highly Hazardous HCWM

The findings and recommendations presented here are based on Chapter 6 Healthcare Waste Study of the Supporting Report. For more detailed information, please refer to the report.

a. Summary of Findings from the Healthcare Waste Study

a.1 Generation of HHCW and HHHCW

Compared to the generation of municipal solid waste (MSW) and non-risk healthcare waste (non-risk HCW is considered as MSW), the generation of hazardous healthcare waste (HHCW) and highly HHCW (HHHCW) is very limited as shown in the table below.

Table 8-2: Generation of HHCW

Items	Generation Amount of MSW	Generation Amount of Non-risk HCW	Generation Amount of HHCW	Generation Amount of HHHCW	Generation Amount of HHCW/HHHCW
LAs	kg/day	kg/day	kg/day	kg/day	kg/day
Kandy	131,000	4,734	359	166	525
Matale	32,000	675	62	29	91
Negombo	136,000	758	60	38	98
Chilaw	22,000	718	49	23	72
Gampaha	54,000	819	60	28	87
Nuwara Eliya	29,000	495	47	22	69
Badulla	41,000	1,407	153	71	224
Total	445,000	9,606	790	376	1,166

It is concluded that the generation of HCW in the sevens model town is very limited compared to that of MSW as shown in the figures below.

- Non-risk HCW: 9.6 tons/day or 2.16 % of MSW
- HHCW/HHHCW: 1.2 tons/day or 0.26 % of MSW

a.2 Current HCM

The results of the medical institution survey undertaken as part of this study are consistent with the picture of medical waste management given in the “State of the Environment – Sri Lanka 2001” report produced by UNEP.

As discussed in the UNEP report and found by this survey, medical institutions may be divided into two categories: those that segregate their non-risk HCW and hazardous health-care waste (HHCW + HHHCW) and those that do not. The majority of medical institutions do segregate their

wastes. They usually dispose of sharps by burning them either in a pit or on open ground within their premises. A few medical institutions are equipped with incinerators where all HHCW is burnt. Body tissues and parts are generally buried or cremated by the authorities of medical institutions, undertakers or the LA. Placentas may also be buried or sold to private vendors. For those medical institutions that do not separate their wastes, sharps and the rest of the HHCW are generally mixed with other MSW and disposed of by the LA. Even when HHCW is segregated, it still may be mixed with non-risk HCW during transportation and eventually reach an open dump site.

This Healthcare Waste Study identified inadequate collection and disposal of HHCW as a serious problem, with the vast majority of medical institutions desiring much improved HCWM, many specifically requesting the provision of incineration facilities. These requests could possibly be addressed by constructing an incinerator at the major government hospital in each town or another suitable location for use by all hospitals within the LA limits for the incineration of HHCW. Private hospitals would be expected to pay a fee for use of this incinerator. This matter is beyond LAs' jurisdiction, but LAs can recommend such a proposal to the Ministry of Health for further consideration.

b. Recommendations

b.1 Through Segregation of HHCW/HHHCW

The results of the Healthcare Waste Study show that the amount of HHCW/HHHCW generated in the model towns is very limited, i.e. 1.2 tons/day, compared with MSW generation amount, i.e. 445 tons /day, and only 0.26 % of the MSW generation amount. If segregation of HHCW/HHHCW from non-risk HCW is thoroughly done, the burden of its treatment is also limited. Therefore, the competent authority (MOHNW) for enforcing segregation at medical institutions shall order the separation of HHCW/HHHCW from non-risk HCW at each stage of SWM; i.e. generation, internal collection, on-site treatment, storage and discharge.

The competent authority (MOHNW) has to concentrate efforts, in the short term, towards elaborating technical instructions to orient the management of the HHCW and HHHCW, and to promote a training program for the operative and executive personnel of the medical institutions.

The operational personnel shall be trained to sort and place waste at the source, to operate the sterilization and incineration equipment, and to carry out maintenance, cleaning and disinfection of floors, vehicles and storage rooms. The selected head-person for these personnel shall be appropriately qualified for planning and executing these services.

Medical and paramedical staff, particularly nurses, shall be motivated for the HCWM system and shall be trained to sort and place waste at the source, as well as to use the sterilization and autoclave equipment.

b.2 Disposal System for HHCW and HHHCW to be Improved Step-wise

It is necessary that a technical system for HHCW and HHHCW be established (i.e. each type of HHCW and HHHCW be separated at generation sources, exclusive collection/transportation and treatment/disposal for HHCW and HHHCW be practiced). Thermal treatment by individual small-scale incinerators has problems in air pollution control and O&M features. Meanwhile, a centralized incinerator project needs to overcome the problems of inefficient scale and cost recovery.

Consequently, it is proposed that an exclusive section of a municipal landfill site be allocated for a sanitary landfill for HHCW and HHHCW for the time being. Separate and isolated landfill operation should be employed there. In the future, HHCW and HHHCW should be sent to and incinerated at an incineration plant for HW. When the centralized incineration plant is in operation, a strict gas emissions regulation may possibly start to be imposed on existing individual small-scale medical incinerators.

The construction of a HHCW and HHHCW disposal site would incur additional expenses. Legally, medical institutions should shoulder all expenses for the handling of HHCW and HHHCW, that is from collection to disposal. A study should be carried out, therefore, as to the manner in which medical institutions should cover the increase in the expenses.

8.6.3 Industrial HWM (IHWM)

a. IHWM for the Time Being

Although regulations, standards and guidelines on HWM are established, they have not been implemented due to lack of HWM facilities. The early construction of HWM facilities is a matter of national concern. Legally the treatment and disposal of HW is the responsibility of the discharger.

The central government shall accelerate the construction of HWM facilities for the whole country. Until such facilities are operated, it is recommended that the authorities of the government practise the following measures in the management of HW.

- Oblige industries to minimise HW generation and to handle and store waste within their premises.
- Investigate the use of existing facilities for the treatment of HW (incineration in kilns of cement factories and furnace of non-ferrous metal smelting factories, etc.). Oblige industries to treat such waste prior to discharge and to store on their premises waste that cannot be treated in the existing facilities.
- Establish a strict monitoring system for incoming haulage vehicles to prevent the disposal

of HW along with municipal waste at the municipal disposal site. As for industries considered as highly potential hazardous industrial waste generators (such as plating, dyeing, etc.), only when the industries prove that their waste is not hazardous will they be entitled to dispose of waste at the municipal disposal site.

b. Promotion of the Use of Cement Factories

It is possible to treat some kinds of HW (such as waste oil and solvent, organic HW (sludge, etc.), etc.) at cement factories if the incineration of the HW does not affect the final product, i.e. if it does not contain a lot of chlorine, heavy metals, etc. Under the above-mentioned situation, the use of cement factories as HW treatment facilities has the following advantages:

1. It promotes waste reuse/recycling by utilizing HW as raw material or fuel, and at the same time it makes up the deficit in final disposal capacity since there is little residue.
2. It will not encounter public opposition as fiercely as the construction of new facilities because the existing cement factories are utilized.

In Japan, cement factories that produce 82 million tons of cement a year receive 25.6 million tons of waste, which is equal to 31% of the production. Waste oil and organic HW account for 1.3% and 6.8%, respectively, of the waste received at the cement factories.

As a reference, the types, uses and volume of wastes that cement factories in Japan received in 1999 are summarized in Table 8-3¹. Various types of wastes are utilized at cement factories in Japan.

Table 8-3: Type, use and volume of wastes received by cement factories in Japan in 1999

Waste	Utilization	Weight '000 ton
Blast Furnace Slag	Raw Material, Mixing Material	11,449
Coal Ash	Raw Material, Mixing Material	4,551
By-product Gypsum	Raw Material (Additive)	2,567
Low Quality Coal from Mine	Raw Material, Fuel	902
Non-iron Slag	Raw Material	1,256
Revolving Furnace Slag	Raw Material	882
Sludge	Raw Material, Fuel	1,744
Soot & Dust	Raw Material, Fuel	625
Molding Sand	Raw Material	448
Used Tire	Fuel	286
Reclaimed Oil	Fuel	250
Waste Oil	Fuel	88
Spent Activated Clay	Fuel	109
Construction wastes	Raw Material, Fuel	2
Others	---	423
Total		25,582

¹ Tadahiro Mihashi, "Challenge to Zero- Waste Factory", Japan Institute of Plant Maintenance, September 2000.

c. Promotion of Waste Analysis/Blending/Adjusting Industry

Cement factories do not apply waste to production lines without a guarantee of quality and quantity that are satisfactory enough to substitute the raw material and fuel currently used. Waste from one factory may not meet the requirement of the cement industry, but if the qualitative and quantitative characters of waste generated at different factories is well understood and blended together to adjust quality and quantity, waste can be acceptable at cement factories. Waste blending and adjusting facilities and technology are essential to establish a recycling system driven by the cement industry. The team recommends the central government to foster and lead the waste analysis, blending and adjusting industry in the following way to appropriately utilize cement factories as treatment/reuse/recycling facilities.

- 1) In order to stimulate the waste generators' demand for the waste blending industry, the central government should strengthen the requirement that factories implement proper HWM. As a result, the need for the waste generators to supply waste that is currently difficult to treat/recycle and has to be disposed of on-site or off-site will increase.
- 2) The central government should provide the cement factories with information about the waste generators' demand for waste treatment/recycling at the cement factories. The information will include what kinds of waste can be recycled at cement factories, and how such waste is currently treated and disposed of in Sri Lanka. Also, the central government should encourage and support the cement factories to prepare waste reception standards.
- 3) In order to promote the waste blending industry, the central government should publicize waste blending technologies used in Japan and other countries.
- 4) The central government should introduce a licensing system that does not only control the waste collection/transportation system, but also officially authorizes the ability of the blenders so that their clients will trust them.

d. Promotion of HW Treatment/Recycling not by Cement Factories

There are many waste treatment/recycling methods other than the application of waste at cement factories, and the central government should also promote them. The central government needs to consider the following in promoting waste the treatment/recycling business.

- 1) Top priority should be given to the improvement of existing facilities and reuse/recycling processes so that HW can be reused, recycled and/or treated.
- 2) The quality and quantity of waste that is acceptable should be clarified.
- 3) The necessity to install pollution prevention equipment must be examined and the fulfilment of the discharge standards should be ensured.
- 4) The profitability of the business is confirmed.

8.6.4 Domestic HWM

The generation amount of domestic hazardous waste (DHW), such as dry cell batteries containing mercury and fluorescent light, is also very limited like that of HHCW/HHHCW. Its disposal, however, together with MSW at municipal landfills has a serious impact on the landfills. In addition, there is no treatment/disposal facility anywhere in the country. Therefore, the Team recommends the central government to take the same measures mentioned in IHWM.

