

Work Item	JICA	DK
1) Work plan, monitoring and implementation	O	O
2) Site selection and data collection	O	O
3) Pre and Post TAS Interview Surveys	O	O
4) Public campaign	O	O
5) Purchase and distribution of plastic bins (Site B)	O	
6) Purchase and distribution of plastic bags (Sites A and C)	O	
7) Purchase and operation of hand cart (Site A)	O	
8) Rent excavator for ditch cleansing (Site C)	O	
9) Organize community participation program for ditch cleaning	O	O
10) Purchase & distribute tools for community participation	O	
11) Provide dump truck at Site B and crew		O
12) Provide armroll containers and vehicles at Sites A and C		O
13) Provide cleaning gangs for ditch cleansing in Site C		O
14) Prepare access road to TPA truck scale	O	
15) Continuous operation of TPA truck scale	O	O

3.2 TAS Sites Selection

(1) Selection methodology and criteria

1) Selection methodology

The four objectives of TAS are described in the preceding section . Each objective was treated individually and a separate site was considered for each;

- ◇ Site A - Adequate use of armroll container
- ◇ Site B - Introduction of fixed time discharge by plastic bin
- ◇ Site C - Adequate ditch cleansing system
- ◇ Tamangapa TPA Weigh Bridge - Improvement of collection vehicle efficiency

The selection methodology for the TAS sites may be briefly described as follows;

- a) For Sites A, B, and C the most suitable approach was to work on the Kelurahan level in order to ensure availability of data, ease of official and public campaigns and TAS implementation. Suitable Kelurahan were identified based on the criteria shown in the following section.
- b) Discussion was held with Dinas Kebersihan and the identified Kelurahan were reduced to a number of suitable Kelurahan, mainly based on Dinas Kebersihan's SWM experience.
- c) Based on site visits made to the suitable Kelurahan by the Study Team and Dinas Kebersihan a trimmed down number of Kelurahan emerged as candidate Kelurahan.
- d) The Kelurahan where TAS would be implemented and the extent of TAS study area in the selected Kelurahan were then finalized in discussions with Dinas Kebersihan.
- e) The results of TAS sites selection were reported to the Technical Committee on May 4th and 16th, 1995.

(2) Selection criteria

1) Site A - Armroll container system

- ◇ Low income area with difficult collection vehicle accessibility
- ◇ Cleanliness conditions need to be improved
- ◇ Walking distances to container locations around 150 to 200 meters
- ◇ Population to be around 7,000 (i.e. two armroll trips)

2) Site B - Fixed time discharge by plastic bin

- ◇ High to middle income area already served by door-to-door
- ◇ Extensive use of permanent bins
- ◇ Population to be around 7,000

3) Site C - Adequate ditch cleansing system

- ◇ Availability of ditch maintained by Dinas Kebersihan

- ◇ Availability of ditch that can be cleaned through community participation
- ◇ Availability of working space next to ditch for using excavator
- ◇ Irregular waste collection service in the ditch vicinity

(2) TAS sites selected

1) Site A

Based on the above criteria four sites were suggested by Dinas Kebersihan. The four sites were visited and compared as shown in the following table.

Kecamatan	Kelurahan	Pop. (1992)	Area (ha)	Remarks
Bontoala	Bunga Ejaya	5,459	18	<ul style="list-style-type: none"> ◇ Area already served by 2 armroll containers located outside the Kelurahan at one site ◇ No space inside area to locate container and difficult vehicle access ◇ Private hand cart operation within the area
Ujung Tanah	Cambaya	6,299	30	<ul style="list-style-type: none"> ◇ Served by one armroll container and one TPS ◇ Container location within area ◇ Container emptied when full (2-3 d/wk) and TPS daily ◇ No hand cart service and citizens walk to container ◇ Area clean
Mariso	Lette	8,518	15	<ul style="list-style-type: none"> ◇ Not possible to locate container within area ◇ Area served by one container located outside but walking distance too far ◇ Rampant discharge of waste directly into sea ◇ Area on solid ground relatively clean
Tallo	Pannampu	15,145	17	<ul style="list-style-type: none"> ◇ Area served by two armroll containers and hand cart ◇ Containers located within the area where vehicle accessibility is possible ◇ Problem is RW IV where waste is used to reclaim the flooded low lands ◇ Drainage and waste problems in and around market area

Of the above four Kelurahan both Bunga Ejaya and Lette offered the most difficult problem because vehicle access is very difficult and rational hand cart operation combined with armroll service should be studied. In view of Dinas Kebersihan's new policy of terminating payment of 40% or retribution fees collected to LKMD for operating hand carts, the problem of hand cart operation has come to the surface. Both areas provided an opportunity to study hand cart service.

Bunga Ejaya provided a further opportunity of relocating one of the two containers placed alongside each other to another position closer to more residents. On the other hand, a major problem in Lette was the practice of waste discharge into the sea. This is a particular problem associated with coastal settlements and much education of the

community is required to stop this habit.

Therefore Bunga Ejaya offered a more general problem and was therefore chosen for TAS Site A.

2) Site B

At the start of discussions with Dinas Kebersihan it became clear that no one Kelurahan could be found with a population of around 7,000 and total door-to-door solid waste collection service.

It was therefore decided to select two sites in different Kelurahan. Two sites provided the advantage of working in one site three days a week and in the other site the other three days without creating confusion by dividing one area into two parts. It also allowed to test the system in two different and distant Kelurahan, north and south of the old city.

The two Kelurahan proposed by Dinas Kebersihan and selected for TAS Site B are as follows;

Kecamatan	Kelurahan	Pop. (1992)	Area (ha)	Remarks
Bontoala	Mallmongen Baru (B1)	5,915	19	<ul style="list-style-type: none"> ◇ Area served by both door-to-door and TPS ◇ Two stretches of streets perpendicular to each other and of sufficient width for vehicle access but not main roads and presently served by door-to-door are suitable ◇ Permanent bin in extensive use ◇ Opportunity to locate open stations at intersection of narrow streets with the two main streets for residents of narrow streets and study open station system as well
Mamajang	Mamajang Luar (B2)	5,627	13	<ul style="list-style-type: none"> ◇ Area served by both door-to-door, TPS and armroll container ◇ Permanent bin in extensive use ◇ Opportunity to locate open stations at intersection of narrow streets with the main streets for residents of narrow streets and study open station system as well ◇ Hand cart service in use but operation is haphazard due to lack of regular funds for operation ◇ Sanitary conditions inside the area and in the ditches not very clean ◇ Area appears to be mixed high and middle income with one stretch of road below middle income therefore providing a broad slice of society

3) Site C

In order to realize the two main objectives of using an excavator and community participation in ditch cleansing, it was decided to identify two sites for Site C. Three ditches were selected for operating the excavator; along Jl. Salemo in Kecamatan Wajo, Jl. Sibula Dalam in Kecamatan Bontoala and Jl. Mawas in Kecamatan Mamajang. Of the three sites Jl. Mawas was selected because of no foot paths across the ditch which would interfere with the excavator operation.

The ditch running perpendicular to Jl. Kakatua II along the border between Kelurahan Parang, Kecamatan Mamajang and Kelurahan Bungaya, Kecamatan Tamalate was of suitable width to be cleaned jointly by Dinas Kebersihan and the community. Both the ditch and the open space along the ditch which has been transformed into an open waste dump were in dire need of removing the accumulated waste there. This area seemed to provide a strong motivation for the promoting community participation and was therefore selected as the second site.

The areas surrounding both sites are served by armroll containers (two at Jl. Mawas and one at Jl. Kakatua II) which also provided the chance to study armroll container service in both sites.

The description of both sites are described in the following table.

Kecamatan	Kelurahan	Pop. (1992)	Area (ha)	Remarks
Mamajang	Mamajang Luar Jl. Mawas (C1)	5,627	13	<ul style="list-style-type: none"> ◇ Ditch length stretches for 200 meter ◇ Two armroll containers and two TPS located along the ditch ◇ No apparent waste disposal in ditch but water flow is stagnant
Mamajang and Tamalate	Parang and Bungaya Jl. Kakatua II (C2)	6,005 9,976	9 19	<ul style="list-style-type: none"> ◇ Ditch length stretches for 260 meters ◇ Adjacent to the ditch is an open area on the Parang side which has become an open dump for waste ◇ Problem of waste disposal into the ditch ◇ One armroll container and a TPS located at the open space which serve adjacent residents of both Kelurahan ◇ Insufficient space for operation of excavator along the ditch

The locations of the five sites are shown in *Fig. 5.39*.

(3) Tamangapa disposal site

The weigh bridge constructed at Tamangapa provides a good opportunity to monitor collection vehicles entering the disposal site. The weight of hauled waste, service area, arrival and departure times, type of waste and number of trips are recorded daily for each collection vehicle. The analysis of this data can help in maximizing vehicle operation efficiency.

Therefore the TAS study on collection vehicle utilization was implemented using the data obtained at Tamangapa disposal site weigh bridge.

3.3 Present Socioeconomic Condition of Selected Sites

(1) General

Efforts were made to collect socioeconomic data on the selected sites through the concerned Lurah office. Unfortunately data was unavailable in some Kelurahan because of the ongoing adjustment in Kelurahan administration on the level of KMUP (from 62 to 142 Kelurahan). Data in divided Kelurahan was especially difficult to obtain.

(2) Population and land use

1) Site A : Kelurahan Bunga Ejaya

a) Population

Kelurahan Bunga Ejaya is in Kecamatan Bontoala. It is about 18.48 ha and was a part of a larger Kelurahan which was divided in March, 1993 and it became a definitive Kelurahan on March, 1995.

Kelurahan Bunga Ejaya is surrounded by the following:

- ◇ North, Kelurahan Layang, Kecamatan Bontoala with the boundary of Jalan Tinumbu and Lrg. 142.
- ◇ South, Kelurahan Bontoala, Kecamatan Bontoala with the boundary of Jalan Bunga Ejaya.
- ◇ East, Kelurahan Baraya, Kecamatan Bontoala and Kelurahan Bunga Ejaya Baru, Kecamatan Tallo.
- ◇ West, Kelurahan Parang Layang, Kecamatan Bontoala with the boundary of

Jalan Tinumbu.

Kelurahan Bunga Ejaya is divided into 4 RW and 21 RT (*Fig. 6.40*) with 981 households and a population of 5,832.

Occupations of the working age population are as follows ;

No.	Occupation	Percentage
1	Governmental Officer	2%
2	Private Employee	4%
3	Commercial	12%
4	Other	81%
TOTAL		100%

In Kelurahan Bunga Ejaya, there are two slum areas where poor house conditions, lack of drinking water and dirty ditches can be observed. The slum areas are located in RW IV comprising 49 houses and in RW II comprising 48 houses. Total houses in Kelurahan Bunga Ejaya is 643, divided into:

The low economic level of the Kelurahan is evidenced by the high rate of temporary and semi-permanent units at 69% of the total.

Temporary	:	125 units
Semi Permanent	:	318 units
Permanent	:	200 units

b) Land use

Land use in Kelurahan Bunga Ejaya (*Fig.6.41*) can be classified into residential (92%), trade and industry (7%) and governmental buildings and religious (1%). There are some Public facilities as;

- Mosque	:	2
- Elementary School	:	1
- Government School	:	2

Main roads path/alleys in Kelurahan Bunga Ejaya are in good condition in general, even though some alleys are still unpaved and in the rainy season become difficult to

use. Most roads are narrow and vehicle accessibility is difficult.

The roads lengths in Kelurahan Bunga Ejaya are as follows (Fig 6.42):

No.	Main Road length (m)	Alley length (m)
RW I	436	575
RW II	395	452
RW III	341	467
RW IV	656	851
TOTAL	1828	2345

Over 56% are classified as narrow alleys with road widths of less than 3 m.

Ditch conditions in Kelurahan Bunga Ejaya are generally good, mainly in RW I. But in RW II and III flow is blocked because the ditch is connected to that in another Kelurahan where it is in bad condition.

Lengths of ditches are as follows;

No.	RW	Ditch Length (m)	Poor Condition (%)
1	I	1397	2%
2	II	1389	4%
3	III	1402	3%
4	IV	1679	5%
TOTAL		5867	

The above data, obtained from Lurah office, shows that about 15% of the total ditch length is classified as poor.

2) Site B1 : Kelurahan Malimongan Baru

a) Population

Kelurahan Malimongan Baru, Kecamatan Bontoala is about 5,12 ha and consists of 4 RW and 20 RT (Fig. 6.43) with a population of 5,072 people. Along the borders of this Kelurahan there are;

- North; Kelurahan Timongan Lompoa
- West; Kelurahan Tompo Balang
- South; Kelurahan Maccini
- East; Kelurahan Karuwisi

All of RW IV, most of RW III and parts of RW I & II are include in the TAS study

area, as show in *Fig. 6.44*.

Occupation of the inhabitants vary as follows:

- Government Employee 65 People
- Private Employee 120 People
- Interpreneur 51 People
- Merchant 150 People

The high rate of private employees is notable

House type are as follows;

- Permanent House 300 Units
- Semi-Permanent House 180 Units
- Non-Permanent House 200 Units

Public facilities in Kelurahan Malimongan Baru, include:

- Mosque
- Public Health Clinic (Puskesmas)
- Salvation Army
- School
- Governmental Office
- Hotel

b) Land use

Land use map is shown in *Fig. 6.45*. Mixed residential/commercial activity is significant along Jl. Pongtiku, Jl. Urip Sumoharjo and Jl. Mesjid Raya. There is also a large food industry facility.

The road network is shown in *Fig. 6.46*. Majority of roads are accessible by collection vehicle which makes the area convenient for the proposed TAS collection system.

3) Site B2 : Kelurahan Mamajang Luar

a) Population

Kelurahan Mamajang Luar, Kecamatan Mamajang is about 3,6 ha and consists of 3

RW and 16 RT (*Fig. 6.47*) with a population of 4211 people. Along its borders are ;

- North: Kelurahan Maricaya
- West: Kelurahan Kunjung Mac
- South: Divided Kelurahan of Bonto Biraeng (under preparation)
- East: Divided Kelurahan of Mandala (under preparation)

Fig. 6.48 shows the area of the Kelurahan covered by TAS.

Occupation figures shown below indicate a high rate of government employees living in this Kelurahan.

- Government Servant 593 People
- Entrepreneur 85 People
- Merchant / Trader 423 People
- Fisherman 6 People
- Laborer 8 People
- Pension 51 People

b) Land use

The land use map in *Fig. 6.49* signifies the residential nature of the area. A hotel occupies about 1/3 rd of the Kelurahan area. Some public facilities located in B2 are;

- Mosque
- School
- Public Health Clinic (Puskesmas Pembantu)
- Market
- Natural Silk Industry

The road network map is shown in *Fig. 6.50*. Although most roads are accessible by the collection vehicle, there are some blind alleys in the eastern part of the Kelurahan, which complicate the collection vehicle routing.

4) Site C1: Jl. Mawas, Kelurahan Mamajang Luar

The ditch running along Jl. Mawas in Kelurahan Mamajang Luar (refer to *Fig. 6.47*) was selected for the survey of ditch cleansing using Excavator.

The population and land use for this Kelurahan are described in the previous section. North of Jl. Mawas there is a large hotel, and south is a residential area mainly for military personnel. The ditch runs north of the road (about 200 meters) with few bridge crossings, making use of an Excavator possible. Waste thrown into the ditch appears to be very rare because of the presence of two armroll containers and the nature of the surrounding residential area.

5) Site C2: Road along border of Kelurahan Parang and Kelurahan Bongaya.

The ditch running along the border of Kelurahan Parang and Kelurahan Bongaya was selected for studying community participation and Dinas Kebersihan activity in ditch cleansing. Therefore the conditions of both Kelurahan are briefly reviewed hereafter. Attached explanatory figures were prepared covering only RW in the proximity of the study ditch in both Kelurahan Parang and Bongaya.

a) Population

Kelurahan Parang is located in Kecamatan Mamajang. Kelurahan Parang has an area of 9.48 ha. This Kelurahan has common borders with;

- North; Jl. Kakatua II, Kelurahan Pa'Battang
- South; study ditch and Kelurahan Bongaya, Kecamatan Tamalate
- West; Mattoanging Dormitory, Kelurahan Pa'Battang
- East; Kelurahan Bontobelang

Fig. 6.51 shows the RW border. As indicated in the TAS implementation area depicted in Fig. 6.52, RW III & IV of Parang and RW V, VI, VII, VIII and IX are included in the TAS study. Population in Kelurahan Parang based on the latest data is 978 households or 6159 people.

Occupations are Classified by RW as shown below

RW. No	Laborer	Government Employee	Private Employee	Commercial	Pension
I	74	81	98	30	16
II	82	67	92	20	21
III	128	144	148	30	12
IV	59	132	11	15	10
Total	343	424	349	104	59

House types are shown in the following table. In RW III & IV over 60% of houses are permanent.

RW. No	Permanent	Semi Permanent	Temporary
I	124	49	61
II	119	53	52
III	147	46	66
IV	157	17	52

Kelurahan Bongaya Occupies a large area of 29,8 ha. in Kecamatan Tamalate. Along the border of this Kelurahan there are;

- North: Kelurahan Parang
- South: Kelurahan Jongaya
- West: Kelurahan Baji Mapakkasunggu, Kecamatan Mamajang
- East: Pa' Baeng-baeng traditional market

Not much data was available for Kelurahan Bongaya. Population in Kelurahan Bongaya based on the latest data is 9,976 people. Main Occupations in Kelurahan Bongaya are

- Government Employee 7.61%
- Private Employee 1.60%
- Merchant 2.08%

b) Land use

Land use map is shown in Fig. 6.53. Significant area is used for educational purpose in Kelurahan Bongaya. Also there is a large slum area at Parang. In both Kelurahan there are many public facilities related to religion, security, and education sectors etc. These public facilities are;

No.	Facility	Parang	Bongaya
1.	Religious sector: - Mosque	1	6
	- Church	-	3
2.	Education sector: - Kindergarten	1	1
	- Elementary School	1	1
	- Jr. High School	1	1
	- Sr. High School	-	4
	- University	-	2
	- Academy	-	1
3.	Medical sector: - Private Hospital	-	2
	- Public clinic	-	1
4.	Government Office	3	1

The road network is shown in *Fig. 6.54*. Absence of an east-west corridor road running through both Kelurahan is notable. In the future it may be necessary to cover the open ditch and construct a road.

Kelurahan Bongaya has many kinds of settlements as follows;

1 (one) Middle income public housing Estate, and 3 (three) Government Employee Estates (Department of Education and Cultural, Department of Public Work, and Police Department)

House type are classified as follows;

- Permanent	683 houses
- Semi permanent	392 houses
- Temporary building	394 houses

3.4 Pre TAS Solid Waste Management Practice

(1) General

In order to prepare for, and study the effect of TAS implementation it was necessary to attempt to grasp the existing SWM conditions in the selected sites.

To achieve this interviews were held with the respective Kelurahan officials, Dinas Kebersihan (DK) Operation Section and the residents. However, the conditions in each site cannot be described independently from the Kelurahan as a whole, or even from adjacent Kelurahan. This is particularly true in the case of collection vehicle routes and waste amounts collected.

The findings are described in the following sections for each site.

(2) Site A: Kelurahan Bunga Ejaya

1) Solid waste collection and transport

Fig. 6.55 shows the pre-TAS solid waste management system. Basically two systems are adopted, armroll container and limited door-to-door service by Kijang vehicle.

a) Armroll container

Three (3) containers serve this Kelurahan and the adjacent Kelurahan Parang Layang,

Kelurahan Layang and Kelurahan Bontoala. The containers are placed at one location along Jl. Tinumbu, behind a public school.

There is only one hand cart provided by the Kelurahan but there are about 10 privately operated hand carts of various sizes (mostly $<0.3\text{m}^3$). All are in poor condition and operation is irregular. Charges for one transport range between Rp. 100 - 500.

In the week of May 24th to May 28th, the following data shown in the is available for the containers.

No.	Container No.	Times Changed	Total Weight (kg)
1.	43	2	2,770
2.	82	4	5,030
3.	87	7	10,110
4.	91	3	5,500
Total		16	23,410

This data is for 5 days. During this period there were 16 container changes, i.e. over 3 changes per day. The amount of waste generated by the served Kelurahan is estimated to be;

Kelurahan Bunga Ejaya	2,158 kg/day
Kelurahan Parang Layang	2,200 kg/day
Kelurahan Bontoala (50%)	532 kg/day
Kelurahan Layang (50%)	1,968 kg/day
Total	6,858 kg/day

Therefore in the five day period, 68% of this amount was discharged into the armroll containers.

b) Door-to-Door service

DK operates one Kijang vehicle along Jl. Tinumbu and Lorong 132A (Kel. Bunga Ejaya) to serve door-to-door. From the TPA records it was possible to identify only two trips in the area during the five-day period (May 24th - May 28th) hauling 2,910 kg. However DK explained that part of the waste collected by the vehicle is taken behind Pasar Panampu and used for land reclamation.

If it is assumed that an amount similar to that hauled to the TPA was used for land reclamation, then total waste collected from the two Kelurahan of Bunga Ejaya and

Parang Layang and half of each of Kelurahan Layang and Bontoala may be estimated at 86%.

2) Ditch cleansing

DK reportedly cleans the ditch running along Jl. Bunga Ejaya. However cleaning frequency is low, said to be once or twice a year.

3) Street sweeping

The main road of Jl. Tinumbu is swept by the DK street sweeping gang, but service again is not regular.

4) Community participation

Efforts for community participation are spearheaded by administrative leaders (Lurah, RW/RT chiefs), environmental conservation groups as Antipala, and youth organizations.

Community is active in street sweeping generally throughout the Kelurahan. Ditch cleansing activity appears to be unbalanced. Citizens of RW III and IV (north and central parts) are actively cleaning the ditch, unlike those in the southern part (parts of RW I and RW II).

(3) Site B: Kelurahan Malimongan Baru (B1) and Mamajang Luar (B2)

1) Solid waste collection and transport

Present SWM conditions are shown in Fig. 6.56 a) and (b) and described hereafter.

a) Kelurahan Malimongan Baru (B1)

The Kelurahan is mostly served by door-to-door daily collection. Residents living in the north-west part discharge their waste in the TPS located at Jl. Laccukang which is also emptied daily. Some residents living near the northern boundary take their waste to an armroll container along Jl. Sultan DG Radja.

DK operates a Dyna Rino dump truck (6m³) during the afternoon shift in this Kelurahan and the northern part of the adjacent Kelurahan Timungan Lompoa. The TPA records show that during the one-week period of May 22nd to 28th the designated vehicle made 7 trips in the area, and collected a total of 19,300 kg (ave. 2,760 kg/day).

The daily generated waste in that Kelurahan is estimated to be 2,110 kg/day. Kel. Timungan Lompoa is estimated to generate a similar waste amount, and it is calculated that the vehicle collects about 30% from that waste.

b) Kelurahan Mamajang Luar (B2)

As the figure shows, the area south of Jl. Mawas is roughly divided into three parts by collection service; the northern part served by the two armroll containers located along Jl. Mawas, the central part served by hand cart hauling the waste to the containers, and the southern part by door-to-door.

DK operates one daily trip by a Rino Plat truck (6m³) for collection of waste in this Kelurahan during the evening shift. Data of that vehicle operation and the armroll containers is shown in the following table.

Vehicle Type	Collected Waste (kg)	Remark
1. Rino Plat Vehicle		
- Total waste/week	11,750	1 trip/day
- Daily average	1,680	
2. Armroll Container		
- Total waste/week	6,870	Container changed 7 times in six days (twice on Saturday)
TOTAL Waste collected	18,620	

The estimated waste generated in B2 is 2,280 kg/day (15,960 kg/week). Therefore DK service of this area is sufficient and obviously the collection vehicle also served another Kelurahan.

2) Ditch cleansing

DK ditch cleansing activity in both Kelurahan in the wet season is limited to removal of floating waste. In the dry season the activity is as shown in the following table Obviously DK actively maintains the ditches in both sites B1 and B2. Cleansing is implemented by gangs of 20 - 30 workers.

Ditch	Cleansing Frequency
1) Kelurahan Malimongan Baru - Jl. Urip Sumoharjo - Jl. Mesjid Raya - Jl. Pongtiku - Jl. Cumi-Cumi - Jl. Sultan DG Raja	twice/year twice/year once/year once/year once/year
2) Kelurahan Mamajang Luar - Jl. Mawas - Jl. Lanto DG Pasewang - Jl. Onta Lama - Jl. Onta Baru - Jl. Ratulangi - Jl. Badak	1-2/year 1-2/year 1-2/year 1-2/year 1-2/year 1-2/year

3) Street sweeping

Street sweeping service provided by DK in both Kelurahan is as follows;

Ditch	Sweeping Frequency
1) Kelurahan Malimongan Baru - Jl. Urip Sumoharjo - Jl. Mesjid Raya - Jl. Pongtiku - Jl. Cumi-Cumi	twice/day twice/day three/week once/day
2) Kelurahan Mamajang Luar - Jl. Lanto DG Pasewang - Jl. Onta Lama - Jl. Onta Baru - Jl. Ratulangi - Jl. Beruang	once/day once/day once/day twice/day once/day

4) Community participation

In Kelurahan Malimongan Baru DK provides regular collection, street sweeping and ditch cleansing services, and community activity in SWM appears to be low.

On the other hand in Kelurahan Mamajang Luar the existing narrow ditches are actively cleaned by community participation. A hand cart service is also operated through community participation in parts of the Kelurahan to bring the waste to the armroll containers from distant houses.

(4) Site C: Kelurahan Mamajang Luar (C1) and Kelurahan Parang/Bungaya (C2)

Present SWM system for Kelurahan Mamajang Luar has already been described. In this section SWM in C2 will be described. Fig. 6.58 shows the SWM in the areas of both Kelurahan that are associated with the ditch cleansing effort.

1) Solid waste collection and transport

DK provides door-to-door service, mainly by Kijang vehicles and armroll container service. A number of vehicles serve the area. The data for the week of May 22nd - May 28th shows that the waste amount transported from the three Kelurahan of Parang, Bungaya and the adjacent Pa'batang is as follows;

Armroll vehicle	7,800 kg/week
Other vehicles	38,590 kg/week

On the other hand the amount of waste generated in the three Kelurahan for one week is estimated as follows;

Parang	15,950 kg/week
Bungaya	25,840 kg/week
Pa'batang	16,990 kg/week

Therefore about 80% of the three Kelurahan waste is collected by DK. Part of the remaining 20% of waste is burnt and part is discharged in the ditch and open space. There are also two slum areas, one in each Kelurahan where waste is mainly discharged in open space or used for land reclamation.

2) Ditch cleansing

The ditch bordering both Kelurahan is cleaned by DK 1 time/year during the dry season to remove the sludge and waste. In the wet season the floating waste is removed by the ditch cleansing gang about three times/year.

3) Street sweeping

Street sweeping by DK is as shown in the following table.

Ditch	Sweeping Frequency
1) Kelurahan Parang	
- Jl. Kakatua II	once/day
- Jl. Dr. Ratulangi	twice/day
- Jl. Mappaodang	once/day
2) Kelurahan Mamajang Luar	
- Jl. Mangerangi	once/day
- Jl. Baji Gau	once/day
- Jl. Pemuda	once/day
- Jl. Kumala	once/day

4) Community participation

Community participation in ditch cleansing is active, but there appears to be no coordination between both Kelurahan, especially concerning the bordering ditch and the triangular open space.

3.5 TAS Implementation

(1) Campaign activity

1) Purpose of the campaign

The TAS campaign was mainly directed to the communities in each of the TAS areas. The purpose of the campaigns was to explain the TAS contents and request the citizens cooperation during TAS implementation. Official meetings with DK and the Lurahs of the four Kelurahan preceded the public campaign meetings. In the official meetings the contents of TAS were discussed and agreed upon and the public campaign schedule prepared.

The main topics covered in the public campaign were as follows;

⇒ General explanation of SWM

⇒ Role of the citizens in SWM

⇒ Description of the TAS studies and defining the related roles of Dinas Kebersihan and the community

2) Campaign implementation

a) Schedule and attendance

The schedule, venues and attendance of the public campaign meetings were as follows;

Date	Kelurahan	Venue	Attendance
May 22	Bunga Ejaya (Site A)	Lurah Office	45
May 23	Mamajang Luar (Site B)	Kecamatan Office	40
May 24	Malimongen Baru (Site B & C)	Lurah Office	45
May 25	Parang and Bongaya (Site C)	Parang Lurah Office	65

All meetings were held in the evening. The Lurah of each Kelurahan was requested to inform the citizens and prepare for the meetings. Site C involved two Kelurahan in

two different Kecamatan, and it was decided to hold the meeting in Kelurahan Parang. Kelurahan officials and RW/RT chiefs attended all the meetings. The general public was well represented in three of the four meetings. Kelurahan officials at Kel. Mamajang Luar misunderstood the purpose of the meeting and invited only officials and RW chiefs. However the public campaign meeting there was delayed for about one hour in order to inform the citizens and some did come after all.

b) Procedure of the public campaign meetings

i) Preparation for the meeting

JICA Study Team prepared a memorandum outlining the subjects the team proposed to be raised. The memorandum was divided into two parts, one general and the second specifically dealing with TAS. Part I explained the sources of solid waste and importance of solid waste management. The role that the citizens can play in solid waste management was emphasized. This role stressed importance of proper discharge, assisting in solid waste management by taking part in street sweeping and ditch cleansing, and reducing solid waste amount discharged through recycling and reuse. The second part described the TAS contents and duties of both the citizens and DK in implementing TAS.

ii) Agenda for the public campaign meetings

At all the meetings the sequence for the speakers was as follows;

- Lurah
- Dinas Kebersihan officials
- Counterpart Team
- JICA Study Team
- Discussion

The Lurah gave a brief description about his Kelurahan, in terms of population and RW divisions. He then explained the purpose of the meeting which was to provide an opportunity to introduce TAS study contents.

The second speaker was the chief of Operations Department in Dinas Kebersihan, Mr. Abdullah Patiroi. He gave an outline of the solid waste management as conducted by DK in Ujung Pandang. He spoke of the new collection system using armroll container being gradually expanded in the city, with presently 128 containers and 13 armroll vehicles in service. He talked about the retribution system and the budget

required by Dinas Kebersihan to provide the required services. He stressed the importance of citizens cooperation in properly discharging their waste into the containers, paying the retribution fees and cleaning and maintaining the ditches in front of their homes.

The third speaker was Mr. Marsin Sahibu from Dinas Kebersihan, a member of the counterpart team. Mr. Marsin explained the JICA Study, its contents and targets. He then briefly outlined the purpose of conducting TAS; to measure the extent of the community participation which can then be utilized to make the DK work more efficient.

Then it was the JICA Study Team's turn to detail the contents of TAS. The Study Team, using OHP slides and printed handouts described the particulars for each site, as;

- Extent of study area
- Discharge and collection system
- Instructions for the community to follow
- Duties of DK
- Expected gain to SWM from implementing TAS

The above speakers usually took about one hour to conclude their remarks. After some refreshments, the second hour of the public campaign meetings was spent on questions and answers. The main questions/remarks are summarized in the following section.

c) Other public campaign activity

In addition to the above the Study Team attended two functions where the community participation was discussed and requested.

i) Friday prayer at mosque in Kelurahan Parang

In relation with TAS Site C1, the Study Team attended a Friday prayer on May 19th. The KMUP Mayor prayed in the mosque and after the prayers gave a lecture to the participants for about 30 minutes. The lecture did not go into specifics on TAS, but rather the Mayor spoke in general terms about the need for KMUP citizens to lead disciplined lives in the community. He emphasized the importance of cleansing and proper waste discharge, as well as maintaining surrounding ditches and streets clean. He drew parallels between the environmental sanitation conditions and citizens

behavior in developed Asian cities as Singapore, Tokyo and Bangkok and called upon KMUP citizens to keep Ujung Pandang also clean. In the end of his lecture he presented the mosque with a present, a large clock with the words "Teduh Bersinar" printed on it.

At the completion of the prayers, the Mayor briefly inspected the ditch near the mosque and expressed satisfaction with the effort made by the citizens to keep it clean.

ii) Meeting with environmental protection group at Kel. Bunga Ejaya

During the Public Campaign Meeting at Kel. Bunga Ejaya the Study Team was introduced to a youth organization called Antipala, which is concerned with environmental sanitation in the Kelurahan. The Study Team requested to have a separate meeting with the group to understand better their activity, and enlist their help in implementing TAS. This meeting was held on May 26th in the evening at the Lurah office. It was attended by about 30 members of Antipala, the JICA Study Team and Counterpart Team.

Antipala was established in 1982 and presently has a membership of some 40 people, mostly youth. The group works at improving environmental and living conditions within the Kelurahan. Its activities include ditch cleansing (2-3 times/month) and street sweeping. The group has some tools and borrows other tools from the community. The group also participated in the construction of the large TPS along Jl. Tinumbu that was used until recently for discharge of the waste from that Kelurahan.

JICA Study Team requested the assistance of Antipala in calling upon the community to cooperate with TAS. The possibility of operating a JICA donated hand cart by Antipala was also discussed.

iii) Leaflets

Leaflets were printed and distributed to all the households within the TAS study areas and at the Public Campaign Meetings.

The leaflets adopted the slogan of Dinas Kebersihan, "Teduh Bersinar". "Teduh" means fresh and "Bersinar" is composed of the abbreviations of the following words;

BER	:	"Bersih" (means clean)
S	:	"Sehat" (health)
IN	:	"Indah" (beautiful)

- A : "Aman" (Save)
R : "Rapi" (Tidy)

The leaflets briefly explained the object of TAS and clearly stated the instructions the citizens should follow during the TAS period for waste discharge.

3) Discussion items at the public campaign meetings

The main discussion items at the public campaign meetings are summarized hereafter.

a) Site A: Kel. Bunga Ejaya

- i) Walking distance to the one container location is too far for the eastern part of the Kelurahan and there is a need to provide hand carts.

DK replied that hand carts previously provided to the Kelurahan were poorly maintained and immediately damaged, and requested the citizens cooperate by bringing their waste by themselves using the distributed plastic bags. JICA Team reminded the community that this is a pilot study which will be subject to modification based on the survey results and hand cart necessity will be one issue for study.

- ii) Much of the waste is discharged into the ditches. It is difficult to transport the waste removed from the ditches by the citizens to the armroll container because of its sludge and sand content.

DK requested that the citizens coordinate their ditch cleansing activity with them and promised to provide the heavy equipment necessary to transport the waste removed from the ditches to the TPA.

- iii) The law for punishing illegal dischargers of waste should be strictly enforced in order to discourage such environmentally damaging activity.

DK explained that the law stipulates that illegal discharges of waste be punished by either a fine of maximum Rp. 50,000 or a prison term of maximum 3 months. Since it was passed last year, 2000 offenders have been sanctioned under this law in various parts of the city, but not in Bunga Ejaya.

- iv) The container specified for Bunga Ejaya should be so identified by a sign in order to prevent dischargers from other Kelurahan from discharging in that container.

It was agreed to stick a poster on the container to state that it is to be used exclusively

by Kelurahan Bunga Ejaya residents only.

b) Site B1: Kelurahan Mallimongan Baru

i) The schedule of TAS calling for waste discharge before 08:00 AM in the morning should be shifted to the evening from 16:00 to 18:00 PM.

DK and JICA Study Team replied that at present the area is served in the morning and the same vehicle and crew will be used in the study so it is better to maintain the same hours. The extent of citizen participation in discharging their bins shall be surveyed and the suitability of the proposed TAS discharge hours shall be evaluated.

ii) Three days/week discharge will make it difficult to immediately discharge problem waste such as dead rats.

DK replied that such waste as dead rats or fish may be buried in the garden. JICA Study Team replied that the TPS serving an area adjacent to the TAS study area will continue to function as before (i.e., collection on a daily basis) so citizens can bring the waste they do not want to keep in their houses there.

iii) Plastic bins to be distributed should be clearly labeled to avoid theft or loss.

JICA Study Team will number the bins to be distributed and maintain a record. Citizens are also free to mark their names on the bins as they want.

iv) Separation of waste into organic and non-organic may help in utilizing organic portion of the waste. KMUP should make more use of organic waste.

DK replied that a new pilot compost plant has been constructed at UNHAS to study compost production and market demand. On the basis of this pilot project expansion of compost production shall be considered.

v) Community participation in ditch cleansing in the area is hampered by lack of tools.

DK suggested that a proposal be prepared describing the required tools and effort will be made to find funds from donations sometimes given to DK to buy the tools.

vi) Upon the completion of TAS period (until June 25th) what discharge and collection system will be employed in the area. DK answered that the purpose of TAS is to identify and introduce possible modifications to the previous system. Upon completion of TAS the previous system will be restored with these modifications.

c) Site B2: Kelurahan Mamajang Luar (and Site C1; Jl. Mawas)

i) The community needs to be strictly warned against illegal discharge of waste and general awareness of environmental sanitation needs to be strengthened.

DK explained about the regulation in place to punish illegal dischargers. Authority to enforce this regulation is presently entrusted to a team from the municipal government (Tim Yuridis), however DK proposes that teams with equal authority should be formed on the Kecamatan basis to provide more strict enforcement.

ii) As a result of TAS some hand cart worker in the TAS study area will lose their jobs, creating social unrest.

The JICA Study Team agreed to study this problem in more detail by actually visiting the area and having discussion with the RW chief who controls the hand cart operation. (In a subsequent visit the extent of TAS study area was once more explained to the RW chief and it was realized that the TAS study area covers only a part of the hand cart route and that the hand cart may still be operated in the remainder of its original route. To substitute the worker for the work lost in TAS area it was agreed that he provide some security against plastic bin theft).

iii) Some of the roads in the TAS study area are too narrow to accommodate DK vehicle access hand cart service is more suitable.

DK and JICA Study Team explained the disadvantages in relying on hand cart service in terms of added expenses to the community for worker salary and hand cart maintenance and repair. TAS attempts to identify the areas where hand cart service may be substituted for open stations and more community participation. Therefore in TAS citizens living along narrow roads will be asked to bring their waste to open stations at the main roads for waste collection.

iv) Concerning TAS plan to clean the ditch along Jl. Mawas (Site C2), it was requested to clean more ditches in the area.

DK and JICA Study Team explained that TAS calls for cleaning the Jl. Mawas ditch by excavator, and cleaning of connecting smaller ditches by community participation in coordination with DK.

d) Site C1: Kelurahan Parang and Bungaya

i) Illegal waste discharge into the ditch and open space is not necessarily done by the citizens living around the area but also by people passing through the area.

DK replied that more monitoring of illegal dischargers by the municipality enforcement team and formation of monitoring teams on the Kecamatan level will help to control illegal discharge.

- ii) As the ditch passes along the border of two Kelurahan, and two Kecamatan ownership of the ditch and responsibility for its maintenance is not clearly defined.

DK replied that ownership of the ditch is not a subject to be decided by DK. The JICA Study Team explained that TAS covers both Kelurahan because regardless of which Kelurahan they belong to, people on both sides of the ditch will suffer if the sanitation conditions along the ditch are not maintained. Therefore TAS calls for joint effort and participation by the community on both sides of the ditch in the cleaning and maintenance effort required.

- iii) A proposal to construct a road where the ditch is located and provide for drainage along the road sides.

DK recommended that such a proposal should be discussed with the Department of Public Works (Dinas PU) in the municipality.

- iv) Illegal waste discharge and piling of waste at the open space near the ditch is a problem of many years which is creating a poor environmental condition and polluting the nearby wells.

JICA Study Team answered that the problem of the dump site in the open space is serious and should be solved through cooperation between DK and community participation as described in TAS.

4) Reflections on the campaign activities

The program for the public campaign for TAS was prepared in discussions with the JICA Study Team members, DK and the Lurah staff of the involved Kelurahan.

The leaflets printed and distributed are considered to be sufficient in detail and context. The Public Campaign Meeting was the main item of the public campaign program. In afterthought, the following points may have added more to the success of these meetings;

- ◇ More detailed explanation on solid waste in general; its generation, amount, hazards may have provided more help to the citizens in grasping the problem

- ◊ More explanation on the objectives of TAS and learning from experience gained to expand the system in other areas
- ◊ An earlier start of the meetings, perhaps at 7 or 7:30 PM may have provided more time
- ◊ Time permitting, it would have been better to have more than one meeting for each Kelurahan, in order to reach a larger range of the community
- ◊ Reliance on RW chiefs to relay the TAS contents to the community is not enough and more attendance by the community itself, in particular housewives should have been encouraged
- ◊ Although the speakers were enough, attendance of more officials from other governmental offices would have lent support to the meeting and discussions
- ◊ A 10 to 15 minute video, or photographs showing SWM conditions in cities of similar Asian countries (in the developing world) may have contributed to explaining to the citizens how they are asked to cooperate

The Study Team was also interested in having the contents of TAS explained at other public venues such as places of worship and schools. The response was that the concerned Lurah would use such places at their discretion to communicate with the public. However it became apparent that the Lurah, in turn relied on RW chiefs. The Study Team realized on the eve of TAS implementation that the contents of TAS had still not reached segments of the community and therefore the efforts of some RW chiefs are questionable.

Fortunately in Sites A and B, distribution of plastic bags and bins to all the households involved during the 3-4 days before implementation provided the Study Team the chance to explain the TAS contents. Surveyors were also dispatched to each Study Area during the first week of implementation in large number in order to directly communicate with the citizens and answer any queries they may have.

Therefore, in conclusion the public campaign including the efforts of the Study Team staff in the final days before starting TAS implementation may be evaluated as positive in obtaining the understanding of the communities involved in TAS operation.

(2) Results of interview survey

1) General

Two interview surveys were held during TAS study, one before TAS implementation (Pre TAS) and one three weeks after implementation started (Post TAS). The surveys were conducted in parts of the four Kelurahan, subject of TAS surveys as follows;

◇ Site A	:	Kel. Bunga Ejaya	197 interviews
◇ Site B1	:	Kel. Malimongen Baru	100 interviews
◇ Site B2	:	Kel. Mamajang Luar	102 interviews
◇ Site C	:	Kel. Parang	100 interviews
		Kel. Bongaya	102 interviews

Pre and Post TAS interviews were conducted at the same households. General questions concerning respondent and household characteristics and income levels were asked only once during the first survey.

Pre TAS interview survey dealt with citizens existing solid waste practices and their opinions on DK activity. The second survey, Post TAS interview covered the citizens opinions on the system of solid waste management studied under TAS.

One questionnaire form was used for the Pre TAS interview survey for all the three TAS sites, while in the case of Post TAS interview survey three different questionnaire sheets were prepared.

2) Pre TAS interview survey

a) Socioeconomic conditions

Income levels, house ownership and types were considered in order to classify the income level in the five Kelurahan. These results are summarized in the following table.

	Bunga Ejaya	Mal. Baru	Mamj. Luar	Parang	Bongaya
1. House Ownership:					
- Private house	76%	74%	78%	84%	75%
- Rental	21%	24%	15%	9%	19%
- Other	3%	2%	7%	7%	6%
2. House Type					
- Permanent	36%	43%	57%	46%	40%
- Semi-permanent	55%	56%	40%	49%	48%
- Temporary	9%	1%	3%	5%	12%
3. Cleansing condition around house					
- Good	44%	38%	44%	35%	35%
- Fair	44%	52%	51%	59%	61%
- Poor	12%	10%	5%	6%	4%
4. Household income level					
- <Rp. 200,000/month	65%	41%	46%	43%	56%
- Rp. 200- 500,000/month	27%	43%	48%	49%	36%
- >Rp. 500,000/month	8%	16%	6%	8%	8%

The first question indicates an overall trend for house ownership in the city as all five Kelurahan showed that over 3/4ths of those interviewed owned their own houses. Data on house types are also similar for all Kelurahan, although of the total interviews permanent houses in Kel. Bunga Ejaya are slightly less than the other Kelurahan. Question 3 reflects the interviewer's perception of the cleansing conditions around the house so this perception may change from one interviewer to another. Most interviewers selected the safe side, choosing "Fair" followed by "Good". However interviewers judged Kel. Bunga Ejaya to have the poorest cleaning conditions.

Question 4 shows Kel. Bunga Ejaya to have the lowest monthly income levels with 65% of respondents stating that they have income of less than Rp. 200,000 monthly. Residents of Kel. Mallimongen Baru appear to enjoy the highest incomes, with 16% stating that their incomes exceed Rp. 500,000 per month.

Based on the results of this survey, in terms of economic classification the five Kelurahan may be arranged in the following descending order of affluence.

Kel. Mallimongen Baru	Site B
Kel. Mamajang Luar	Site B
Kel. Parang	Site C
Kel. Bongaya	Site C
Kel. Bunga Ejaya	Site A

b) Solid waste storage and discharge practices

The main objective of TAS was to tailor waste discharge practices in such a manner as to achieve an efficient collection service. Pre TAS interview survey included questions pertaining to present storage and discharge practices. Results are summarized in the following table.

	Bunga Ejaya	Mal. Baru	Mamj. Luar	Parang	Bongaya
1. Waste storage inside house	52%	44%	50%	57%	46%
- Plastic bag	19%	35%	24%	15%	27%
- Plastic bin					
2. Waste discharge place					
- Permanent Bin	18%	43%	48%	16%	9%
- Armroll container/TPS	62%	49%	46%	68%	74%
- Self treatment	2%	0%	2%	5%	12%
3. Discharge frequency					
- Daily	42%	39%	58%	47%	57%
- 2-3d/week	19%	16%	4%	16%	17%
- Once a week	18%	5%	4%	12%	10%
- Irregular	21%	40%	34%	24%	17%
4. Discharge time					
- 06:00 - 12:00	27%	24%	35%	38%	42%
- 12:00 - 18:00	6%	2%	1%	2%	3%
- 18:00 - 22:00	38%	16%	15%	21%	31%
- 22:00 - 06:00	1%	4%	2%	1%	2%
- Irregular	28%	54%	47%	38%	22%
5. Waste storage inside house	86%	64%	63%	67%	64%
- No problem	10%	32%	30%	23%	22%
- Bad odor	3%	0%	5%	8%	8%
- Attraction of insects	1%	10%	2%	3%	3%
- Takes up space					

Plastic bag use has increased reaching 50% or just below that in all five Kelurahan. This was particularly important in the case of the three Kelurahan of Bunga Ejaya, Parang and Bongaya where residents must walk to the armroll container/TPS. In sites A and C armroll container collection is associated with plastic bag discharge.

On the other hand TAS intended to introduce plastic bin discharge in Mal. Baru and Mamj. Luar in association with door-to-door and open station collection. Therefore extent of plastic bin use there was important to understand. Roughly a quarter or third of those interviewed use bins which means that more effort to get the citizens there used to plastic bin use was necessary.

Question 2 indicated the suitability of each Kelurahan for the TAS system proposed. In Bunga Ejaya, Parang and Bongaya armroll container use is dominant and therefore

armroll container use can be studied there. On the other hand in Mal. Baru and Mamj. Luar permanent bin associated with door-to-door collection is roughly equal to armroll container/TPS use. This means that some of the households included in Sites B were required to shift to the door-to-door system under TAS.

Finally it is interesting to note that self treatment (burial or burning of waste) is relatively high in both Site C2 Kelurahan. This may indicate the residents inability to rely on the DK armroll container serving these Kelurahan. Many residents may feel that walking distance to the container is too far. Another point is the dirty condition of the ditch running along the border separating both Kelurahan. Self treatment may also include illegal discharge of waste into the ditch.

Questions 3 and 4 deal with discharge frequency and time. At Kelurahan Bunga Ejaya, Parang and Bongaya armroll containers are available daily for discharge of waste. Yet the need to daily discharge waste is not so pressing as can be interpreted from the daily discharge rates indicated. Obviously in Mal. Baru introduction of 3 days/week discharge (under TAS) did not appear to pose a problem, but this was not the case in Mamj. Luar where citizens were accustomed to daily discharge. Lastly the high rates of irregular discharge in all Kelurahan should be noted. This suggests that there is room to introduce 2-3 days/week discharge with relative ease.

Discharge time pattern for residents using armroll container could not be identified. Bunga Ejaya residents prefer to discharge their waste in the evening while residents of Parang and Bongaya discharge in the morning. In Mal. Baru and Mamj. Luar morning discharge is dominant in relation to door-to-door service. But the high rates of irregular discharge in these two Kelurahan may point to the disadvantage of the permanent bin system. Waste is discharged into the permanent bins in front of the houses and may be left for long hours before collection. These bins are mostly uncovered and waste discharged is unpacked.

Majority of all Kelurahan households interviewed said that there were no problems concerning waste storage in their houses. Yet the 10% of Kel. Mal. Baru households that responded that waste storage in the houses takes up space may pose a small problem, since the new TAS system requires these households to store their waste in side the house for two to three days.

c) Solid waste management services

Households were interviewed concerning their opinion on SWM service.

	Bunga Ejaya	Mal. Baru	Mamj. Luar	Parang	Bongaya
1. Collection & haul institution					
- Dinas Kebersihan	66%	80%	54%	60%	75%
- RW/RT	8%	12%	45%	15%	3%
- Private/NGO	17%	4%	1%	0%	2%
2. Use of hand cart service	37%	20%	58%	21%	13%
3. Waste collection frequency					
- Daily	56%	23%	32%	61%	6%
- 2-3d/week	31%	47%	26%	26%	21%
- Once a week	4%	3%	7%	1%	14%
- Irregular/Don't know	9%	27%	34%	12%	59%
4. Dissatisfaction with service					
- Unpredictable collection freq.	11%	15%	5%	23%	24%
- Insufficient collection freq.	21%	23%	10%	16%	54%
- Collection should be daily	12%	1%	1%	7%	4%
- Insufficient ditch cleansing	5%	3%	1%	4%	3%
- Not all waste removed	4%	3%	5%	16%	21%
- General dissatisfaction	66%	78%	3%	2%	5%
5. Condition of nearby TPS/Container					
- Waste flowing out into street	17%	6%	7%	39%	39%
- Collection is irregular	6%	12%	6%	30%	27%
- Bad odor/insects attraction	6%	4%	2%	13%	15%
- Good condition	50%	25%	23%	19%	16%
- Don't know	21%	51%	55%	12%	26%

Question 1 indicated that the majority of households are now receiving the service directly from DK either through armroll container or door-to-door service. Two particular points are noticed. The high rate of private/NGO provision of SWM service in Bunga Ejaya (17%) may be attributed to the operation of private hand cart service there and the sharp decrease in RT/RW operated hand cart service. The second point is the high share of RW/RT service provision in Mamj. Luar (45%) which is due to use of hand cart to bring the waste to the container. Although RW/RT has ceased to receive a share from the retribution fee, hand cart operator salary is covered by tips and fees directly obtained from the users.

Hand cart use was high in Mamj. Luar (58%), and this posed some problem as TAS called for door-to-door service without hand cart. Of course total abolition of hand cart service in that area was evaluated under TAS and is reported on elsewhere in this report. The relatively high rate of hand cart service in Bunga Ejaya (37%) indicated the need to rationalize hand cart use there due to the rather distant location of armroll container. Subsequently TAS system for Site A was slightly modified to introduce a hand cart there from the second week of TAS implementation.

Question 3 covered the residents' knowledge as to collection frequencies of DK.

Majority of residents served by armroll container in Bunga Ejaya (56%) and Parang (61%) responded that container is served daily. Although Parang residents use the same container as Parang their perception that container was served daily was low at 6%. The container is located in Parang and rather far from Bongaya residents so the residents there may not be aware of the daily service.

The high rates of households responding to 2-3 days/week collection service in Mal. Baru (47%) and Mamj. Luar (26%) indicated the suitability of providing 3 days/week collection under TAS there.

Question 4 deals with households complaints with the SWM service provided. In Site C (Parang and Bongaya) where the main theme of TAS was ditch and open space cleansing three responses in particular were interesting. Roughly a quarter of all interviewed in the two Kelurahan complained about unpredictable collection service and about a fifth observed that waste is not properly removed by the cleansing workers. These two responses may help explain the illegal discharge of waste in the ditch and open space. Surprisingly only 4% and 3% in Parang and Bongaya respectively complained of insufficient ditch cleansing. This shows that awareness of surrounding citizens on the importance of maintaining the ditch clean must be sharpened.

In Site B (Mal. Baru and Mamj. Luar) only 1% requested daily collection frequency service. This result indicated the relative ease in introducing 3 day/week discharge under TAS.

The high rate of general dissatisfaction in Bunga Ejaya (66%) reflects residents feeling that the sanitary conditions in their living environment are lacking. The high rate of general dissatisfaction in Mal. Baru (78%) may be the result of infrequent collection service combined with frequent discharge of loose waste in permanent bins. Therefore the system introduced in TAS linking discharge with collection service and abolishing use of permanent bin in favor of plastic bin is suitable here.

As DK is expanding armroll container use in the city it was necessary to ask the residents opinion on that system. Question 5 was posed to all five Kelurahan and the high response of "Don't Know" in Mal. Baru (51%) and Mamj. Luar (55%) indicated the relative distance of the containers to those areas. Bunga Ejaya residents' satisfaction with the container condition (50%) can be partially due to the container being located in another Kelurahan.

The dissatisfaction expressed by Parang and Bongaya residents concerning dirty conditions around the container site and irregular collection must be noted. The

present system of collecting the container when it is filled up (every 2-3 days) and leaving the container location empty until the container is returned (sometimes a couple of hours, sometimes 2 days), in addition to the bad discharge habits of some residents are the reasons for this problem. Therefore TAS was modified in the last two weeks of implementation to introduce a fixed container rotation system that will be known to the residents and campaign for proper waste discharge into the container.

d) SWM cost

Households were queried concerning SWM costs and the results are summarized in the following table.

	Bunga Ejaya	Mal. Baru	Mamj. Luar	Parang	Bongaya
1. Monthly retribution fee					
- < Rp. 500	51%	56%	18%	6%	15%
- Rp. 550 - 1,000	41%	7%	54%	88%	79%
- >Rp. 1,000	7%	37%	28%	7%	6%
2. Opinion on retribution fee					
- Cheap	11%	28%	19%	8%	7%
- Fair	70%	62%	71%	73%	75%
- Expensive	18%	10%	10%	19%	18%
3. Tip paid to collector					
- No tip	60%	75%	80%	77%	95%
- <Rp. 500	20%	12%	12%	9%	0%
- Rp. 550 - Rp. 1,000	10%	9%	8%	8%	5%
- >Rp. 1,000	10%	4%	0%	6%	0%

Surprisingly majority of residents of both Mal. Baru, considered the most economically prosperous of the five Kelurahan and Bunga Ejaya, at the lowest end in terms of prosperity pay Rp. 500 per month. Majority of residents in all five Kelurahan consider retribution level fair, although almost a fifth of the three Kelurahan served by armroll container (Bunga Ejaya, Parang and Bongaya) judged the tariff levels to be expensive. More education to make such residents realize that the container service is for them and should be covered by the retribution fee is necessary.

Question 3 shows that a healthy majority of residents do not pay tips to collection workers.

e) Community participation

Questions were included in the interview to try and understand the citizens opinion on their surrounding environment and what they do about it. Results are shown in the following table.

With the exception of Mal. Baru roughly a third of respondents all Kelurahan perceived poor cleanliness conditions in their areas. In Mal. Baru over half of the respondents had that opinion. These replies indicated the citizens call for more effort in SWM.

Response to ditch cleanliness (question 2) was rather surprising with high rates of respondents stating that the ditch cleansing was in "good condition". This confirms the need, stated before in item (3) to sharpen the awareness of the citizens on the importance of maintaining clean ditch.

Question 3 shows that Lurah and RW/RT chiefs take the lead in educating the community on solid waste. The mass media also plays a convincing role. However the poor attention given to this subject by other civic organizations and public forums such as religious places of worship, schools, women organizations and the work place is significant.

	Bunga Ejaya	Mal. Baru	Mamj. Luar	Parang	Bongaya
1. Perception on surrounding cleanliness	35%	52%	29%	35%	32%
- Poor	40%	32%	39%	37%	43%
- Fair	25%	16%	32%	27%	25%
- Good					
2. Perception on ditch cleanliness					
- Waste thrown In ditch	22%	12%	5%	18%	14%
- Drainage problem	15%	28%	18%	19%	12%
- Both waste and drainage problem	12%	14%	10%	24%	27%
- Good condition	51%	46%	67%	39%	47%
3. SWM discussed by following					
- Lurah, RW/RT chiefs	65%	70%	61%	48%	50%
- Religious leaders	1%	20%	10%	2%	5%
- LKMD	9%	6%	19%	10%	19%
- PKK	2%	7%	20%	19%	5%
- School	0%	2%	0%	2%	3%
- Work place	0%	0%	2%	0%	0%
- Other (TV, radio, newspapers)	24%	20%	24%	49%	48%
4. SWM activity willing to participate in	24%	7%	10%	13%	9%
- Take waste to container personally	1%	2%	2%	20%	12%
- Clean around communal container	63%	89%	82%	64%	77%
- Sweep street in front of house	68%	73%	68%	24%	72%
- Participate in ditch cleaning	2%	0%	0%	0%	0%
- Not willing to participate					

Question 4 attempted to understand what SWM activities the citizens are willing to participate in. It was interesting to note the relatively high rate of residents willing to clean around the container at Parang and Bongaya and this willingness was incorporated in the TAS public participation program for Site C. A very positive response was shown by the citizens in all Kelurahan to take part in street sweeping and ditch cleansing.

The survey did show that more effort was needed to convince citizens of Bunga Ejaya, Parang and Bongaya to bring their waste by themselves to the armroll container and reduce their reliance on, or continuous demand for hand cart service.

Finally it was a relief to see that all respondents in four Kelurahan voiced willingness to participate in one form or another. Share of respondents not willing to participate in Bunga Ejaya, although very low (2%) should nevertheless be kept in mind.

f) Summation of pre TAS interview survey results

The results of Pre TAS interview survey may be summarized as follows;

- ⇒ No clear linkage between economic level and SWM practices could be established
- ⇒ Plastic bag discharge is increasingly in use and is associated with armroll container use
- ⇒ Discharge frequency is mostly irregular and there is good possibility for fixing 2-3 days/week discharge
- ⇒ There is a demand by the community to improve cleanliness conditions in their surrounding area
- ⇒ There is a general satisfaction with ditch cleansing conditions which may indicate that more effort is needed to educate the citizens on ditch cleansing and maintenance
- ⇒ Although the Lurah and RW/RT chiefs are active in increasing SWM awareness among the community the lack of attention on the part of other groups is significant
- ⇒ Citizens of the community have a strong willingness to participate in street sweeping and ditch cleansing activities

(3) Site A: TAS implementation phase

1) Study area

Kelurahan Bunga Ejaya in Kecamatan Bontoala is the subject of TAS Site A.

2) Implementation period

TAS was implemented in Site A as follows;

- ◊ Implementation commencement in May 29th, 1995
- ◊ Introduction of JICA hand cart in June 5th, 1995
- ◊ Completion of TAS in June 26th, 1995 at 10:00 AM

3) Implementation methodology

TAS was implemented at Site A as follows (refer to *Fig. 6.59*);

- ◊ Plastic bags (25 bags, 30 liter size/household) distributed to 742 households (76% of total households) before implementation start
- ◊ Alternative armroll container locations studied but no suitable location identified
- ◊ Of two containers located at Jl. Tinimbu, one specialized for Site A residents
- ◊ Surveyors at container location 24 hours
- ◊ JICA hand cart service introduced on second week (service 6 days/week, at two locations on alternative days, from 16:00 to 22:00)
- ◊ Shovels, spades and fork picks provided for community participation

4) Survey items

The following items were surveyed throughout the TAS implementation.

- ◊ Daily record of discharger number, time, walking distances, number of household members
- ◊ Daily record of hand cart use and volume of waste transported by hand cart
- ◊ Frequency of container change
- ◊ Measurement of weight of waste in container at TPA

◇ Activity of community participation in ditch cleansing and street sweeping

◇ Effect of TAS on cleansing conditions in Site A

5) Analysis and evaluation

The data have been analyzed on a daily basis, aggregated into four weeks and the results are shown in the following table and explained hereafter.

Items	Unit	Week 1	Week 2	Week 3	Week 4
1. Waste Collection Coverage					
- Waste amount collected	Kg/wk	15,235	14,460	14,500	12,646
- Estimated generated waste	Kg/wk	15,105	15,105	15,105	15,105
- Waste collection coverage	%	101%	96%	96%	84%
2. Dischargers Walking Distances					
- <100m	%	20%	27%	32%	28%
- 101 - 200m	%	41%	46%	45%	46%
- 201 - 300m	%	32%	23%	21%	22%
- >301m	%	6%	4%	3%	4%
3. Hand Cart (HC) collection					
- Estimate share of HC hauled waste	%	15%	28%	21%	22%
- Share of Private HC haul	%	100%	60%	58%	32%
4. Container Capacity Requirement					
- Ave. daily waste discharged	m ³	9.5	9.0	9.0	6.9
5. Discharge Frequency					
- Ave. daily share of population discharging	%	32%	35%	30%	25%
- Ave. daily waste discharged/capita	Kg/cap/d	1.2	1.0	1.2	1.1
- Ave. discharge frequency per capita	day	3.2	2.7	3.2	2.9

a) Waste collection coverage

It is difficult to identify exactly the amount of waste collected from this site before TAS implementation because there was no exclusive armroll container provided for Kelurahan Bunga Ejaya exclusively. However significant open spaces littered with waste and burning of waste were observed.

The generated waste was estimated based on the Kelurahan population data of 5,832 and unit generation rate of 0.37 kg/cap/day (estimated based on Site B data analysis). The first three weeks showed that citizens cooperation was very strong in bringing their waste to the armroll container, but there was a drop in the last week. This may be explained by a drop in citizens enthusiasm, and indicates the need to continuously carry out public campaigning.

b) Dischargers walking distances

As shall be elaborated in item (7) hereafter, a second location for placing of container was not found. Therefore all the site was served by one location only, at JI. Tinumbu along the border of Site A.

Population living within a 200m radius of the container, the maximum suitable walking distance, accounted for approximately 55% of the total population. Table 6.4.1 shows that 60-75% of dischargers responded that they are within 200m walking distance of the container. Discrepancy is not significant when considering the difficulty of obtaining accurate responses as to actual distance.

In order to determine the influence of hand cart primary collection on the 45% of residents living more than 200m from the container a hand cart was introduced (referred to as JICA HC) at the start of the second week. The results show a decrease of about 10% in dischargers walking to the container from distances of more than 200m.

Plastic bags were distributed in order to facilitate carrying the waste to the armroll container and eliminating need to return home to take back bin. However about 24% of the households did not receive plastic bags for various reasons; nobody at home, no interest to participate, suspicion of the motivation behind the distribution, etc. It is difficult to measure the effect plastic bags have had.

c) Hand cart collection

With the introduction of JICA HC the amount of waste estimated to be transported by hand cart increased by just less than 10% from 15% in the first week. Hand cart transported waste averaged about 20 to 25% of total waste brought to the container. The operation system of the JICA HC may be one reason for not attracting the residents attention and also lack of knowledge on the operation. The JICA HC was operated six days a week (no operation on Sundays) at two locations on alternative days between the hours of 16:00 to 22:00. Residents were requested to bring their waste to the hand cart. On average the hand cart made 2.6 trips every operating day serving about 600 people.

In addition to JICA HC, 12 other hand carts are operating in the area on an irregular basis by the private sector. In the second and third weeks private sector hand carts transported 60% of total hand cart transported waste, but the share fell inexplicably to 30% in the fourth week.

d) Container capacity requirement

The maximum average daily discharged waste for the four weeks of the survey was 9.5m^3 . Therefore a minimum of three container capacities are required every two days. During TAS implementation on average the container was changed three times every two days thereby satisfying the demand.

If the residents living more than 200m distant from the container are served by another means than one container daily is sufficient for the site. The population living within a 200m walking distance from the container are about 2,400 (population density of 380 capita/ha, on an area of 6.3 ha). Their daily generated waste is approximately 4m^3 .

e) Discharge frequency

An armroll container serves the site daily, thereby allowing for daily waste discharge by the residents. However the survey showed that residents discharged their waste on average every 3 days. This result encourages introduction of 2-3 days/week discharge in parts of the city.

f) Discharge time

There are two distinct discharge time peaks, the first between 20:00 and 21:00 and the second, slightly lesser between 05:00 and 06:00. Discharger arrival is distributed throughout the day with the exception of the hours of 02:00 to 04:00. Discharger activity in the evening hours is slightly more than in the daytime hours (see *Fig. 6.60*).

g) Container location

Fig. 6.59 shows the locations considered for container placement. The ideal situation of placing a container inside the Site is not possible because of narrow streets. Three alternate locations were considered, the most promising of which is located near the Arab Cemetery. After visiting the site with DK, Lurah and RW chief it was agreed to move an additional container there. But one week before TAS implementation started the concerned RW chief reported that the nearby residents rejected placing a container at the proposed location.

This issue was raised in the community campaign meeting but no solution could be found. It is obvious that more effort must be made to gain the acceptance of nearby residents when locating containers through proper container maintenance and regular collection. Presently the containers serving the site are placed in front of a school.

h) Community participation in ditch cleansing and street sweeping

During TAS implementation community participation in cleansing activity was held twice on 6/4th and 6/11th. This activity was led by the Antipalla group and mainly involved ditch cleansing with some street sweeping.

The main items related to this activity are shown in the following table and depicted in Fig. 6.61.

Items	June 4th	June 11th
1. Start and finish time	06:00 to 11:00	07:00 to 11:00
2. Length of ditch cleaned (m)	500	774
3. Citizens participating	48	43
Total		
Male	40	33
Female	8	10
4. Volume of dirt removed (m ³)	3.1	2.9
5. Tools used (number)		
Pick	8	13
Spade	4	7
Hand cart	3	2

In addition to the ditch cleansing other activities such as street sweeping and clearing up of permanent bins were also carried out.

Under TAS some tools were provided to facilitate the work;

Spades	3
Picks	5
Hand cart	1

(4) Site B: TAS implementation phase

1) Study area

Two sites have been selected for execution TAS study B; Kelurahan Malimongan Baru (B1) and Kelurahan Mamajang Luar (B2).

2) Implementation period

TAS was implemented in Site B1 from May 29th to June 23rd, 1995, and in Site B2 from May 30th to June 24th, 1995.

3) Implementation methodology

TAS was implemented in Sites B1 and B2 as follows (refer to Fig. 6.62 and 6.63);

- ◊ Pre-numbered plastic bins of size 40 liters distributed to 324 households in B1 and 327 households in B2 before implementation start

- ◇ Residents discharge their plastic bins on Monday, Wednesday, and Friday in B1, and Tuesday, Thursday and Saturday in B2, before 08:00 AM
- ◇ Dinas Kebersihan collection vehicle begins collection operation in each site on the designated discharge days respectively between 08:00 and 10:00 AM
- ◇ Study Team surveyors collect data during vehicle collection time

4) Survey items

The following items were surveyed during TAS implementation at Site B;

- ◇ Households discharging bins on collection day
- ◇ Vehicle collection start and finish times and number of trips on the collection route
- ◇ Number of open stations where residents living in narrow alleys bring out their waste bins to the main street and time spent at each
- ◇ Citizens acceptance or rejection of this collection system through spot interviews held mainly at the open stations
- ◇ Investigation of reasons when any household does not discharge its plastic bin all three days of the week
- ◇ Vehicle route in the collection zone
- ◇ Extent of use of permanent bins
- ◇ Measurement of collected waste amount by weight

5) Analysis and evaluation

The collected data during TAS Site B implementation was analyzed and the weekly averages are shown in the following table and graphically in *Fig. 6.64*. It is notable that all the indices showed gradual improvement, reflecting the need for both the citizens and DK crew to get accustomed to the new system.

Items	B1: Kel. Mal. Baru				B2: Kel. Mamajang Luar			
	Wk. 1	Wk. 2	Wk. 3	Wk. 4	Wk. 1	Wk. 2	Wk. 3	Wk. 4
1. Share of bins used (%)	77%	86%	90%	85%	90%	94%	96%	91%
2. Collection time (min/t)	96	90	65	51	86	70	59	38
3. Time at open station (min/ton)	NA	67	44	32	NA	61	44	35
4. Discharge per capita (Kg/cap/day)	0.38	0.32	0.39	0.45	0.34	0.35	0.39	0.43
5. Spot Interview								
- Reject 3 d/wk			7%	0%			0%	3%
- Reject collection time			7%	0%			0%	0%

a) Plastic bin use

The graph shows that the community's enthusiasm to use plastic bin gradually increased during the first three weeks, but fell down slightly on the fourth week. During the first three weeks the Study Team surveyors knocked at doors of houses that had not yet discharged their bins to inform them of the collection vehicle arrival, but in the last week this was discontinued. That may be the reason for the slight fall. The much voiced fear at the start of TAS that citizens would use distributed bins for other purposes was unfound.

Of particular significance is the cooperation of citizens living along narrow alleys in bringing their plastic bins to the main road for collection. Walking distances varied from 50 to 100m (maximum 200m). Points where residents brought their waste are referred to as open stations, and the number of open stations in each site were 14.

One problem which persisted throughout TAS implementation was the residents' fear that plastic bins left unattended may be stolen. In B1 and B2, 6 and 5 plastic bins were reported as stolen. Therefore most residents were reluctant to take out their bins before the vehicle arrived and time was wasted in knocking on the doors of those residents who did not notice vehicle arrival.

b) Collection time on the route

The main objective of TAS in Site B was to determine the citizens willingness to cooperate in bringing out their waste 3 d/week in plastic bins. Therefore no effort was made in selecting sites which offer rational vehicle routes. In the cases of both B1 and B2 the vehicle collection routes were far from ideal (refer to Fig. 6.62 and 6.63), with many necessary U-turns and rear motion.

Nevertheless the combined effect of plastic bin use and 2 days accumulated waste discharge, as opposed to daily loose waste discharge on the collection time spent on the route was positive. The gradual fall in time from the first week to the fourth in

both sites B1 and B2 is indicative of the crew's getting used to the route and the increased cooperation of the citizens in bringing out their waste early. In the time and motion survey conducted in this Study the required time on the collection route averaged 77 min/ton. During the last two weeks of TAS this required time was reduced at both sites. As this system is expanded taking into consideration more rational vehicle routing in the collection zone it may be possible to maintain lower time requirement.

c) Open station collection time

Although the average number of bins collected from the open stations was 10, in many stations more than 20 bins were picked up. These open stations resemble the permanent TPS that are still in use in many parts of the city for discharge of waste, mostly in loose form. In last year's time and motion study average time spent to load waste from TPS was roughly 50 min/ton. This is longer than the time needed under TAS at the open stations.

Open station system calls for discharge of packed waste at fixed time and the prompt collection of such waste by DK according to a fixed time schedule. While the system provides a much better environment in the living area it demands strong cooperation of the citizens and high efficiency of DK. In TAS Sites B1 and B2 both sides showed that they were up to the task.

d) Citizens acceptance of TAS system

During the last two weeks 30 spot interviews were held with residents, mainly housewives at the open stations on the collection days. In total 180 interviews were held in each site. The citizens were asked two "yes or no" questions; did they object to having only 3 days/week discharge service, and secondly was the morning collection time suitable or not? There was overwhelming support for the system with only 3 and 2 persons answering "Yes" to questions one and two respectively from amongst the total interviewed in both sites.

e) Waste discharge rate

As a "by-product", the average monthly waste discharged per capita was calculated to be 0.36 and 0.38 kg/cap/day in Sites B1 and B2 respectively. These figures help to confirm the results of the unit generation rate survey carried out in 1994 by this study.

f) Summation

In conclusion the results of TAS Site B may be summed up as follows;

- i. Citizens accept the system of 3 days/week discharge at fixed hours
- ii. Packed waste discharge decreases time spent on collection route and can contribute to improving vehicle utilization efficiency
- iii. Concept of open stations coupled with discharge of packed waste at fixed discharge and collection schedules is feasible and improves collection operation efficiency
- iv. This system improved the living environment by removing the loose waste that used to be discharged in permanent bins in front of the houses at any time

(5) Site C: TAS implementation phase

1) Study area

Two sites have been selected for execution of TAS study C; Jl. Mawas in Kelurahan Mamajang Luar (C1) and the bordering ditch between Kelurahan Parang and Kelurahan Bungaya (C2). TAS activities in each site are respectively;

C1: 1) Ditch cleansing using excavator

2) Citizens participation in ditch cleansing

3) Armroll container rotation system

C2: 1) Dinas Kebersihan ditch cleansing activity

2) Citizens participation in ditch and open space cleansing

3) Armroll container rotation system

2) Period of implementation

TAS study in Site C was implemented under the following schedule;

Site	Item	Implementation time
C1	C1.1)	June 2 - 3, 1995
	C1.2)	May 31, 1995 June 4, 1995
	C1.3)	June 12 - 25, 1995
C2	C2.1)	June 2 - 4, 1995
	C2.2)	June 4, 1995
	C2.3)	Phase 1: May 29 - June 4, 1995 Phase 2: June 12 - 25, 1995

3) Implementation methodology

TAS was implemented at Site C1 as follows (refer to *Fig. 6. 65*);

- ◊ Excavator rented for ditch cleansing
- ◊ Dinas Kebersihan vehicles used for transport of removed sludge from ditch
- ◊ Shovels, spades and picks provided for community participation
- ◊ Surveyors observed ditch cleansing by excavator
- ◊ Surveyors observed community participation
- ◊ Surveyors stationed at container location during container rotation study

TAS implementation in Site C2 is shown in *Fig. 6. 66*. Implementation was as follows;

- ◊ One week 24 hour survey of citizens discharge practice (Phase 1)
- ◊ Dinas Kebersihan dispatched ditch cleansing gang
- ◊ Shovels, spades and picks provided for community participation
- ◊ Surveyors observed ditch cleansing by ditch cleansing
- ◊ Surveyors observed community participation
- ◊ Plastic bags (14 bags, 30 liter size/household) distributed to 250 households

Surveyors at container location 24 hours (Phase 2)

4) Survey items

At TAS Site C1 the following items were surveyed;

- a) C1.1) ◊ Excavator utilization time and running expenses

- ◇ Length of ditch cleaned and cross section
- ◇ Volume of sludge/dirt removed from ditch
- b) C1.2) ◇ Activity of community participation
 - ◇ Methods of organizing community for the activity
 - ◇ Tools used in the activity
 - ◇ Extent of work accomplished
- c) C1.3) ◇ Measurement of waste amount

For TAS Site C2 the survey items were as followed;

- a) C2.1) ◇ Dinas Kebersihan manpower and time used for ditch cleansing
 - ◇ Length of ditch cleaned and cross section
 - ◇ Volume of sludge/waste removed from ditch
- b) C2.2) ◇ Activity of community participation
 - ◇ Methods of organizing community for the activity
 - ◇ Tools used in the activity
 - ◇ Extent of work accomplished
- c) C3.3) ◇ Daily record of discharger number, time, walking distances and household members number
 - ◇ Frequency of container change
 - ◇ Measurement of weight of waste in container at TPA

5) Analysis and evaluation

C1.1) Ditch cleansing using excavator

An E 110 B Caterpillar excavator (0.6 m³ bucket size) was used at Site C1 to clean the ditch. The ditch cross section is shown in *Fig. 6.67*. The particulars of the ditch cleansing operation are shown in the table.

Item	Unit	Description	Remark
1. Excavator Operation			
- Length of ditch cleared	m	233.3	
- Sludge/dirt removed	m ³	47.7	
- Operated days	day	1.5	
- Operator	person	1	
- Manual workers	person	20	Cleaned under bridges for 1/2 day
2. Operation Cost			
- Salaries	Rp.	95,000	Operator: 2d x Rp. 15,000/d Workers: 1d x Rp. 3,250/d
- Fuel	Rp.	64,000	20 li/hour
- Maintenance	Rp.	56,410	Rp. 220 mil x 1/5yr x 1/312 x 0.4
- Depreciation	Rp.	141,000	Rp. 220 mil x 1/5yr x 1/312
- Excavator transport cost to site	Rp.	182,870	Trailer cost Rp. 130 mil, life 8 yrs
3. Unit Cost	Rp./m ³	11,300	Operation cost/Sludge removed
4. Work rate	m ³ /hour	4.0	Sludge removed/work duration

It should be noted, that while excavator use is obviously more efficient, the use of the large excavator, rented under TAS is only possible for larger ditches (width of over 3-4 m) and where there is little interference by small foot paths constructed to access houses or alleys. Also working space along the ditch is necessary. Furthermore the transport of excavator to the site by trailer is costly and troublesome. It is roughly estimated that such an excavator can only be utilized in 30-40% of the ditches maintained by DK.

C1.2) Citizens participation in ditch cleansing

Community participation for ditch cleansing was held on May 31st (a national holiday) and Sunday, June 4th. The Study Team assisted in promoting ditch cleansing activity and the record of the activity is shown in the following table.

Items	May 31st	June 4th
1. Start and finish time	06:30 to 10:10	06:00 to 08:00
2. Length of ditch cleaned (m)	276	320
3. Citizens participating		
Total	45	36
Male	35	29
Female	10	7
4. Approx. volume of waste removed (m ³)	3.2	NA
5. Tools used		
Pick	8	
Spade/shovel	8	21
Wheelbarrow	1	
Hand cart	3	1

The community participants were organized into four (4) groups as follows;

- a) Group 1 ◊ Remove the waste from the ditch
- b) Group 2 ◊ Transport removed waste by hand cart to container
- c) Group 3 ◊ Sweep roads
- d) Group 4 ◊ Supervise and control the work

Small interviews were held with the participants and the responses were as follows;

- a) Motivation ◊ Important to keep streets in front of houses clean and in general maintain a clean environment in the area
- b) Frequency of work ◊ Schedule is for working twice weekly (Friday and Sunday), 1.5 hours each time
- c) Problems ◊ Removed ditch waste is kept on the road side for 2-3 days before it is removed by Dinas Kebersihan vehicles
- d) Satisfaction with Community response
 - ◊ Instruction for community participation is widely spread
 - ◊ Community members enthusiastic to participate when asked
 - ◊ Community satisfied when living environment is clean

Under TAS some tools were provided as follows;

Spades	5
Picks	5

Although some citizens reported that community participation is held twice/week, it is more likely that this activity is done on Sundays. Usually community initiative is on a limited scale, such as cleaning ditch and street in front of own house when the need arises. However the community participates as a whole when instructed by the Lurah through the RW/RT chiefs. On the two times arranged by TAS the Lurah issued such instructions.

The two apparent main problems are the delay in removal of cleared waste from the area by DK and secondly lack of tools. It is difficult for each community to coordinate with DK prior to community activity as there are 142 Kelurahan and over 700 RW involved throughout the city. A more definite schedule for this activity should be

established; for example the first and third Sundays in the northern Kecamatan and second and fourth Sundays in southern Kecamatan. DK would then take into consideration increase of collection vehicle trips in the respective areas on the following Mondays.

There are no tools provided by DK or the Lurah office and citizens use their own tools or borrow from their neighbors. Some primitive tools are made such as tying a can to the end of a long wooden stick to clean the ditch. Community members are more than the tools and so the full effort of those members can not be harnessed.

Another problem, not mentioned by the participants themselves was the entering into ditches barefooted to clean them. In addition to the obvious sanitary problems the presence of discharged glass and other sharp materials can cause injuries (DK workers complained of this problem). It is therefore easy to understand why many people avoided going into the ditch.

C1.3) Armroll container rotation system

At the start of TAS, two armroll containers and two TPS were located along Jl. Mawas. Analysis of the TPA reports showed that the hauled waste amount by the two containers was not sufficient to warrant keeping both containers continuously seven (7) days a week to serve the area. Therefore a container rotation system (to be described in section C2.3) hereafter) was studied. Under this system the area was served by nine (9) container days in one week. In other words on four days of the week there was only one container.

The two containers are placed at a distance of around 100m apart. A surveyor was present at the site during the days when there was only one container, to ask the residents bringing their waste to the location of the removed container, to walk to the second container location. A sign was also placed at the empty container base. However the cooperation of the residents was sometimes lacking with many refusing to walk the extra 100 or so meters and simply placing the waste on the base.

While TAS actively provided public campaign in Kel. Parang for the container rotation system, on purpose no serious campaign was provided here. The purpose was to understand whether the lone surveyor and sign placed at the site would be enough. Obviously they were not. An effective public campaign, as that in Kel. Parang involving instructions from the Lurah, RW chiefs and RT chiefs is indispensable.

C2.1) Dinas Kebersihan ditch cleansing activity

DK mobilized its ditch cleansing gang at the ditch bordering Kelurahan Parang and Bongaya and implemented ditch cleansing there from Friday 6/2, for three days. Particulars of this activity and the location are shown in the table. The ditch cross section is shown in *Fig. 6.67*.

Item	Unit	Description	Remark
1. DK Cleansing Operation - Length of ditch cleared - Sludge/waste removed - Working days - Supervisors - Manual workers	m m ³ day person person	179.9 28.7 2.5 4 34	Sunday worked until 12:00 Worked all three days Average of three days (29, 33 and 40)
2. Tools - Picks - Spades - Wheelbarrows	unit unit unit	7 24 6	
3. Operation Cost - Salaries - Tools - Lunch cost	Rp. Rp. Rp.	477,000 10,000 230,000	Supervisor x 3d x Rp. 10,000/d Workers x 3d x Rp. 3,500/d Depreciation Lunch furnished by TAS
4. Unit Cost - Total cost - Cost excluding lunch	Rp/m ³ Rp/m ³	25,000 17,000	Tot. cost/sludge-waste removed (Tot. cost-lunch)/sludge-waste removed
5. Work Rate	m ³ /hour	1.4	Sludge-waste removed/work duration

A remark on the working conditions is needed. The majority of workers had no boots or gloves to protect them, and many complained of injuries suffered on the job. Secondly in this particular ditch, the problem was mainly removal of waste which indicates the frequent illegal discharge of waste into the ditch.

C2.2) Citizens participation in ditch and open space cleansing

In conjunction with DK ditch cleansing activity in the area community participation activity was organized under TAS on June 4th. The data for this activity is being processed at this time. Preliminary results are as follows;

Items	June 4th
1. Start and finish time	06:30 to 10:00
2. Length of ditch cleaned (m)	250
3. Citizens participating	Total
Male	45
Female	35
4. Approx. volume of waste removed (m ³)	10
5. Tools used	Pick
Spade/shovel	28
Wheelbarrow	21
	2

Adjacent to the ditch there is open space dumping. The waste has accumulated in the open space and a small garbage hill has resulted. On this same open space a TPS is located and recently an armroll container has been placed. Public community campaign under TAS included admonishing illegal waste discharge in both the ditch and open space and encouraging community participation in cleaning of both ditch and open space. Members of the community participated in both activities.

C2.3) Armroll container rotation system

Two armroll containers are located in C1 at Jl. Mawas (@ 100 meters apart) and a third container serves Kelurahan Parang and Kelurahan Bongaya, C2. Results of the first week of TAS showed that the container in C2 is needed only 4 days a week, and likewise it is not necessary to maintain both containers at Jl. Mawas all the week. Therefore the idea to test the public's reaction to container rotation system was considered. Instead of three containers, two would be used in the three locations and the citizens would be asked to refrain from discharging their waste on specific weekdays.

While a surveyor was positioned at Jl. Mawas to guide the citizens, data collection and analysis was mainly done for C2. Survey results are in the following table. The containers were rotated as shown in Fig. 6.68.

Item	Unit	Week 1	Week 3	Week 4
1. Discharge Manner				
- Discharge in container	%	75%	93%	90%
- Discharge in TPS	%	10%		
- Discharge in open space	%	15%	7%	10%
2. Dischargers Walking Distances				
- <100m	%	47%	7%	18%
- 100 - 200m	%	38%	25%	25%
- 201 - 300m	%	14%	44%	26%
- >301m	%	1%	24%	31%
3. Hand Cart collection share	%	4%	1%	4%
4. Container capacity requirement				
- Ave. daily waste discharger	m ³	1.5	1.4	1.4
5. Discharge Frequency/capita	day	2.8	3.0	2.4
6. Dischargers by Kelurahan				
- Kelurahan Parang	%	41%	37%	35%
- Kelurahan Bongaya	%	57%	63%	65%

a) Discharge manner

During the first week the discharger, upon arriving to the site had three options on where to put his waste; 1) in the armroll container, 2) in the TPS, and 3) illegal dumping in the open space. This illegal dumping appears to have been going on for a long time.

Results show that 15% discharger their waste in the open space, and 10% in the TPS despite the presence of an armroll container. More effort on public education and campaigning is obviously needed.

At the end of the 1st week, DK abolished the TPS structure and the container only remained. During the second week a surveyor was stationed at the site to admonish would-be dischargers to open space to refrain from such action. Open dumping was completely stopped during that week.

On the third and fourth weeks some dischargers brought their waste on Wednesdays and Saturdays despite the campaign not to discharge on those two days because there would be no container. Upon not finding a container, the citizens just left their waste on the container base. The rather high share of dischargers (10%) doing so on the fourth week is partly due to some problems concerning adhering to the rotation schedule by DK.

b) Dischargers walking distances

There were wide discrepancies in walking distances answers over the three weeks

which is may be due to poor sense of distance. The replies show that around 50% fall in the range of 100 to 200m walking distances. Hand cart collection share is low, at 4%.

c) Container capacity requirement

The maximum average daily discharged waste for the three weeks was 1.5m³. Therefore the container is required for a minimum of 2 days at this site. That is to say, in theory the container can be brought to this location on Wednesdays and Saturdays and used elsewhere on other days. The citizens would be instructed to bring their waste only on these two days.

d) Discharge frequency

The survey showed that residents discharge their waste on average every three (3) days, and it is therefore feasible to remove the container from the site some on certain days.

e) Dischargers by Kelurahan

At the public campaign meeting held before TAS implementation there was heated discussions between the residents of each of Parang and Bongaya concerning with which Kelurahan the responsibility to maintain the ditch and armroll container lies. It was therefore interesting to note that roughly 2/3rds of dischargers are from Kelurahan Bongaya. This should be kept in mind when conducting future community participation and public campaign activities.

f) Discharge time

Fig. 6.69 shows the dischargers arrival time to the site during the three weeks. Compared with Bunga Ejaya (Site A) residents, there is a slightly higher tendency for residents in Kel. Parang/Bongaya to discharge their waste in the early hours of the morning between 05:00 and 06:00 AM.

g) Modification of the system

The container rotation system studied under TAS consisted of shifting two containers around three locations. This proved at times confusing to the assigned armroll driver, especially when the driver was changed twice during the two weeks. Upon completion of TAS Dinas Kebersihan and the Study Team held a meeting with Lurah Parang and it was agreed that Dinas Kebersihan would follow the container rotation system, but rotate one container between two locations both located in Kelurahan

Parang (see Fig. 6.70), as follows;

Day	Site 1 (C2)	Site 2
Monday	X	O
Tuesday	O	X
Wednesday	X	O
Thursday	O	X
Friday	X	O
Saturday	O	X
Sunday	O	X

where O: there is container, X: no container

This new system therefore benefited the new site for which Lurah Parang had been requesting a container. The Study Team assisted DK in visiting the new site to confirm its suitability and printout and distribute leaflets to the residents concerned explaining the above schedule.

A second modification to the original container rotation plan dealt with the allowable number of days a container should be kept on site. Originally the schedule called for keeping the container at Parang Sunday through Tuesday. However Lurah Parang worried about generation of smell and insects/pests and it was decided that the armroll container would be taken from Parang on Monday and returned immediately after emptying to the same location. So it should be borne in mind that even though the capacity of one container is sufficient for three days waste at a certain area, instead of being kept there for all three days, it would be better to bring the container there every third day and ask the citizens to discharge only on that day.

6) Summation

In conclusion the results of TAS Site C can be summarized as follows;

- i. Mechanical ditch cleansing is more cost efficient but restricted in use
- ii. Citizens respond positively to community participation if such a call is issued by the community leaders
- iii. Community participation in cleansing activities is hampered by shortage of basic tools
- iv. More public campaigning and education is needed to stop the bad habit of illegal waste dumping and inform the citizens of the waste discharge facilities available to them

- v. Armroll container rotation system should be expanded, initially through rotating one container amongst two locations possibly in the same Kelurahan, but after studying the waste discharge demand in the locations

(6) TPA truck scale data analysis

1) Study area

The data obtained from the Tamangapa truck scale was used to analyze the collection service efficiency in all KMUP areas served by Dinas Kebersihan.

2) Implementation period

The starting date of this survey was delayed by the fact that the access road to the truck scale was damaged and could not be used. The Study Team repaired the access road and the regular survey commenced on May 22nd, 1995. Under TAS data obtained up to July 10th is scheduled to be analyzed.

3) Implementation methodology

Under TAS, the Study Team stationed surveyors at the truck scale, 24 hours to monitor the collection vehicle traffic. In addition to the computer at the truck scale, the Study Team employed a laptop computer there to immediately analyze the data.

4) Survey items

The following items were monitored throughout the survey on a daily basis;

- ◇ Arrival and departure time of collection vehicles by type and police number
- ◇ Weight and type of waste hauled in
- ◇ Kelurahan where waste is coming from
- ◇ Number of crew members in the vehicle

5) Analysis and evaluation

Weekly reports were prepared and submitted to DK. The report contained a summation of the week by vehicle type and the police numbers of vehicles that were performing a low number of trips or carrying small loads.

The report was then broken down by vehicle type and daily performance of each vehicle was recorded in detail. Finally the report highlighted the amount of waste

collected from each Kecamatan and compared that amount to the estimated generated amount in the respective Kecamatan to determine the service coverage rate. Graphs were enclosed in the report as appropriate to facilitate understanding the contents at a glance.

Two meetings were held with DK and the contents of the report were reviewed, and the vehicles requiring route modification were highlighted. Analysis of the first four weekly truck scale reports is briefly reviewed in the following table.

Item	Week 1	Week 2	Week 3	Week 4
Total Waste Amount Collected by DK (Kg)	1,763,232	1,794,356	1,900,635	2,186,500
Ave. daily waste amount collected (Kg/d)	251,890	256,337	271,519	312,357
1) Kijang				
- Haul share of total hauled waste (%)	14%	14%	14%	13%
- Ave. haul/trip (Kg)	971	825	974	978
- Ave. trips/shift	1.6	1.6	1.6	1.6
- Vehicle operation rate (%)	83%	94%	80%	83%
2) Rino Plat				
- Haul share of total hauled waste (%)	10%	13%	11%	10%
- Ave. haul/trip (Kg)	1,714	1,876	1,984	2,125
- Ave. trips/shift	1.8	2.0	2.0	1.6
- Vehicle operation rate (%)	86%	94%	77%	91%
3) Two arm haul container vehicle				
- Haul share of total hauled waste (%)	2%	2%	2%	1%
- Ave. haul/trip (Kg)	1,144	1,149	1,074	964
- Ave. trips/shift	5.1	4.9	6.1	6.1
- Vehicle operation rate (%)	100%	100%	100%	100%
4) Dump Truck Uncovered				
- Haul share of total hauled waste (%)	18%	16%	18%	17%
- Ave. haul/trip (Kg)	2,033	2,162	2,459	2,427
- Ave. trips/shift	1.8	1.4	1.5	1.5
- Vehicle operation rate (%)	70%	76%	77%	75%
5) Dump Truck Covered				
- Haul share of total hauled waste (%)	13%	18%	14%	12%
- Ave. haul/trip (Kg)	1,744	1,659	2,459	2,427
- Ave. trips/shift	2.0	1.8	1.5	1.5
- Vehicle operation rate (%)	100%	94%	97%	90%
6) Isuzu Dump Truck				
- Haul share of total hauled waste (%)	9%	11%	10%	10%
- Ave. haul/trip (Kg)	2,708	2,827	3,498	3,281
- Ave. trips/shift	1.2	1.3	1.1	1.2
- Vehicle operation rate (%)	76%	83%	79%	77%
7) Armroll Vehicle				
- Haul share of total hauled waste (%)	28%	25%	24%	24%
- Ave. haul/trip (Kg)	1,472	1,303	1,328	1,333
- Ave. trips/shift	4.2	4.0	4.2	4.5
- Vehicle operation rate (%)	59%	70%	65%	66%
8) Chevrolet				
- Haul share of total hauled waste (%)		1%	1%	0.5%
- Ave. haul/trip (Kg)		1,274	1,371	715
- Ave. trips/shift		2.0	2.0	1.4
- Vehicle operation rate (%)		100%	100%	100%
9) TOTAL VEHICLES				
- Haul share of total hauled waste (%)	96%	96%	96%	96%
- Ave. haul/trip (Kg)	1,547	1,467	1,631	1,834
- Ave. trips/shift	1.6	2.0	2.1	2.1
- Vehicle operation rate (%)	77%	86%	79%	81%

The above table shows overall weekly figures which are helpful to form a general understanding of the operation conditions. However the main objective of the analysis is for the personnel responsible for operation to follow the daily operation of each vehicle and determine whether modifications are necessary to improve operation. data is therefore presented by vehicle.

The next table shows the vehicles that are operated inefficiently (low loading and/or low trip number/shift) and for which review is necessary.

Vehicle Type	Week 1	Week 2	Week 3	Week 4
1) Kijang	2090, 2101, 2103 2108, 2110, 2192 2195	2020, 2022, 2070 2090, 2098, 2104 2107, 2108, 2112 2117, 2167, 2170 2191, 2192, 2195 2196	2020, 2071, 2098 2104, 2107, 2108 2192, 2195	2020, 2022, 2070 2090, 2098, 2101 2103, 2104, 2106 2107, 2108, 2111 2170, 2184, 2194 2196, 2263
2) Rino Plat	4223, 4225, 4226 4227	4220, 4223, 4226 4227, 4232	4218, 4226, 4227 4232, 4240	4220, 4227, 4229 4240, 4223
3) Dump Truck Uncovered	4017, 4023, 4027 4030, 4033, 4034 4035	4017, 4024, 4033 4035, 4042	4017, 4020, 4027 4033, 4034	4017, 4021, 4023 4027, 4029, 4032 4033, 4034, 4036 4037
4) Dump Truck Covered	4252, 4255, 4258	4245, 4251, 4254	4252, 4254, 4255 4258	4252, 4253, 4254 4258
5) Isuzu	4106, 4108, 4111 4115	4106, 4109, 4112 4113, 4114, 4124	4109, 4114, 4115 4124	4109, 4112, 4114
6) Amroll	4554, 4560, 9501 9504, 8211, 8425	4554, 9501, 9502 8211, 4235	4554, 4559, 9501 9502, 8211	4554, 9502, 8211 8253

6) Summation

The results of this TAS study at Tamangapa can be summarized as follows;

- i. For the first time since installation in June 1994, the truck scale has been operated continuously for two months
- ii. Access road to truck scale has been repaired and operation continued even during rainy days
- iii. Dinas Kebersihan's staff worked alongside the Study Team surveyors and their skill to operate the truck scale has been confirmed
- iv. Dinas Kebersihan Operation Section has deemed that the form in which the weekly data has been submitted makes it possible to follow the activity of each individual vehicle

(7) Post TAS interview survey

1) Site A

The following table summarizes the major items concerning the opinion of the citizens on the TAS study.

Survey Items	Percent (%)
1. Use of Armroll Container	
1. a) Container distance is acceptable	72%
1. b) Frequency of discharge to armroll container	
- Daily	17%
- 4 - 5 d/week	53%
- 2 - 3 d/week	5%
- Once/week	12%
2. Use of JICA hand cart	
2. a) Share of respondents using hand cart service	30%
2. b) Share of hand cart users using JICA hand cart	20%
2. c) JICA hand cart users objecting to the system applied	11%
3. Armroll Container System	
3. a) The container area is always clean	78%
3. b) Conditions of the Kelurahan after implementing TAS	
- The streets are cleaner	64%
- The ditches are cleaner	57%
- The open spaces are cleaner	61%
3. c) The armroll container system is better than the old TPS	92%
3. d) Acceptance to have a container located within 100 m of own house	49%
3. e) Total rejection of armroll container in the Kelurahan	49%
4. TAS Public Campaign	
4. a) Did not know about the public meeting held at the Lurah's office	68%
4. b) Received the leaflet distributed concerning TAS	79%
4. c) Satisfied campaign effort was sufficient in motivating the people	87%
4. d) Most suitable frequency for conducting cleanliness campaign	
- Once every 1 to 2 months	44%
- Don't know (no opinion)	54%
5. Willingness to pay the extra cost for plastic bag and/or hand cart use	
5. a) Not willing to pay any extra cost	7%
5. b) Increment willing to pay	
- Rp. 100 - 500/month	4%
- Rp. 501 - 1,000/month	15%
- Rp. 1,001 - 1,500/month	69%
- Rp. 1,501 - 2,000/month	6%
6. Knowledge on awarding of Adipura trophy to KMUP this year	
6. a) Respondents knowing about Adipura award to KMUP	73%
6. b) Getting the Adipura award is mainly due to	
- Effort of the Municipality	1%
- Combined effort of Municipality and Community	99%
- Don't know	0%

Specific items related to TAS Site A are analyzed in the following sections. General items are dealt with for all three sites in a separate section.

a) Armroll container utilization

Surprisingly 72% of respondents consider the distance to the container acceptable. But it may be said that those who replied in the negative are the ones living at far away from the containers.

Most citizens discharge their waste 4-5 days a week, and it may therefore be possible to rotate the containers and not keep a container permanently at the site.

b) Hand cart use

In total about 30% of the respondents rely on hand carts to transport their waste to the container. As the JICA hand cart was used free of charge, majority of hand cart users depended on the JICA hand cart.

JICA hand cart system was operated on a 3 day/week, fixed location system as explained earlier in section 5.2. Although this system may cause inconvenience to some users, only 11% of those respondents actually using the system objected.

c) Armroll container system

Respondents answers clearly indicate that they are satisfied with the container conditions and that the general cleanliness in the area has improved after implementing TAS. Most prefer the container system to the previous old TPS system.

But the last response (3. e)) requires some thought. Almost 50% did not favor the armroll container system in their area because odor is generated and insects are attracted. During TAS DK changed the container at least once daily (and many times twice daily) so the odor and insect problem should not have been so severe. The present container location serves four Kelurahan and two containers are located alongside each other. It may be necessary for DK to make more effort to find another location in order to separate the containers, and introduce container rotation system. Response to question 3. d) shows that residents may yet be convinced to accept a container near their houses.

2) Site B

The following table summarizes the main items concerning citizens opinion on the TAS study.

Interview Items	B1: M Baru	B2: M Luar	Total
1. Use of Plastic Bin			
1. a) Use of liner in plastic bin	29%	37%	33%
1. b) On collection day the container is put;			
- In front of the house	60%	52%	56%
- Inside the yard	31%	24%	28%
- Inside the house	9%	24%	17%
1. c) Which household member discharges the plastic bin			
- Father	4%	0%	2%
- Mother	8%	5%	7%
- Children	14%	14%	14%
- Elderly family member	21%	21%	21%
- Irregular	53%	60%	56%
2. Fixed-time plastic bin discharge system			
2. a) Satisfied with 3 d/week collection frequency	98%	95%	97%
2. b) Satisfied with morning discharge and collection time	100%	100%	100%
2. c) Plastic bin is better than permanent bin	95%	100%	98%
2. d) Plastic bin is better than plastic bag	97%	100%	99%
2. e) This system better than anytime discharge with armroll	99%	98%	98%
2. f) Conditions of the Kelurahan after implementing TAS			
- The streets are cleaner	82%	99%	91%
- The ditches are cleaner	61%	74%	68%
- The open spaces are cleaner	71%	70%	70%
2. g) Would like the TAS system to continue	98%	100%	99%
3. TAS Public Campaign			
3. a) Knew about the public meeting held at Lurah's office	41%	29%	35%
3. b) Received the leaflet distributed concerning TAS	100%	96%	98%
3. c) Satisfied campaign effort sufficient to motivate people	98%	89%	94%
3. d) Most suitable frequency for cleanliness campaign			
- Once every 1 to 2 months	80%	61%	71%
- Don't know	8%	16%	12%
4. Willingness to pay extra cost for plastic bin purchase			
4. a) Not willing to pay any extra cost	26%	25%	25%
4. b) Increment willing to pay			
- Rp. 100 - 500/month	48%	56%	52%
- Rp. 501 - 1,000/month	19%	15%	17%
- Rp. 1,001 - 1,500/month	7%	5%	6%
5. Knowledge on Adipura trophy award to KMUP this year			
5. a) Respondents knowing about the Adipura award	95%	85%	90%
5. b) Getting the Adipura award is mainly due to			
- Effort of the Municipality	3%	1%	2%
- Combined effort of Municipality and Community	94%	83%	89%
- Don't know	3%	16%	10%

Specific items related to TAS Site B are analyzed in the following sections. General

items are dealt with for all three sites in a separate section.

a) Plastic bin use

To question 1.b), over 40% in both Kelurahan responded that they keep their bin either inside their house or yard on collection day. This is mainly due to fear of the bin being stolen, but may also be over reliance on DK workers to come in and take the bin. This practice delays the collection work, and more effort to educate the public is necessary.

Share of children and elderly people discharging the bin is 36% in both Kelurahan. Therefore there may be some concern about the weight of the bin with two days waste inside it. But during TAS implementation the Study Team surveyors asked many of the children and elderly people at the open stations if the bins were too heavy, and most replied that there was no problem.

b) Fixed-time plastic bin discharge system

The overwhelming approval of the system introduced under TAS, as indicated by results of question 2.a) through f) is very gratifying.

3) Site C

The main points of interest on the opinions expressed by Site C residents are shown in the table.

Interview Items	Parang	Bongaya	Total
1. Community Participation in Ditch Cleansing			
1. a) Aware that DK/Community jointly cleaned ditch	75%	72%	73%
1. b) Participation by household members in the joint effort			
- On May 28th only	23%	28%	26%
- On June 4th only	19%	15%	17%
- On both days	26%	29%	27%
1. c) Did you use your own tools in the effort	98%	93%	95%
1. d) Kelurahan conditions better after implementing TAS	70%	70%	70%
1. e) Not willing to participate in future similar efforts	9%	10%	10%
1. f) Willing to participate in the following activities			
- Cleaning of ditch	33%	27%	30%
- Providing money for ditch cleansing	1%	1%	1%
2. Armroll container rotation system			
2. a) Object to remove container from site 2 days/week	20%	19%	20%
3. TAS Public Campaign			
3. a) Knew about the public meeting held at Lurah's office	47%	62%	55%
3. b) Received the leaflet distributed concerning TAS	43%	68%	56%
3. c) Satisfied campaign effort sufficient to motivate people	60%	73%	67%
3. d) Most suitable frequency for cleanliness campaign			
- Once every 1 to 2 months	87%	98%	93%
- Once every 1/2 year	4%	2%	3%
4. Willingness to pay extra cost for plastic bag purchase			
4. a) Not willing to pay (will use old plastic bag)	83%	78%	81%
4. b) Increment willing to pay			
- Rp. 100 - 500/month	4%	4%	4%
- Rp. 501 - 1,000/month	2%	0%	1%
- Rp. 1,001 - 1,500/month	0%	0%	0%
- Rp. 1,501 - 2,000/month	0%	0%	0%
5. Knowledge on Adipura trophy award to KMUP this year			
5. a) Respondents knowing about the Adipura award	95%	99%	97%
5. b) Getting the Adipura award is mainly due to			
- Effort of the Municipality	0%	0%	0%
- Combined effort of Municipality and Community	95%	100%	98%
- Don't know	5%	0%	3%

Specific items related to TAS Site C are analyzed in the following sections. General items are dealt with for all three sites in a separate section.

a) Community participation in ditch cleansing

Over 70% of respondents said that at least one member of their household participated

in the ditch cleansing activity held under TAS on May 28th and June 4th. About 27% participated on both days. One week between both days may be too short and it is probably better to space such activity two weeks apart.

During TAS implementation most participants complained about lack of tools and the interview survey result (I.c) that most relied on their own tools.

Finally 90% of respondents expressed their intention to continue participating in ditch cleansing activity. But only 30% were willing to actually clean the ditch, with the remainder limiting their participation to refraining from illegal waste discharge into the ditch and admonishing other people who do.

b) Armroll rotation system

The container was removed from Kelurahan Parang on Wednesdays and Saturdays, during the last two weeks of TAS. Respondents objecting to this system were limited to 20% of the total.

4) Analysis of general post TAS interview survey items

a) TAS public campaign

Before TAS implementation a public campaign meeting was held for each site (A, B1, B2, and C2) at the respective Lurah office. The Study Team requested the Lurah to arrange the meeting and inform the residents. The Lurah apparently passed on his instructions to the RW chiefs and RT chiefs. However the results of the survey showed that not more than 40% of respondents knew about the meetings in Sites A, B1 and B2. In C2 it was slightly better with about 55% knowing about the meeting.

The Study Team dependent on the Lurah office because of the reluctance to operate outside the existing administrative system. In afterthought the Study Team should have offered more help to the Lurah in informing the residents through hanging of posters, etc. However the majority of the respondents positive response to the campaigns sufficiency to motivate the residents in all the sites slightly vindicates the Study Team effort. The continuous presence of the Team surveyors in the sites during one month before implementation and daily contact with the residents helped to spread the information about TAS.

It is advisable in future similar campaigns not to rely solely on the Lurah office, but also involve other civic groups in the society.

b) Willingness to pay extra cost

The adoption of TAS in each site will have some financial burden on the residents as follows;

- ◊ Site A: Use of plastic bags and hand cart service
- ◊ Site B: Purchase of plastic bins (when the ones distributed under TAS need to be changed)
- ◊ Site C: Use of plastic bags and hand cart service

In Site A, only 7% were against paying any additional costs. A surprisingly high figure of respondents (69%) were willing to pay an incremental cost of between Rp. 1,000 - 1,500/month.

In Site B, those refusing to shoulder extra financial burden jumped to 25%. Those willing to pay Rp. 100 - 500/month (to buy a new plastic bin every other year) were about 52%.

In terms of willingness to pay, the response in Site C2 was the most negative. Over 80% of respondents, explaining their lack of need for hand cart service and intention to use old plastic bags received while shopping, etc. expressed their unwillingness to pay any extra costs. Many also said that money for purchasing tools for community participation in ditch cleansing should be provided by the Municipality.

c) Knowledge on adipura award

Majority of respondents in all the sites know about awarding of Adipura trophy to KMUP in 1995. It is also interesting to note that in Sites A, B and C majority of respondents believed that the combined effort of the municipality and community was the force behind getting the trophy. This means that the citizens are aware that keeping the environment clean cannot be achieved only by the efforts of the municipality.

4 Additional Table of Master Plan

The tables listed below are attached in the Supporting Report for further information and/or data of the Master Plan.

- i. Table 6.6 Collection Vehicles Comparison
- ii. Table 6.7 Details of Alternatives in 2005 and 3015
- iii. Table 6.8 Investment Cost of Alternatives in 2005 and 2015

- iv. **Table 6.9** **Operation and Maintenance Costs of Alternatives in 2005 and 2015**
- v. **Table 6.10** **Major Facilities of Tamangapa Final Disposal Site (KMUP)**
- vi. **Table 6.11** **Major Facilities of Samata Final Disposal Site (Gowa)**
- vii. **Table 6.12** **Personnel Requirements by Branch Office and Sector**

Table 6.1 Summation of Time and Motion Survey Results

Vehicle	Kecamatan	Shift D/N	Driver and Crew	Time (min)		Dis. (Km)		Trip No.	Sta. No.	Tot. Waste (Kg)	Ave. Time at TPA	Kg/ crew	Min/ Sta. (Route)	Min/ Tot.	Gross Vel. km/hr	Net Vel. km/hr
				Tot.	Route	Tot.	Route									
Isuzu DT	Bontoala	D	4	401	301	50.2	4	2	262	3640	5.5	910.0	1.1	110.2	7.5	0.8
Rino Flat T	Mamajang	N	4	282	183	41.8	3.2	2	51	2060	31.0	515.0	3.6	136.9	8.9	1.0
Isuzu DT	U. Pandang	N	4	545	480	29.4	4.8	1	139	2910	5.0	727.5	0.2	187.3	3.2	9.8
Rino D Uncov.	Panakkukkang	D	4	324	244	38.9	1.7	3	15	4380	6.0	1095.0	16.3	74.0	7.2	0.4
Kijang	Biringkanaya	D	3	239	99	41.1	2.2	3	68	1570	15.3	523.3	1.5	152.2	10.3	1.3
Rino D Cov.	Wajo	N	4	404	299	58.4	6.1	2	174	2400	5.0	600.0	1.7	168.3	8.7	1.2
Armroll	Tamalate	D	2	274	26	93	0	4	4	6140	2.8	3070.0	6.5	44.6	20.4	0.0
Kijang	Tallo	M	3	268	128	77.3	2.4	3	39	2560	13.3	853.3	3.3	104.7	17.3	1.1
Rino D Uncov.	U. Tanah	D	4	407	223	72.7	2.9	3	70	5060	3.0	1265.0	3.2	80.4	10.7	0.8
Isuzu	Makassar	N	4	446	353	51.9	2.6	2	88	4730	4.5	1182.5	4.0	94.3	7.0	0.4

Table 6.2 Dinas Kebersihan 1993/94 Expenditure and 1994/95 Budget

	1993/94 Expenditure	1994/95 Budget (1994/95 budget)/(1993/94 Exp.)	1.09	Remarks on 1994/95 Budget
1. ROUTINE BUDGET	2,311,437,263	2,518,136,790		
A. Administration	1,449,304,263	1,635,233,340	1.13	
Salaries, etc.	651,385,060	666,924,660	1.02	DK staff
Office Equipment, etc	137,093,155	98,605,400	0.72	
Vehicle & Heavy Equip. Maintenance	660,826,048	755,153,000	1.14	
Repairs & Spare Parts	112,494,965	110,000,000	0.98	Waste & night soil veh.
Fuel and Oil	489,494,220	503,465,000	1.03	Waste, night soil & heavy equip (312 d)
Batteries	37,340,270	80,000,000	2.14	Waste & night soil veh.
Others	21,492,593	60,973,000	2.84	Waste & night soil veh.
Office Equipment Maintenance	1,000,000	715,000	0.72	
Travelling Expenses	11,876,850	15,000,000	1.26	
Other Expenditures	39,682,345	99,550,280	2.51	Incentives, guidance, etc.
B. Operation Costs	862,133,000	882,903,450	1.02	
Ditch Cleaning	163,647,250	150,531,950	0.92	99 Contract workers salaries, 33 DK staff allowances
Sanitation	698,485,750	732,371,500	1.05	
Street Sweeping	199,356,750	200,000,000	1.00	174 Contract workers salaries, 21 DK staff allowances
Grass Cutting	3,752,000	5,000,000	1.33	
Waste Collection and Transport	495,377,000	527,371,500	1.06	Salary (contract staff), allowance (DK staff) and small equipment
SW collection and transport	381,546,000	424,000,000	1.11	Contract: 73 drivers & 211 workers, DK: 29 drivers & 6 workers
Night soil transport	26,268,750	30,500,000	1.16	Contract: 2 drivers & 12 workers, DK: 5 drivers & 2 workers
Supervision	37,757,000	40,392,750	1.07	
Loader transport of waste	11,766,000	14,729,250	1.25	Contract: 6 drivers, 3 workers
TPA	19,186,250	16,541,750	0.86	Contract: 9, DK Staff: 3
Night soil disposal site	563,500	1,207,750	2.14	Contract: 2

	1993/94 Expenditure	1994/95 Budget	
2. DEVELOPMENT		4,770,454,000	
1. TPA Development Project (IBRD)		907,964,000	Kecamatan Panakkukang and Biringkanaya
1) New TPA Development		122,304,000	Continuation from 1993/94
2) Former TPA closing		75,620,000	
3) Workshop Development		434,240,000	
4) Bulldozers		275,800,000	
2. TPA at Panakkukang (IBRD)		191,600,000	Continuation from 1993/94
1) Transport Depot completion		38,790,000	
2) Supply of Containers (23 units)		142,140,000	
3) Warehouse Equipment Supply		10,670,000	
3. TPA Project (IBRD)		306,599,000	
1) Supply of Containers (11 units)		67,979,000	
2) TPA expansion (2.5 ha)		238,620,000	
4. SW Project (INPRES)		489,339,000	
1) Armroll D. Truck (1 hoist) (4 units)		213,400,000	
2) Armroll D. Truck (2 hoist) (4 units)		198,000,000	
3) Containers (1 hoist) (2 units)		12,360,000	
4) Containers (2 hoist) (6 units)		15,579,000	
5) Pick up trucks (2 units)		50,000,000	
5. Sanitation Development/Improvement		229,500,000	Land and Property Tax (PBB)
1) Public Education/Informing		38,300,000	
2) Operation and Maintenance		121,200,000	
3) Land compensation for TPA		50,000,000	10,000 m2
4) General Overhead Budget		20,000,000	
6. Sanitation Development/Improvement		191,550,000	Continuation from 1993/94
210 units in 11 Kecamatan		191,550,000	IBRD
7. Sanitation Development/Improvement		137,350,000	IBRD
130 units in 5 Kecamatan		137,350,000	
TOTAL DINAS KEBERSIHAN BUDGET		7,288,590,790	
Note: In July 1994, KMUP requested revision of Development Budget Item 4, contents as follows (money amount is not changed)			
1) Armroll D. Truck (1 hoist) (4 units)	Rp. 216,859,000	2) Pick up trucks (2 units)	Rp. 50,000,000
3) Containers (1 hoist) (36 units)	Rp. 222,940,000	Total	Rp. 489,339,000

Table 6.3 Final Disposal Site (TPA) Chronology

Former TPA	Location	Operation Period	Dumping Type	Present Land-Use
KARUWISI	Kec. Panakkukang	1963 - 1975	Open Dumping	Warehouse
	Kel. Karuwisi Utara			
SAPPABULO	Kec. Tamalate	1976 - 1982	Open Dumping	Primary School
	Kel. Balang Baru			Residential Area
ANDI TONRO	Kec. Tamalate	1982 - 1984	Open Dumping	Residential Area
	Kel. Jongaya			
PANNAMPU	Kec. Tallo	1984 - 1987	Open Dumping	Residential Area
	Kel. Pannanpu			(Slum Area)
KANTISANG	Kec. Biringkanaya	1987 - 1990	Open Dumping	Private University
	Kel. Tamacanrea Indah			Center (Kopertis)
TANJUNG	Kec. Tamalate	1990 - 1993	Open Dumping	Vacant Land
BUNGA	Kel. Maccini Sombala			(Planning for Recreation Center)
TAMANGAPA	Kec. Panakkukang	1993 -	Controll Land	Final Disposal Site
	Kel. Tamangapa		Fill	

Table 6.4 Condition of Existing & Potential Site Disposal (TPA)

Description	Existing Site of TPA (Extension)			Potential Site for TPA		
	KMUP	GOWA	MAROS	KMUP	GOWA	MAROS
1 Location Kecamatan Kelurahan :	Panakkukang Tamangapa	Sombaopu Desa Mawang	Mandai Bonto Mate'ne	Biringkanaya Bulurokeng	Sombaopu Desa Samata	Maros Baru Palisi
2 Disposal Land Area (Ha)	5.0 Ha	1.5 Ha	1.0 Ha	--	--	--
3 Required Land for 10 years (h = 10 m)	38 Ha	50 Ha	50 Ha	43 Ha	50 Ha	50 Ha
4 Distance from UP City Center (30 Km/hour)	14 Km	17 Km	30 Km	17 Km	17 Km	26 Km
6 Average Time for Transport	28 Minutes	34 Minutes	60 Minutes	34 Minutes	34 Minutes	52 Minutes
7 Soil Condition	Clay Soil	Clay Soil	Clay Soil	Bed Rock Sand	Clay Soil	Clay Soil
8 Land Price	Rp.13,000/m ²	Rp.4,000/m ²	Rp.6,000/m ²	Rp.15,500/m ²	Rp.5,000/m ²	Rp.6,000/m ²
9 Land Use of Prospect Site	--	--	--	Rice Field Vacant	Vacant	Rice Field
10 Land Use of Surroundings	Residential Rice Field	Vacant	Vacant	Fish Pond	Rice Field	Rice Field
11 Land Productivity	Rice Field : 1 time/year	No-product	No-product	Rice Field Fish Pond	Rice Field : 1 time/year	Rice Field : 1 time/year
12 Toll Fee	None	None	Rp.300/mobil	Rp.300/mobil	None	Rp.300/mobil
13 Land Status of Surrounding Land Status of Site	Private Municipal	Private Municipal	Munici.(100ha) Municipal	Private Private	Private Private	Partly Private Partly Private
14 Topographic Condition	Hill & Flat	Flat	Flat	Flat	Hill & Flat	Flat
15 Distance from UP Boundary	2.0 Km	8.0 Km	9.0 Km	4.6 Km	1.2 Km	5.3 Km
16 Access from Main Road	0.2 Km	0.1 Km	1.3 Km	1.0 Km	1.5 Km	2.0 Km
17 Condition of Access Road	Asphalt Paved	Not-Paved (Soil)	Not-Paved (Soil)	Not-Paved (Gravel)	Not-Paved (Soil)	Not-Paved (Gravel)
18 Distance to Residential	0.2 Km	0.2 Km	1.5 Km	0.3 Km	0.2 Km	0.3 Km
19 View from Surrounding Area	Partly Hidden	Hidden	Hidden	Hidden	Hidden	Partly Hidden
20 Natural Drainage Condition	Rainy Season : Flood	Normal	Normal	Rainy Season : Flood	Rainy Season : Partly Flood	Rainy Season : Flood
21 Depth of Ground Water		--		10 m	--	
22 Covering Soil	Available	Not-Available	Available	Not-Available	Available	Not-Available
23 Distance to close River (measured from the edge)	2.8 Km	1.0 Km	3.5 Km	0.4 Km	3.5 Km	2.5 Km
24 Distance to Airport	> 3 Km	> 3 km	2.5 Km	> 3 Km	> 3 Km	2.2 Km
25 Dumping System	Control Landfill	Open Dumping	Semi-Control	--	--	--
Remarks	Interfere with Perumnas Extension Plan	Lake "Danau Mawang" located 0.4 Km north	Newly Planned for TPA		Two School located near the site	High-Tension wire exist

Table 6.5 Field Survey Area for Solid Waste Amount and Quality (1)

Sampling Places	(Jalan / Place)	(Kelurahan)	(Kecamatan)	(Cod)	
1 High-Income Location					
a.	Jl. Tulip I, Jl. Tulip II, Jl. Asoka III (Panakkukan Mas)	Kel. Masale	Kec. Panakkukang	A	
b.	Jl. Botolempangan, Jl. Lamadukelleng	Kel. Sawerigading Kel. Losari Kel. Maluku	Kec. Ujung Pandang	B	
c.	Jl. Haji Bau, Jl. Kasuari Jl. Ratulangi (selatan)	Kel. Kunjung Mae Kel. Mario Kel. Mangkura	Kec. Mariso Kec. Ujung Pandang	C D	
d.	Jl. Syarif Alqadri, Jl. G. Batu Putih Bundar Jl. Monginsidi	Kel. Maricaya Baru Kel. Maricaya	Kec. Makassar	D	
e.	Jl. Sungai Tangka	Kel. Sawerigading Kel. Mangkura	Kec. Ujung Pandang	E	
2 Middle-Income Location					
a.	Jl. Sukamulia, Jl. Sukaria	Kel. Tamamaung	Kec. Panakkukang	F	
b.	Jl. Kejayaan Utara 1, Jl. Kejayaan Utara 5 (Perumnas Tamalanrea)	Kel. Tamalanrea	Kec. Biringkanaya	G	
c.	Jl. Onta Lama, Jl. Onta Baru, Jl. Beruang	Kel. Bonto Biraeng Kel. Mamajang Luar	Kec. Mamajang	H	
d.	Jl. Tamalate I, Jl. Tamalate II, Jl. Tidung VI (Perumnas Panakkukan)	Kel. Bonto Makio Kel. Tidung	Kec. Tamalate	I	
e.	Jl. Lacukang, Jl. Sunu, Jl. Petta Ponggawa	Kel. Malimongan Kel. Timungang Lompoa	Kec. Bontoala	J	
3 Low-Income Location					
a.	Jl. Rajawali II : Lorong 13A, Lorong 13B Lorong 10	Kel. Lette Kel. Panambungan	Kec. Mariso	K	
b.	Jl. Kajenjeng, Jl. Ujung Bori Dalam Jl. Ujung Bori Dalam I (Perumnas Antang)	Kel. Manggala	Kec. Panakkukang	L	
c.	Jl. Galangang Kapal I : Lorong 1, Lorong 1A, Lorong 2	Kel. Camba Benua	Kec. Ujung Tanah	M	
d.	Jl. Kande III : Lorong 2, Lorong 3, Lorong Kip V	Kel. Baraya	Kec. Bontoala	N	
e.	Jl. D.G. Tantu : Lorong 2A, Lorong 3	Kel. Rappokalling	Kec. Tallo	O	
4 Commercial Area					
4-1 Department Store					
a.	Gelael	Jl. Hasanuddin	Kel. Baru	Kec. Ujung Pandang	D1
b.	Kembang Melati	Jl. Rappocini Raya	Kel. Banta Bantaen	Kec. Tamalate	D2
c.	Baji Pamae	Jl. Rångong	Kel. Bulu Gading	Kec. Ujung Pandang	D3
d.	Hawa Baru	Jl. G. Lati Mojong	Kel. Pisang Selatan	Kec. Ujung Pandang	D4
4-2 Hotel					
a.	Pondok Suwada Hotel	Jl. Hasanuddin	Kel. Bulu Gading	Kec. Ujung Pandang	H1
b.	Makassar G. Hotel	Jl. Pugibur	Kel. Baru	Kec. Ujung Pandang	H2
c.	Victoria Hotel	Jl. Gen. Sudirman	Kel. Sawerigading	Kec. Ujung Pandang	H3
d.	Ramayana Hotel	Jl. G. Bankarayang	Kel. Wajo Baru	Kec. Bontoala	H4

Table 6.5 Field Survey Area for Solid Waste Amount and Quality (2)

	(Jalan / Place)	(Kelurahan)	(Kecamatan)	(Code)	
4-3	Restaurant				
	a. Banbu Deng	Jl. Gen. Bawakaraeng	Kel. Lariangbangi	Kec. Makassar	R1
	b. Asia Baru	Jl. G. Salahutu	Kel. Maradekaya Utara	Kec. Makassar	R2
	c. Ujung Pandang	Jl. Irian	Kel. Pattunuang	Kec. Wajo	R3
	d. Surya	Jl. Nusakanbangan	Kel. Pattunuang	Kec. Wajo	R4
4-4	Shopping Street				
	a. Jl. Bulu Saraung		Kel. Pattunuang	Kec. Wajo	S1
	b. Jl. Irian		Kel. Meyalu Baru	Kec. Wajo	S2
	c. Jl. Veteran		Kel. Barana	Kec. Makassar	S3
5	Market				
	a. Pasar Sanbung Jawa		Kel. Kampung Buyang	Kec. Mariso	P1
	b. Pasar Baru		Kel. Balo Gading	Kec. Ujung Pandang	P2
	c. Pasar Pabaeng-Baeng		Kel. Jongaya	Kec. Tamalate	P3
	d. Pasar Panampu		Kel. Panampu	Kec. Tallo	P4
6	Office				
	a. Komplek Dinas Pemda TK II		Kel. Maccini	Kec. Makassar	O1
	b. BCA Bank	Jl. Achmad Yani	Kel. Patunuang	Kec. Wajo	O2
	c. Assuransi Bumi Putera	Jl. Gu. Bawakaraeng	Kel. Wajo Baru	Kec. Bontoalla	O3
	d. Walikota	Jl. Achmad Yani	Kel. Baru	Kec. Ujung Pandang	O4
7	Street Sweeping				
	a. Jl. Jendral Sudirman		Kel. Saweri Gading	Kec. Ujung Pandang	St1
	b. Jl. Bontolempangan		Kel. Saweri Gading	Kec. Ujung Pandang	St2

Table 6.6 Collection Vehicles Comparison

A. Collection Vehicles Operation Indices

Vehicle	Cap. (m ³)	Loading		Loading Time (Min/Ton)	Trip/shift (1)		Trip/shift with less Collection Freq (2)		Waste hauled (Ton/Shift) (3)	
		Man- ual	Mech- anical		Pt.Bag/ Indiv. Bin	Communal Cont.	Pt.Bag/ Indiv. Bin	Communa l Cont.	Pt.Bag/ Indiv. Bin	Communal Cont.
1. Pick-up	3	o		40	3.3	-	4.1	-	3.1	-
2. Tipper L.	10	o		40	1.8	-	2.3	-	6.8	-
3. Tipper M.	6	o		40	2.4	-	3.0	-	5.3	-
4. Armroll L.	10		o	10	-	3.9	-	3.9	-	11.0
5. Armroll M.	6		o	5	-	4.8	-	4.8	-	8.0
6. Compactor L.	15	o	o	30	1.2	1.6	1.5	2.0	11.1	14.7
7. Compactor M.	10	o	o	30	1.6	2.0	2.0	2.5	9.8	12.5

B. Vehicle Operation and Maintenance Costs

Vehicle	Vehicle Operation and Maintenance Cost									
	Crew	Vehicle Cost (Rp. 1,000)	Container Cost (Rp. 1,000)	Salary (Rp/shift)	Fuel(4) (Rp/shift)	Maint- enance (Rp/shift)	Deprec- iation (5) (Rp/shift)	Miscell. 4% (6) (Rp/shift)	Total O&M (Rp/shift)	Unit Cost (7) (Rp./Ton)
1. Pick-up	3	30,000	-	9,500	68,727	4,110	9,247	3,129	94,713	30,869
2. Tipper L.	4	110,000	-	12,500	20,520	16,952	33,904	1,321	85,197	12,622
3. Tipper M.	4	54,000	-	12,500	27,000	7,397	16,644	1,580	65,121	12,220
4. Armroll L.	2	95,000	7,800	6,500	38,842	13,014	50,357	1,814	110,526	10,041
5. Armroll M.	2	50,000	6,000	6,500	47,128	6,849	34,381	2,145	97,003	12,105
6. Compactor L.	3	250,000	2,000	9,500	19,330	42,808	487,641	1,153	560,433	38,192
7. Compactor M.	3	140,000	2,000	9,500	24,700	23,973	561,644	1,368	621,184	49,695
Compactor Vehicles Unit Cost using Plastic Bag discharge										
6. Compactor L.	4	250,000	NA	12,500	14,577	42,808	85,616	1,083	156,585	14,151
7. Compactor M.	4	140,000	NA	12,500	19,330	23,973	47,945	1,273	105,021	10,736

- Notes: (1) Based on present operation indices in KMUP and elsewhere
 (2) Time reduction is 25%
 (3) Calculated using lesser collection freq. and loading densities for pickup, tipper, armroll, and compactor of 0.25/m³, 0.3/m³, 0.28/m³, and 0.5/m³
 (4) Petrol fuel for Pick-up and solar fuel for all others
 (5) Depreciation costs include container for Armroll (7 containers/shift) and Compactors (L: 50, M: 40/trip)
 (6) Miscellaneous costs are 4% of (salaries + fuel)
 (7) Total hauled weight per shift taken as that calculated assuming communal container use for the compactor vehicles

Table 6.7 Details of Alternatives in 2005 and 2015

Item	Year Unit	2005		2015						Without Improvement (GOWA)
		Alt. 1 Tampangapa	Alt. 1 Gowa	Alt. 2 Maros	Alt. 3 Gowa + Maros	Alt. 4 T+S + Maros	Alt. 5 T + Gowa + Maros	Alt. 6 Bulur		
1. COLLECTION AND TRANSPORT										
1.1 Amount of KMUP Waste										
1) Generated KMUP Waste Amount	td	662	1439	1439	1439	1439	1439	1439	1439	1439
2) Collected KMUP Waste	td	777	1368	1368	1368	1368	1368	1368	1368	1368
a. Direct haul to Tampangapa										
Gowa	td		1368		1024		459			1368
Maros	td			1368	314	403	339			0
Baluroeng	td							1368		0
Transfer Station	td					965				0
Incineration Plant	td						570			0
b. Secondary haul to Gowa										
Maros	td					965				86
1.2 Equipment Requirement										
1) Hand cart for primary collection	unit	429	429	429	429	429	429	429	429	429
2) Vehicles: Compactor (10 m3)										
Armroll (6 m3)	unit	0	45	122	61	34	53	82	0	0
Tipper (6 m3)	unit	50	75	80	71	69	71	73	143	143
Total Vehicles	unit	62	85	60	78	90	73	62	213	213
3) Containers for armroll (6 m3)										
Total Vehicles	unit	112	205	262	210	193	197	217	356	356
Containers for armroll (6 m3)	unit	523	701	468	581	706	650	535	931	931
1.3 Manpower Requirement										
1) Primary Collection workers										
Driver	No.	429	429	429	429	429	429	429	429	429
2) Secondary Collection										
Driver	No.	118	211	268	216	199	203	223	363	363
Workers and Supervisors	No.	275	505	664	525	479	487	513	814	814
3) Ditch Cleansing										
Driver	No.	3	3	3	3	3	3	3	3	3
Workers and Supervisors	No.	141	141	141	141	141	141	141	141	141
Total Manpower Requirement	No.	966	1289	1505	1311	1251	1262	1338	1750	1750
2. TRANSFER STATION										
2.1 Treatment Capacity										
td						1200				
2.2 Equipment Requirement										
Vehicles: Tractors										
unit						10				
Trailer containers										
unit						15				
2.3 Manpower: O & M personnel										
No.						31				
Drivers	No.					20				
3. INCINERATION PLANT										
3.1 Treatment Capacity										
td							600			
3.2 Equipment Requirement										
Ash transport vehicles										
unit							5			
3.3 Manpower: O & M personnel										
No.							60			
Drivers	No.						5			
4. SANITARY LANDFILL SITE										
4.1 Tampangapa										
1) Amount of waste										
a. Daily amount	td	775								
b. Total amount	million ton	2.6								
c. Area to be used	ha	35								
2) Equipment										
a. Vehicle	unit	5								
b. Heavy equipment	unit	4								
3) Manpower										
a. O & M staff	person	17								
b. Driver	person	12								
4.2 MAROS										
1) Amount of waste										
a. Daily amount	td		82	1418	426	1418	426	82	82	82
b. Total amount	million ton		0.3	4.3	1.2	4.3	1.2	0.3	0.3	0.3
c. Area to be used	ha		3.6	51.2	14.3	51.2	14.3	3.6	3.6	3.6
2) Equipment										
a. Vehicle	unit		3	8	4	8	4	3	3	3
b. Heavy equipment	unit		2	7	3	7	3	2	2	2
3) Manpower										
a. O & M staff	person		6	17	11	17	11	6	6	6
b. Driver	person		5	20	9	20	9	5	5	5
4.3 GOWA										
1) Amount of waste										
a. Daily amount	td		1451	85	1107	85	695	85	1451	1451
b. Total amount	million ton		4.4	0.4	3.5	0.4	2.0	0.4	4.4	4.4
c. Required area	ha		52.4	4.8	41.7	4.8	23.8	4.8	52.4	52.4
2) Equipment										
a. Vehicle	unit		8	3	7	3	6	3	8	8
b. Heavy equipment	unit		7	2	6	2	4	2	7	7
3) Manpower										
a. O & M staff	person		17	6	17	6	15	6	17	17
b. Driver	person		20	5	17	5	13	5	20	20
4.4 Baluroeng										
1) Amount of waste										
a. Daily amount	td		0	0	0	0	0	1366	0	0
b. Total amount	million ton		0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0
c. Required area	ha		0.0	0.0	0.0	0.0	0.0	47.6	0.0	0.0
2) Equipment										
a. Vehicle	unit		0	0	0	0	0	12	0	0
b. Heavy equipment	unit		0	0	0	0	0	7	0	0
3) Manpower										
a. O & M staff	person		0	0	0	0	0	17	0	0
b. Driver	person		0	0	0	0	0	23	0	0
Total Area	ha	35.0	56.0	58.0	56.0	56.0	38.1	56.0	56.0	56.0

Table 6.8 Investment Cost of Alternatives in 2005 and 2015

(unit: Rp. 10⁶)

Item	Year	2015							Without Improvement (GOWA)
	2005	Alt. 1 Tamangapa	Alt. 1 Gowa	Alt. 2 Maros	Alt. 3 Gowa + Maros	Alt. 4 T/S + Maros	Alt. 5 Ic + Gowa + Maros	Alt. 6 Bulur	
1. COLLECTION		9285	19143	27426	20052	17613	19061	21961	19143
1) Hand carts		279	279	279	279	279	279	279	279
2) Collection Vehicles		5868	14660	24337	16286	13098	14883	18473	14660
3) Armroll Containers		3138	4204	2810	3486	4236	3899	3209	4204
2. TRANSFER STATION						35226			
1) Civil works						11456			
2) Mechanical works						19070			
3) Transport vehicles						4700			
4) Others									
3. INCINERATION PLANT							192700		
1) Civil works							41000		
2) Mechanical works							151000		
3) Transport vehicles							700		
4) Others									
4. LANDFILL SITE		9552	45385	45652	45735	45652	40001	53139	40585
1) Civil works		6797	36770	37037	36830	37037	29496	43339	36770
2) Mechanical works		1810	3815	3815	4105	3815	3305	5000	3815
3) Plant		945	4800	4800	4800	4800	7200	4800	
4) Others									
5. STREET SWEEPING		943	1162	1162	1162	1162	1162	1162	1162
1) Mechanical Sweepers		840	1050	1050	1050	1050	1050	1050	1050
2) Hand Carts		103	112	112	112	112	112	112	112
6. Branch Office and Depot		1580							
1) Kampong Botong		1000							
2) Biling Kanaya		580							
Sub Total		21360	65690	74240	66949	59653	252924	76262	60890
7. LAND ACQUISITION		4061	3990	4370	3990	4770	3840	10925	3990
1) Tamangapa		3900							
2) Maros			1140	3420	1140	3420	1140	1140	1140
3) Gowa			2850	950	2850	950	1900	950	2850
4) Bulurokeng								8835	
5) T/S, Ic/P, Branch office		161				400	800		
8. ADMINISTRATION		427	1314	1485	1339	1993	5058	1525	1218
9. ENGINEERING SERVICE		2563	7883	8902	8034	11958	30351	9151	7307
10. PHYSICAL CONTINGENCY		2136	6569	7424	6695	9965	25292	7626	6089
Total		30547	85446	96427	87006	128339	317466	105490	79494

Table 6.9 Operation and Maintenance Costs of Alternatives in 2005 and 2015

(unit : Rp. 10⁶)

Item	Year	2015							without Improvement (Gowa)
	2005	Alt. 1 Tamangapa	Alt. 1 Gowa	Alt. 2 Maros	Alt. 3 Gowa + Maros	Alt. 4 T/S + Maros	Alt. 5 Ic + Gowa + Maros	Alt. 6 Bulur	
1. COLLECTION		4111	7635	9308	7707	7189	7561	8082	9925
1.1 Primary Collection		558	558	558	558	558	558	558	558
1) Personnel		433	433	433	433	433	433	433	433
2) Maintenance		32	32	32	32	32	32	32	32
3) Hand cart depreciation		93	93	93	93	93	93	93	93
1.2 Secondary Collection		3669	6893	8566	6965	6446	6819	7340	9183
1) Personnel		426	825	1090	854	776	931	885	1408
2) Fuel		1529	2470	2324	2348	2363	2269	2327	3223
3) Maintenance		288	806	1425	916	710	836	1062	929
4) Vehicle and container depreciation		1348	2660	3591	2720	2471	2640	2937	3438
5) Others		78	132	137	128	126	143	129	183
1.3 Ditch Cleansing		184	184	184	184	184	184	184	184
1) Personnel		139	139	139	139	139	139	139	139
2) Fuel		11	11	11	11	11	11	11	11
3) Maintenance		5	5	5	5	5	5	5	5
4) Vehicle depreciation		14	14	14	14	14	14	14	14
5) Others		15	15	15	15	15	15	15	15
2. TRANSFER STATION			0	0	0	3341	0	0	0
2.1 Plant Operation						2165			
1) Personnel						44			
2) Utility and Fuel						398			
3) Maintenance						358			
4) Plant depreciation						1285			
5) Others						80			
2.2 Transport to Disposal Site						1176			
1) Personnel						25			
2) Fuel						481			
3) Maintenance						185			
4) Plant depreciation						416			
5) Others						69			
3. INCINERATION PLANT			0	0	0	0	10282	0	0
3.1 Plant Operation							12486		
1) Personnel							83		
2) Utility and Fuel							216		
3) Maintenance							2470		
4) Plant depreciation							8917		
5) Others							800		
3.2 Ash Transport to Disposal Site							-2204		
1) Personnel							6		
2) Fuel							7		
3) Maintenance							14		
4) Plant depreciation							16		
5) Others							3		
6) Electricity							-2250		
4. SANITARY LANDFILL SITE		1287	5019	4897	5073	4897	3802	5408	5015
1) Personnel		37	52	52	69	62	82	62	52
2) Fuel and Maintenance		192	390	390	424	390	343	495	390
3) Plant depreciation		1058	4392	4392	4425	4392	3270	4525	4392
4) Others		0	184	53	155	53	107	326	181
5. STREET SWEEPING		447	534	534	534	534	534	534	738
1) Personnel		192	208	208	208	208	208	208	653
2) Fuel		48	77	77	77	77	77	77	0
3) Maintenance		56	67	67	67	67	67	67	22
4) Depreciation		139	168	168	168	168	168	168	56
5) Others		12	14	14	14	14	14	14	7
6. HEAD-QUARTERS		506	618	618	618	618	618	618	618
1) Personnel		389	475	475	475	475	475	475	475
2) Others		117	143	143	143	143	143	143	143
Total		6651	13805	15317	13931	16578	22797	14642	16296

Table 6.10 Major Facilities of Tamangapa Final Disposal Site (KMUP)

No	Facility	Dimension	Unit	Quantity		Total (I + II)
				Zone I	Zone II	
1	Access road	Road width : 10 m	m	110	0	110
2	Onsite road					
	a. with dike	Road width : 5 m, h = 3 m	m	655	455	1,110
	b. without dike	Road width : 5 m	m	655	580	1,235
3	Partition dike with onsite road	width : 5 m, h = 3 m	m	365	0	365
4	Storm water drainage		m	1,675	1,035	2,710
5	Site area (cut and fill)	average : h = 1.8 m (with earth compaction)	ha	19	13	32
6	(Landfill area)		ha	15	11	26
7	Groundwater drainage	dia 150	m	1,640	1,375	3,015
8	Leachate collection pipe		m	3,275	2,865	6,140
9	Gas collection pipe	length : 15 m/pipe, n = 90	m	780	570	1,350
10	Leachate treatment plant	35 m ³ /ha	m ³	630	0	630
11	Weigh bridge	Load cell type, 30 ton capacity	unit	--	--	--
12	Liner	h = 0.5 m	m ²	--	--	--
13	Control building		unit	--	--	--

Table 6.11 Major Facilities of Samate Final Disposal Site (Gowa)

No	Facility	Dimension	Unit	Quantity		Total (I + II)
				Zone I	Zone II	
1	Access road	Road width : 10 m	m	1,500	0	1,500
	Bridge	Bridge width : 8 m	m	30	0	30
2	Onsite road					
	a. with dike	Road width : 5 m, h = 3 m	m	3,150	2,215	5,365
	b. without dike	Road width : 5 m	m	0	0	0
3	Operation road	width : 5 m, h = 1.5 m	m	2,200	1,510	3,710
4	Storm water drainage		m	5,350	4,365	9,715
5	Site area (cut and fill)	average : h = 1.0 m (with earth compaction)	ha	65	56	121
6	(Landfill area)		ha	59	52	111
7	Groundwater drainage	dia 150	m	7,950	6,505	14,455
8	Leachate collection pipe		m	14,270	11,995	26,265
9	Gas collection pipe	length : 15 m/pipe, n = 308	m	2,475	2,145	4,620
10	Leachate treatment plant	35 m ³ /ha	m ³	600	0	600
11	Weigh bridge	Load cell type, 30 ton capacity	unit	1	0	1
12	Liner	h = 0.5 m	m ²	477,300	414,200	891,500
13	Control building		m ²	100	0	100