

(15) Environmental Stations, Quality Control and Engineering Facilities

- Site manual rain gauge (5") to be provided to enable the leachate run off to be correlated with the site rainfall;
- 9 Screened groundwater quality and level monitoring wells at 6 selected locations around the quarry. Three of the locations to be 'twin' monitoring aquifers within the upper and lower strata (shown located in Figure 2-2-5;
- site equipped with at least (a) portable gaseous monitoring equipment for water vapor, humidity, methane, carbon dioxide, and oxygen. and (b) waste monitoring equipment for the sampling and determination of the physical characteristics of wastes and compacted densities,
- permanent landfill setting out stations and bench marks constructed round the site. Manager's office equipped with a tachometer and stock of sight rails and level posts, pegs etc; to facilitate landfill grading, advance planning and preparation of further filling platforms and cells;

(16) Internal Screening Facilities

- Set of three movable internal working area screens/fences with spares to assist in the containment of wind blown waste matter.

(17) Rodent, Insect, Parasite and Bird Control Facilities

- Site with pest control facilities and officer;
- spray equipment and stock of insecticides and pesticides (stock sufficient for 3 years);
- bird control equipment and 4 sets of operation nets as detailed;

(18) Site Entrance Facilities

- Main entrance facilities with two pairs of vehicle entrance and exit gates and a staff pedestrian entrance;
- permanent site office to initially serve as reception, gatehouse, weighbridge, power distribution, and computer house.
- two sets of perimeter fence vehicle inlet and outlet gates, a pedestrian gate and card operated computerized entrance and exit weighbridges and automatic barriers;
- 4 No 35 ton weight bridges;
- reception office equipped to issue 'occasional commercial vehicle' entrance #exit cards. Escape 'slip road' provided exit of rejected visitors.

(19) Landfilling Consumables

- Precast concrete road slabs to be used as the site expands and to replace breakages etc. (1,875 m)
- Granular roadbase material (3,000 m³)
- Porous concrete gas discharge risers (1,000 m)
- Crushed rock; gas riser (3,500 m³)
- Horizontal gas headers (1,800 m)
- Leachate collection pipe (800 m)
- Leachate pipe surround (200 cu m)
- Leachate pipe with specials (500 m)
- Anti litter fencing (300 m)
- Misc. (road salt, Sodium Hypochlorite, Caustic soda)

(20) Landfill Site Vehicles

- Manager's Car 1 No Site Van 2 No
- Personnel Bus 1 No
- Falconer's Vehicles 2 No

(21) Landfill Plant

- Waste Compactors 3 No
- Dozers/Graders 4 No
- Excavators-Tracked 4 No
- Dump trucks 6 No
- Backacting excavator 1 No
- Dumper (small works) 1 No
- Tanker 1 No

2.2.13 Environmental Protection Measures

Protection measures incorporated in the environmental engineering proposals are a statutory requirement and are a necessary and fundamental consequence of the design approach and of the ethical standards applied, and of the design criteria established in the Master Plan

In the case of Katina it is reiterated that the adaption of this former open cast coal mine for the confinement of methane producing landfill is not an ideal solution. The presence of the coal strata is probably the one single and dominating environmental hazard will inevitably have to be the subject of constant vigilance by the Site Manager.

Until such time as the General Bulgarian Land acquisition and ownership difficulties are resolved, no satisfactory economically exploitable alternative can be located. Accordingly the

use of this site is 'recommended' for adoption only provided it is properly engineered, properly constructed and competently managed by experienced geotechnical staff.

Having said that, it is also be pointed out that if the recommendations are followed the Site is otherwise considered eminently suited for Municipal, Commercial Waste Deposit and for other wastes satisfying the EC criteria as suitable for joint landfilling.

(1) Care Required in the Design, Construction and Management

Accordingly considerable care has been taken to study alternatives for site preparation, and implementation of the isolation of the coal seams and the substantial earthmoving and filling operations. This work included lake drainage and so engineering a gravity watertable drawdown arrangement whereby the presence of the groundwater below the fill is advantageously used to provide positive protection against leachate ingress.

It is clear that mismanagement at Katina could not only lead to misuse of a costly investment (eg: poor compaction, filling with building and commercial waste at unrealistic economic rates) but it could also result in the hazardous exposure of the fill to self igniting lignite, gas migration and other major safety risks.

(2) Self Protective Engineering achieving Substantial Economy

Substantial economies have been achieved therefore by engineering some quite unusual measures in order to achieve 'self protective hydraulic isolation'. Success of this exercise is now apparent and SGM can therefore benefit from the advantage of being able to avoid the use of the costly protective HDPE liners, and other proprietary systems now adopted elsewhere.

(3) Eventual Environmental Enhancement

The main engineering effort and protective measures taken in the designs have therefore concentrated on applying the principals of Modern Sanitary Engineering and Geotechnical Technology to enable SGM to acquire a useful and properly engineered site and achieve Environmental Enhancement if the filling is professionally and competently managed and when, around the year 2010, the last scars of the Mine are buried and the Natural Patrimony of the area is restored.

(4) Lake and Underground Drainage

As mentioned, a review of the inner lake water quality indicates that it is technically unsuitable for discharge into the local watercourses even although the main water body:

- a. currently supports a fish population,
 - b. is substantially better in quality than many of the adjacent Iskar Tributaries,
 - c. is the natural groundwater that is most probably feeding the River Iskar as 'recharge' at Novi Iskar and downstream towards the Danube,
 - d. contains low levels of some locally acquired surface water pollutants which are reminiscent of the characteristics of a typical Urban Area storm water run off,
 - e. would only be at larger flow rates for a limited period,
 - f. would clearly not be a 'Gross' contamination.
- Sediment samples drawn from the settled muds from the silts, clays, coals and other minerals of the aquifer system confirm the presence of inevitable heavy metals; lead, nickel, mercury, etc. Others such as Uranium can also be expected.
 - The discharge of muds, oils, suspended sediments etc from the site during construction and the watertable drawdown is a very real and normal contractual risk for this type of work.
 - Options for the lake water discharge (440,000 m³ over a period of 4 to 6 months) are:
 - a. discharge directly to the Katinska stream
 - b. pipe the discharge to the nearby Novi Iskar Town surface water drainage system: Collects to the Katinska and discharges into the Iskar

These options are considered as follows:

- Option a): Katinska stream is heavily used and as it passes the Site it is frequently dry or at exceptionally low levels. Compared with option (b) this choice would be almost untenable especially when the feed pipework can be routed to the culvert with others,
- Option b) is the obvious first choice if permission is granted from the Ministry of Environment.

2.2.14 Operational Plan

As previously referred to, an operational plan to economically maximize the internal volume of the quarry has been carefully worked out in some detail and the base design and site arrangements adjusted accordingly.

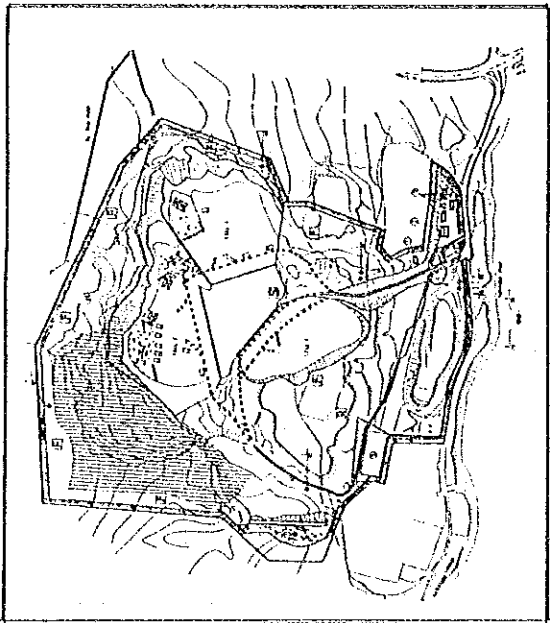
Figure 2-2-13 shows the plan in a series of staged and progressive developments of a cellular system of working until the site is full and can be closed.

The plan:

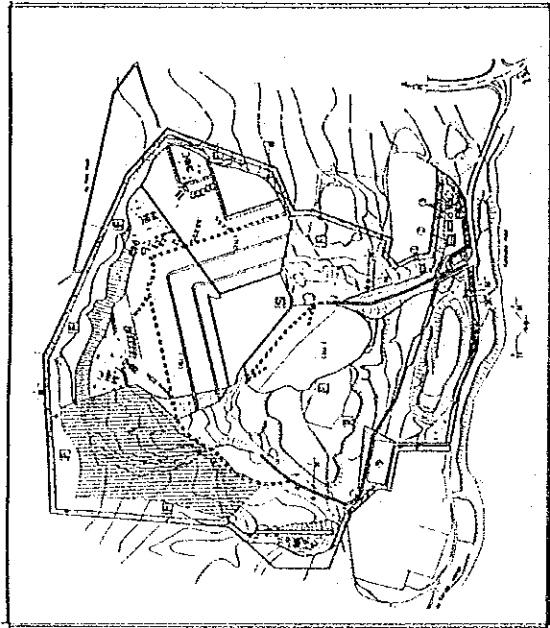
- Is achievable with proper on-site professional control and supervision;
- avoids importing building waste or other cover material into the central body of the quarry;
- nominates an advance program of operationally stage cover material borrow pits;
- reutilizes temporary road matting (PC concrete) in a manner which optimizes traffic circulation and avoids mixing site compaction and earth moving plant with the waste deliver vehicles;
- maintains cellular working throughout the filling life;
- maintains a workable system of surface water separation as the quarry is filled;
- targets and achieves early completion and final covering of the area nearest to the Holiday Homes;
- selects and minimizes extent to which the quarry pit outer edge has to expand as cover material burrowing progresses and as the working platforms rise over the years. Expansion has been confined to the areas most remote from the adjacent homes;
- provides facilities for the staff to achieve proper control over the landfill biological activity and gives SGM the facilities to influence internal anaerobic processes.

2.2.15 Bird Control Measures

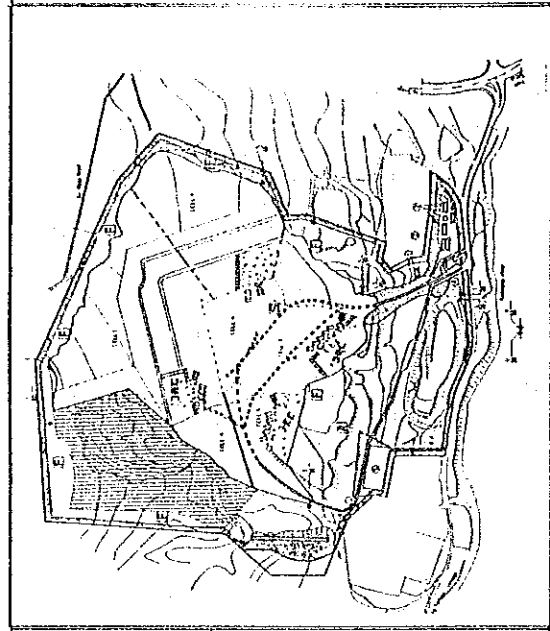
In view of the proximity of the Military Airfield, this Section is written specifically to set out the 'philosophy' and 'technology' envisaged to enable SGM to operate at the site with confidence that it will not increase or permit an increase in the Bird Population in the Katina Landfill Area.



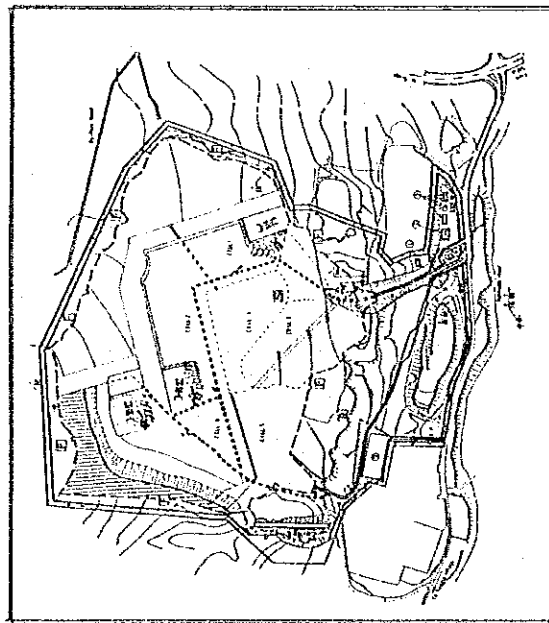
STAGE 1



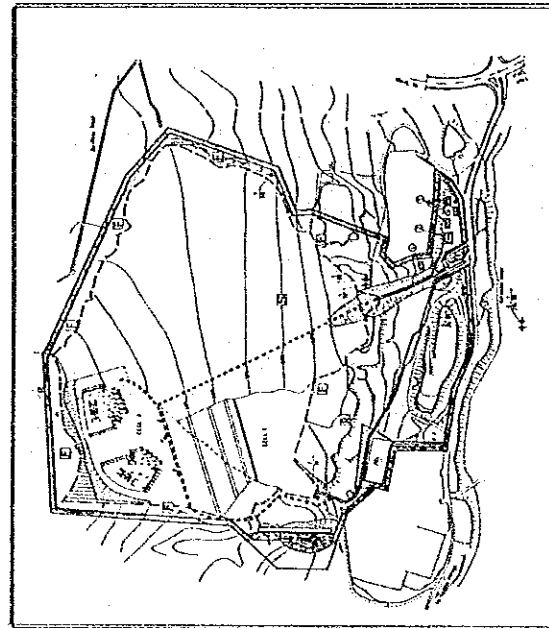
STAGE 2



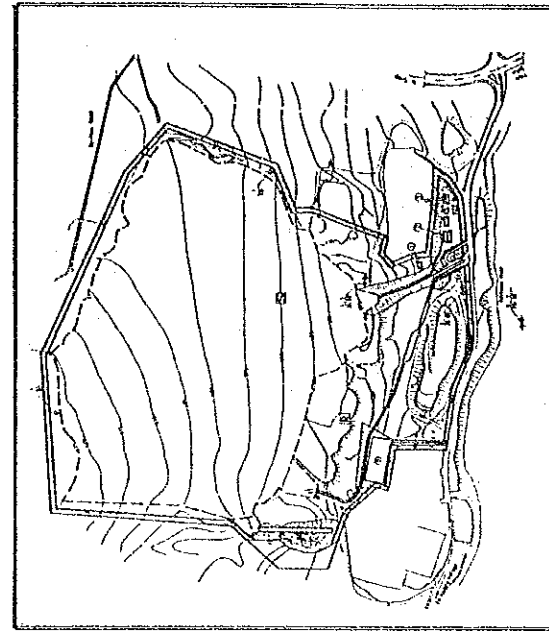
STAGE 3



STAGE 4



STAGE 5



STAGE 3

KEY SYMBOLS

- [F] Area Investigating Force
- ◆ Control point (interlocking with 100' and 200' for the stream)
- Vertical line at the top end of the main underground tunnel
- [S] [R] [B] [G] [Y] [C] [M] [W] [K] [L] [P] [D] [N] [E] [O] [Q] [U] [V] [X] [Z]
- [H] [I] [J] [K] [L] [M] [N] [O] [P] [Q] [R] [S] [T] [U] [V] [W] [X] [Y] [Z]
- [A] [B] [C] [D] [E] [F] [G] [H] [I] [J] [K] [L] [M] [N] [O] [P] [Q] [R] [S] [T] [U] [V] [W] [X] [Y] [Z]
- [1] [2] [3] [4] [5] [6] [7] [8] [9] [10] [11] [12] [13] [14] [15] [16] [17] [18] [19] [20] [21] [22] [23] [24] [25] [26] [27] [28] [29] [30] [31] [32] [33] [34] [35] [36] [37] [38] [39] [40] [41] [42] [43] [44] [45] [46] [47] [48] [49] [50] [51] [52] [53] [54] [55] [56] [57] [58] [59] [60] [61] [62] [63] [64] [65] [66] [67] [68] [69] [70] [71] [72] [73] [74] [75] [76] [77] [78] [79] [80] [81] [82] [83] [84] [85] [86] [87] [88] [89] [90] [91] [92] [93] [94] [95] [96] [97] [98] [99] [100]

Legend

- 1. Location of main line and mainline roads
- 2. Stationing line
- 3. From inside perimeter
- 4. From outside and nearby
- 5. Area cleared 1/3 day (dotted pattern)

Figure 2-2-13 Staged Operation Plan

The measures are summarized:

- Introducing a team of 3 specialist Falconers to the site equipped with vehicles, dogs, rifles, Falcons (a breeding and captive population) and standard electronic bird scarers.
- Working the landfilling under anti-bird netting

These measures are expensive both to provide and maintain. They are both proven and, particularly the netting, well established and very effective. They are included in the costs of developing and running the site:

The following discusses/explains related aspects of the proposals.

Airport authorities are always concerned in respect of Landfill especially in coastal areas. This is due to the possibility that overflying could 'raise' a hazardous flock of Birds or the flocks could well take to loafing at the airfield or some other spot in the flight path on their way to or from a Landfill site (even some considerable distance from their nesting/breeding grounds).

Seagulls known to regularly visit landfills have been studied soaring to altitudes of some 1,000 feet near or over a refuse site.

Accordingly, landfill designers tend to plan to avoid airport areas whenever possible. If there is no option but to plan to operate a Site in areas known to tend to attract landfill-type birds or within a few kilometers of an airport there are standard design and operating procedures and measures which can be applied. Some are as mentioned above.

In Bulgaria there are no legal requirements although guidelines suggest that landfill sites be at least 10 Km from an airfield. In UK there is a statutory requirement that if a landfill site is planned within 8 Km of an airport, then consultations with the Airports authority must take place.

Accident rates due to birds at airports vary depending on the region. An example of the situation is illustrated by the following News report of Jan 1994:

"The Indian Civil Aviation Authority is searching with an advertising campaign for persons or institutes who have experiences in falconry. The falcons should help chase away

all birds in the vicinity of Airports to minimize the collisions with birds. With approximately 230 accidents per year, India has the highest rate of damage by Birds, followed by Canada with 205 and Australia with 123."

In order of increasing 'appraised merit/suitability' the following discusses standard Bird Deterrent/scaring techniques:

a. Distress calls

Several patented devices for retransmitting Bird distress calls exist. They seem to be only as effective as the user can persist in varying location and circumstances of use. Problems occur when Birds get used to the calls and ignore the efforts. With other devices/methods the system can be a useful addition, particularly when vehicle mounted (or movable).

b. Dogs

Dogs can be trained to assist in bird scaring. Much depends on the operator/owner.

c. Shell crackers.

This method is the 'standard' effective bird clearer at London Heathrow Airport. It involves firing explosive shells over settled birds. The result is said to be extremely frightening to all concerned.

d. Falconry - Birds of prey (Using Hawks, Kestrels, Owls etc)

This method is well proven and is the most common adopted in UK by the various Bird Clearing Contractors employed by the Royal Air Force.

In general, a Falconer is employed who holds a license for keeping a particular type of bird. For a major site with strong attractions, falconers work in teams. Typically on a land fill the site will close down some 2 to 3 times daily and a team of say two birds are flown. The most effective methods of falconry involve regular killing of the invading species. Otherwise the gulls/other birds may attack and kill the falcon (or owl etc) as in pest clearing instinct. Falconers occasionally take to shooting the gulls to reinforce the technique.

Proposals are to introduce a suitable 'captive killing species' into the region by bringing breeding pairs from a UK (or western) contractor and establishing the 'art' of falconry in the country.

Preliminary proposals are for three falconers to operate a full 7 day coverage and to establish a working pattern over the first year. During the second year it is proposed that the techniques and falconry be 'handed over' for local training and operation.

e. Landfill Nets

Landfill Nets were first developed in South West England. They are extremely effective if used properly and are reported by the UK local authority operators as some "99%" effective, ie an almost total elimination of Birds.

Comparable UK instances of the specification of the use of these nets are at:

- The Brenkley landfill site located 2.4 Km from Newcastle Airport. At this landfill, nets were specified for use by the Civil Aviation Authority.
- A 'Blue Circle' landfill site within 1 km of Cardiff Airport and also 2.5 Km from a Royal Air Force Base.

The standard design of the netting system in use comprised a set of peripheral movable standards, 12.5 m high from which a rectangular Box-shaped net is suspended. Internal dimensions are 36m x 36m. Due to local conditions at Katina it is considered that the plan dimensions should be increased to at least 48m and possibly 60m X 36m: To give improved working area in wet weather when the clay material may be troublesome if the space is too small.

Due to the traffic intensity, three such nets will be required to allow filling to take place on three simultaneous faces. One net in addition is proposed as 'Spare' for moving/standby etc.

Secondary benefits of net working is the elimination of wind blown waste.

The standard methods of eliminating/and or reducing the Bird flocks are to:

- Frighten them away
- Remove the attraction

Due to the seriousness of the problem at Airports there is a lot of Professional expertise and experience from which to draw. In relation to Katina, expert opinion is clear. It is:

- Remove the strongest attraction and prevent the Birds feeding on the waste. The remaining task is then to permanently deter the flocks from site visits.
- Adopt prompt and efficient waste covering and keep the site clean of attractions
- Persist vigilantly with proven methods such as Falconry (7 days per week)
- In the event of a serious problem eliminate any attraction by using nets.

All of these are recommended in combination.

2.3 Recycling

2.3.1 General

Recycling of reusable material is one of the important issues dealt with in the draft waste act of Bulgaria that may be put into force within 1994. To promote recycling activity in the future, the master plan recommends that a pilot project for recycling be implemented and amenity centers constructed. The following three points shall be carefully examined to promote and ensure the success of recycling.

- a. Existence of reusable material market demand.
- b. Consideration of, and planning for requirements of the users (factories in this case).
- c. Enthusiasm and cooperation of the residents that have a key role in separation and cleaning of reusable material. Great effort shall be paid to obtain residents' cooperation and enough information shall be given to them.

2.3.2 Market of used Paper and Glass Cullet

As paper and glass are the main reusable items to be collected, the market demand for both items has to be studied.

There is only one company that receives used paper in Sofia, although there are 3 other companies in Bulgaria. This company produces cardboard and receives used cardboard and mixed paper that consist of old newspapers, magazines etc through Mehaplast (around 50%) and other recycle shops (around 50%).

The processed material consists of 70% used paper and 30% raw material at present. At this time there is not much demand for used paper because of small demand for the final product itself. However, if demand for cardboard increases in the future, around 77,000 ton/year of used paper may be marketable considering production capacity of the company.

Also it shall be considered that there may be a sufficient market for used cardboard but only a limited market for mixed paper to fulfill shortage of cardboard.

Table 2-3-1 shows the available potential for recycling of paper.

Table 2-3-1 Potential for Paper Recycling
(Unit: ton/year)

	Production	Market of used paper			Total
		Mehaplast	Recycle Shop	Other	
1993	30,000-35,000	10,000	10,000	0	20,000
Maximum	110,000	10,000	10,000	57,000	77,000

Note: Amount through Mehaplast and private shops assumed to be the same as at present.

It shall also be assumed that the decreasing recycled amount through Mehaplast shall be covered by other ways to supply necessary material for production of paper company.

Presently, there is only one company that is using cullet of glass in Sofia but there are 6 companies nationwide. The company produces white and green glass bottles and receives white and green cullet from Mehaplast, wine factories and other sources. At present only 4,500 ton/year of cullet is reutilized including 2,000 ton/year of cullet generated in the process (6 - 7% of production amount).

Maximum cullet amount that can be used in processing represents 33% of production, but at present only 10 to 12% is used. Table 2-3-2 shows the possible amount to be used at present and in the future.

Table 2-3-2 Potential of Cullet Recycling
(unit: ton/year)

	Production	Possible amount of cullet			Total	
		From process	Mehaplast	Wine factory source		Other
1993	31,000	2,000	1,500	750	5,980	10,230
Maximum	62,000	4,000	1,500	750	14,210	20,460

Note: Amounts through Mehaplast and other factory assumed the same as present

Recycling of bottles is another form of recycling. Soft drink and beer bottles are reutilized through recycle shops.

Present prices of used paper and cullet of glass are summarized as follows.

Used paper	
Used cardboard	1,350 Lv/ton
Mixed paper	850 Lv/ton
Cullet	
Green cullet	500 Lv/ton
White cullet	450 Lv/ton

The paper market has no room to receive additional reusable material because production of the company is limited by shortage of demand at present. However glass market has room for an additional demand of about 6,000 ton/year at this time. Market for used paper and cullet is expected to increase in anticipation of the economic recovery in Bulgaria.

2.3.3 Basic policy for recycling

1) Recycling system

The technical systems employed in recycling in Europe and Japan are summarized as follows.

a. Container system

This is widely used in Europe. Different containers are provided for each reusable material. Glass is separated by color. Sometimes, paper is also separated by type. Reusable materials in containers are collected periodically such as once a month.

b. Specified day's collection system

This system is practiced in Japan using community organizations. Residents are informed to bring reusable material on a specified day to a specified place and municipality or private companies collect these reusable materials. In most cases, community organizations receive some assistance from municipalities or private companies.

The container system may be more suitable in Sofia considering everyday use of containers in SWM and lack of community organizations.

Under the container system, both systems of hauled container and stationary container are used. As an experimental stage,

stationary container system is recommendable for its flexibility.

2) Organization of recycling

The present activity of Mehaplast, recycling shops and scavengers is expected to continue in the future.

Paper and glass factories, as users of recyclable material have a role in the recycling system. Mehaplast and recycling shops will also play an important role in the process such as packaging of used paper.

In the new SWM organization proposed under the M/P, planning and design section at the headquarters and the depot where the pilot project area is located, shall be the responsible agencies for the pilot project.

Mehaplast, recycling shops and scavengers are the main participants in the recycling at present. Users of reusable material are paper and glass companies. In the future the relationship between their recycling activities and those of the PLC shall be well coordinated through experience gained from the pilot project and based on the following principals.

- a. The new recycling system is not intended to conflict with Mehaplast, recycling shops and scavengers. Activities of Mehaplast and recycling shops are expected to continue in the future. To avoid conflict with scavengers, some field for their activity shall be maintained.
- b. Mehaplast and recycling shops can participate in municipal recycling activity because packaging of used paper is one of the users' requirements.
- c. Paper and glass companies will function as users of reusable material.

3) Flow of reusable material

The system adopted in the pilot project calls for residents to separate reusable materials such as glass and paper from their waste, and discharge that waste at specific locations. The municipality will be responsible for collecting and delivering the separated reusable materials to the users. A pilot project is intended to provide experience and know-how for future extension of the system. The project shall help promote and ensure residents cooperation in separation to fulfill users requirements and ensure a good outcome of the recycling system.

Flow of reusable materials will be as shown in Figure 2-3-1.

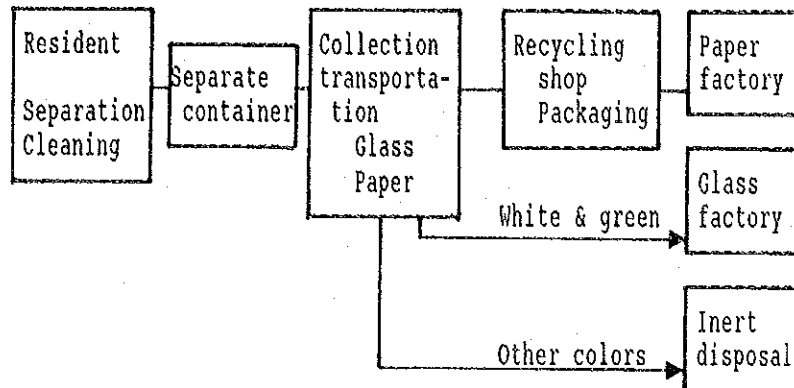


Figure 2-3-1 Flow of Reusable Materials

4) Schedule and expansion of the recycling project

As mentioned above, market demand for used paper is presently not enough because of limited paper production at the factory. Therefore, the recycling pilot project is proposed to start later in 1997, although market demand of glass is sufficient to warrant earlier commencement of the pilot project.

Based on the experience gained from the pilot project, further expansion of the area is necessary to achieve targeted recycled amounts set in the master plan as follows.

Year	Percentage	Recycled amount
2000	5%	22,800 ton/year
2005	10%	50,000 ton/year
2010	15%	81,400 ton/year

To achieve these targets the following approach, shown in Figure 2-3-2 is recommended to start with the pilot project then expand to other areas.

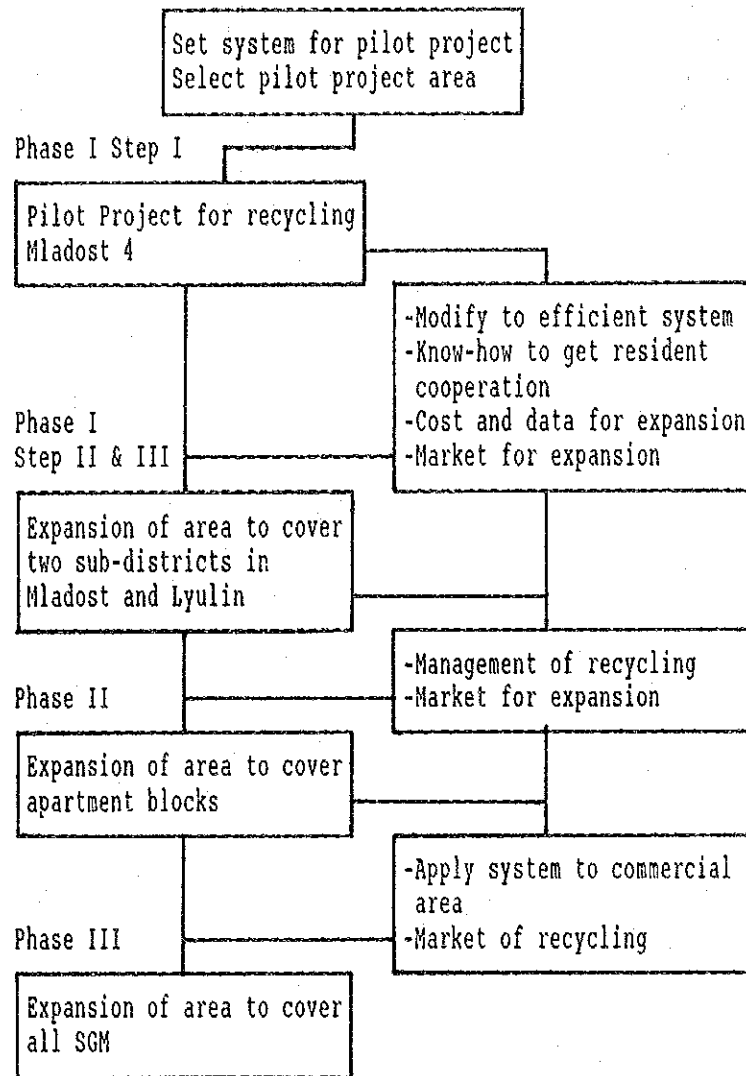


Figure 2-3-2 Phased Introduction of Recycling

2.3.4 Recycling Pilot Project

1) Target and selection of the area

Targeted amount of reusable material to be recycled in year 2000 is set at 5% of domestic and commercial waste. Therefore, around 10% of paper and 20% of glass shall be recycled as follows.

	Percentage	Amount	Recycling amount	
	in wet base composition	in total (ton/year)	Percentage	Amount (ton/year)
Paper	25%	114,000	10%	11,400
Glass	12%	55,000	20%	11,000
Total		169,000		22,400

It is noted that soft drink and beer bottles will be recycled through recycle shops in the future, as the current practice.

2) Selection of project area

The most suitable and least complicated area shall be selected for the pilot project. This should be an area where it seems relatively easy to obtain citizens cooperation, as that is one of the key points to ensure the project's success. A block apartments area is considered the best area that meets those requirements, due to the following:

- a. It is easy to find space to put recycling containers
- b. It can be expected to generate some amount of reusable material on a continuous basis.

Block apartment areas are scattered around the center of Sofia. Considering stepped expansion of the area, a part of Mladost district, with a total population of 91,000 person in 1992 may be the most suitable area for the recycling pilot project. Characteristics of the area are shown in Table 2-3-3 and Figure 2-3-3 shows the location.

Table 2-3-3 Population of Mladost District

Sub-district	1992	1995	2000	2005	2010	Remark
Mladost 1 A	6,046	6,320	6,805	7,190	7,570	
1	28,768	30,072	32,379	34,200	36,110	
2	16,010	16,736	18,019	19,033	20,100	
3	22,329	22,341	25,131	26,545	28,010	
4	18,149	18,972	20,427	21,580	22,770	Pilot proj.
Total	91,302	95,441	102,761	108,548	113,560	

The pilot project shall start with a targeted population of 24,000 up to the year 2000, cover 2/3rds of the total population, ie 88,000 by the year 2005, and all the district's population by 2010.

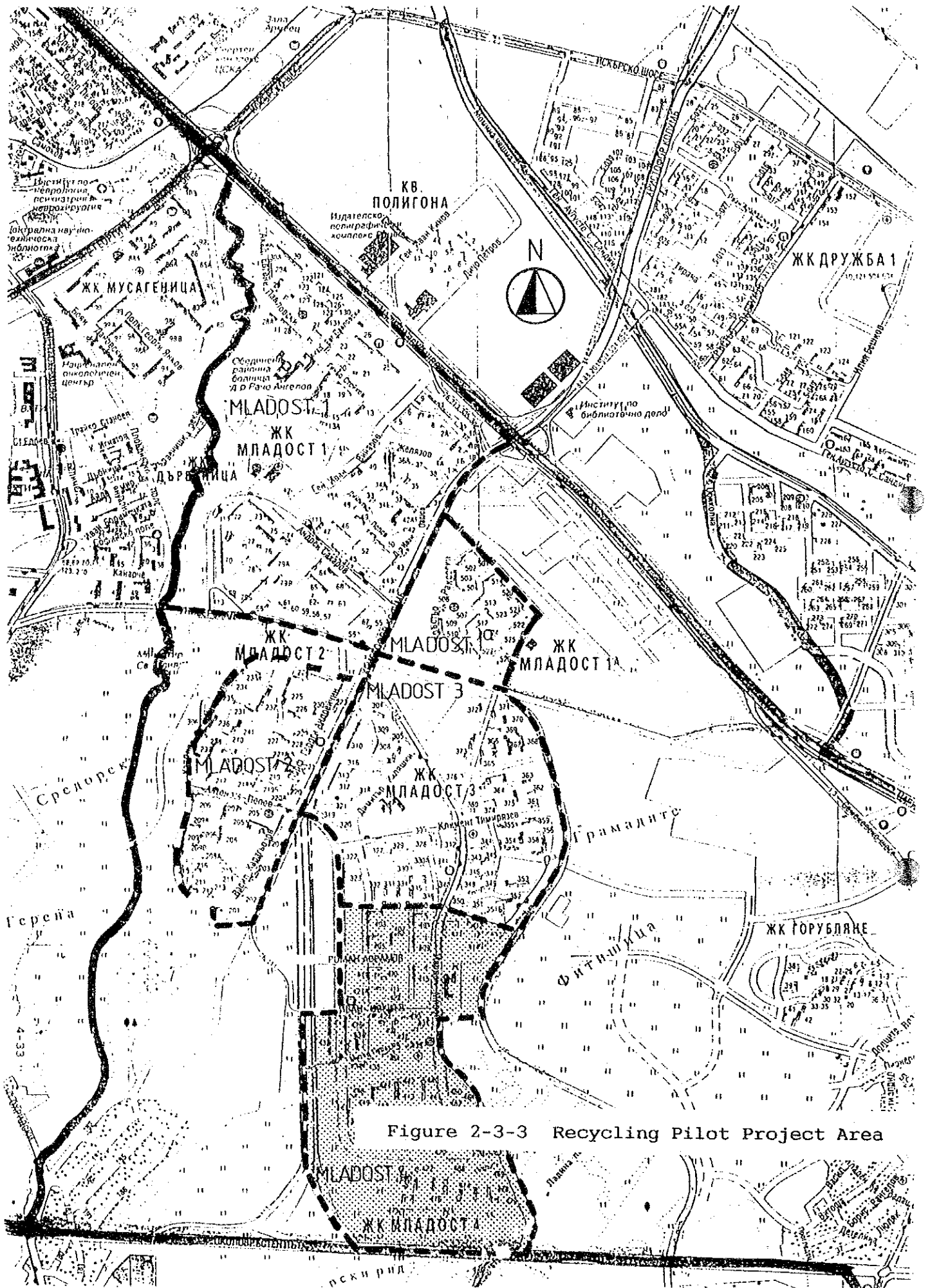


Figure 2-3-3 Recycling Pilot Project Area

To achieve this target, the pilot project shall be expanded to cover all Mladost in 1999 and into another district, such as Lyulin, in 2000.

3) Recycling system for pilot project

Considering efficient use of transportation vehicles for reusable material, the stationary container system will be employed. Stationary container consists of containers for each of white glass, green glass, other colors glass, used cardboard and mixed paper.

Residents shall carry their reusable material after separation and cleaning to the container location and dispose of them according to the instructions at the container location.

Special vehicles shall collect the reusable material from containers twice a month. Green and white glass will be delivered to the glass factory and other colors of glass shall be disposed of at an inert disposal site. Since cardboard and mixed paper shall be packaged at some place, these shall be carried to designated recycling shop. Collection frequency will be twice a month in the pilot project. The system is shown schematically in Figure 2-3-4.

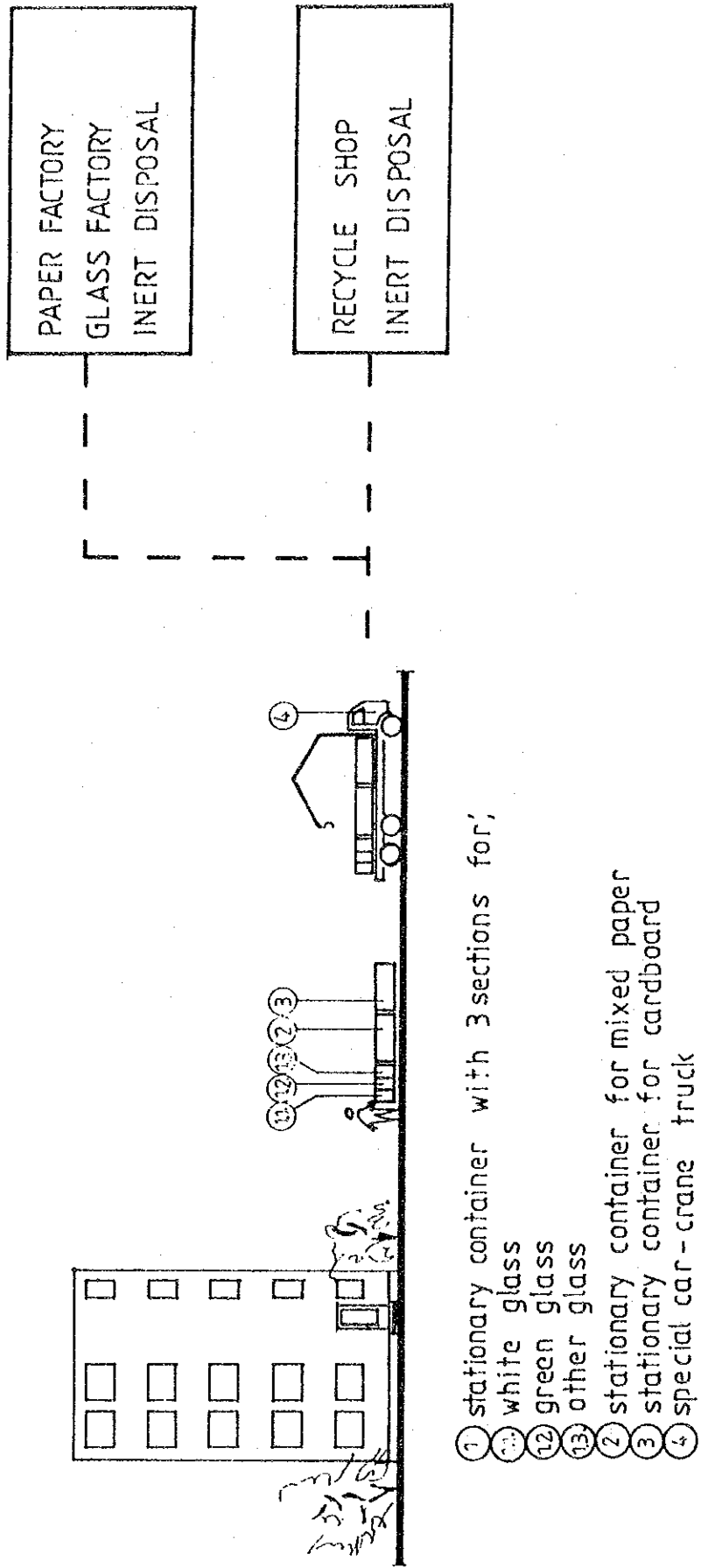
4) Recycled amount

Monthly recycled amount of paper will be 5.0 - 7.8 kg/household and glass will be 4.2 - 4.6 kg/household on the basis that 30% of paper and 50% of glass can be separated by residents.

Recycled amount of the pilot project in 1997 will be 897 ton/year and annual figures are shown in Table 2-3-4.

Table 2-3-4 Annual Recycling Amount
(Unit: ton/year)

	1995	1996	1997	1998	1999	2000
Household number			7,856	7,856	39,500	92,300
Paper			474	494	2,626	6,422
Glass			423	427	2,169	5,118
sub total			897	921	4,795	11,540
Through others	12,282	12,282	12,282	12,282	12,282	12,282
Total	12,282	12,282	13,178	13,207	17,076	23,822



- ① stationary container with 3 sections for;
 - ① white glass
 - ② green glass
 - ③ other glass
- ② stationary container for mixed paper
- ③ stationary container for cardboard
- ④ special car - crane truck

Figure 2-3-4 Scheme of Proposed Recycling System

5) Equipment

A set of containers consists of 5 containers for green glass, white glass, other glass, cardboard and mixed paper. Each 130 households are served by one set.

A special truck equipped with a crane and 5 containers collects glass and paper. Five container sets will be collected in one trip. One truck can make 2 trips per day however it is planned to make one trip during the pilot project.

An Estimate of the necessary equipment is outlined in Table 2-3-5.

Table 2-3-5 Equipment for Recycling Pilot Project

	1997	1998	1999	2000
No. of households	7,856	7,856	39,500	92,300
Waste amount (t/year)	897	921	4,795	11,540
No. of container sets	60	60	304	710
No. of vehicles	1	1	3	6

The Pilot Project is summarized in Table 2-3-6. Table 2-3-7 shows the recycling amounts and extent of served population needed to meet the master plan targets.

2.3.5 Amenity center

1) Function of the Amenity Center

The most important function of the amenity center is to receive domestic hazardous waste for separate disposal. But the center is also planned to have supplemental functions to receive reusable materials.

Paper and glass will be received at the centers, the same as the pilot project.

2) Location of amenity center

Amenity centers will be constructed at each depot and Katina disposal site. In total 6 amenity centers are planned.

Table 2-3-6 Outline of the Pilot Project

1. Project area	Mladost 4
2. Population	20,427 person
Number of household	7,856 household
3. Item to be recycled	Cardboard and mixed paper Green and white cullet Other color cullet
Note : Other color cullet will also separated and disposed at inert disposal site.	
4. Amount to be recycled	Paper 547 ton/year in 1997 Glass 436 ton/year in 1997
Note : It is assumed that 30% of waste paper and 50% of waste glass shall be separated.	
Monthly recycled amount	
	Paper 5.0 - 7.8 kg/household
	Glass 4.2 - 4.6 kg/household
5. Equipment	
a. Container set	60 set
1.0 m ³ for mixed paper for cardboard	
0.2 m ³ for green glass for white glass for other glass	
b. Crane truck with container	1 unit
Loading weight with container & crane	8 ton
Container for mixed paper	4 m ³
for cardboard	4 m ³
for green glass	1 m ³
for white glass	1 m ³
for other glass	1 m ³
Crane lifting capacity	2 ton
6. Location of container	
One container set for 130 household (one set for one or two apartment)	
7. Frequency	Twice a month

Table 2-3-7 Recycled Amount

Year	Generation amount (ton/day)	Population (1000 person)	Generation rate (g/capita per day)	Recycle waste		Number of Household	Recycled Amount		Total
				Paper (kg/hh /month)	Glass (kg/hh /month)		Papar ton/year	Glass ton/year	
1993	1005.2	1183	850	4.39	4.63				12282
1994	1007.5	1190	847	4.45	4.51				12282
1995	1009.7	1205	838	4.51	4.39				12282
1996	1057.7	1220	867	4.76	4.44				12282
1997	1105.7	1235	895	5.02	4.48	7856	474	423	12282
1998	1153.7	1250	923	5.28	4.53	7856	498	427	12282
1999	1201.7	1265	950	5.54	4.57	39500	2626	2169	12282
2000	1249.7	1280	976	5.80	4.62	92300	6422	5118	12282
2001	1273.7	1290	987	5.99	4.58	141540	10622	7674	12282
2002	1297.7	1300	998	6.18	4.54	190780	14822	10230	12282
2003	1321.7	1310	1009	6.37	4.49	240020	19022	12786	12282
2004	1345.7	1320	1019	6.56	4.45	289260	23222	15342	12282
2005	1369.7	1330	1030	6.75	4.41	338500	27422	17898	12282
2006	1393.2	1340	1040	6.96	4.36	376960	31874	19715	12282
2007	1416.6	1350	1049	7.17	4.31	415420	36326	21488	12282
2008	1440.1	1360	1059	7.38	4.26	453880	40778	23217	12282
2009	1463.5	1370	1068	7.59	4.21	492340	45229	23565	12282
2010	1487.0	1380	1078	7.80	4.17	530800	49681	23565	12282
2011									12282
2012									12282
2013									12282
2014									12282
2015									12282
2016									12282
2017									12282
2018									12282
2019									12282
2020									12282
2021									12282
2022									12282
2023									12282
2024									12282
2025									12282
2026									12282
2027									12282
2028									12282
2029									12282
2030									12282
2031									12282
2032									12282
2033									12282
2034									12282
2035									12282
2036									12282
2037									12282
2038									12282
2039									12282
2040									12282
2041									12282
2042									12282
2043									12282
2044									12282
2045									12282
2046									12282
2047									12282
2048									12282
2049									12282
2050									12282
2051									12282
2052									12282
2053									12282
2054									12282
2055									12282
2056									12282
2057									12282
2058									12282
2059									12282
2060									12282
2061									12282
2062									12282
2063									12282
2064									12282
2065									12282
2066									12282
2067									12282
2068									12282
2069									12282
2070									12282
2071									12282
2072									12282
2073									12282
2074									12282
2075									12282
2076									12282
2077									12282
2078									12282
2079									12282
2080									12282
2081									12282
2082									12282
2083									12282
2084									12282
2085									12282
2086									12282
2087									12282
2088									12282
2089									12282
2090									12282
2091									12282
2092									12282
2093									12282
2094									12282
2095									12282
2096									12282
2097									12282
2098									12282
2099									12282
2100									12282

Since hazardous domestic waste and reusable material shall be brought by residents to the amenity center, the number of amenity centers shall be increased in future considering convenience of residents.

2.4 Public Limited Company

2.4.1 Establishment of Public Company for SWM

1) Form and Formation of Company

The Company will be established as a Sole Proprietor Public Limited Company. The Law of Commerce (Trade Act) specifies the basic features for formation, the required legal and administrative aspects of any new company, its status, bodies etc. and highlights as well the particulars for a Municipality owned company.

The most important articles to be respected are:

- Art.61 determines the status of state owned and municipality owned companies
- Art.62 Para.(2) specifies the necessity of a special decision of SGM for the formation of a new company
- Art.117 depicts the capital and equity of a limited liability company. Para.(1) sets the minimum authorized capital to 50 000 BGL.
- Art.119 stipulates the requirement to be registered in the Commercial Register and 70% of the authorized capital has to be paid in
- Art.135 and the following comprise the "Administration" of a Public Limited Company (PLC)
- Art.136 specifies the members of the General Assembly and the position of the PLC-Manager. If he is not a proprietor, in this case he shall be entitled to an advisory vote only. A company exceeding 50 employees shall be represented at the General Meeting by one selected representative entitled to an advisory vote too.
- Art.137 specifies the rights and duties of the General Assembly; the most important are connected with approving the yearly budget and the balance sheet of the company, appointing the Manager, determining his remuneration, associating new members etc.
- Art.144 highlights the election of a Controller(s), the relevant duties, as well those persons who can not assume the position of Controller.
- Art.147 deals with the management of a PLC.

The applications of these articles for the formation of the new Sole Proprietor Public Limited Company stipulates a clear and simple setup consisting of

- The General Assembly, the forum which consists of the owners representatives, the Management and the

Employees Representative of the PLC

- The Company itself with the General Manager, the Directors, Department and Section Heads and the Superintendents of the outstations and
- The Controller or the Controlling Body for the supervision resp. the control of the activities of the Company on behalf of the owner.

2) Responsibility of the PLC

Following the recommendations of the Progress Report I and the Interim Report and taking into consideration the decision of the Municipality Representative in December 1993 the objectives of the new PLC to be formed should be:

"Collection & haulage, transport and treatment of solid household waste and waste similar to household waste according to the ecological, technical and sanitary requirements of the Environmental Protection and the Waste Law."

The PLC should be free to accept any other waste such as commercial and/or industrial non-hazardous waste at the disposal site or to collect and dispose of waste on contract basis at a profitable rate.

The above mentioned objectives automatically includes the responsibilities of the PLC to develop and implement strategies and actions on waste reduction and waste separation and to encourage producers of goods to implement multiple use of waste material like bottles etc. and/or recycling.

The main responsibilities of the PLC as envisioned at present can be summarized as follows:

- making available appropriate collection containers and/or plastic bags to the clients
- collection of containers and/or plastic bags in agreed time intervals including cleaning up of container place before and after emptying them and/or loading of plastic bags in the most effective and economic way
- transport of collected waste to the selected disposal site by the shortest and most economic way
- disposal of the waste in an efficient way to guarantee maximum use of the disposal site and
- the "after care" services of any closed disposal site under the responsibility of the PLC

The existing disposal site Suhudol and Katina, the new disposal site to be developed, should become the property of the

PLC being then responsible not only for development and operation but as well for the after care services. Concerning Dolny Bogrov the PLC should be only responsible for the ongoing operation up to the final closure of the site.

Any after care services and necessary remedial work for the environmental sound protection of the site itself and the surroundings, the impact on the environment which has occurred already can not be the responsibility of the new PLC due to the high costs and risks involved.

From the economic viewpoint PLC will have to take care that:

- administration and operation related to SWM will be executed in the most effective and economic way on profitable basis for the benefit of the owner, to guarantee minimization of subsidies during the transition period and to run the company generally on profitable basis as soon as the taxes and/or tariffs for waste are adjusted to a cost effective level
- tariffs for commercial and/or non-hazardous industrial waste will be calculated on cost effective basis plus a reasonable profit margin, which means that investment, operation and after care service costs will be included
- necessary capital for future investments can be raised by themselves and repayment of capital costs will be guaranteed from their own earnings.

3) Responsibilities of the SGM

The responsibilities of the PLC specified above can only be undertaken under certain conditions which have to be met by the owners such as:

- formation of the company in the most independent way possible under the prevailing legislation and integration of rights and responsibilities in the companies statutes
- transfer of assets to the new PLC including collection and haulage vehicles, heavy equipment and other vehicles, equipment, material and furniture necessary for the efficient operation of the company and transfer of ownership of the land for disposal sites and other infrastructure like headquarters building, vehicle depots and central workshop
- preparation and approval of a realistic first budget for the PLC including reasonable price revision formulas for quarterly adjustments in relations to price increases and approval of following budgets based on the experiences and expenditures of the previous year

- payment of the approved budget amounts at agreed dates to the PLC including amounts resulting from price revisions.

The rights and responsibilities of both partners, the SGM and the new PLC, and the resulting actions are rather complex, they will require a careful and detailed professional approach to create an efficient new organization which will meet the long term requirements of the SGM.

4) Relationship with other Companies (BKC and CHISTOTA)

The existing BKC Companies will be restructured according to their activities and the majority of the experienced staff dealing with solid waste up to now will be integrated into the new PLC to avoid major social conflicts. The street cleaning activities will be concentrated as well in one central Cleansing Company being responsible for street waste, cleaning of roads during all seasons within the territory of the SGM according to the decision of the responsible Representatives of the Municipality.

It is suggested that all inert material like sand and gravel resulting from street cleaning will be disposed off in existing municipal inert landfill sites.

The existing Chistota Company will have to hand over equipment and operation of the existing disposal sites to the new PLC and a part of the experienced personnel might be taken over by them as well.

5) Schedule for Establishment of the new PLC

This most important period for the establishment of the new Public Limited Company comprises four essential phases

- Decision Phase
- Preparation Phase
- Implementation Phase, and
- Operation and Optimization Phase

The activities during each phase will be specified below:

a. Decision Phase

The main decision concerning the concentration of all activities regarding SHW and the formation of a new Public Limited Company requires the official approval of the Municipal Council which is still outstanding. Further decisions and activities such as:

- selection of an internal team of specialists consisting of one legal, one administrative and one engineering professional of the Municipality, the so called Project Implementation Unit (PIU) which will continuously follow all activities required for the establishment of the PLC
- selection of a local Consultant for the preparation of the necessary as-build drawings for the PLC infrastructure
- preparation of the Terms of Reference (TOR) for a Management Consultant, invitation for proposals, evaluation of them and award of contract

will have to follow immediately after above basic decision is approved by the Municipal Council in order to switch over to the next phase.

b. Preparatory Phase

This phase will include the following activities:

- detailed as-build drawings of the selected areas including buildings for the headquarters, 5 vehicles depots and the central workshop
- tender documents for the necessary adaptation and if required extension work
- award of work to local contractors and supervision of work in cooperation with the PIU
- assessment of the existing staff with experience in SWM and operation in all 24 BKC and the Chistota Companies including proposals for selection and salary structure
- assessment of existing vehicles at BKC and Chistota Companies for collection and transport, heavy equipment and other equipment and material required for the new PLC including valuation for asset appraisal
- evaluation of infrastructure, headquarters, depots, workshop and land value for Suhudol and Katina including existing facilities for asset appraisal
- specification of administrative, financial and operational procedures including selection of hard and software for EDP Section, management information system, budget and balance sheet programs etc.
- preparation of companies statute, articles of association, rights and responsibility, capital of the PLC etc.
- formation of the PLC, registration, appointment of key-staff and other employees
- preparation of budget for the first financial year together with price revision indices for adjustment
- development of an implementation schedule in such detail, that the transition period can be shortened as much as possible.

The Constituent Assembly of the new PLC with the approval of the budget for the first year of operation could terminate this most important phase of preparatory work and lead directly to the following phase. It is recommended that the PIU be assisted by local consultants together with management consultants to complete the above works properly and on time.

c. Implementation Phase

At an agreed date but not before the registration of PLC is completed and the Constituent Assembly has been held, headquarters, vehicle depots, disposal sites and central workshop will be taken over, and the detailed schedule for implementation will give the guidelines in which way the different activities of all together 25 companies will be transferred, taken over and integrated into PLC to guarantee a minimum disturbance to citizens and to shorten simultaneously the transition period as much as possible.

The transition period as shown in the schedule for establishment of the PLC extends over three months which certainly can be shortened if the implementation schedule and practical preparation for transfer are organized in an efficient way. The final phase closely interlinked with the implementation shall follow.

d. Operation and Optimization Phase

As soon as all activities are taken over by PLC an extensive training program on theoretical and practical aspects as training on the job shall be organized which will lead step by step to efficient management and operation.

For this special training program it is suggested to employ an experienced consultant together with an experienced foreign waste disposal management company dealing with similar installations like Sofia.

All activities during the different phases will have to be guided by the SGM and the PIU. They will only be successful if a close cooperation and coordination between all parties concerned will take place.

The proposed schedule for establishment of the public limited company is shown in Table 2-4-1.

The attached schedule for establishment of the PLC shows an optimistic approach how the different activities in each

phase may be timed. Under this scenario establishment of PLC could be finalized at the end of 1994 and implementation, operation and optimization will be carried out during the first half of 1995.

The efficiency of the PIU together with the capability and willingness to make decisive decisions by the SGM will give the real period which will be required to form the new PLC.

In addition to the activities and the related time requirements during the four phases mentioned above, other actions by the SGM resp. the PIU are necessary simultaneously as shown on the attached schedule. For the PLC establishment mainly the legal activities like transfer of ownership and the request for a permit acc. Art.18 of the Waste Act for the new PLC must be arranged.

Further exercises to be attacked almost immediately are application to funding agencies concerning project financing, and final design including EIA for Katina new disposal site.

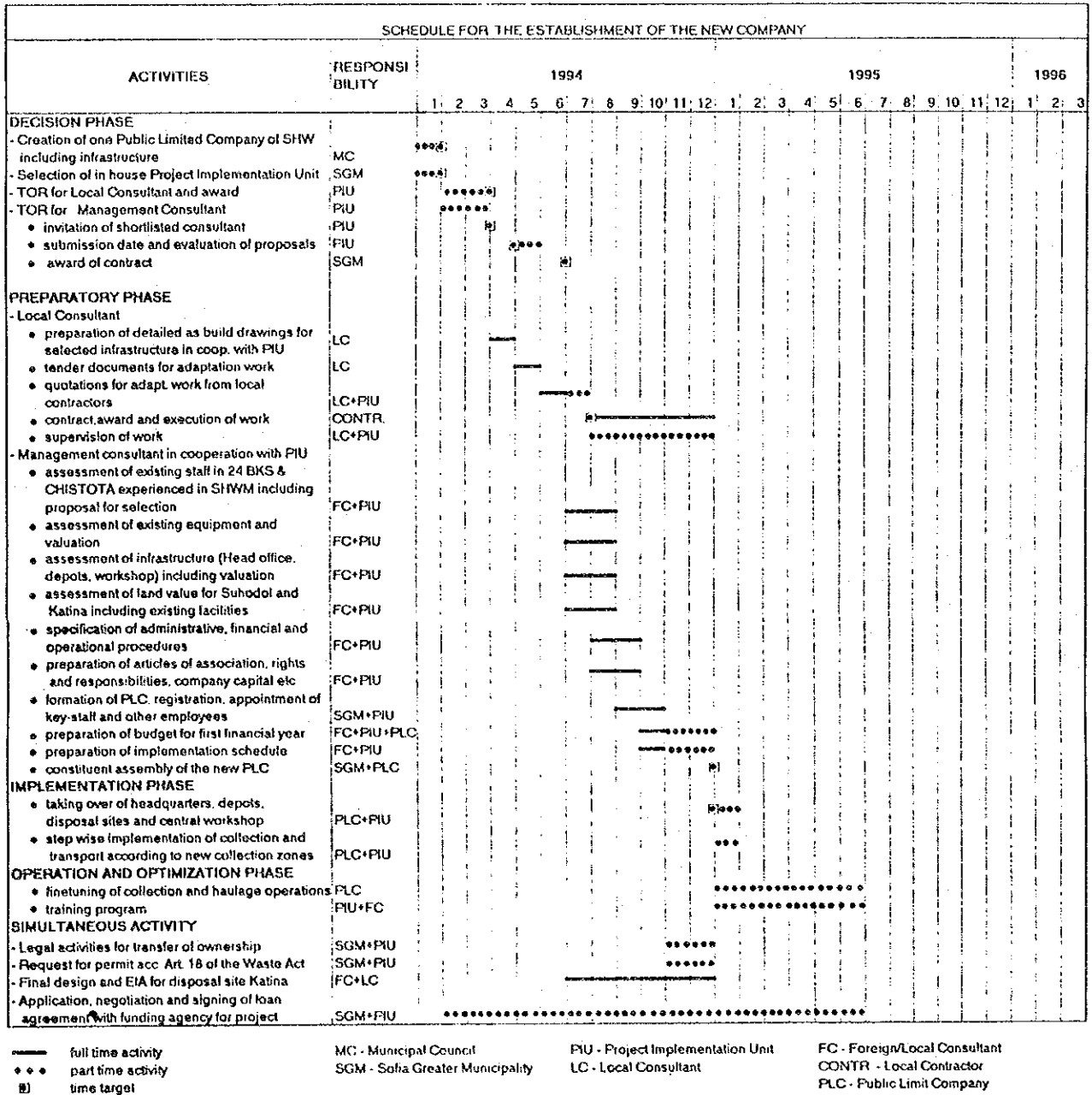
2.4.2 Operation of the Public Limited Company (PLC)

The organizational structure of PLC has been developed in considering results of discussions with the Counterparts. The main points as;

- central administration and general coordination of operation in the headquarters
- central operation for collection and transport to disposal sites from five vehicles depots
- central operation of one work shop for maintenance and repair of vehicles and heavy equipment
- operation of each waste disposal site with own facilities

have been kept and the structure of PLC will be explained in the following sections.

Table 2-4-1 Schedule for Establishment of the New Company



1) Organization of PLC

a. General Structure of the Company

Figure 2-4-1 represents the general structure of PLC with the basic arrangement of the head-office and the different out-stations like depots, work station and disposal sites

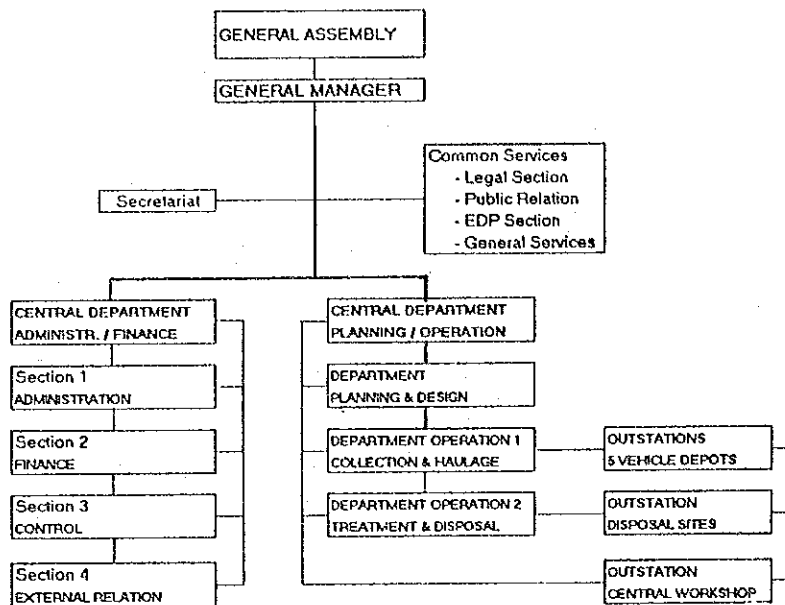


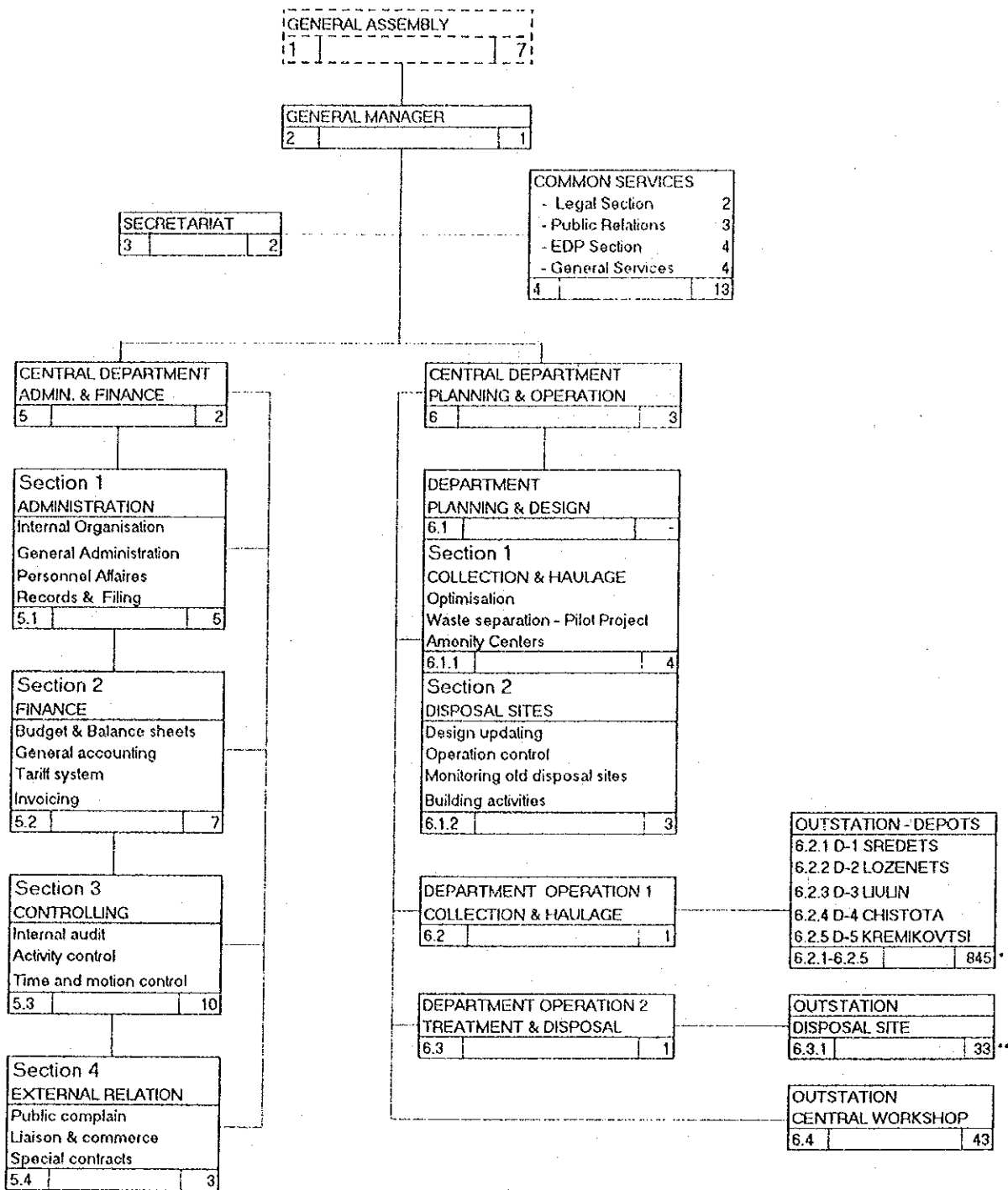
Figure 2-4-1 General Structure of PLC

b. Detailed Structure of the Headquarters

Figure 2-4-2 specifies the detailed structure of the headquarters with the General Manager (GM) at the head of PLC, the common services mainly under the guidance of the GM as a block of services which might be used by all different departments for assistance, the Central Department for Administration and Finance with four different sections and the Central Department for Planning and Operation with three different departments.

The important Department for Planning and Design, staffed with experienced engineers is split into two sections, Section 1 Collection & Haulage responsible for:

- optimization of collection and haulage activities in cooperation with area managers and collection crews
- development of waste reduction and separation strategies including preparation and implementation together with Department of Operation 1



* Required manpower in 1995
** Required manpower in 1997

Figure 2-4-2 Detailed Structure of Headquarters

- preparation of pilot project, implementation and monitoring for further fine tuning and extension
- implementation of amenity centers together with Superintendents of vehicle depots, monitoring for necessary adjustments and/or extensions

Section 2 Disposal Sites will be responsible for:

- regular updating of design for disposal site
- control of operation in cooperation with site scientist
- establishment of inventory of old disposal sites and continuous monitoring including necessary remedial measures
- identification of appropriate after care services
- preparation of required construction and maintenance work for the companies infrastructure
- development of future disposal facilities for further master plan phases

Department Operation 1 is responsible for overall coordination of the depot activities.

Department Operation 2 represents the link between the disposal sites as outstation and the headquarters. Coordination of activities, follow up of investment requirements etc. will be the main targets despite the fact, that these outstations will operate independently to the greatest possible extent.

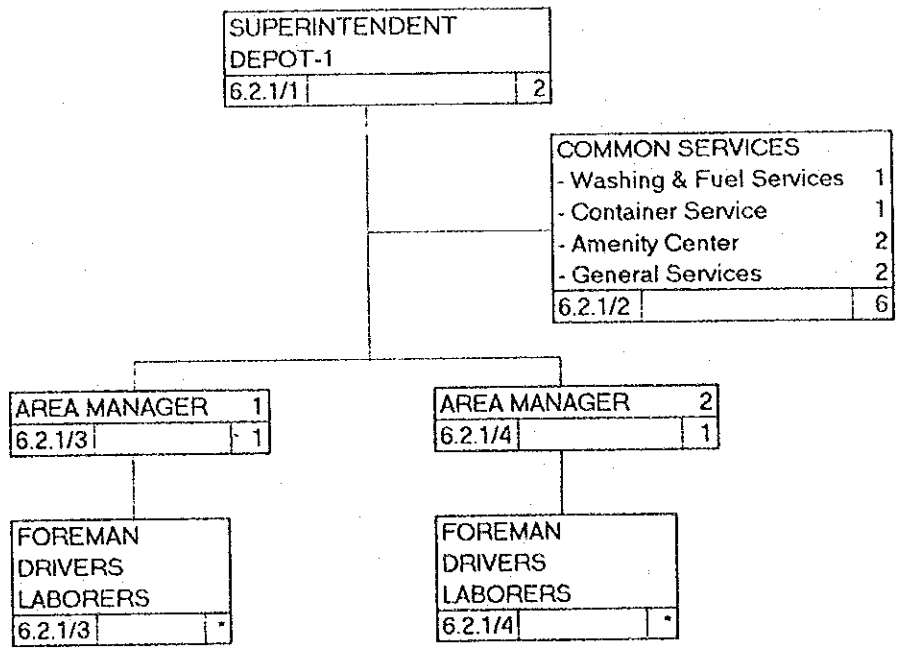
The Central Work Shop is directly subordinated to the Director of Central Department Planning and Design for obvious reasons.

The numbers in each column represent the chronological figure for each department and section on the left side and the staff strength on the right side. The same system is followed in para. (3) specification of departments and sections.

c. Typical Structure of Vehicle Depot

Figure 2-4-3 shows the typical organizational structure of a vehicle depot.

The staff strength varies to a great extent based on the service area and the density of population. The general administration and coordination of operation should be limited to the minimum requirements at each depot and will be between 5 and 10 employees depending on the number of crews and taking into consideration that each depot will have one amenity center for which two employees are required.



Manpower varies for each depot

Figure 2-4-3 Typical Vehicle Depot Organization Chart

The Superintendent has the main responsibility for each depot together with the common service block for washing facilities, container and cleaning services and the operation of the amenity center represents the nucleus of each depot.

Depending on the crew numbers (15 to 56) at each depot one or two area managers will be responsible for the coordination of operation, distribution of manpower and settling of all disputes and internal problems.

It is suggested that 7 to 8 crews each consisting of one driver and three to four laborers will select one senior driver as foreman representing the interests of these crew members. The foremen will discuss any problem with the area manager to avoid endless discussions with too many people.

Decision of the Municipality is outstanding whether each depot will be equipped with one fuel station or only one station at the Central Work Shop will be operated. A further option would be an arrangement with any private company on contract basis for the fueling of the vehicle fleet.

c. Organization of Katina Disposal Site

Figure 2-4-4 specifies the organizational structure of the future disposal site at Katina. The Superintendent of the site, responsible for the overall management and coordination has under his direct guidance and control the common service block consisting of maintenance of facilities, transport and general services and three different sections such as:

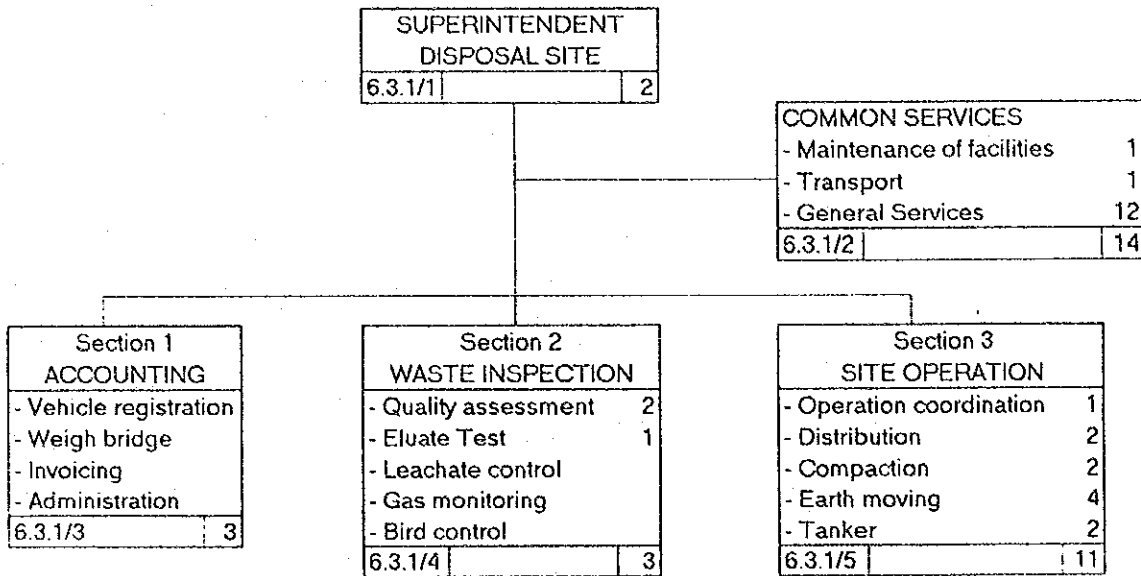


Figure 2-4-4 Katina Disposal Site Organization Chart

Section 1: Accounting being responsible for all administrative work, vehicle registration, weigh bridge operation, invoicing etc.

Section 2: Waste Inspection for the assessment of the waste quality whether hazardous or not, inspection of doubtful waste, eluate test, leachate control, disinfection, gas emission control, compaction efficiency etc.

Section 3: Site Operation headed by an experienced geotechnical engineer as site operator responsible for all operations related to waste distribution, compaction, earth moving for cover material and tanker services.

d. Organization of the Central Work Shop

The central work shop will be responsible for the regular maintenance and the special repair work of all collection and haulage vehicles and the heavy equipment which operates on the disposal sites.

Figure 2-4-5 below represents the structure of the shop which is headed by the Superintendent. Under his direct control are the spare part store, the fuel station and the accounting section.

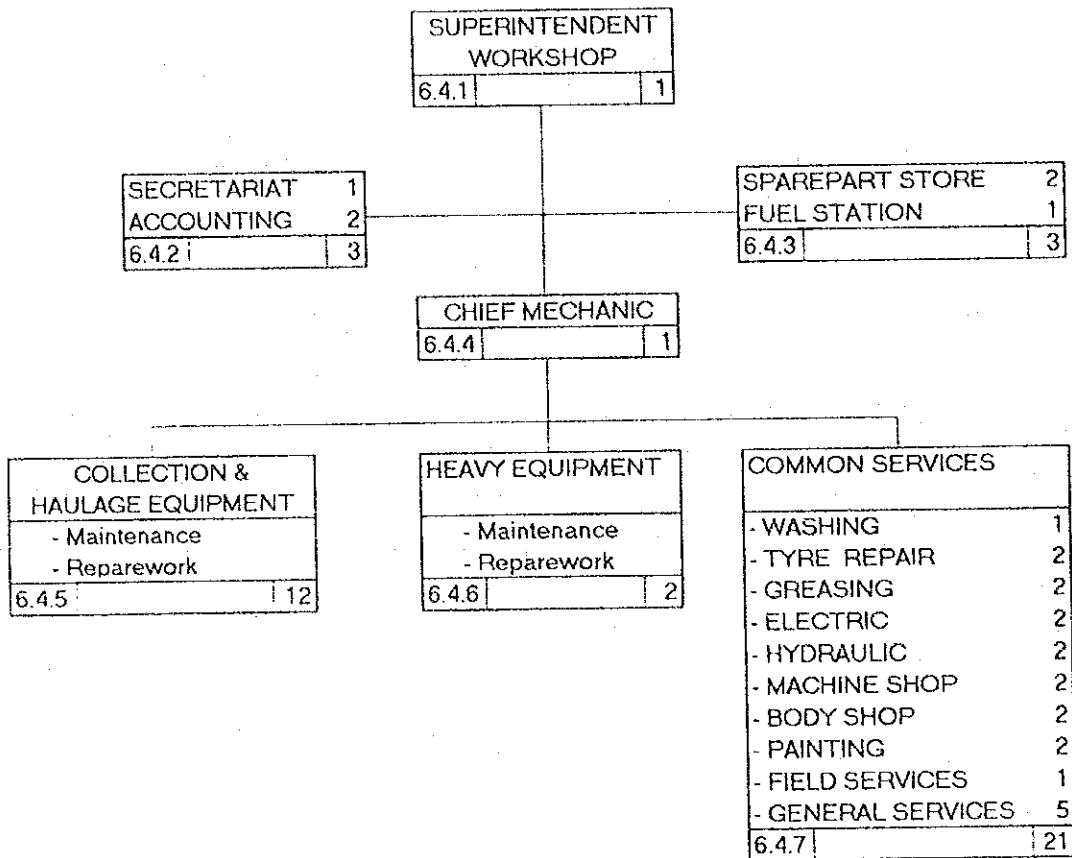


Figure 2-4-5 Central Workshop Organization Chart

The Chief Mechanic coordinates all maintenance and repair work including all common services like electric, hydraulic, machine and body shop, painting, site and general activities.

2) Facilities of the Organization

In order to manage the organization, facilities such as a Headquarter, Vehicle Depots, a Central Workshop, and Amenity Centers are required. Though detailed investigation must be made at detailed design stage, general concept of the facilities are described hereafter, and required for each depot are summarized in Table 2-4-2.

Table 2-4-2 Requirements of Company Facilities

Name	Office building							Remarks
	Exist- ing area (m ²)	Addition					Total reqr'd area (m ²)	
		Office (m ²)	Refrsh. room (m ²)	Locker room (m ²)	Shower room (m ²)	Toilet (m ²)		
1] Headquarters	---	---	---	---	---	---	1,155	Rental of existing building
2] Workshop (Chistota 25/2 depot)	N.A. (R)	R	R	R	R	R	462	
3] Depots								
No.1 Sredets depot	300	N	N	119	50	N	469	
No.2 Lozenets depot	175	N	175	82	50	N	482	
No.3 Liulin depot	720	N	N	N	N	N	432	
No.4 Chistota depot	270	N	65	35	50	N	420	
No.5 Kremikovtzi depot	820	N	N	N	N	N	391	

Legend; R : Required
N : Not required
Numeral : Required area

Name	Gate house (m ²)	Amenity center	Car washing facility		Work- shop	Add. of pavem't	Removal of existing building	Remarks
			Well	Facility				
1] Headquarters	20	---	---	---	---	---	---	Rental of existing building
2] Workshop (Chistota workshop)	R	R	R	R	Exist.	N	R	
3] Depots								
No.1 Sredets depot	Exist.	R	R	R	---	N	N	
No.2 Lozenets depot	Exist.	R	Exist.	R	---	R	N	
No.3 Liulin depot	Exist.	R	Exist.	R	---	N	N	
No.4 Chistota depot	Exist.	R	Exist.	R	---	R	N	
No.5 Kremikovtzi depot	Exist.	R	Exist.	R	---	R	N	

Legend; R : Required
N : Not required
Numeral : Required area

(1) Headquarter

For the management and maintenance of PLC, a headquarter is required. Office space for each department of the organization, including rooms for general manager, secretariat, electronic data processing, conference rooms, toilets, and car parking are necessary. An existing building is planned to be used as the Headquarter, and a suitable one located around the city center shall be rented for that purpose. Exact location is to be decided by SGM.

(2) Vehicle depots

For collection and haulage vehicles, depots are necessary. Garages, inspection bridges, wash and cleaning facilities, an office building, and others including car parking are required. For this purpose, the following existing 5 vehicle depots as shown in Section 1 of this chapter are planned to be used;

- Sredets depot
- Lozenets depot
- Liulin depot
- Chistota 25/1 depot
- Kremikovtsi depot

Depots shall have an additional function serving as branch offices. Though it is planned to use existing facilities as they are at first, modifications and/or enlargements of the facilities if necessary shall be implemented by the year 1997 if capacities are insufficient.

An Amenity center is planned to be provided in each depot.

(3) Central workshop

For maintenance of collection and haulage vehicles, a central workshop is required. Repair halls, body workshops, special workshops, painting shops, wash and cleaning facilities, a fuel station, an office building, and others including car parking are necessary.

A central workshop shall be prepared at the existing Chistota 25/2 depot with necessary refurbishment and modification. In the site the existing service center is to be refurbished and used as the workshop. The existing building for canteen, diagnostic center and warehouse shall be demolished and a new office constructed in its place.

Necessary workshop equipment shall be installed.

Though it is planned to use existing facilities as they are at first, modifications and/or enlargements of the facilities if necessary shall be implemented by the year 1997 if capacities are insufficient.

(4) Amenity center

For the purpose of receiving domestic hazardous waste, reusable materials etc., amenity centers should be provided. The amenity center is shown in Figure 7-5-1 of Volume I. Container spaces to receive the wastes, a small office, surrounding fence and gates are to be provided. Covering shed is made for the container space where dry reusable materials are received.

The Amenity center is to be provided at each vehicle depot and at Katina landfill site.

2.5 New Fee System

2.5.1 Outline of the New Fee System

1) General

The present fee system rests mainly on placing the burden on companies. Citizens bear only one fifth of SWM cost through payment of waste tax. This situation causes budgetary problems for SWM and complaints from companies on SWM services.

One of the master plan targets is that financial resources of SWM in 2010 should be composed in proportion to the waste amount discharged on the basis of 'beneficiaries-to-pay' principle. Therefore expenses incurred in collection, treatment and disposal of waste discharged from households should be covered by the waste tax collected from the residents.

SWM fee shall be collected through waste tax from households and companies in principal. Service fee shall be directly collected from shops and dischargers of non-hazardous industrial waste and for street waste. SWM fee in 2000 will comprise:

- a. Waste tax - from household and companies.
- b. Service fee
 - Collection/disposal- from shops and dischargers of non-hazardous industrial waste.
 - Tipping at disposal- from shops and dischargers of non-hazardous industrial waste and others

The proposed system ensures least expenses in fee collection and avoids loss of money in operation. It is necessary to develop EDPS (electronic data processing system) in order to implement and maintain operation. Needless to say a tentative discharger has the choice to pay the tipping fee by cash at the disposal site.

2) Executing Organization

PLC shall be established to execute the actual day-to-day SWM operations in SGM. However collection of waste tax shall be done by SGM itself. Private companies may participate in transportation of solid waste from shops and factories. The responsibilities of each body with respect to financial aspects are summarized in Table 2-5-1 and Figure 2-5-1.

Table 2-5-1 Responsibility of SWM executing bodies

Body	Responsibilities
SGM	Supervision and/or control of SWM Collection of waste tax Mediation and guarantee of loans for PLC
PLC	Operation of waste collection, AC's and disposal Investment for above operations Collection of collection fees and tipping fees Contract out some operations to PvC
PvC	Operation of waste collection Investment for above operations

Notes: SGM - SWM department of SGM
 PLC - New public limited company
 PvC - Private companies
 AC - Amenity Center

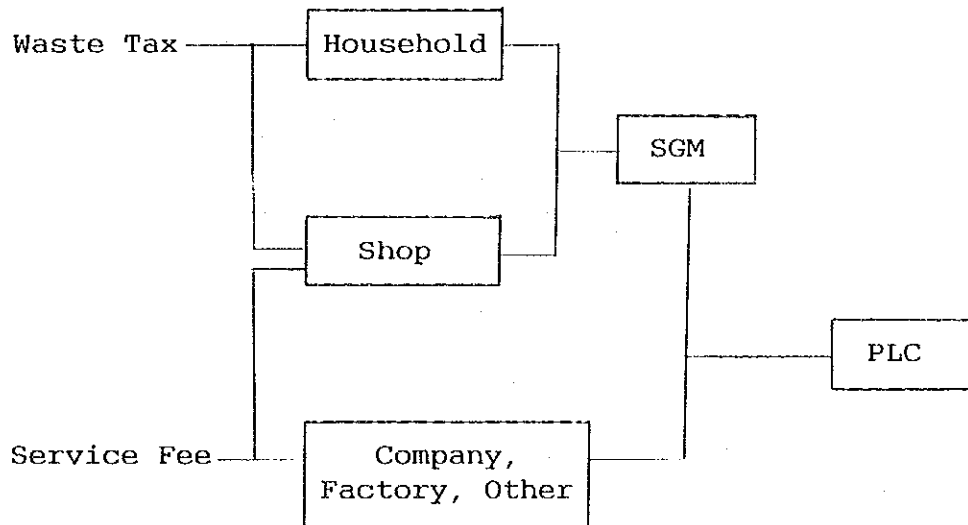


Figure 2-5-1 Flow of Waste Tax and Service Fee

3) Income and Expenditure

Incomes and expenses according to executing body are summarized as shown in Table 2-5-2.

Table 2-5-2 Incomes and Expenses according to Executing Body

Body	Income	Expenses
SWM department of SGM	Waste tax	- Personnel and managerial cost for supervising and control - Budget allocation to PLC
PLC	Budget allocation from SGM	- Operation and maintenance cost of collection, and disposal - Interest for loans - Loan repayment - Managerial cost including taxes
	Service Fees - Collection/Tipping Fee - Tipping Fee	
Private	Revenue from contract with discharger	- Operation and maintenance cost of activities including vehicle rental cost - Tipping fee - Managerial cost

The cost for street cleaning and snow removing is excluded from the SWM cost.

2.5.2 Fee Tariff and Improvement Schedule

1) Fee tariff

The cost estimation of the feasibility study identifies the necessary burden in 2000 as US\$ 22.1 per ton and US\$ 6.6 per capita per year.

Fee tariff are accordingly set as shown in Table 2-5-3, and taking into consideration a number of assumptions as described hereafter.

Table 2-5-3 Fee Tariff (Feasibility Study)

		1993	1997	2000

Waste Tax				
Household	US\$/Capita	0.9	3.3	6.6
Shops, etc	US\$/Ton	54.4	47.8	42.9
Collection/Tipping Fee	US\$/Ton	5.1	22.0	22.0
Tipping Fee	US\$/Ton	1.5	7.4	7.4

Cost	US\$/Ton	13.7	22.0	22.1

Note: Tariff formulated to cover SWM cost by 2000

The figures presented in the table are adopted for the following reasons.

- It will be difficult to set tariff on residents to cover all SWM cost in 1997 considering economic conditions in Bulgaria, especially the most recent price hike in public utilities. Therefore tariff in 1997 will be set at half the cost in 2000. This is more than three times the present burden without considering the influence of inflation.
- The waste tax on companies is higher than the total SWM cost. But it will be necessary to continue this cross-subsidy from companies to residents in order to establish the PLC financial base. Therefore total amount of the waste tax from companies will be the same as the present amount in real terms.
- Collection/tipping fee will be set to cover SWM cost including disposal cost at Katina disposal site and cost of workshop etc.
- Tipping fee will be set to cover disposal cost at Katina disposal site.

2) Revenue

The revenue based on the above tariff and its schedule is summarized as shown in Table 2-5-4. Revenue from sale of reusable material is estimated using the present prices of used paper and cullet.

It should be noted that a subsidy from SGM will be required up to the year 1999 to avoid a steep increase in residents burden.

Table 2-5-4 Financial Source for Annual Cost
(unit: US\$ 1,000)

	1993	1997	2000
Waste Tax			
Household	1,056	4,106	8,409
Shops, etc	5,583	5,583	5,583
Collection Fee			
Shops, etc	717	1,036	1,355
Tipping Fee	38	129	141
Reusable Material	0	20	264
SGM Budget Allocation	325	325	0
Total	7,719	11,199	15,752
Self-financing rate (%)	95.8	97.1	100.0

3) Cost bearing capacity of residents

The monthly data on living costs per household member point out that the cost shares of housing rent, heating, electricity and water in September of 1993 totaled 11.9% of total living cost. This figure signifies an increase by 4.4 points compared to December of 1992.

The burden by residents is summarized in Table 2-5-5.

Table 2-5-5 Burden by Residents

	1966	1997	2000
Residents(1,000 \$)	1,056	4,111	8,420
per capita(\$)	0.9	3.3	6.6
share of income(%)	0.07	0.20	0.26

The tariff of waste tax to be borne by residents is about 0.26 percent of their income. It is not a small amount for residents but at the same time not an impossible amount for them to pay.

4) Improvement schedule

Concerning the waste tax on residents, the improvement plan up to the year 2000 shall be scheduled as follows;

- 1995 Preparation of new public company and strengthening waste tax collection
- 1997 Increase waste tax rate to US\$ 3.3/capita in real terms
- 2000 Increase waste tax rate to US\$ 6.6/capita in real terms

Service fees shall be revised at the start of operation of Katina disposal site to cover the costs of SWM, although the burden on companies may increase at that time. To improve upon fee collection PLC shall;

- a. Prepare a "data base" on dischargers of large waste amounts
- b. Expand service to, and contracts with dischargers of large amounts of waste, and
- c. Improve service.

5) Other Improvement Activities by PLC

During the priority project, up to year 2000, solid waste will be collected and directly hauled to Katina disposal site without intermediate treatment. Under that condition self-financing will be achieved by the year 2000, as shown in Table 2-5-4.

However the master plan proposes that an incineration plant be constructed and in operation by 2005, and therefore more cost for SWM will be required and more revenue will be earned. It is therefore recommended to study means of strengthening financial capability and prepare a data base, in consideration of the much expanded financial scale of SWM beyond the year 2000.

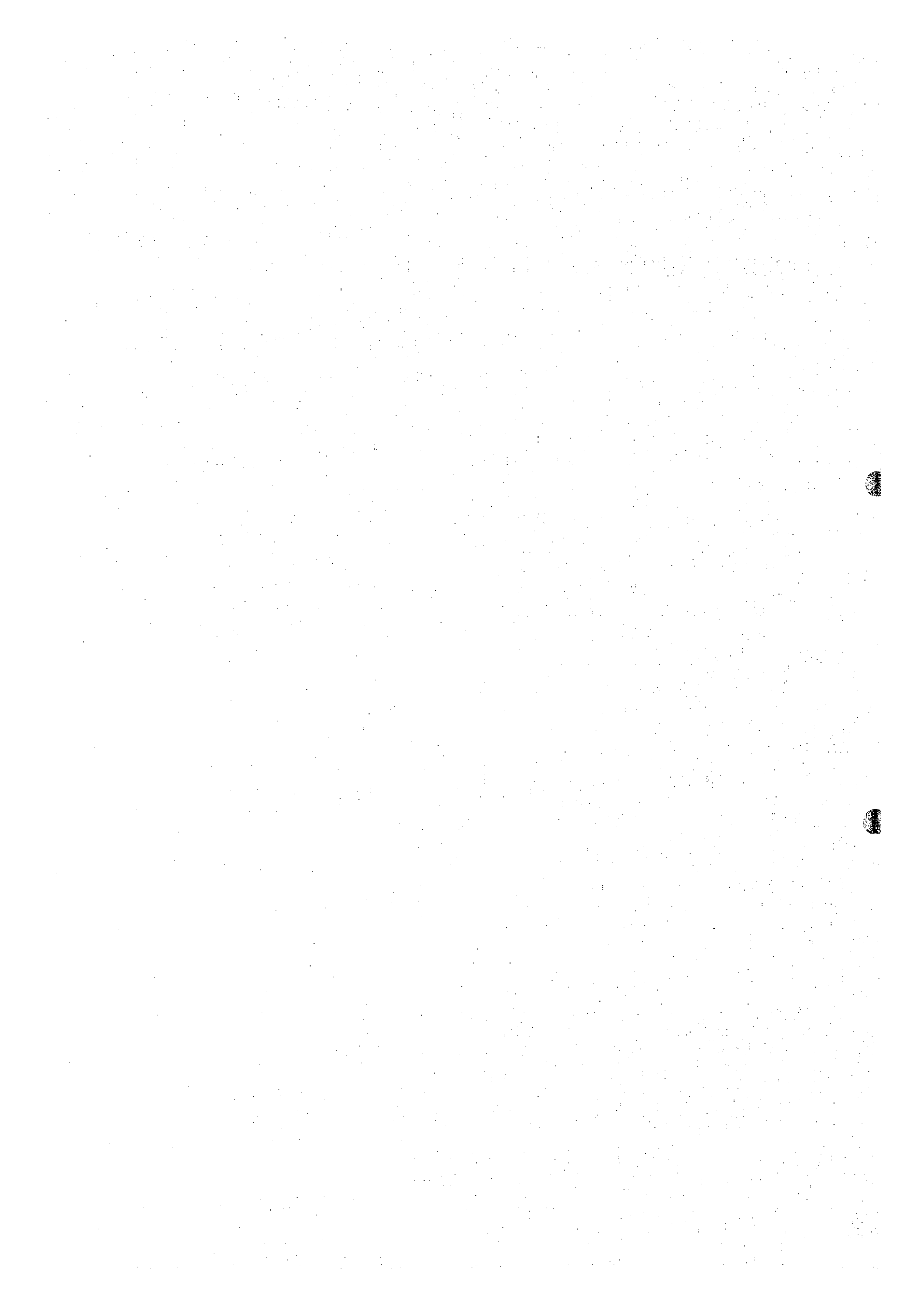
Accordingly PLC should implement the following tasks;

- a. Waste tax and service fee shall be charged based on waste amount discharged. This is expected to encourage dischargers to reduce waste volume through recycling and other cooperative activities.
- b. Measurement base of waste amount shall be changed from volume base to weight base.
- c. Efforts shall be made to enter into a large number of contracts with dischargers.



CHAPTER 3

PROJECT COST AND FINANCIAL PLAN



CHAPTER 3 PRIORITY PROJECT COST AND FINANCIAL PLAN

3.1 Project Cost

3.1.1 Conditions of Cost Estimation

The priority project cost estimation has been made based on the following conditions.

1) Items of Cost

The costs for the priority project are estimated separately according to the following items shown in Table 3-1-1;

Table 3-1-1 Costed Items of Priority Project

	Investment cost	Operation and maintenance cost
a. Collection	Purchase cost of collection vehicle and container	Depreciation Maintenance cost Personnel cost Other Operation
b. Landfill site	Construction cost Purchase cost of equipment Competent cost	Depreciation Maintenance cost Personnel cost Other operation cost
c. Recycling	Purchase cost of vehicle and container	Depreciation Maintenance cost Personnel cost Other operation cost
e. Headquarters	Cost for adaptation of depot, workshop Construction cost of amenity center Purchase cost of equipment	Depreciation Maintenance cost Personnel cost Rent cost of headquarter Other operation cost

Personnel cost covers mainly the salaries of staff, drivers, workers etc. Maintenance cost is principally the cost for repair and maintenance of vehicles, mobiles, machinery and other equipment. The 'other operation cost' includes costs for consumables such as water, electricity, fuels, oils, chemicals and miscellaneous.

2) Foreign portion and local portion

The local and foreign portions of the cost are estimated based on the following considerations;

a. Foreign portion

- | | |
|---------------------|---|
| - Construction work | Machinery cost of construction
Material cost (Foreign product) |
| - Equipment cost | Equipment purchase cost (foreign product) |
| - Consultant cost | Foreign expert cost |

b. Local portion

- | | |
|---------------------|---|
| - Construction cost | Personnel cost
Material cost (local product) |
| - Equipment cost | Equipment purchase cost (local product) |
| - Consultant cost | Local expert cost |

3) Exchange rate and others

- Price level is as of January 1994.
- All costs are estimated in US dollars in consideration of the severe inflation in Bulgaria.
- Though the land acquisition costs of Katina landfill site are not included in the cost, the construction cost of Katina by-pass road is included.
- Price escalation is not considered in the cost.
- Exchange rate is used as follows in principal.
US\$ 1.00 = 36.4 Leva (January 1994)

3.1.2 Investment Cost

Tables 3-1-2, 3, 4 and 5 show the investment costs of the priority project components, namely collection, final disposal site, recycling pilot project and Headquarters respectively.

Table 3-1-2 Collection Priority Project Investment Cost

Year	Vehicle				Container			Total cost (US\$ 1,000)	
	Procured number		Cost (US\$ 1,000)	Procured number			Cost (US\$ 1,000)		
	Faun L	Faun S		GAZ 53KM	Meva	Ra			Kison
1995	0	0	0	0	16,880	4,206	51	1,324	1,324
1996	25	0	31	2,840	1,308	313	18	109	2,949
1997	28	10	63	4,305	1,359	325	207	218	4,523
1998	22	10	5	2,865	18,292	4,543	35	1,421	4,286
1999	28	4	4	3,000	1,467	349	0	110	3,110
2000	22	0	4	2,150	18,403	4,569	76	1,452	3,602
Total				15,160				4,634	19,794

Notes: 1) The costs after the year 2001 are set under the assumption that no new measures of solid waste management are adopted after the year 2001.
2) Above costs include costs for design, supervision and stand-by vehicles & crew.

Table 3-1-3 Landfill Priority Project Investment Cost

No.	Item	Foreign portion (US\$ 1,000)	Local portion (US\$ 1,000)	Total (US\$ 1,000)
[1]	CIVIL WORK			
1.1	CONSTRUCTION CONTRACT			
1)	General items and preliminaries	347	215	562
2)	Enlarge and strengthen local public access road	67	230	297
3)	Mass earthmoving	3,966	4,014	7,980
4)	Clay seal to lake area	1,140	696	1,836
5)	External drainage connections	242	242	484
6)	Drainage water and leachate systems	25	312	337
7)	Site roads	67	579	646
8)	Perimeter screen and track	171	761	932
9)	Power and lighting	147	113	260
10)	Domestic and operational water supplies	9	125	134
11)	Administration and entrance control	134	555	689
12)	Miscellaneous facilities	21	49	70
13)	Provide operational facilities and equipment	473	560	1,033
14)	Initial operational stock	42	374	416
15)	Provisional sums	152	102	254
	SUB-TOTAL	7,003	8,927	15,930

Table 3-1-3 (cont...)

No.	Item	Foreign portion (US\$ 1,000)	Local portion (US\$ 1,000)	Total (US\$ 1,000)	
1.2	AMENITY CENTER	0	15	15	
1.3	NOVI ISKAR BY-PASS ROAD	0	2,222	2,222	
1.4	DESIGN AND SUPERVISION	908	0	908	
1.5	WAYLEAVES & COMPENSATION				
1)	Compensation for Katina Residents	0	2,500	2,500	
2)	Wayleaves for Track Diversion	0	27	27	
	SUB-TOTAL [1]	7,911	13,691	21,602	
[2]	CONTRACT (Q'ty)				
1.	Site manager's car	1	20	0	20
2.	Site van	1	15	0	15
3.	Personnel bus	1	30	0	30
4.	Falconer's vehicle	2	50	0	50
5.	Waste compactor	3	450	0	450
6.	Dozers/Graders	4	540	0	540
7.	Excavator(with crawlers)	4	702	0	702
8.	Trencher	1	44	0	44
9.	Trucks(for earth moving)	6	531	0	531
10.	Dumper	1	15	0	15
11.	Tanker	1	60	0	60
	SUB-TOTAL	2,457	0	2,457	
[3]	DESIGN AND SUPERVISION	123	0	123	
	SUB-TOTAL [2]	2,580	0	2,580	
[4]	PHYSICAL CONTINGENCY	2,063	0	2,063	
	GRAND TOTAL	12,554	13,691	26,245	

Table 3-1-4 Recycling Investment Cost

Year	Vehicle		Container		Total cost (US\$ 1,000)
	Procured number	Cost (US\$ 1,000)	Procured number	Cost (US\$ 1,000)	
1995	0	0	0	0	0
1996	0	0	0	0	0
1997	1	60	60	90	150
1998	0	0	0	0	0
1999	1	60	244	366	426
2000	4	240	406	609	849
Total		360		1,065	1,425

Notes: 1) Costs after the year 2001 are set under the assumption that no new SWM measures are adopted after 2001.
2) Above costs cover design and supervision.

Table 3-1-5 Headquarters Investment Cost

(unit: US\$ 1,000)

No.	Item	Foreign portion	Local portion	Total
[1]	HEADQUARTERS			
1.	CONSTRUCTION			
1.1	Headquarter office (Rental: See O/M cost)	NA	NA	NA
1.2	Vehicle depot			
1) Sredets		90	90	180
2) Lozenets		106	106	212
3) Liulin		39	39	78
4) Chistota 25/1		127	127	254
5) Kremikovtsi		83	83	166
1.3	Central workshop	1,273	321	1,594
	SUB-TOTAL	1,718	766	2,484
2.	DESIGN AND SUPERVISION	0	521	521
	TOTAL [1]	1,718	1,287	3,005
[2]	Container	0	600	600
	GRAND TOTAL	1,718	1,887	3,605

3.1.2 Operation and Maintenance Costs

Tables 3-1-6, 7, 8 and 9 show the operation and maintenance cost of collection, final disposal site, recycling pilot project and headquarters respectively.

Table 3-1-6 Collection Operation and Maintenance Cost
(unit: US\$ 1,000)

Year	Personnel	Maintenance	Others	Total Cost
1995	2,194	1,384	1,183	4,761
1996	1,957	1,244	989	4,190
1997	1,859	1,323	1,001	4,183
1998	1,907	1,330	1,058	4,295
1999	1,942	1,210	1,084	4,236
2000	1,977	757	1,100	3,834

Notes: 1) Personnel cost include drivers & workers salaries
 2) Maintenance cost include costs for maintenance and repair of collection vehicles.
 3) Other cost include costs of fuels & oils for collection vehicle and other miscellaneous costs.

Table 3-1-7 Landfill Site Operation and Maintenance Cost
(unit: US\$ 1,000)

Year	Personnel	Maintenance	Others	Total Cost
1995	89	5	346	440
1996	93	5	360	458
1997	107	0	725	832
1998	107	83	753	943
1999	107	101	503	711
2000	107	136	512	755

Notes: 1) Personnel cost include operating staff & drivers salaries.
 2) Maintenance cost include costs for maintenance & repair of mobiles and equipment.
 3) Other cost include costs of fuels & oils for mobiles, consumables and other miscellaneous costs.

Table 3-1-8 Recycling Operation and Maintenance Cost
(unit: US\$ 1,000)

Year	Personnel	Maintenance	Others	Total Cost
1995	0	0	0	0
1996	0	0	0	0
1997	11	6	3	20
1998	11	6	3	20
1999	16	20	8	44
2000	43	50	22	115

Notes: 1) Personnel cost include driver & worker salaries
 2) Maintenance cost include maintenance & repair costs of vehicles used in recycling.
 3) Other cost include fuel & oil costs for vehicles used in recycling and other miscellaneous costs.

Table 3-1-9 Headquarters Operation and Maintenance Cost
(unit: US\$ 1,000)

Year	Personnel	Maintenance	Others	Total Cost
1995	96	0	117	213
1996	96	0	117	213
1997	192	12	285	489
1998	192	12	285	489
1999	192	12	285	489
2000	192	12	285	489

Notes: 1) Personnel cost include management staff salary
 2) Maintenance cost include maintenance and repair costs for workshop equipment.
 3) Other cost include consumables costs such as water, electricity and other miscellaneous costs.

3.2 Financial Plan

Inflation is not considered in the formulation of the financial plan of the priority project. The financial plan is prepared for PLC, to be established in 1995.

3.2.1 Financial requirement

1) Investment cost

Based on the priority project implementation schedule discussed in Chapter 5 and cost estimation, the total investment cost by year 2000 has been estimated as shown in Table 3-2-1. The construction of the disposal site is scheduled during 1995 and 1996. Total investment cost including renewal cost of equipment will be US\$ 51.1 million.

Table 3-2-1 Investment Cost
(Unit : US\$ 1,000)

	1995	1996	1997	1998	1999	2000	Total
Collection							
Vehicle	0	2,840	4,305	2,865	3,000	2,150	15,160
Container	1,324	109	218	1,421	110	1,452	4,634
Landfill							
Civil Work	2,725	20,694	0	0	0	0	23,419
Mobil	0	2,826	0	0	0	0	2,826
Recycling							
Vehicle	0	0	60	0	60	240	360
Container	0	0	90	0	366	609	1,065
Workshop etc.							
Civil Work	522	2,484	0	0	0	0	3,005
Container	0	600	0	0	0	0	600
Total	4,570	29,552	4,673	4,286	3,536	4,451	51,069

Note: Total figures show some error because of rounding.

2) Annual Cost

Operation and maintenance cost in the year 2000 is estimated to be US\$ 32.2 million as shown in Table 3-2-2. Beside operation and maintenance cost, interest payments on loan and profit tax levied on PLC should be taken into account. Amount of interest is estimated based on the loan conditions and amount. PLC shall pay a profit tax equivalent to 52% of its profit.

Table 3-2-2 Operation and Maintenance Cost
(Unit: US\$ 1,000)

	1995	1996	1997	1998	1999	2000	Total

Collection							
Personnel	2,194	1,957	1,859	1,907	1,942	1,977	11,836
Maintenance	1,384	1,244	1,323	1,330	1,210	757	7,248
Others	1,183	989	1,001	1,058	1,084	1,100	6,416
Landfill							
Personnel	89	93	107	107	107	107	611
Maintenance	5	5	0	83	101	136	330
Others	346	360	725	753	503	512	3,200
Recycling							
Personnel	0	0	11	11	16	43	81
Maintenance	0	0	6	6	20	50	81
Others	0	0	3	3	8	22	36
Workshop etc.							
Personnel	96	96	192	192	192	192	960
Maintenance	0	0	12	12	12	12	50
Others	117	117	285	285	285	285	1,376

Total	5,415	4,862	5,525	5,748	5,481	5,192	32,224

Note: Total figures show some error because of rounding.

3.2.2 Financial Source

1) Revenue from Fee Collection

SWM revenue consists of waste tax, collection and tipping fees, income through sales of reusable material and subsidy from SGM.

- a. Waste tax shall be collected by SGM and transferred to PLC.
- b. Fee for collection and tipping service shall be collected directly by PLC.
- c. Sales of reusable materials shall be managed by PLC.
- d. SGM will continue to provide the same 1993 subsidy amount up to 1999.

The revenue is estimated as shown in Table 3-2-3. In principal, the annual cost shall be covered by that revenue.

Table 3-2-3 Composition of Revenue (1994 price)
(Unit: US\$ 1,000)

	1995	1996	1997	1998	1999	2000	Total
Waste tax							
Household	1,056	1,056	4,106	4,106	4,106	8,409	22,839
Shops etc.	5,583	5,583	5,583	5,583	5,583	5,583	33,498
Collection fee							
Shops etc.	717	717	1,036	1,142	1,249	1,355	6,216
Tipping fee	38	38	129	133	137	141	616
Selling of re-usable material	0	0	20	21	109	264	413
SGM budget allocation	325	325	325	325	325	0	1,625
Total	7,719	7,719	11,199	11,310	11,509	15,752	65,206

Note: Total figures show some error because of rounding.

b. Source of Investment Cost

The foreign portion of the disposal site cost shall be financed by a loan from an overseas bank under the conditions shown in Table 3-2-4. Loan condition has been set considering the usual EBRD and IBRD loan condition where interest rate will be around 7% and more for Eastern Europe Countries.

Table 3-2-4 Loan Conditions

	Repayment condition	Interest rate
Foreign Loan	Repayment over 15 years with a 5 year grace period	7.5%
Local Loan		
long term	Repayment over 10 years with a 3 year grace period	8.5%
short term	Repayment in the following year	12.5%

The local portion shall be financed by domestic banks under the conditions shown in the same table. Remaining investment cost including purchase cost of collection vehicles, contain-

ers and equipment required for recycling and their renewal cost, and construction cost for adaptation of depots and workshop, and for amenity centers shall be covered by own fund. Shortage shall be covered by a short term loan from a domestic bank(s). The financial source for investment is shown in Table 3-2-5.

Table 3-2-5 Sources of Investment Funds (1994 Price)
(Unit: US\$ 1,000)

	1995	1996	1997	1998	1999	2000	Total
Own fund	586	912	2,932	2,603	2,769	4,451	14,253
Foreign Loan	2,725	11,547	0	0	0	0	14,272
Local Loan							
long term	522	15,056	0	0	0	0	15,578
short term	738	2,037	1,740	1,684	768	0	6,966
Total	4,570	29,552	4,673	4,286	3,536	4,451	51,069

Note: Total figures show some error because of rounding.

c. Financial source for annual cost

Annual costs that include operation and maintenance cost, and interest payments on loan shall be covered by own fund. Shortage shall be covered by short term loan as necessary.

3.2.3 Financial plan

Based on the above mentioned financial requirement and financial source, the financial plan has been prepared and is summarized in Table 3-2-6.

Table 3-2-6 shows that balance will be in the red in 1997, 1998 and 1999 because resident burden is set at half of actual SWM cost. Therefore, it is necessary to continue receiving a subsidy from SGM until 1999 and profit tax of PLC shall be exempted in 1995 and 1996 to secure own fund to cover shortage in the following years. These shortages shall also be covered by short term loan provided by domestic bank.

In 2000, balance will change to black figures and PLC shall therefore be able to pay profit tax after 2000 according to the regulations.

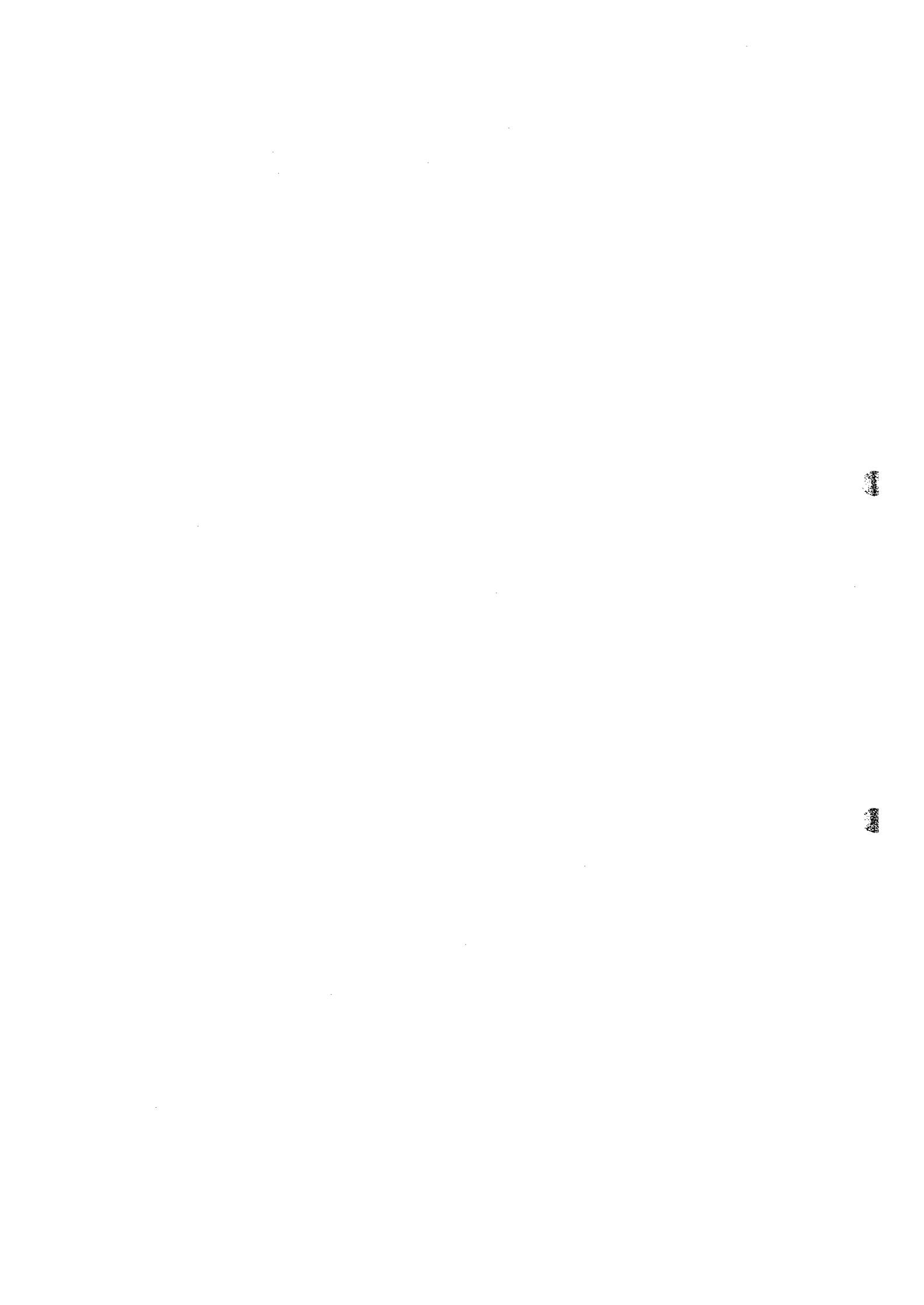
Table 3-2-6 Financial Plan for PLC (in US\$ 1,000)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
A. PROFIT AND LOSS STATEMENT											
Revenue (1)											
Waste tax: Household	1056	1056	4106	4106	4106	8409	8409	8409	8409	8409	8738
Shops, etc.	5583	5583	5583	5583	5583	5583	5583	5583	5583	5583	5583
Collection Fee											
Shops, etc.	717	717	1036	1142	1249	1355	1366	1377	1388	1399	1410
Tipping Fee	38	38	129	133	137	141	142	144	145	147	148
Reusable Materials	0	0	20	21	109	264	428	591	755	919	1082
SGM Budget Allocation	325	325	325	325	325	0	0	0	0	0	0
Sub-total (1)	7719	7719	11199	11310	11508	15752	15928	16104	16280	16456	16961
Annual Expense (2)											
O & M Cost: Personnel	2380	2146	2169	2217	2257	2319	2354	2390	2441	2477	2512
Maintenance	1389	1249	1341	1432	1343	955	986	1018	1056	1087	1119
Others	1647	1467	2015	2100	1881	1919	1949	1977	2018	2045	2063
Depreciation	532	908	3858	4236	4713	5160	5315	5470	5642	5797	5949
Interest(long)	0	249	2394	2394	2388	2199	1989	1693	1397	1101	805
Interest(short)	0	0	0	94	255	553	531	354	84	0	295
Sub-total (2)	5947	6019	11778	12473	12838	13104	13125	12903	12638	12507	12743
Balance	1772	1699	-579	-1163	-1330	2648	2803	3201	3642	3949	4217
Tax	0	0	0	0	0	686	1458	1665	1894	2054	2193
Profit or Loss	1772	1699	-579	-1163	-1330	1963	1345	1537	1748	1896	2024
B. CASH FLOW											
Balance + Depreciation (3)											
Sub-total (3)	2303	2608	3279	3073	3384	7122	6661	7007	7390	7693	7974
Money Demand (4)											
Investment	4570	29552	4673	4286	3536	4451	1594	1193	2436	7027	7287
Loan Repayment											
Long Term	0	0	0	75	2225	2498	3653	3653	3653	3653	3578
Short Term	0	0	0	755	2043	4421	4248	2835	673	0	2358
Sub-total (3)+(4)	4570	29552	4673	5116	7805	11371	9495	7680	6761	10680	13224
Money Supply (5)											
SGM Budget	0	0	0	0	0	0	0	0	0	0	0
Long Term											
Foreign Loan	2725	11547	0	0	0	0	0	0	0	0	0
Local Loan	522	15056	0	0	0	0	0	0	0	0	0
User	0	0	0	0	0	0	0	0	0	0	0
Short Loan	0	0	755	2043	4421	4248	2835	673	0	2358	5250
Sub-total (5)	3247	26603	755	2043	4421	4248	2835	673	0	2358	5250
Surplus of Money	979	-341	-639	0	0	0	0	0	629	-629	0
Reserved Fund	979	639	0	0	0	0	0	0	629	0	0
Total Debt	3247	29850	30604	31818	31971	29300	24234	18419	14094	12800	12113

The total debt will commence a downtrend turn in 2000, decreasing to US\$ 12.1 million in 2005, under the case where the tariff will remain the same level as that of 2000 and without construction of an incineration plant. The total debt of US\$ 12.1 million in 2005, consists of the remainder of the long term loan (US\$ 6.9 million) and the short term loan (US\$ 5.2 million). The maximum requirement of short term loan will be US\$ 5.2 million in 2005. Considering that total amount of profit tax to be paid from 2000 to 2005 will be US\$ 9.9 million, the PLC is expected to be in a position where it can implement the priority projects and operate SWM in the territory of SGM.

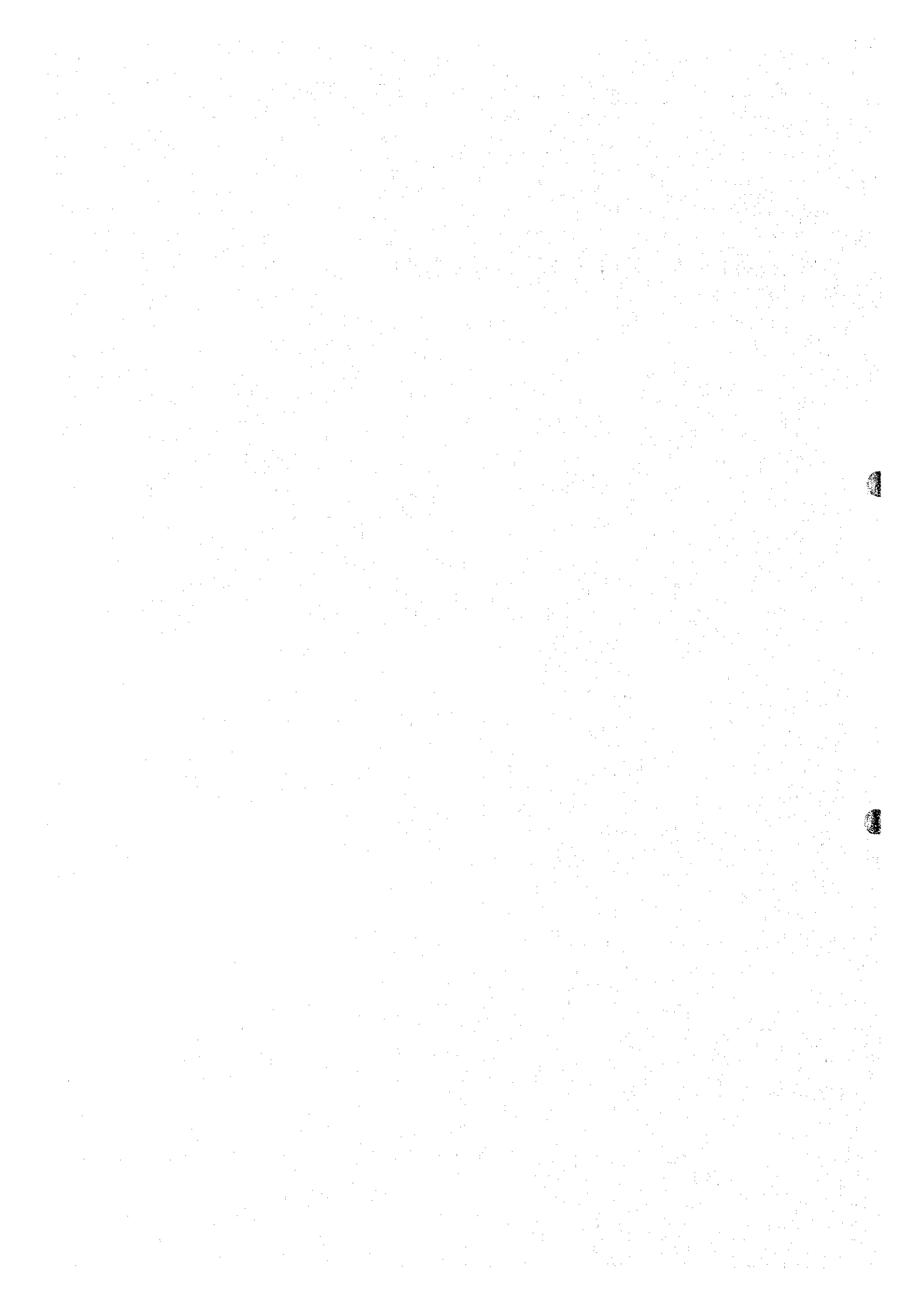
In addition the following points should be examined in the future by the PLC in order to establish a better SWM system.

- As mentioned above, profit tax levied on PLC shall be considered in relation to providing low cost SWM service. At least this tax should be used to provide better SWM service including after care of final disposal site.
- Interest payments will impose a heavy burden on PLC. Municipality should assist PLC to obtain better sources of finance with low interest rate.
- Subsidy for investment to promote SWM upgrading shall be considered.
- Because of high inflation rate in Bulgaria, SWM tariff should be periodically revised to secure necessary revenue for PLC.



CHAPTER 4

PRIORITY PROJECT EVALUATION



CHAPTER 4 PRIORITY PROJECT EVALUATION

4.1 Technical Evaluation

The technical aspects of the project have been evaluated on the basis of suitability of technical system adopted and ease of operation and maintenance. The major three activities of SWM are evaluated hereafter.

1) Improvement of Collection System

From technical viewpoint there seems to be no problem to improve collection and haulage system because the system proposed in the project is based on the container types and vehicles presently used with minor modifications to improve equipment utilization.

Reorganization of the present 24 collection zones into 8 has been proposed taking into consideration district, as well as natural boundaries and similar land use. This reorganization is proposed at the same time of establishment of PLC to avoid creating confusion in the service.

2) Construction of Katina Disposal Site

The project proposes to construct the disposal site at the abandoned Katina quarry site. The construction of the disposal site and proper sanitary landfill operations pose no technical problems.

Leachate resulting from the disposal site operation shall be recycled and discharged into the SGM sewerage system and thereby excessive investment required for construction of a leachate treatment plant may be avoided.

An issue necessary to resolve concerning Katina site is the control of bird congregation there once disposal operations starts. Countermeasures including construction of protection net and keeping birds of prey at the site are proposed.

Based on the above, consensus on using Katina site as the new disposal site should be achieved.

3) Recycling Pilot Project and Amenity Center

The recycling pilot project largely depends on availability of market demand for the reusable materials and extent of citizens cooperation in separating waste. The system proposed for the pilot project is widely employed in Europe where it has proved to be effective.

Materials to be collected are paper and glass and their market is considered secure, as described in Chapter 2. It is recommended to start with a small area, and expand as experience is gained on the most effective ways to secure citizen cooperation.

It is also proposed to establish amenity centers in each depot and at Katina disposal site to provide a place where residents may bring their hazardous domestic waste and other bulky waste. Hazardous domestic waste will then be transported from the amenity centers to Kremikovtzi disposal site.

4.2 Economic Evaluation

4.2.1 General

1) Benefits of the Priority Project

The following benefits are expected to result from the priority project implementation.

- a. More cost efficient collection and haulage
- b. Unifying a high standard of collection service level throughout SGM, thereby upgrading public health and aesthetics
- c. Ensure efficient and proper sanitary landfill operation will continue in the future for a long time by using Katina disposal site
- d. Proper sanitary landfill operation at Katina disposal site will make it possible to close down existing poorly operated disposal sites and put a stop to the environmental damage they are creating
- e. The Katina disposal site will make it possible to accept non-hazardous industrial waste that is now disposed of illegally, thus reducing the environmental hazards of illegal disposal
- f. Waste recycling will provide an income from sale of reusable materials and decrease the volume of waste to be collected and disposed of, thereby decreasing SWM costs
- g. Reutilization of resources will lead to savings in raw materials and energy costs
- h. The establishment of the PLC will lead to more efficient utilization of personnel, facilities and equipment
- i. PLC will allow savings in personnel and more efficient depots utilization
- j. Revised fee system will ensure a fair burden on citizens and provide a sounder financial base for SWM
- k. Amenity center introduction will ensure that hazardous domestic waste and bulky waste are properly disposed of, thereby positively affecting the environment

Of the above effects, only those described in a., f. and h. can be quantitatively evaluated.

2) Method and Criteria

Economic evaluation of basic human needs projects is usually carried out by the least cost method because quantitative benefits estimation is very difficult. However in this case study, the cost-benefit analysis was examined as follows;

- a. Collection and haulage improvement project
Quantitative analysis was carried out in order to analyze the cost saving effect the project is expected to produce.
- b. Katina disposal site
Quantitative analysis has been adopted because it is the least cost technology required to fulfill the standards of landfill and environmental protection.
- c. Recycling pilot project
Quantitative analysis has been adopted to analyze cost saving effect on collection and disposal operations, including cost recovery through sale of reusable materials.
- d. PLC Establishment
Quantitative analysis was carried out in order to estimate the cost saving effect the new SWM organization will produce.

3) Condition of economic evaluation

The main assumptions for both economic and financial evaluation (financial evaluation shall be dealt with in the following section) are as follows:

- Evaluation period is from 1995 to 2010
- Investment costs and Operation and Maintenance costs for collection and haulage are based on the no-incineration case (this is only for priority project evaluation).
- After the year 2005, operation and maintenance costs for Katina disposal site will remain the same as in 2004.
- Operation and maintenance costs for headquarter, workshop and vehicle depots will remain the same as that of 1997.

Evaluation conditions for each of the main three components are as follows:

(1) Collection and Haulage

The cost benefit analysis of the collection and haulage improvement project was done by assuming that collection and transport cost without improvement is the benefit, and that cost in case of implementing the improvement is the cost.

Effects to be considered for qualitative analysis are;

- Upgrading collection service in areas where service level is low

- Improvement of work conditions of workers

(2) Katina disposal site

The benefits incurred from construction of Katina disposal site are described in items c., d. and e. of section 4.2.1 1) above. These benefits can be used as a basis for qualitatively comparing Katina disposal site to another site of sufficient disposal capacity.

(3) Recycling pilot project

Benefits that are evaluated under the recycling pilot project are described in items f. and g. of 4.2.1 1) above.

(4) PLC

The benefits that are considered under this project are described in h. and i. of section 4.2.1 1).

4) Basic Unit Costs

Operation and maintenance and investment costs shall be considered for each project. Costs are converted from market price to economic price considering domestic transfer payments, international prices and minimum wages in Bulgaria.

The basic rates to calculate benefits and costs adopted for the economic evaluation are as follows;

- Waste haulage cost	: US\$	19.4/ton
- Final disposal cost	: US\$	2.5/ton
- Fuel prices	: US\$	0.35/l
- Salaries		
Administration	: US\$	1,620/month
Workers	: US\$	1,575/month
- Selling prices of reusable materials:		
Paper	: US\$	32/ton
Glass	: US\$	17/ton
- Office rental space	: US\$	42/year

4.2.2 Project Evaluation

1) Collection and Haulage

Table 4-2-1 shows the benefit and cost calculation for the collection and haulage improvement project.

During the 1995 to 2010 period benefit was US\$ 136 million, while cost is estimated to be US\$ 123 million, ie. a B/C ratio of 1.11. With an additional benefit of an EIRR of 24% and under preconditions of institutional development and revised waste tariffs, the evaluation shows that the project is economically feasible.

Table 4-2-1 Collection and Haulage Benefit and Cost Estimation
(unit: US\$ 1,000)

Year	Waste collected (t/d)	Benefit		Cost			Total Cost	Discount Rate (24%)	
		Base case	Collection & Haul	Inves- tment	Operation and main- tenance	Workshops, etc		Inves- tment	Operation and main- tenance
1995	1,010	7,139	530	4,570	124	214	5,438	5,758	4,385
1996	1,051	7,427	2,864	4,019	3,481	214	10,578	4,830	6,879
1997	1,091	7,714	5,581	4,057	0	489	10,127	4,046	5,311
1998	1,132	8,001	2,734	4,166	0	489	7,390	3,384	3,126
1999	1,172	8,288	5,370	4,106	0	489	9,966	2,827	3,399
2000	1,213	8,576	2,710	3,702	0	489	6,901	2,359	1,898
2001	1,222	8,642	1,140	3,734	600	489	5,964	1,917	1,323
2002	1,232	8,708	857	3,764	0	489	5,110	1,558	914
2003	1,241	8,774	4,647	3,820	0	489	8,957	1,266	1,292
2004	1,251	8,840	3,168	3,842	0	489	7,500	1,029	873
2005	1,260	8,907	5,761	3,868	0	489	10,119	836	949
2006	1,266	8,953	2,710	3,878	600	489	7,677	677	581
2007	1,273	8,999	1,140	3,889	0	489	5,519	549	337
2008	1,280	9,045	857	3,907	0	489	5,254	445	259
2009	1,286	9,092	4,647	3,914	0	489	9,051	361	359
2010	1,293	9,138	3,168	3,955	0	489	7,612	292	244
Total	19,273	136,244	47,883	63,193	4,805	7,280	123,162	32,135	32,131

Qualitative analysis of the following points also evaluated the project as feasible:

- Workshop and vehicle depots will guarantee proper collection vehicles operation and upgrade service levels.
- New vehicles are more safe and provide better working conditions for the workers.
- Total fuel consumption will decrease thereby relatively reducing CO_x, NO_x and SO_x exhaust emissions.

2) Katina disposal site

Quantitatively, the investment cost for construction of Katina disposal site is about 1/3rd the respective cost for continuing disposal operation at the existing Suhodal and Dolni Bogrov disposal sites. Qualitative analysis concluded the project feasible based on the following effects:

- Improvement of public sanitary conditions and the surrounding environment by sanitary landfill
- Protection of groundwater from deterioration by applying a seepage liner and leachate collection pipes
- Protection against surface water contamination by discharging leachate into the sewage system
- Prevention against birds gathering by hanging a net over the site, and careful monitoring and operation supervision
- Improvement of working conditions of workers

3) Recycling Pilot Project

Benefit and cost of the project are estimated as shown in Table 4-2-2.

Table 4-2-2 Recycling Benefit and Cost Estimation (unit: US\$ 1,000)

Year	Waste Amount		Benefit				Cost			Discount Rate (26.6%)	
	Recy- cled (t/d)	Disp- osed (t/d)	Resource recov- ery	Cost saving ----- Coll. Land- & Haul fill	Total	Inves- tment	Oper. & Main.	Total	Benefit	Cost	
1997	2.5	0.4	20	17	2	39	144	19	163	19	80
1998	2.5	0.4	21	18	2	41	0	19	19	16	7
1999	13.1	2.0	109	93	10	212	420	43	463	65	142
2000	31.6	4.7	264	224	25	512	825	111	936	124	227
2001	50.1	7.0	428	354	40	822	731	168	898	158	172
2002	68.6	9.3	591	485	55	1,131	821	225	1,045	171	158
2003	87.1	11.7	591	616	70	1,277	783	291	1,074	153	129
2004	105.7	14.0	919	747	85	1,750	1,097	348	1,444	165	137
2005	124.2	16.3	1,082	878	100	2,060	1,394	404	1,798	154	134
2006	141.3	18.0	1,246	999	114	2,359	1,229	466	1,695	139	100
2007	158.4	19.6	1,408	1,120	128	2,657	1,319	518	1,836	124	86
2008	175.3	21.2	1,571	1,239	143	2,953	1,388	569	1,957	109	72
2009	188.5	21.5	1,718	1,332	155	3,204	1,649	609	2,257	93	66
2010	200.7	21.5	1,860	1,419	166	3,445	1,892	648	2,539	79	58
Total	1,349.7	167.7	11,827	9,541	1,094	22,462	13,688	4,438	18,125	1,570	1,569

Assuming the pilot project will be successfully implemented and expanded to other areas, in 2010 benefits incurred from this activity will be US\$ 22 million, while cost will be US\$ 18 million. Therefore a B/C ratio of 1.24 is estimated. With an estimated EIRR of 26.6%, this project is considered economically feasible. Qualitative analysis also concluded the project to be feasible because of its expected effects in awakening citizens awareness and reduction in waste amount.

4) PLC

The quantifiable economic benefits that will be incurred from setting up one PLC in the place of 24 BKC and the Chistota company are as follows (Table 4-2-3).

Table 4-2-3 PLC Benefit and Cost Estimation

A. SAVINGS IN SALARIES					
	Market Unit Price (US\$/Year)	Employee Number		Annual Salary (US\$ 1,000)	
		W/O PLC	PLC	W/O PLC	PLC
Employees					
- Director/Manager	1,620	30	4	49	6
- Deputy Manager	1,512	40	6	60	9
- Section Chief	1,440	55	12	79	17
- Clerk, etc.	1,260	85	33	107	42
Total Annual Salaries				295	74
Benefit (US\$ 1,000)					221
B. SAVINGS IN HEADQUARTERS COSTS					
	Market Rent Price (US\$/Year)	Floor Area (m ²)		Annual Rental (US\$ 1,000)	
		W/O PLC	PLC	W/O PLC	PLC
Office Space	42	2,700	700	113	29
Utilities (5%)				6	1
Total Headquarters Costs				119	31
Benefit (US\$ 1,000)					88

- Reduction in management and supervisory staff at the company headquarters will lead to savings in salaries.
- Reduction in required office space and utilities consumption will lead to savings from office rental.

Savings in employees salaries shall be US\$ 221 thousand, and those in headquarters office shall be US\$ 88 thousand annually. Therefore a total annual saving of US\$ 309 thousand for the company headquarter is estimated.

4.3 Financial Evaluation

4.3.1 General

The priority projects for which financial evaluation was made are the same as those which were the subject of economic evaluation;

- Collection and haulage
- Katina disposal site
- Recycling

The above activities are planned to be executed mainly by the PLC to be newly established. Therefore PLC's financial feasibility was investigated after the financial evaluation for each project was done.

The concept of the financial evaluation method is shown in Table 4-3-1.

Table 4-3-1 Financial Evaluation Method

Stage	Method	Criteria
I. Project evaluation		
a- Collection & haulage	quantitative analysis	R-E > 0
b- Katina disposal site	quantitative analysis	R-E > 0
c- Recycling	quantitative analysis	R-E > 0
II. Financial evaluation of PLC		
	quantitative & qualitative analysis	FIRR > 8.5% Trends of Debt

Notes: FIRR means Financial Internal Rates of Return
R means Revenue and E means Expense

4.3.2 Project Evaluation

1) Evaluation of each project

(1) Collection and Haulage

Table 4-3-2 shows the estimated revenues and expenditures for the collection and haulage project. Attaining an FIRR of 31.9%, the quantitative analysis concluded the project to be feasible.

Table 4-3-2 Collection and Haulage Revenue and Expenditure
(unit: US\$ mill.)

	1995	1997	2000	2005
Revenue				
Waste Tax				
Household	1,014	3,947	8,083	8,311
Shops, etc.	5,360	5,360	5,360	5,360
Collection Fee				
Shops, etc.	717	1,037	1,357	1,412
Total	7,090	10,343	14,799	15,083
Expenditures				
O & M				
Collection	4,761	4,183	3,834	4,003
Disposal	437	2,987	3,321	2,943
Workshop, etc.	214	489	489	489
Depreciation				
Collection	530	1,488	2,557	2,659
Workshop, etc.				
Civil work	0	200	200	200
Containers	0	120	120	120
Total	5,941	9,468	10,522	10,415
Balance	1,419	875	4,278	4,668

Note: Disposal cost in 1995 will be paid to Suhudol site

(2) Katina Disposal Site

Based on the quantitative analysis the project has been concluded as feasible because even though FIRR is 2.9%, revenue exceeds expenditure as shown in Table 4-3-3.

(3) Recycling Pilot Project

The quantitative analysis concluded the project was feasible for the following reasons, even though FIRR could not be calculated because R/E is larger when discount rate is higher. The financial figures are shown in Table 4-3-4.

- R/E = 1.06 at discount rate of 8.5%
- Present value (R-E) = US\$ 418,000

Table 4-3-3 Katina Disposal Site Revenues and Expenditures
(unit: US\$ mill.)

	1995	1997	2000	2005
Revenue				
Collection: Waste tax	0	2,635	2,860	2,534
Coll. fee	0	352	461	409
Recycling	0	1	13	38
Tipping fee	0	129	141	149
Total	0	3,118	3,475	3,130
Expenditures				
O & M: Personnel	0	107	107	107
Maintenance	0	0	136	136
Others	0	725	512	543
Depreciation: Civil work	0	1,563	1,563	1,563
Mobile	0	473	473	473
Total	0	2,869	2,791	2,822
Balance	0	248	684	308

Note: Disposal cost in 1995 will be paid to Suhudol site

Table 4-3-4 Recycling Pilot Project Revenues and Expenditures
(unit: US\$ mill.)

	1995	1997	2000	2005
Revenue				
Waste Tax: Household	0	2,635	2,860	2,534
Shops, etc.	0	352	461	409
Reusable materials sales	0	1	13	38
Total	0	3,118	3,475	3,130
Expenditures				
O & M: Personnel	0	107	107	107
Maintenance	0	0	136	136
Others	0	725	512	543
Depreciation: Vehicle	0	1,563	1,563	1,563
Container	0	473	473	473
Total	0	2,869	2,791	2,822
Balance	0	248	684	308

Note: Disposal cost in 1995 will be paid to Suhudol site

2) Financial Evaluation of PLC

Financial evaluation of the PLC concluded that PLC was feasible due an estimated FIRR of 14.4%. The cash flow diagram shown in Figure 4-3-1 is based on constant price of 1994 and excludes future inflation.

The figure shows that revenue will exceed expense after year 2000, and total debt in 2010 will be US\$ 11 million.

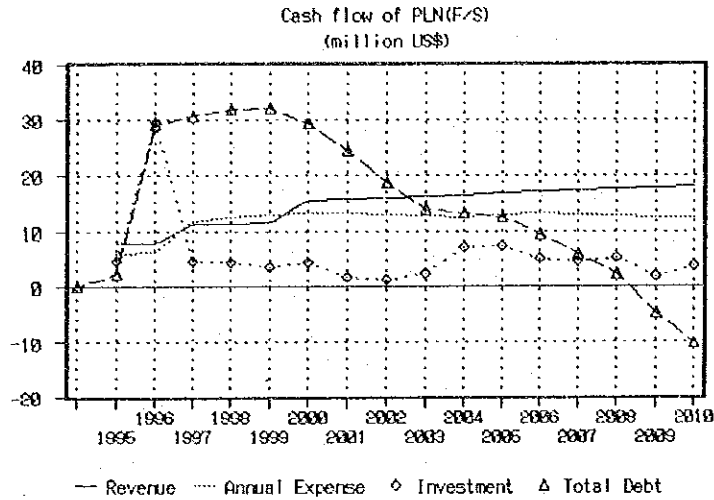


Figure 4-3-1 PLC Cash Flow (F/S)

3) Sensitivity Analysis

The result of sensitivity analysis is shown in Figure 4-3-2.

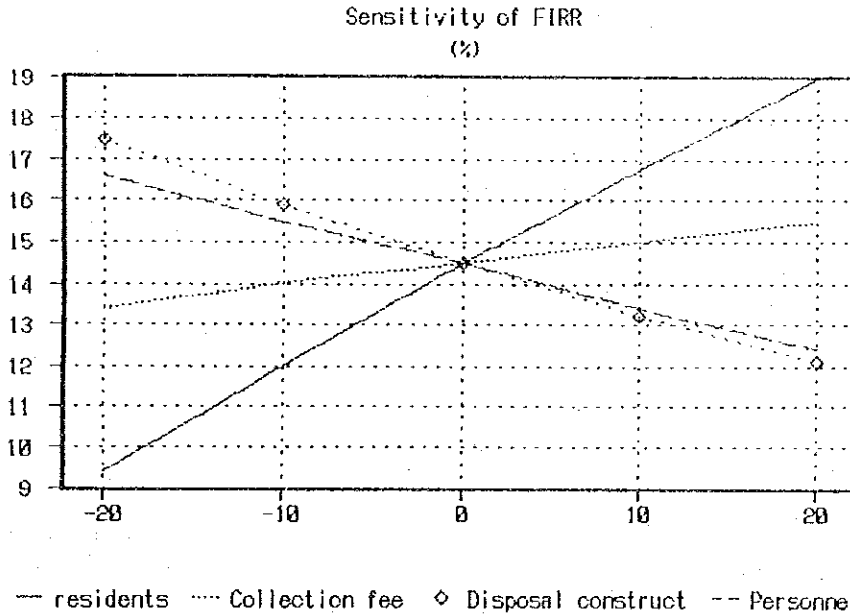


Figure 4-3-2 Result of Sensitivity Analysis (FIRR)

As mentioned above, the priority project including establishment of PLC has been evaluated to be feasible. However feasibility is conditional on securing sufficient income and saving in costs. The influence on the total debt that the following important factors may have are examined by sensitivity analysis:

- Income through waste tax collected from residents
- Construction cost of Katina disposal site
- Personnel cost
- Loan conditions

Each item was examined within a range of +20% to -20% and the results are as shown in the figure. The results show that the most important factor affecting sound PLC operation is securing of sufficient amount of waste tax as planned.

Additional sensitivity analysis was made for a number of cases developed as shown in Table 4-3-5. FIRR and total debt resulting from each case are shown in the table.

Table 4-3-5 Result of Additional Sensitivity Analysis

Option	FIRR	Total Debt in 2010

Waste tax from residents	Tariff in 1997	
Case 1	US\$ 0.9/capita	10.9%
Case 2	US\$ 2.4/capita	13.0%

Construction cost of Katina		
Case 3	exclud. NI road	15.4%

Interest rate		
Case 4	0.8 times of base	14.4%
Case 5	1.2 times of base	14.4%

Repayment of foreign loan		
Case 6	20 years with 5 years grace period	14.4%

Figure 4-3-3 shows the differences between case 1, case 2 and the base case (F/S case) concerning waste tax amount levied on residents. Figure 4-3-4 compares the base case with case 3, while Figure 4-3-5 shows the influence of the loan conditions, comparing the base case with cases 4 and 5.

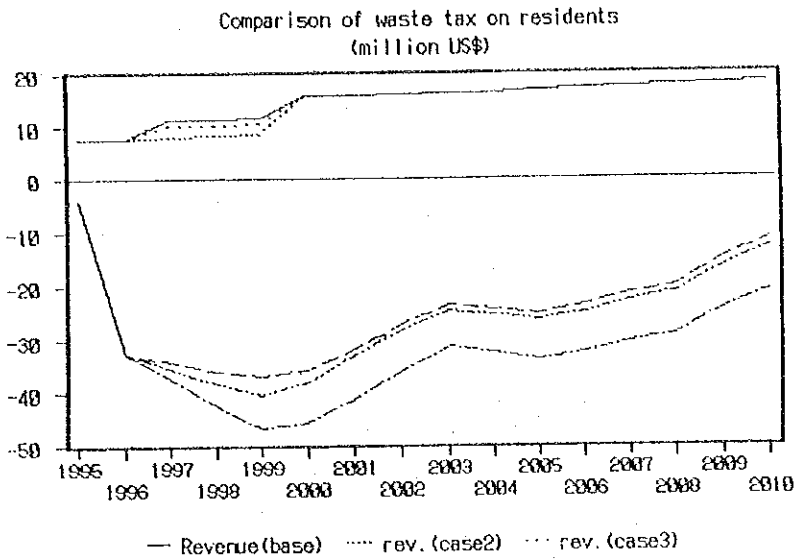


Figure 4-3-3 Comparison of waste tax on residents

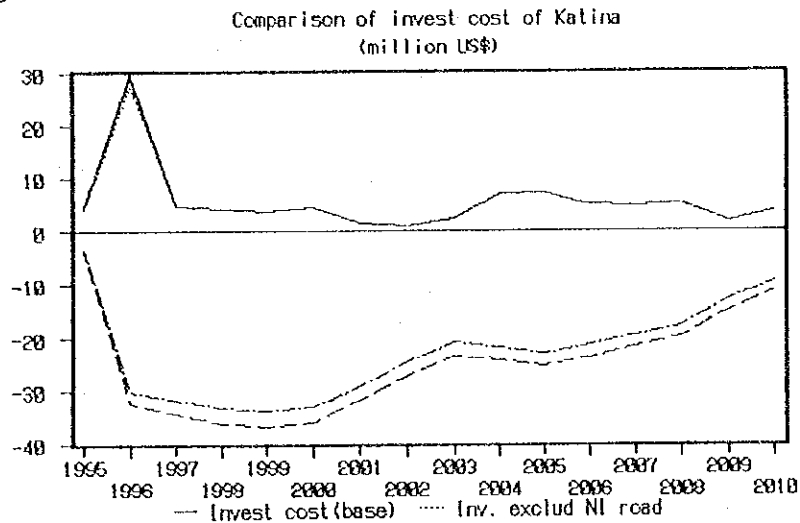


Figure 4-3-4 Comparison of investment cost of Katina

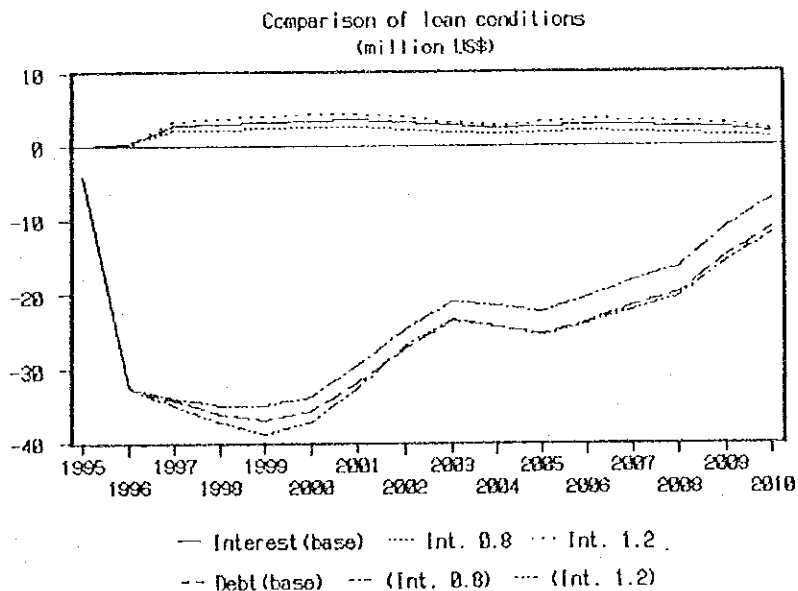


Figure 4-3-5 Comparison of loan conditions

4) Conclusion

The financial evaluation concludes that the priority projects proposed in this case study are financially feasible on the condition of successfully revising the fee system as planned.

4.4 Social Evaluation

1) Service level of collection

Change in the collection frequency proposed in the plan aims at standardizing service levels in similar areas, and not to reduce collection frequency. For all residential areas, excluding remote suburban areas, collection service is provided more than twice a week. Daily collection service, except for Sunday will be provided to the center area. Therefore this system is judged acceptable to SGM residents.

2) Recycling Pilot Project

Recycling activity is conducted by Mehaplant, recycle shops and scavengers at present. The pilot project is planned to start in 1997 in a small area, and gradually expand as economic conditions improve. The pilot project will initially be aimed at residential and not at commercial areas, where scavenger activity is presently concentrated.

Therefore, the pilot project is not expected to conflict with scavenger activities.

3) Construction Katina disposal site

Use of Katina quarry site as a disposal site is conditional upon the consent of the residents and the Ministry of Defense. On the other hand, the proposed proper sanitary landfill operation of the site will not offer the opportunity for scavengers to operate there, as is the case of the presently poorly operated Dolny Bogrov disposal site.

Therefore scavenging activity conflicts with proper sanitary landfilling and scavengers will lose their job. However the proper operation of the disposal site will protect the surrounding environment and somewhat ease the anxiety of the adjacent residents. Also the economic recovery in Bulgaria may contribute to providing new job opportunities.

4) Establishment of SWM PLC

To ensure efficient SWM, establishment of public limited company is proposed. This company will concentrate on solid waste management with the exclusion of street sweeping, cleaning and snow removal. However establishment of new company will imply streamlining the present excessive SWM staff to ensure efficient operation. In addition, an improved collection system will reduce staff.

However, other BKC functions will still require staffing for better street sweeping service. Presently this service is provided on an irregular basis due to shortage of funds, and as funds become available and service improves more staff may be required.

5) Increase of waste tax

To secure financial source for SWM, waste tax shall be increased to cover all costs by the year 2000. However amount of waste tax is estimated at less than 0.5% taking into consideration the recovering economy in Bulgaria and the need to avoid social confliction.

4.5 Environmental Evaluation

4.5.1 Preliminary Environmental Assessment at Katina site

1) Water protection

At the construction stage of Katina disposal site, the water of the inner lake shall be discharged for reclamation by soil. As the lake water has a high sulfate concentration, dilution of the water by Katinska river may be possible if discharge season is limited from January to June.

After start of operation, leachate and other waste water will be produced and groundwater will be collected separately. Leachate and waste water will be discharged to the sewerage system and treated at SGM treatment plant. As concentration of groundwater will be less than the inner lake water, it is planned to be discharged into Katinska river under strict monitoring to assure its quality. If the water quality exceeds the standard limits, considering dilution of Katinska river the discharge point will be changed to the drainage system of Iskar river.

2) Human settlement

In the year 1992 the Bulgarian Ministry of Health defined Sanitary Protection Zones as areas which have to be kept free from any human activity to protect against dangerous impacts resulting from facilities located in the zone.

The main residential areas of Novi Iskar and Katina village are situated within a radius of 1-2 kilometers of the site, while only a small area with permanent housing is located within a 500 m radius. However some 80 houses constructed as holiday homes, but actually used as temporary residences are located just adjacent to the site. Therefore the priority project has considered resettlement and compensation for residents of these holiday homes.

3) Scattering of light materials by wind

Fear of light materials and aerosol scattering by the wind is not so great because of the site geomorphological characteristics. The danger will be further reduced by construction of a green belt around the site during the first stage of construction.

4) Traffic and noise

Maximum possible frequency of vehicles arriving at Katina disposal site is estimated to be 150 vehicles/hour. However collection vehicles will have the option of using the new Novi Iskar bypass, which is planned to be constructed in 1996, and it will not be necessary to access the site through the center of Novi Iskar village.

5) Animal, pest and bird control

Since disposal sites are known to have very high attraction for different animal groups, precautions have to be taken to control these populations. Attraction of bird populations is a very serious problem especially when an airport is located in the near vicinity. Therefore countermeasures for bird control at the Katina disposal site are very important and effective measures adopted in other European cities such as netting construction and introduction of birds of prey have been considered.

6) Hygienic Aspects

Cleaning facilities shall be provided at Katina disposal site for collection vehicles to remove clay and solid waste items that may become attached to the vehicles, before vehicle departure from the site.

4.5.2 Monitoring Activity

To minimize negative impact on the environment, monitoring is planned as follows.

1) Construction stage

- Water quality discharged from the site including sediments
- Selection and cultivation of trees used for the green belt constructed along the site perimeter
- Bird population at the site

2) Operation stage

- Solid waste amount, type and composition
- Dumping activity
- Access road condition and cleanliness
- Groundwater, leachate and other waste waters quality
- Development of green belt trees
- Bird and animal population at the site

4.5.3 Conclusion

Katina site is an abandoned quarry with no measures for environmental protection. Presently coal is observed to be continuously burning and small landslides are occurring at the site.

Although employment of Katina site for a disposal site will generate some negative impacts created from dumping activity and storage of solid waste, this project is considered acceptable from environmental viewpoint considering the following points.

- a. As described earlier, this site is not stable and already has a negative impact on the environment. Therefore reclamation or restoration is necessary.
- b. Katina disposal site has a life time of around 15 years. After this period, disposal operation will cease and the site may be used for other purpose.
- c. Negative impacts generated from using site as a disposal site may be minimized by the mitigation plans proposed in the priority project.

It is necessary to note that Katina site can only be used after sufficient discussions between the concerned authorities, residents of Katina and Novi Iskar and the Ministry of Defense and a consensus has been achieved.

4.6 Overall Conclusion

As described in this chapter, this case study shows that the priority project is feasible considering technical, economical, financial, social and environmental aspects, despite some impact on the surrounding area of Katina disposal site and new unemployment as a result of operating a more efficient SWM system.

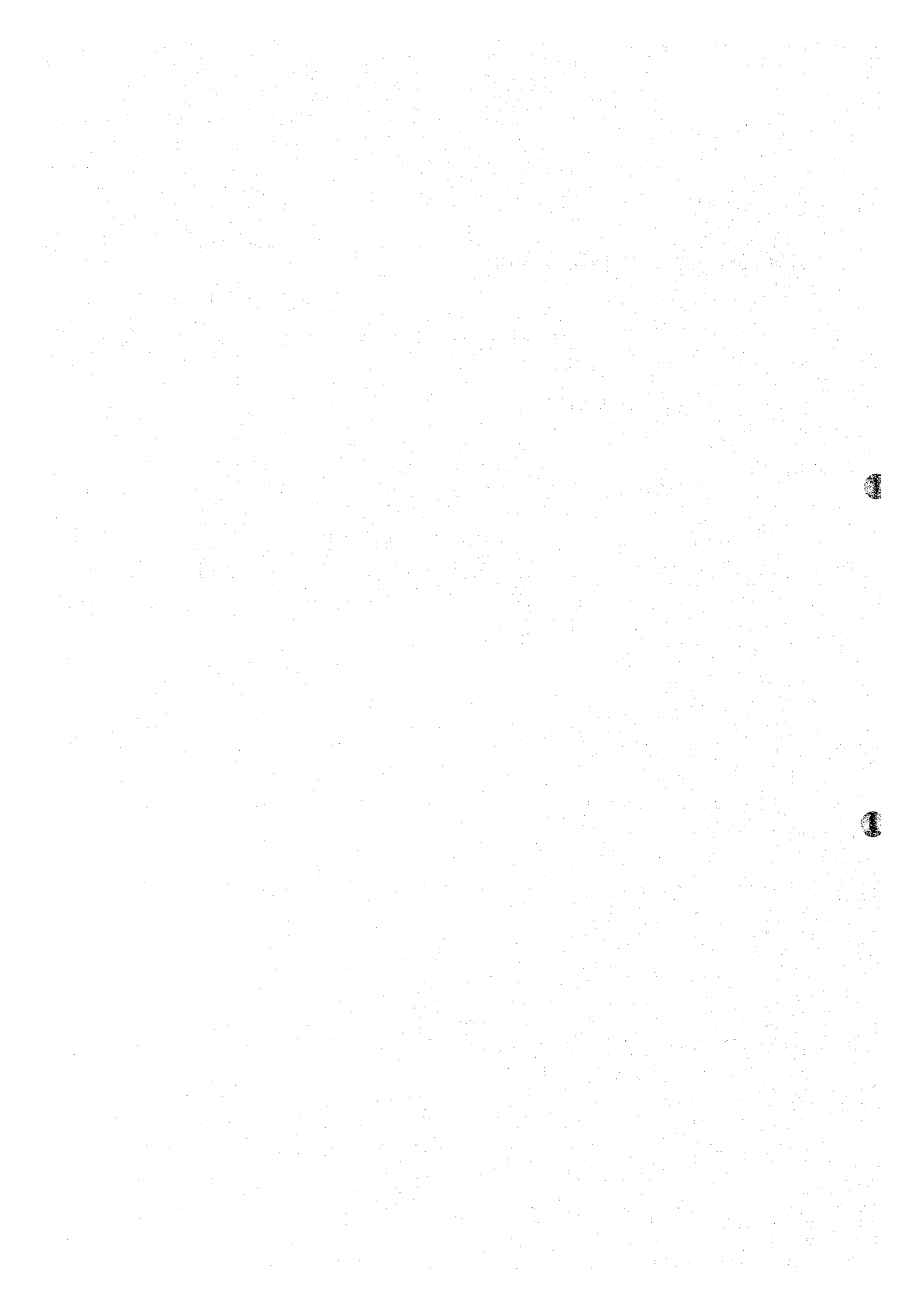
Environmental effects resulting from Katina disposal site can be minimized by enforcing countermeasures to protect the environment and strict monitoring.

The priority project developed in the Master Plan and Case Study is believed to provide a concrete base for adequate SWM, especially for the following.

- a. A disposal site, at Katina will be secured up to the year 2010, thereby providing greater flexibility to implement the further improvements proposed in the master plan. A comparatively long-term solution to the most controversial SWM problem, that of securing suitable disposal site, as rendered by Katina disposal site, is very significant.
- b. The proposed new SWM organization, in the form of PLC, conforms to the national policy of transforming to market oriented economy and expansion of privatization. PLC will contribute to efficient SWM including further expansion of privatization.
- c. The proposed recycling pilot project for paper and glass will assist in determining the suitable recycling systems for SGM. Insights on how to achieve citizens cooperation and valuable experience are expected. Based on the pilot project results further expansion of the pilot project area and increase of recycling items will be established.
- d. Amenity Centers will contribute to the adequate disposal of hazardous domestic waste, the amount of which is expected to increase in the near future. These centers will also provide a venue for exchange of opinion and information between the public and SWM operators and officials.

CHAPTER 5

IMPLEMENTATION PLAN



CHAPTER 5 IMPLEMENTATION PLAN

5.1 Implementation Organization

The new PLC shall be responsible for implementing the priority project. However to prepare for establishing the PLC and implementing the priority project, a project implementation unit (PIU) is proposed to be set up within SGM. When the PLC starts operation, to ensure continuity the PIU staff will transfer to it.

The PIU should be formed of municipality experts coming from environmental, public utilities, technical and financial departments, BKC companies and Chistota. The PIU shall work for launching the new organization by the beginning of 1995.

5.2 Implementation Schedule

The implementation schedule is shown in Figure 1-5-1. Already half of 1994, the proposed preparatory period has passed, but this Study should be considered as part of the preparatory process and its results are expected to assist in the preparations. The remaining period of 1994 is very busy and critical. Particular attention should be paid to the following.

(1) Establishment of PLC

The schedule calls for PLC to commence operation in 1995, using available facilities. No delay due to construction of new facilities is necessary. Although a number of facilities currently used by BKC are planned to be turned over to PLC for depots and workshop, any needed renovations will be executed within two years at a slow pace, to avoid delay in PLC establishment and imposing early heavy financial burden.

(2) Collection

With the launching of the new PLC, it is necessary to show immediate improvement in SWM to impress the citizens and gain their support. Therefore rearrangement of the collection zones into 8, to improve equipment usage efficiency and introduction of fixed frequency collection system is scheduled to start with the PLC. Actual procurement of new vehicles, to replace the aged vehicle fleet will commence in 1996 after preparing the necessary financial resources. Vehicle renewal shall be done over a period of three to four years.

	1994	1995	1996	1997
a. Loan application				
b. Loan agreement		x		
c. Establishment of new organization		x		
- Preparation				
- Head Office		x		
- Depot		x	=====	x
- Workshop		x	=====	x
- Amenity center			=====	x
c. Collection				
- Preparation				
- Veh. Procurement, etc.			=====	x
- Zone rearrangement		x		
- Container Procurement		x		
- Change frequency & collection system		x		
d. Katina disposal site				x
- Detail design & tender document				
- EIA				
- Construction			=====	
- Heavy equipment purchase			=====	x
e. Establish new tariff value		x	x	x
- Preparation				
g. Prepare groundwork for privatization				
h. Recycle Pilot Proj				x
- Preparation				
- Vehicle & Container				x
i. Related work				
- Novi Iskar bypass				
- Suhudol II ext.		x		

Note: ===== Tender process
----- Construction and other work
Existing facility of workshop and depot will be used temporary until 1997.

Figure 1-5-1 Priority Project Implementation Time Schedule