Survey Sheets

No. _____

TIME & MOTION STUDY FOR LABORER

Date : _____

Weather : _____

Surveyor : _____

Name of Worker : _____

Name of Overseer : _____

Name of Survey Area : _____

Type of Job

Van Laborers	Heaping	Drain Cleansing	Road Sweeping	Grass Cutting	Beach Cleansing

Collection System in Area Serviced by the Laborer

Daily & Direct Collection	Daily & Indirect Collection	Alternate Day & Direct Collection	Alternate Day & Indirect Collection	Others (specify)

Direct Collection is door to door collection system by Van Laborer.
Indirect Collection is door to door collection system by Heaper.

Type of Roll Call Place : _____

Description of place for
Storage of tools : _____

Number of Equipment stored
in the storage place : _____

Van Laborers

1. Working Time : (hours)

_____	~	_____	: _____
_____	~	_____	: _____
_____	~	_____	: _____
_____	~	_____	: _____
_____	~	_____	: _____
	Total		: _____

2. Number of residence or shops served by the labourer. _____

3. Number of Van Laborers in the group. _____

4. Amount of Waste collected :

(Capacity of Equipment used in collection) (l)	X	(Frequency or Number of trips)	=	Collection Volume (l)
_____		_____		_____

5. Equipment utilized/condition of equipment. _____

6. Note/Remarks : _____

HEAPING

(hours)

1. Working Time : _____ ~ _____ ; _____
_____ ~ _____ ; _____
_____ ~ _____ ; _____
_____ ~ _____ ; _____
_____ ~ _____ ; _____

2. Number of residence served by heaper. _____
_____
_____
_____
_____

3 Amount of Waste Collected by heaper :

(Capacity of Hand Cart) (l)		Trips		(Collection Volume) (l)
_____	X	_____	=	_____
_____				
_____				

4. Equipment used in collection service & condition of equipment.
_____
_____

5. Note/Remark _____
_____
_____
_____

DRAIN CLEANSING

1. Working Time : (hours)

_____ ~ _____ ; _____
_____ ~ _____ ; _____
_____ ~ _____ ; _____
_____ ~ _____ ; _____
_____ ~ _____ ; _____
Total ; _____

2. Length of drain cleaned up by the worker.

	Total Length (m)	Memo (for calculation purposes)
Monsoon drain		
Roadside drain		
Back lane drain		
Total		

3. Equipment used for drain cleansing & condition of equipment.

_____
_____
_____

4. Note/Remarks

_____
_____
_____
_____

Road Sweeping

(hours)

1. Working Time : _____ ~ _____ ; _____
_____ ~ _____ ; _____
_____ ~ _____ ; _____
_____ ~ _____ ;
_____ ~ _____ ; _____
Total ; _____

2. Length of Road cleaned up by the sweeper.

	Total Length (m)	Memo (for calculation purposes)
Federal Road		
State Road		
City Road (Street)		
Village Road		
Back lane & others		
Total		

3. Equipment used by sweeper & condition of equipment.

_____
_____
_____
_____

4. Note/ Remarks

_____
_____
_____
_____

Grass Cutting

1. Working Time : (hours)

_____	~ _____	;	_____
_____	~ _____	;	_____
_____	~ _____	;	_____
_____	~ _____	;	_____
_____	~ _____	;	_____
	Total	;	_____

2. Total Length & Areas where grass are cut.

	Total Length (m) or Areas (㎡)	Memo (for calculation purposes)
Length	(m)	
Areas	(㎡)	

3. Equipment used by grass cutter & its condition.

_____

_____

_____

_____

4. Note/Remarks

_____

_____

_____

_____

BEACH CLEANSING

(hours)

1. Working Time : _____ ~ _____ ; _____
_____ ~ _____ ; _____
_____ ~ _____ ; _____
_____ ~ _____ ; _____
_____ ~ _____ ; _____
Total ; _____

3. Length of Beach to be cleaned up :

Length (m)	Note

3. Number of Laborers in beach cleansing. _____

4. Equipment used by workers and its condition.

_____
_____
_____

5. Note/Remarks. _____
_____
_____
_____

Type of Work / Time	Roll Call	Van Laborer	Drain Cleansing	Road Sweeping	Grass Cutting	Beech Cleansing	Others (meal, rest etc.)
5:00							
5:30							
6:00							
6:30							
7:00							
7:30							
8:00							
8:30							
9:00							
9:30							
10:00							
10:30							
11:00							
11:30							
12:00							
12:30							
13:00							
13:30							
14:00							
14:30							
15:00							
Total Time							

3 Results of Interview Survey on Residents

3.1 Objectives of the Survey

Collection and haulage of waste is the initial point of contact between the administration and the residents in Solid Waste Management. To ensure effective collection and haulage of waste, the cooperation from the residents are as important as any other matters in SWM.

To have effective and economical collection and haulage system, the present condition and method of discharge of waste from the premises as well as the overall opinion of the public on the present services rendered etc. should be studied and considered. The information gathered from this survey shall be used as the fundamental and basic data in establishment of the solid waste masterplan.

3.2 Survey Areas

The survey areas were divided accordingly into Town Areas and Rural Areas, in order to differentiate the present condition and method of discharge of waste and services employed in both areas.

For MPPP, town area is governed by George Town and the areas such as Tanjung Bungah, Tanjung Tokong, Bayan Baru and Ayer Itam which surround it.

As in the case of MPSP, Town Area include Butterworth, Bukit Mertajam and areas that surround it.

The Town Area is subdivided into 5 categories of residence listed as follows:

(i) High Income Residence
(ii) Middle Income Residence
(iii) High-rise Building
(iv) Kampung Area
(v) Shophouses

The rural areas for MPPP and MPSP are all areas other than town areas. The samples selected in the rural areas are representative samples which characteriz the typical rural area.

Distribution of samples with regard to areas in MPPP and MPSP are shown below in Table 3.2-1

Table 3.2-1 DISTRIBUTION OF SAMPLES

	NO. OF AREA CHOSEN	
	PULAU PINANG	SEBERANG PERAI
1. Town Area		
(1) High income	5 (80)	4 (60)
(2) Middle income	5 (80)	7 (70)
(3) High-rise building	6 (80)	4 (60)
(4) Kampong	5 (80)	2 (40)
(5) Shophouse	4 (80)	4 (70)
2. Rural Area	5 (100)	12 (220)
Total	30 (500)	36 (520)

* Figures in parenthesis indicate the number of interviews carried out in each category of residence.

A list of all the interview survey area for MPPP and MPSP are shown in Table 3.2-2 and 3.2-3 respectively.

The location of the interview survey areas for MPPP and MPSP are as shown in Fig. 3.2-1～3.2-4 respectively.

Table. 3. 2-2 LIST OF INTERVIEW SURVEY AREA (MPPP)

1. TOWN AREA

(i) High Income Residence

1. JALAN TUNGKU ABDUL RAHMAN
2. JESSELTON ROAD
3. WESTERN ROAD
4. PEEL AVENUE
5. WATER FALL ROAD

(ii) Middle Income Residence

6. CANTONMENT ROAD
7. LIM CHENG TEIK SQUARE
8. ABOO SITTEE LANE
9. TANJONG BUNGAH
10. BAYAN BARU

(iii) High- Rise Building

11. GAT LEBUH MACALLUM
12. TAMAN FREE SCHOOL
13. JONES ROAD, KELAWEI ROAD
14. BOUNDARY ROAD
15. KAMPUNG SUNGAI NIBONG/
    JALAN SUNGAI DUA
16. BAYAN BARU

(iv) Kampung

17. BURMA CRESENT
18. JALAN TUNKU, JALAN MD. TAIB
19. PERAK LANE
20. Kg. Jalan Maqbul
21. Kg. in Ayer Itam
    Kg. Pasar Ayer Itam
    Kg. Pisang

(v) Shophouse

22. PENANG ROAD
23. JALAN C.Y. CHOY
24. DATO KRAMAT ROAD
25. LEBOH PASAR

2. RURAL AREA

26. TELOK BAHANG
27. KG. TELUK KUMBAR
28. BATU FERINGGI
29. BALIK PULAU
30. BAYAN LEPAS

Table. 3. 2-3 LIST OF INTERVIEW SURVEY AREA (MPSP)

1. TOWN AREA

(i) High Income Residence

1.	TAMAN SELAT	NOTRH DISTRICT
2.	TAMAN TELUK MOLEK	
3.	TAMAN RIANG	
4.	TAMAN BUKIT	CENTRAL DISTRICT

(ii) Middle Income Residence

5.	SEBERANG JAYA	CENTRAL DISTRICT
6.	CHAI LENG PARK	
7.	DESA DAMAI	
8.	TAMAN ALMA	
9.	TAMAN SENANGAN	NORTH DISTRICT
10.	TAMAN BAGAN AJAM	
11.	JALAN PANTAI	

(iii) High-Rise Building

12.	BAGAN AJAM FLAT	NOTRH DISTRICT
13.	JALAN MOHD SAAD	
14.	SEBERANG JAYA	CENTRAL DISTRICT
15.	DESA DAMAI	

(iv) Kampung

16. JALAN PAK ABU - NORTH DISTRICT
17. JALAN ASTON (TANAH LIAT) - CENTRAL DISTRICT

(v) Shophouses

18.	JALAN KAMPUNG BENGGALI	NORTH DISTRICT
19.	JALAN BAGAN LUAR	
20.	JALAN OOI CHOOI CHENG/ JALAN ASTON/JALAN KULIM	CENTRAL DISTRICT
21.	JALAN PASAR	

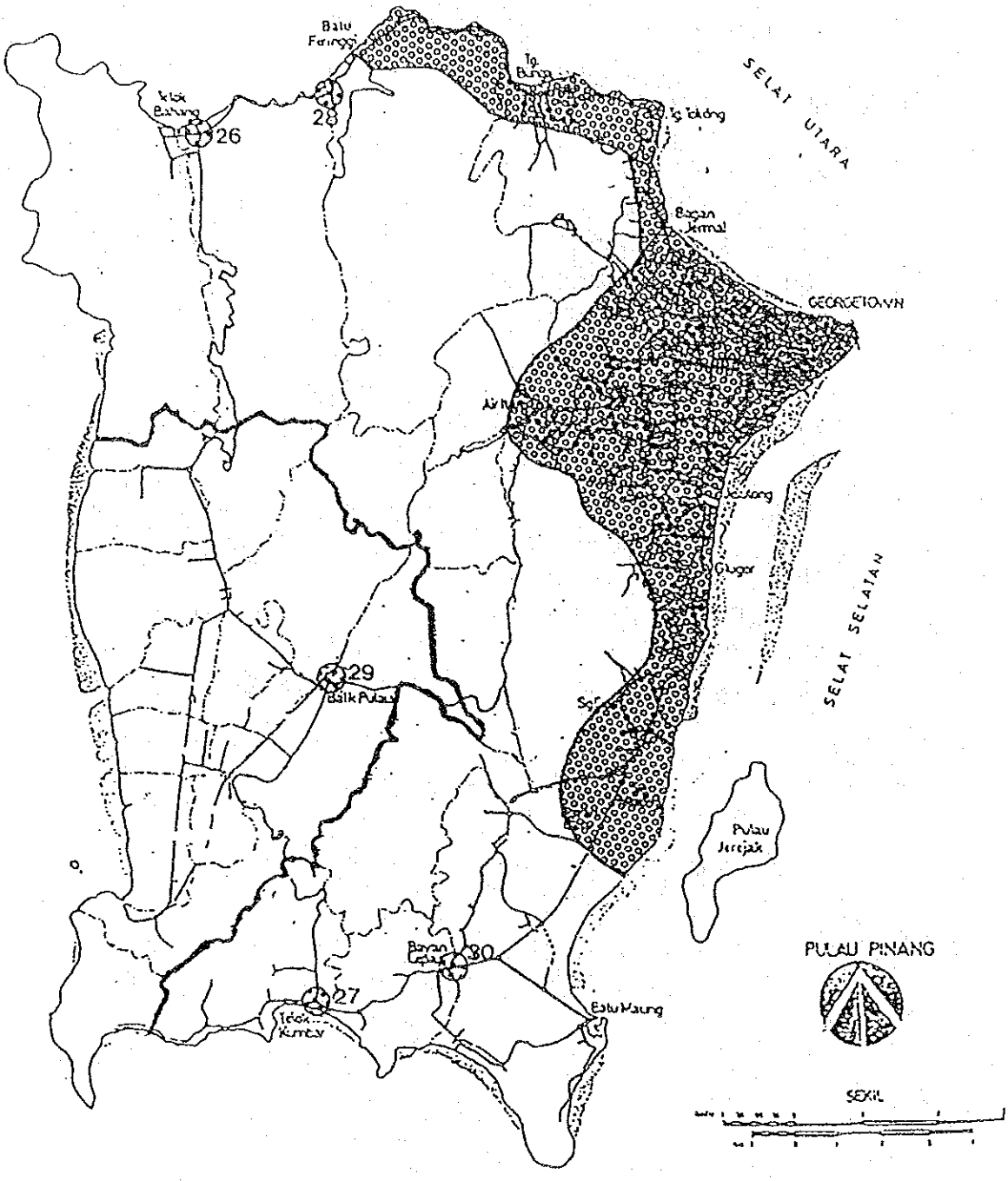
2. RURAL AREA

(i) Rural Area

22. KUALA MUDA
23. KEPALA BATAS — NORTH DISTRICT
24. TASIK GELUGOR
25. KUBANG SEMANG - CENTRAL DISTRICT
26. SUNGAI BAKAP
27. NIBONG TEBAL — SOUTH DISTRICT
28. JAWI (High-Rise Building) — SOUTH
29. TAMAN SEMPADAN (Middle Income Residence) — DISTRICT

(ii) New Village

30. KAMPUNG SELAMAT - NORTH DISTRICT
31. PERMATANG TINGGI — CENTRAL DISTRICT
32. JURU
33. VALDOR - SOUTH DISTRICT



LEGEND

TOWN AREA

RURAL AREA: 26 Telok Bahang
27 Telok Kumbar
28 Batu Feringgi
29 Balik Pulau
30 Bayan Lepas

Source: JICA Study Team

Interview Survey Area (MPPP)

Fig. 3.2-1

Fig. 3.2-2

INTERVIEW SURVEY AREA (MPPP)

1. TOWN AREA- GEORGETOWN

1. High income residence

1. JALAN TUNGKU ABDUL RAHMAN
2. JESSELTON ROAD
3. WESTERN ROAD
4. PEEL AVENUE
5. WATER FALL ROAD

2. Middle income residence

6. CANTOMENT ROAD
7. LIM CHENG, TEIK SQUARE
8. ABOO SITTER LANE
9. TG. BUNGAH
10. BAYAN BARU

3. High-rise Building

11. GAT LEBUH MACALLUM
12. TAMAN FREE SCHOOL
13. JONES ROAD, KELAWEI ROAD
14. BOUNDARY ROAD
15. KG. S. NIBONG
16. BAYAN-BARU

4. Kampung

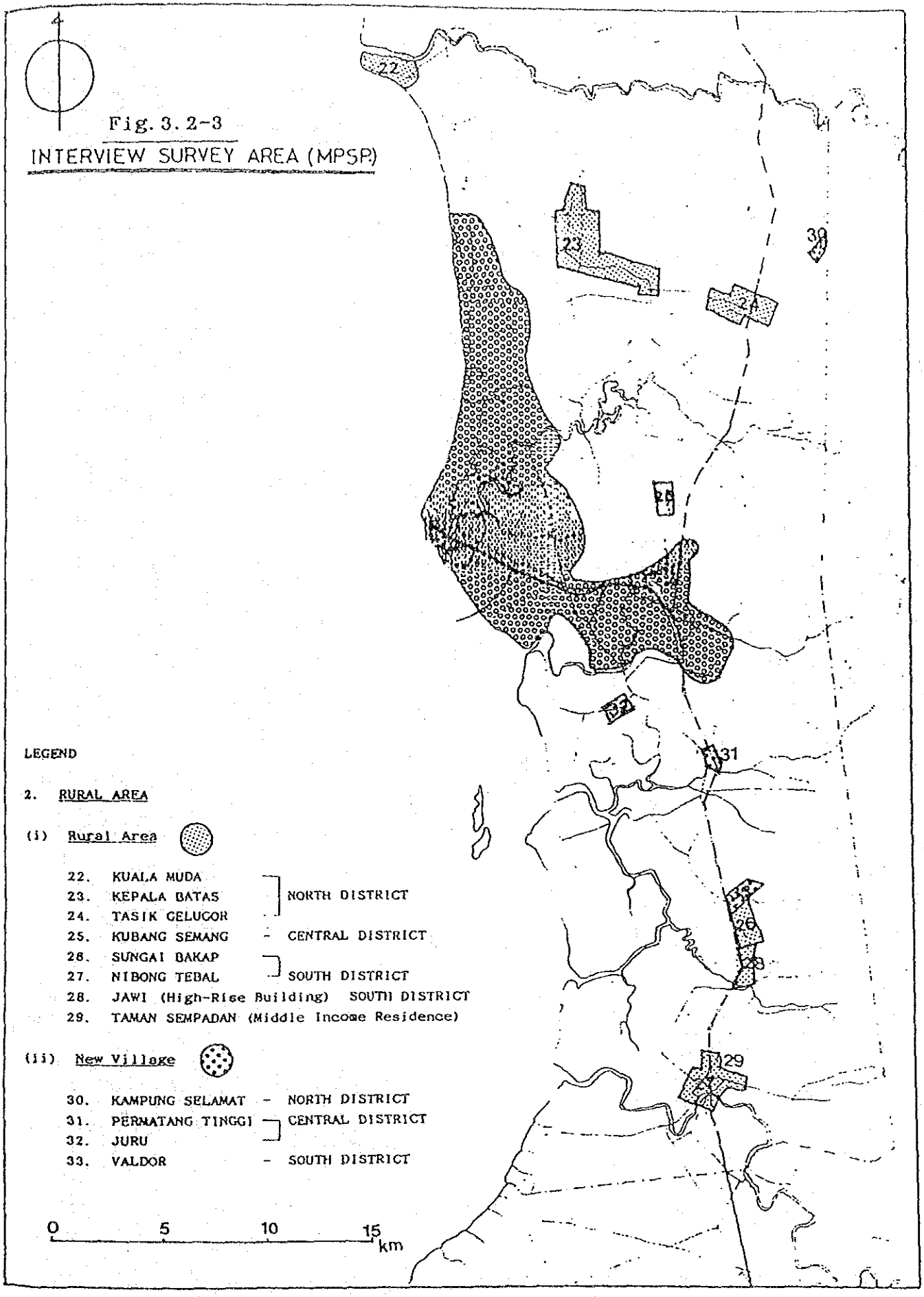
17. BURMA CRESENT
18. JLN TUNKU, JALAN MD. TAIB
19. PERAK LANE
20. K. JLN MAQBUL
21. KG. AYER ITAM

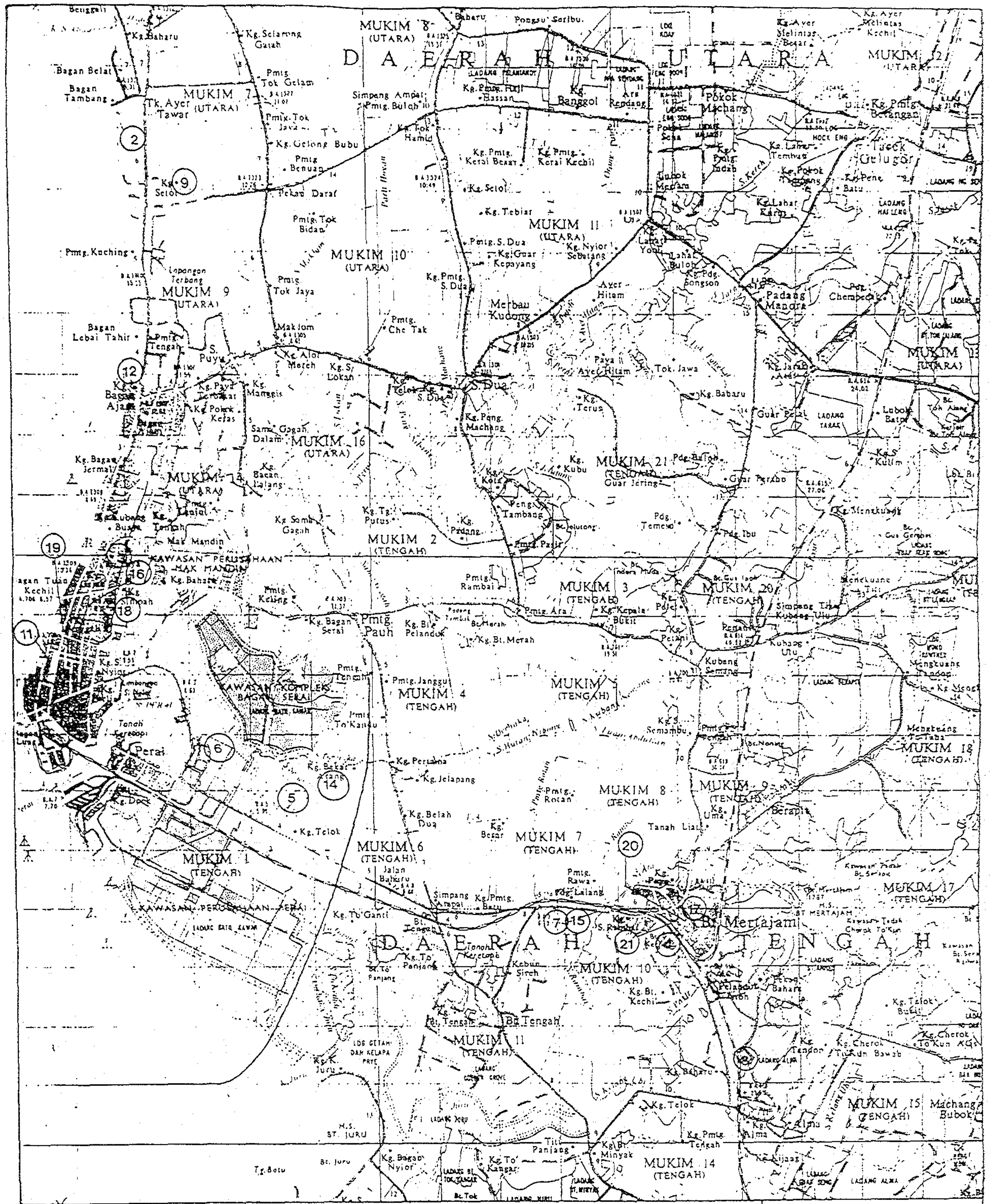
5. Shophouse

22. PENANG ROAD
23. JALAN C. Y. CHOY
24. DATO KRAMAT ROAD
25. N. LEBOH PASAR

Fig. 3.2-3

INTERVIEW SURVEY AREA (MPSP)





LEGEND

1. TOWN AREA

(i) High Income Residence

1. TAMAN SELAT
2. TAMAN TELUK MOLEK
3. TAMAN RIANG
4. TAMAN BUKIT

NORTH DISTRICT

(ii) Middle Income Residence

5. SEBERANG JAYA
6. CHAI LENG PARK
7. DESA DAMAI
8. TAMAN ALMA

CENTRAL DISTRICT

9. TAMAN SENANGAN
10. TAMAN BAGAN AJAM
11. JALAN PANTAI

NORTH DISTRICT

(iii) High-Rise Building

12. BAGAN AJAM FLAT — NOTRH DISTRICT
13. JALAN THAMBY KECIL
14. SEBERANG JAYA
15. DESA DAMAI

CENTRAL DISTRICT

(iv) Kampung

16. JALAN PAK ABU - NORTH DISTRICT
17. JALAN ASTON - CENTRAL DISTRICT

(v) Shophouses

18. JALAN KAMPUNG DENGGALI
19. JALAN BAGAN LUAR
20. JALAN OOI CHUI CHENG

NORTH DISTRICT

21. JALAN PASAR - CENTRAL DISTRICT

Fig. 3.2-4

INTERVIEW SURVEY AREA(MPSP).

0 1 2 3 KM

3.3 Schedule and Duration of Survey

Interview Survey conducted was carried out by 10 interviewers. The allocation of work and schedule for each interviewer is as shown in Table 3.3-1 for MPPP and Table 3.3-2 for MPSP.

Duration of Interview Survey was 2 weeks:

27th. June - 01st. July 1988 in MPPP
04th. July - 09th. July 1988 in MPSP

Table. 3. 3-1 Interview Area Assignment Schedule (MPPP)

Date	Interview area	Number of samples (Questionnaire No.)	Interviewer
27th. Jun (Monday)	TOWN AREA High Income Residence		
	1. JALAN TUNKU ABDUL RAHMAN	20 (1~20)	A,B
	2. JESSELTON ROAD	20 (21~40)	C,D
	3. WESTERN ROAD	20 (41~60)	E,F
	4. PEEL AVENUE	10 (61~70)	G
	5. WATER FALL ROAD	10 (71~80)	H
	Middle Income Residence		
	6. CANTONMENT ROAD	20 (81~100)	J,K
28th. Jun (Tuesday)	7. LIM CHENG, TEIK SQUARE	10 (101~110)	A
	8. ABOO SITTEE LANE	10 (111~120)	B
	10. BAYAN BARU	20 (141~161)	E,F
	Highrise Buiding		
	11. GAT LEBUH MACALLUM	10 (161~170)	G
	12. TAMAN FREE SCHOOL	10 (171~180)	H
	13. JONES ROAD, KELAWEI ROAD	10 (181~190)	J
	14. BOUNDARY ROAD	10 (191~200)	K
	16. BAYAN BARU	20 (221~240)	C,D
29th. Jun (Wednesday)	Middle Income Residence		
	9. TANJONG BUNGAH	20 (121~140)	C,D
	Highrise Building		
	15. KAMPUNG SUNGAI NIBONG/ JALAN SUNGAI DUA	20 (201~220)	A,B
	Kampung		
	17. BURMA CRESENT	10 (241~250)	E
	18. JALAN TUNKU, JALAN HJ TAIB	10 (251~260)	F
	19. PERAK LANE	20 (261~280)	G,H
	20. K. JALAN MAQBUL	20 (281~300)	J,K
30th. Jun (Thursday)	21. KG. IN AYER ITAM (1) KG. PASAR AYER ITAM (11) KG. PISANG	20 (301~320)	A,B
	Shophouse		
	22. PENANG ROAD	20 (321~340)	C,D
	23. JALAN C.Y CHOY	20 (341~360)	E,F
	24. DATO KRAMAT ROAD	20 (361~380)	G,H
	25. S. LEBOH PASAR	20 (381~400)	J,K
1st. July (Friday)	RURAL AREA Fishing Area		
	26. TELOK BAHANG	10 (401~410)	B
	27. KG. TK. KUMBAR	10 (411~420)	A
	Resort Area		
	28. BATU FERINGGI	20 (421~440)	C,D
	Others		
	29. BALIK PULAU	30 (441~470)	E,F,G
	30. BAYAN LEPAS	30 (471~500)	H,J,K

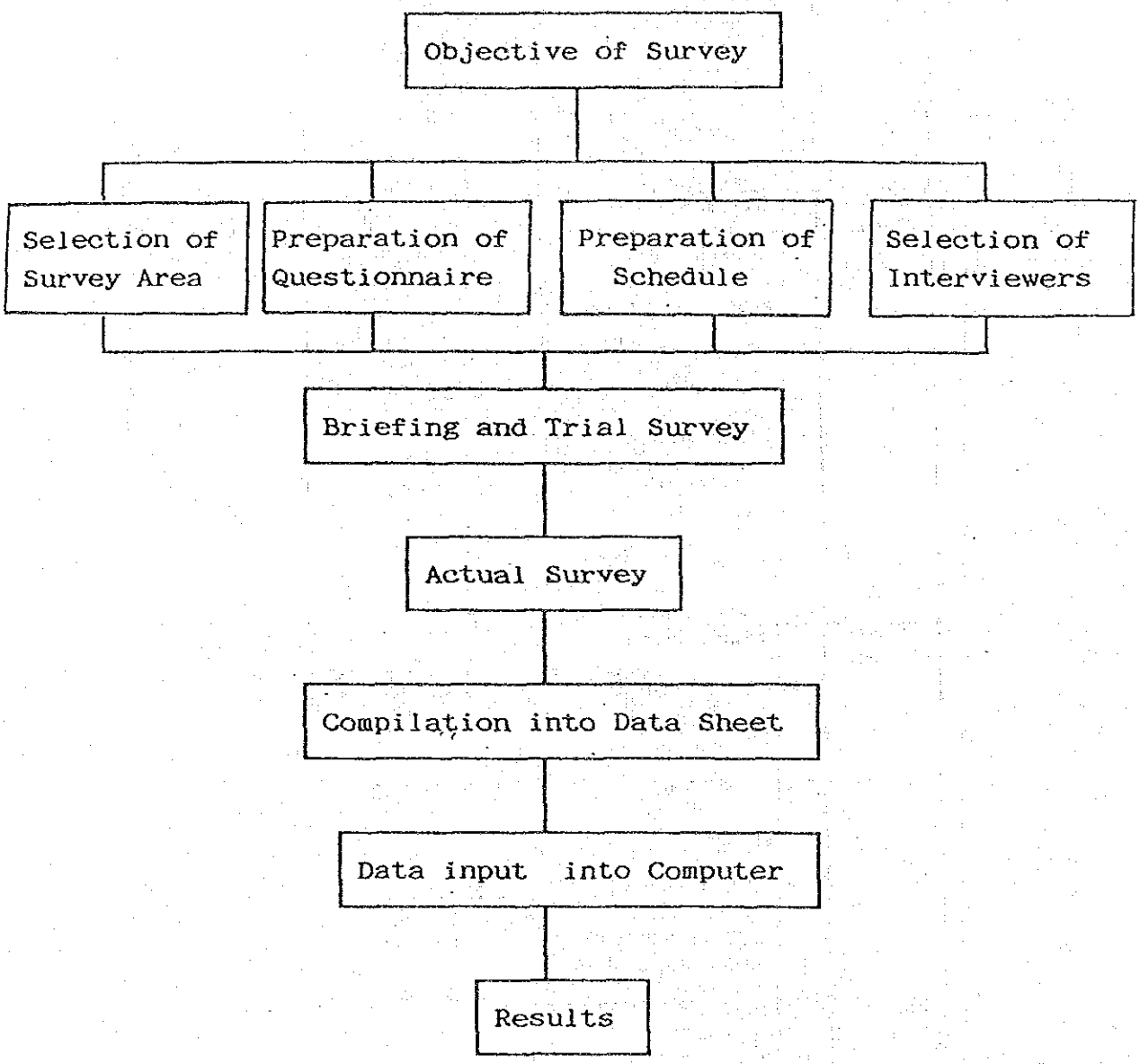
Table. 3. 3-2 Interview Area Assignment Schedule (HBSP)

Date	Interview area	Number of samples (Questionnaire No.)	Interviewer
4th. July (Monday)	TOWN AREA High Income Residence		
	1. TAMAN SELAT	10 (501-510)	A
	2. TAMAN TELUK MAS	20 (511-530)	B,C
	3. TAMAN RIANG	10 (531-540)	D
	Middle Income Residence		
	5. SEBERANG JAYA	10 (561-570)	E
	6. CHAI LENG PARK	10 (571-580)	F
	9. TAMAN SENANGAN	10 (601-610)	G
	10. TAMAN BAGAN AJAM	10 (611-620)	H
	11. JALAN PANTAI	10 (621-630)	J
	High-Rise Building		
	12. BAGAN AJAM FLAT	10 (631-640)	K
5th. July (Tuesday)	High Income Residence		
	4. TAMAN BUKIT	20 (541-560)	A,B
	Middle Income Residence		
	7. DESA DAMAI	10 (581-590)	C
	8. TAMAN ALMA	10 (591-600)	D
	High-Rise Building		
	14. SEBERANG JAYA	20 (651-670)	E,F
	15. DESA DAMAI	20 (671-690)	G,H
	Kampung		
	17. JALAN ASTON (TANAH LIAT)	20 (711-730)	J,K
6th. July (Wednesday)	High-Rise Building		
	13. JALAN MOHD SAAD	10 (641-650)	A
	Kampung		
	16. JALAN PAK ABU	20 (691- 710)	D,C
	Shophouses		
	18. JALAN KAMPUNG BENGGALI	20 (731-750)	B,E
	19. JALAN BAGAN UJAR	10 (751-760)	F
	20. JALAN OOI CHOOI CHENG/ JALAN ASTON/JALAN KULIN	20 (761-780)	G,H
	21. JALAN PASAR	20 (781-800)	J,K
7th. July (Thursday)	RURAL AREA Rural Area		
	27. NIBONG TEBAL	20 (901-920)	A,B
	28. JAWI	10 (1001-1010)	C
	29. TAMAN SEMPADAN	10 (1011-1020)	D
	NEW VILLAGE		
	26. SUNGAI BAKAP	20 (881-900)	G,H
	31. PERMATANG TINGGI	20 (941-960)	E,F
	32. JURU	20 (961-980)	J,K
8th. JULY (FRIDAY)	RURAL AREA		
	22. KUALA MUDA	20 (801-820)	A,B
	23. KEPALA BATAS	20 (821-840)	C,D
	24. TASIK GELUGOR	20 (841-860)	G,H
	25. KUBANG SEMANG	20 (861-880)	E,F
	30. KAMPUNG SELAMAT	20 (921-940)	J,K
9th. July (Saturday)	33. VALDOR	20 (981-1000)	A,B

3.4 Method and Procedure of Survey

A brief outline of the various stages of work involved in undertaking the interview survey is as shown below in Fig. 3.4-1

Fig. 3.4-1 Procedure of Interview Survey



3.5 Summary of Results

Summary of results are indicated as follows. The subsequent pages show the highlighted questions of the survey.

Question 15: Percentage of residents who uses plastic bag to discharge waste

	MPPP (%)	MPSP (%)
High Income	93	93
Middle Income	96	92
High Rise	94	100
Kampung	81	94
Shophouse	55	57
Rural	72	74
Average	81	80

Question 16: Percentage of residents who appreciate usage of plastic bags to discharge waste.

	MPPP (%)	MPSP (%)
High Income	98	100
Middle Income	99	96
High Rise	98	98
Kampung	90	96
Shophouse	79	71
Rural	88	86
Average	92	88

Question 24: Percentage of residents who discharge waste at various fixed times

	MPPP (%)	MPSP (%)
6:00 ~ 8:59 AM	28	41
9:00 ~ 11:59 AM	19	9
12:00 ~ 14:59 PM	12	3
15:00 ~ 17:59 PM	20	15
18:00 ~ 5:59 PM	20	32

Question 30: Percentage of residents who have dustbins with lids

	MPPP (%)	MPSP (%)
High Income	62	78
Middle Income	59	80
High Rise	-	-
Kampung	17	57
Shophouse	15	51
Rural	31	48
Average	38	62

Question 33: Percentage of residents who agree to cooperate by carrying their waste to communal containers fixed in their areas when requested

	MPPP (%)	MPSP (%)
High Income	19	48
Middle Income	38	31
High Rise	35	25
Kampung	47	80
Shophouse	35	41
Rural	64	60
Average	41	50

Question 42: Percentage of residents who have solid waste collection service in their area

	MPPP (%)	MPSP (%)
High Income	100	100
Middle Income	100	100
High Rise	99	97
Kampung	100	98
Shophouse	100	100
Rural Area	89	67
Average	98	86

Question 43: Percentage of residents who are satisfied with present collection services

	MPPP (%)	MPSP (%)
High Income	94	77
Middle Income	94	87
High Rise	81	76
Kampung	77	69
Shophouse	75	79
Rural Area	75	76
Average	82	77

Question 45: Percentage of residents who are aware of the collection method in their area

	MPPP (%)	MPSP (%)
High Income	93	98
Middle Income	97	100
High Rise	93	95
Kampung	100	100
Shophouse	98	97
Rural Area	99	96
Average	97	97

Question 47: Percentage of residents who have their waste collected daily (including six times a week collection).

	MPPP (%)	MPSP (%)
High Income	83	92
Middle Income	95	98
High Rise	85	65
Kampung	91	90
Shophouse	95	85
Rural Area	85	75
Average	89	82

Question 48: Percentage of residents who are able to store the waste if the alternate day collection day is employed in their area.

	MPPP (%)	MPSP (%)
High Income	21	39
Middle Income	16	4
High Rise	2	18
Kampung	20	14
Shophouse	15	21
Rural Area	20	27
Average	16	22

Question 49: Percentage of residents who disagree with alternate day collection syste with various reasons

	MPPP (%)	MPSP (%)
Present system is better	24	28
We have plenty of waste daily	19	16
We have small dustbin for garbage	4	1
It ia very smelly and unpleasant to keep waste in the house	50	46
It is difficult to handle the dustbins	0	0

Question 50: Percentage of residents who have their collection service done at fixed time in the day

	MPPP (%)	MPSP (%)
High Income	86	92
Middle Income	87	92
High Rise	79	68
Kampung	84	98
Shophouse	90	86
Rural Area	89	85
Average	86	86

Question 51: Percentage of residents who have their waste collected at the specified time

	MPPP (%)	MPSP (%)
6:00 ~ 8:59	71	72
9:00 ~ 11:59	21	27
12:00 ~ 14:59	4	0
15:00 ~ 17:59	0	0

Question 52: Percentage of residents who are aware of recycling

	MPPP (%)	MPSP (%)
High Income	75	80
Middle Income	86	52
High Rise	80	63
Kampung	65	70
Shophouse	65	55
Rural Area	72	55
Average	74	60

Question 54: Percentage of residents who are aware of someone who collects or buys their unused or recyclable materials in their area

	MPPP (%)	MPSP (%)
High Income	49	61
Middle Income	74	58
High Rise	52	58
Kampung	63	74
Shophouse	29	16
Rural Area	48	55
Average	52	52

Question 55: Percentage of frequency of collectors who visits the residents' area

	MPPP (%)	MPSP (%)
Once a week	29	22
Once a month	31	43
Once every other week	11	14
Once every other month	11	8
Once a half year	3	1
Once a year	0	0

Question 57: Average price of the type of recyclable materials

	MPPP ($/kg)	MPSP ($/kg)
Newspaper	0.134	0.092
Other paper	0.103	-
Glass bottles	0.055	0.037
Textile	-	-
Plastic	0.040	-
Ferrous metal	-	0.150
Other metal	-	-
Other materials	0.040	0.35

Question 58: Average amount of the types of recyclable materials sold by the residents to the collectors

	MPPP (kg/mon. /house)	MPSP (kg/mon. /house)
Newspaper	1.60	0.24
Other paper	-	-
Glass bottles	1.82	4.54
Textile	0.01	-
Plastic	-	-
Ferrous metal	-	0.10
Other metal	0.01	-
Other materials	0.06	0.24
	3.50 kg/mon. /house	5.12 kg/m/h

Question 59: Percentage of residents who agree to sell off reusable or recyclable materials for beneficial activities in their area

	MPPP (%)	MPSP (%)
High Income	79	93
Middle Income	86	96
High Rise	83	80
Kampung	91	74
Shophouse	79	78
Rural Area	85	86
Average	84	85

Question 60: Percentage of residents who think that present solid waste management cost is high

	MPPP (%)	MPSP (%)
High Income	19	28
Middle Income	30	62
High Rise	54	55
Kampung	47	48
Shophouse	54	57
Rural Area	47	49
Average	42	50

Question 61: Percentage of residents who cannot contribute any amount of money for solid waste management cost

	MPPP (%)	MPSP (%)
High Income	59	57
Middle Income	57	85
High Rise	82	80
Kampung	73	90
Shophouse	85	85
Rural Area	81	94
Average	73	85

Question 63: Percentage of residents who have never had any guidance on methods of proper discharge

	MPPP (%)	MPSP (%)
High Income	86	87
Middle Income	91	79
High Rise	88	87
Kampung	91	94
Shophouse	93	84
Rural Area	94	93
Average	91	89

Question 64: Percentage of residents who have "Clean Day" in their area and participation of residents on "Gotong Royong" basis

	MPPP (%)	MPSP (%)
High Income	30	49
Middle Income	18	52
High Rise	51	22
Kampung	30	42
Shophouse	11	9
Rural Area	48	42
Average	32	36

Questionnaire to Residents

QUESTIONNAIRE

No. _____

I Items for Interviewer

1. Date : _____

2. Interviewer : _____

3. Town Area or Rural Area : _____
   1 Town Area 2 Rural Area

4. Types of residence in town area : _____
   1 High income residence
   2 Middle income residence
   3 High-Rise Building
   4 Kampung
   5 Shophouse

5. Types of rural area : _____
   1 Fishing Village
   2 Resort Area
   3 Others

6. Distance from the house to road (width: more than 3 m) : _____
   1 In front of the premises
   2 Less than 10 m
   3 10 ~ 29 m
   4 30 ~ 49 m
   5 50 m or more

7. Distance from the house to communal container : _____
   1 In front of the premises
   2 Less than 10 m
   3 10 ~ 29 m
   4 30 ~ 49 m
   5 50 m or more
   6 There is no communal container in this area.

II General Questions | Answers

8. Type of Interviewee : _____
   1 Housewife
   2 The Master
   3 Children
   4 Other family member
   5 Housekeeper (servant)
   6 Others

9. Address : _____

10. Employment of The Master : _____
   1 Primary Industry (Agriculture & Mining)
   2 Secondary Industry (Manufacturing)
   3 Tertiary Industry (Service orientated profession)
   4 Pensioner (Retired)
   5 Unemployed
   6 I don't know

11. Number of persons staying in the house or working in the shop : _____

12. Number of dwelling years at this place : _____
   1 Less than 5 years
   2 5 ~ 9 years
   3 10 ~ 19 years
   4 20 years or more
   5 I don't know

13. Total expenditure of your family per month : _____
   1 Less than $500
   2 $500 ~ $990
   3 $1,000 ~ $1,499
   4 $1,500 ~ $1,999
   5 $2,000 or more
   6 I don't know

III Questions on Discharge of waste from your house

14. Who discharge waste from your house? _____
    1 Housewife
    2 The Master
    3 Children
    4 Other family member
    5 Housekeeper (servant)
    6 Others
    7 I don't know

15. Do you use plastic bag when you discharge waste? _____
    1 YES
    2 NO
    3 I don't know

16. What is your opinion about discharge of waste by using plastic bag? _____
    1 Good (Go to Question 17)
    2 Not Good (Go to Question 18)
    3 I don't know

17. Why is it "Good"? _____
    1 It is clean after collection work.
    2 It prevents foul odour.
    3 It is easy handling.
    4 Keep away pest such as flies.
    5 Others (Please specify) :
    _____

18. Why is it "Not Good"? _____
    1 We don't have any plastic bag.
    2 It is expensive to buy the bags.
    3 Take much time to handle.
    4 Cats and dogs may scavenge waste from waste from plastic bag.
    5 Others (Please specify) :
    _____

19. Where do you discharge waste from your house? _____

1 Into dustbins to be collected by worker
2 Around my premises without dustbins
3 Communal container
4 Dust chute in my building
5 Garbage compartment fixed in the house
6 Others (Please specify) :

_____

7 I don't know

20. What types of container do you use for carrying waste to discharge point in Question No. 19? _____

1 Plastic bag
2 Plastic bucket
3 Metal bucket
4 Bamboo basket
5 Others (Please specify) :

_____

6 I don't know

21. How much capacity does such container hold? _____

1 Less than 10 liter
2 10 ~ 19 liter
3 20 ~ 29 liter
4 30 liter or more
5 I don't know

22. What volume of waste do you discharge per day? (Interviewer to calculate) _____

23. Do you discharge waste at fixed time? _____

1 YES
2 NO
3 I don't know

24. If "YES", what time do you usually discharge your waste? _____

1 6:00 ~ 8:59
2 9:00 ~ 11:59
3 12:00 ~ 14:59
4 15:00 ~ 17:59
5 Others (Please specify) :

_____

6 I don't know

25. Do you have ever discharged waste soon after it had been collected? _____

1 YES
2 NO
3 I don't know

If you have dustbins to be collected by worker (for Question No. 19 answer 1 only) Please answer the followings (Nos. 26 ~ 32);

26. How many dustbins do you have? _____

1 1
2 2
3 3
4 4
5 5 or more
6 I don't know

27. What type of the dustbins do you use? _____

1 Plastic bucket
2 Metal bucket
3 Bamboo basket
4 Drum can
5 Others (Please specify) :

_____

6 I don't know

28. How much capacity does your dustbin hold? _____

1 Less than 30 liter
2 30 ~ 49 liter
3 50 ~ 99 liter
4 100 liter or more
5 I don't know

29. Where do you put your dustbin to be collected by workers? _____

1 In front of my premises with stand
2 In front of my premises without stand
3 Behind the premises
4 In the house (kitchen)
5 In the garden
6 Others (Please specify) :

_____

7 I don't know

30. Is the dustbin with or without lid? _____

1 With
2 Without
3 I don't know

31. What is your opinion about having a dustbin set on a stand and placed in front of your house? _____

1 Good (Go to Question 33)
2 Not Good (Go to Question 32)
3 I don't know

32. What are the reasons of "Not Good"? _____

1 It is not aesthetic.
2 It is difficult to discharge waste into dustbin.
3 It is difficult for the collection workers to carry the dustbins from the stand to vehicle or communal container.
4 It is costly to construct the stand.
5 Because of theft or vandalism.
6 Others (Please specify) :

_____

33. Are you able to co-operate to carry your waste to communal containers fixed in your area if you are so requested? _____

1 YES
2 NO
3 I don't know

34. If "NO", what are the reasons? _____

1 Present system is better.
2 We have nobody who will carry the waste to communal containers.
3 Communal containers are far.
4 Communal containers is not hygienic.
5 Others (Please specify) :

_____

35. Do you have ever had experience of human scavengers & animals scavenging on your waste? : _____

1 YES
2 NO
3 I don't know

36. How do you discharge cut trees or grasses? _____

1 Discharge to collection point fixed by municipality
2 Discharge in front of the house
3 Open combustion/burning
4 Composting
5 I don't know
6 Others (Please specify) :

_____

7 We don't cut trees or grass

If "1", please answer the followings: (No. 37 ~ No. 38)

37. Who discharge the cut tree or grasses? _____

1 Housewife
2 The Master
3 Children
4 Other family member
5 Housekeeper (servant)
6 Gardener
7 Others
8 I don't know

38. How often do you discharge them to collection point? _____

1 Everyday
2 Once A Week
3 Twice A Month
4 Once A Month
5 Others
6 I don't know

39. Does anyone in your family sweep the road shoulder or adjacent public area in front of your house? _____

1 YES, Everyday
2 YES, Sometimes
3 NO
4 I don't know

40. Does anyone in your family clean the drain around your house? _____

1 YES, Everyday
2 YES, Sometimes
3 No
4 I don't know

41. How are your bulky waste disposed? (such as large condemned furniture or electric appliances) _____

1 Collected by municipal worker
2 Sold/collected by special collector
3 Disposed by ourselves
4 Sold to Junkyard
5 Others (Please specify) :
_____
6 I don't know

IV Questions on services of waste in your area.

42. Is there a collection service in your area? _____

1 YES
2 NO
3 I don't know

If "YES", please answer the following; (No. 43 ~ No. 51)
Otherwise go to No. 52

43. Are you satisfied with the collection service? _____

1 YES
2 NO
3 I don't know

44. If "No", what are the reasons? _____

1 Frequency of collection service is low
2 Collection time is irregular
3 Collection time is very early or late
4 Behaviour of Workers is bad
5 Collection work is crude
6 Other (Please specify)

_____

45. Do you know how the waste discharged from your house is collected? _____

1 YES
2 NO
3 I don't know

46. If "YES", how is the waste collected? _____

1 Door to door collection system by using collection vehicle
2 Door to door collection system by collection worker
3 Residents, themselves carry waste to a collection points
4 Collection from dust chute in the building
5 Others (Please specify)

_____

6 I don't know

47. How many times a week is your waste collected? _____

1 Everyday
2 Six times a week
3 Three times a week (alternately a week)
4 Twice a week
5 Once a week
6 I don't know

48. In Petaling Jaya, alternate day collection is employed to cut cost. If alternate day collection is employed in your area, will you be able to keep waste in the house until the next collection? _____

1 YES
2 NO
3 I don't know

49. If "NO", what are the reasons? _____

1 Present system is better
2 We have plenty of waste daily
3 We have small dustbin for garbage
4 It is very smelly and unpleasant to keep waste in the house
5 It is difficult to handle the dustbins
6 Others (Please specify) :

_____

50. Is collection service done at fixed time in the day? _____

1 YES
2 NO
3 I don't know

51. If "YES", what time is your waste normally collected? _____

1 6:00 ~ 8:59
2 9:00 ~ 11:59
3 12:00 ~ 14:59
4 15:00 ~ 17:59
5 Others (Please specify) : _____

V Questions on Recycling

52. Do you know that newspaper, bottles etc are recycled? _____
    1 YES
    2 NO

53. Do you know that there are people scavenging resource materials from refuse at the dumping ground? _____
    1 YES
    2 NO

54. Do you have someone who comes around to collect or buy your unused or recyclable materials? _____
    1 YES
    2 NO (Go to Question 59)
    3 I don't know

55. If "YES", how often does the collector comes around your place? _____
    1 Once a week
    2 Once a month
    3 Once every other week
    4 Once every other month
    5 Once a half year
    6 Once a year
    7 I don't know

56. What kinds of transport vehicles does the collector use to haul them? _____
    1 Tri-cycle
    2 Bicycle
    3 Motorcycle
    4 Pick-up Truck
    5 Small Lorry
    6 Others (Please specify) :
    _____

57. Please state the types of recyclable materials and their prices.

1	Newspaper	$ /kg
2	Other paper	$ /kg
3	Glass bottles	$ /kg
4	Textile	$ /kg
5	Plastic	$ /kg
6	Ferrous metal	$ /kg
7	Other metal ( )	$ /kg
8	Other materials ( )	$ /kg

58. Please state the amount of each item which you sell to him.

1	Newspaper	kg/month
2	Other paper	kg/month
3	Glass bottles	kg/month
4	Textile	kg/month
5	Plastic	kg/month
6	Ferrous metal ( )	kg/month
7	Other metal ( )	kg/month
8	Other materials ( )	kg/month

59. If the resident association or club in your area were to raise some funds (in order to engage beneficial activities for the residents), through sale of reusable or recyclable materials, would you be able to contribute or participate?

1 YES
2 NO
3 I don't know

VI Others

60. The present cost of waste management (all cleansing services - including collection service, street sweeping, drain cleansing and tree and grass cuttings) is M$150 ~ M$200 per year per household. This is about 30% of total municipal budget. What do you think of this rate? _____

1 Very High
2 High
3 Average
4 Low
5 I don't know

61. The waste management cost is already included in the yearly assessment, but it is insufficient. If municipality requests extra, how much can you contribute towards management of waste? _____

1 Less than $50 per year
2 $50 ~ $99 per year
3 $100 ~ $149 per year
4 $150 ~ $199 per year
5 More than $200 per year
6 I cannot contribute

62. Do you know which authority is responsible for disposal of solid waste discharged by residents? _____

1 Federal government
2 State government
3 Municipality
4 Yourself
5 Others (Please specify) : _____
6 I don't know

63. Have you ever had any guidance on methods of proper discharge? _____

1 YES
2 NO

64. In your area, are there "Clean Day" in which people are requested to participate on the "Gotong Royong" basis? _____

1 YES
2 NO
3 I don't know

65. If "YES", did you participate in such "Gotong Royong" in your area? _____

1 YES
2 NO
3 I don't know

4 Results of Factory Survey

4.1 Objectives of Survey

Principally, all factories should be responsible for proper treatment and disposal of the waste generated from their industries. However, in almost all of the cases, these industrial wastes are disposed off at the municipal disposal sites. Thus, apart from domestic waste, it is also essential to consider industrial waste in the preparation of the Solid Waste Management Master Plan.

In the study of industrial waste, several aspects of waste treatment and management such as the type of waste generated from the industry, its amount, quality of waste (whether toxic or hazardous to health), availability of treatment facilities, storage facilities, disposal facilities, etc are posed in the questionnaire and forwarded to the relevant factories.

4.2 Method and Procedure of Survey

A brief outline of the various stages of work involved in undertaking of the interview survey is as shown below in Fig. 4.2-1

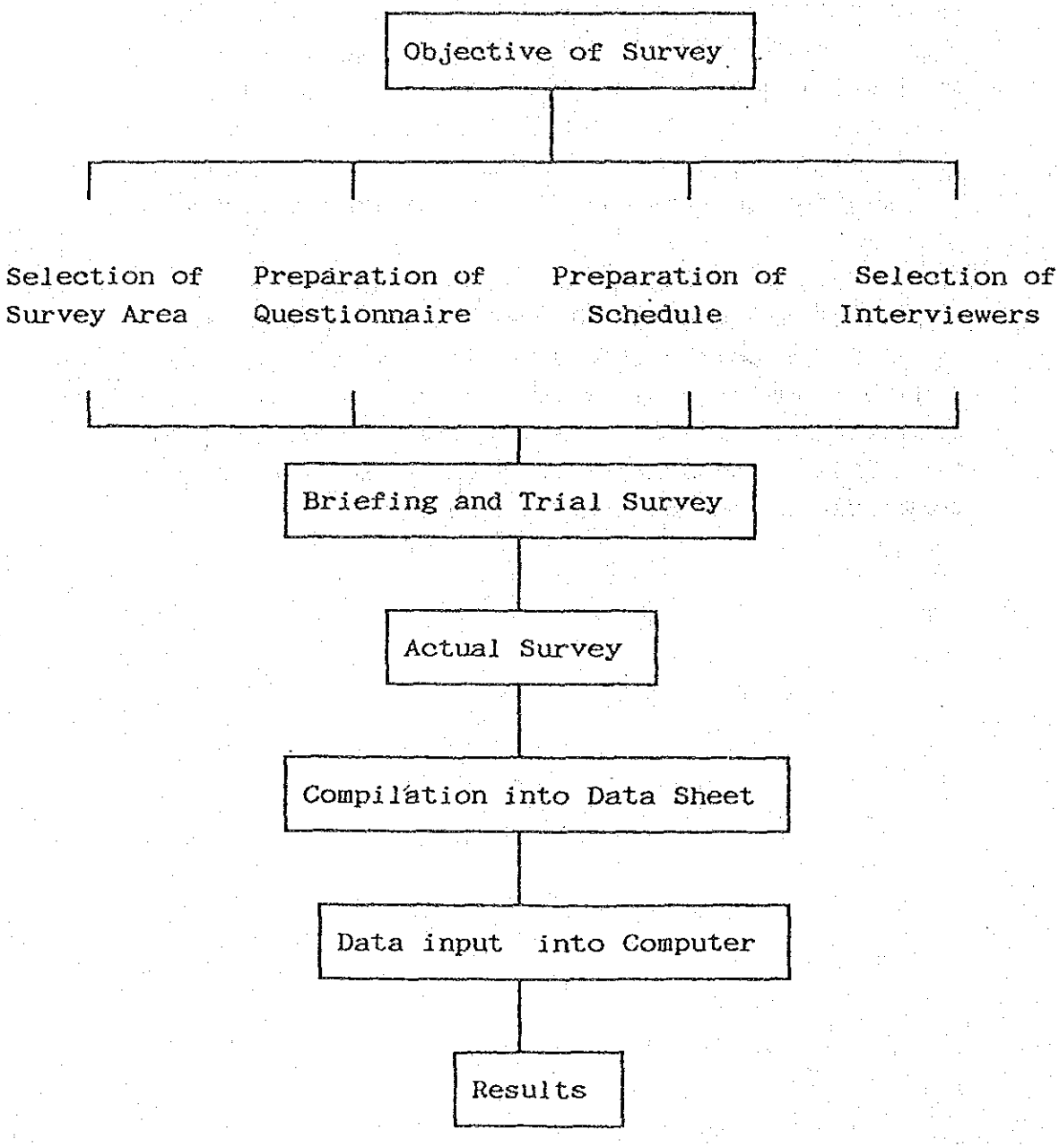


Fig. 4.2-1 Procedure of Survey

4.3 Survey Area and Number of Factories Surveyed

The factories identified for the survey in each municipality are as follows:-

Municipality		Survey Area
MPPP	-	Free Trade Zone, Bayan Baru
	-	Non Free Trade Zone, Bayan Baru
	-	Others (Factories with more than 30 employees each)
MPSP	-	Prai Industrial Area
	-	Mak Mandin Industrial Area

The number of factories surveyed are summerized Table 4.3-1

Table. 4.3-1 NUMBER OF FACTORIES SURVEYED BY SURVEY AREA AND PERCENTAGE OF RESPONDENT

INDUSTRIAL AREA		NO. OF FACTORIES SURVEYED (A)	NO. OF QUESTION-NAIRE RECEIVED FROM FACTORIES (B)	PERCENTAGE (%)
MPPP	BAYAN BARU	59	47	79.66%
	OTHERS	28	25	89.29%
	SUB-TOTAL	87	72	82.76%
MPSP	PRAI	101	76	75.25%
	MAK MANDIN	77	70	90.91%
	SUB-TOTAL	178	146	82.02%
	TOTAL	265	218	82.26%

Note: Others * means factories with more than 30 employees.

4.4 Categories of Industories

To identify the many types of factories and types of waste generated, we have classified the factories into three main industries listed below:-

i. Primary Industry
ii. Secondary (Manufacturing) Industry
iii. Tertiary Industry

For survey purpose, the industries are further divided into 26 categories as shown in Table 4.4-1

Details on distribution of factories surveyed according to nature of business and localities are listed in Table 4.4-2

Table. 4. 4-1 Categories of Industries

A. Primary Industry

1. Agriculture
2. Forestry
3. Livestock
4. Fishing
5. Mining & Quarrying

B. Secondary Industrial
(Manufacturing)

6. Food, Beverage & Tobacco
7. Textiles & Wearing Apparel
8. Leather & Footwear
9. Wood & Furniture
10. Paper, Printing & Publishing
11. Chemical & other Chemical Product
12. Rubber & Plastics
13. Other Non-Metallic Products than those mentioned above
14. Iron & Steel
15. Non-ferrous Metals
16. Fabricated Metal Products
17. Machinery
18. Electrical
19. Transport Equipment
20. Others
21. Construction

C. Tertiary Industry

22. Electricity, Gas & Water
23. Transport, Storage & Communication
24. Finance, Insurance, Real Estate and Business Centers
25. Government Services
26. Other services

Table. 4. 4-2 DISTRIBUTION OF FACTORIES ACCORDING TO NATURE OF BUSINESS AND LOCALITY

NATURE OF BUSINESS	CODE	M.P.P.P.			M.P.S.P.			GRAND TOTAL
		BAYAN BARU	OTHERS	SUB-TOTAL	PRAI	MAK MANDIN	SUB-TOTAL	
FOOD, BEVERAGE AND TOBACCO	6	2	4	6	19	15	34	40
TEXTILES & WEARING APPAREL	7	8	7	15	8	9	17	32
LEATHER & FOOTWEAR	8	0	1	1	0	1	1	2
WOOD & FURNITURE	9	0	1	1	2	3	5	6
PAPER, PRINTING & PUBLISHING	10	1	2	3	3	10	13	16
CHEMICAL & OTHER CHEMICAL PRODUCE	11	0	0	0	3	15	18	18
RUBBER & PLASTICS	12	9	1	10	14	5	19	29
OTHER NON-METALLIC PRODUCTS	13	3	1	4	2	3	5	9
IRON & STEEL	14	0	1	1	1	5	6	7
NON-FERROUS METAL	15	2	0	2	0	3	3	5
FABRICATED METAL PRODUCTS	16	3	1	4	4	4	8	12
MACHINERY	17	2	0	2	3	1	4	6
ELECTRICAL	18	24	0	24	1	7	8	32
TRANSPORT EQUIPMENT	19	0	1	1	4	3	7	8
OTHERS	20	5	8	13	11	16	27	40
CONSTRUCTION	21	0	0	0	1	2	3	3
TOTAL		59	28	87	77	101	178	265

4.5 Industorial Waste Management Flow

The general and basic flow chart of industrial was waste predetermine prior to commencement of survey. Please refer to Fig. 4.5-1

Fig. 4.5-1 explains the 2 types of wastes generated ie. the useful or reusable materials and/or waste to be treated and disposed.

Unwanted waste may be self managed by the company or the private contractor may be employed to remove the waste from the factory. Either way, the waste are further sent for treatment before being disposed to the specified disposal site or stored at their own disposal yard.

Although wastes are generally treated before being finally disposed, some types of waste discharged by these factories are directly dumped at the disposal sites. Thus, the treatment phase has two branches of flow ie.

(i) Treatment of waste before being finally disposed or

(ii) Directly discharging and disposing the waste to the disposal site or storage yard.

In the treatment phase, however, sometimes useful recyclable materials are obtained as by-products. These useful materials are collected and sold to potential buyer or sometimes, reused by the factory again.

The various types of wastes that may be generated was divided into 20 categories. This is shown in Table. 4.5-1

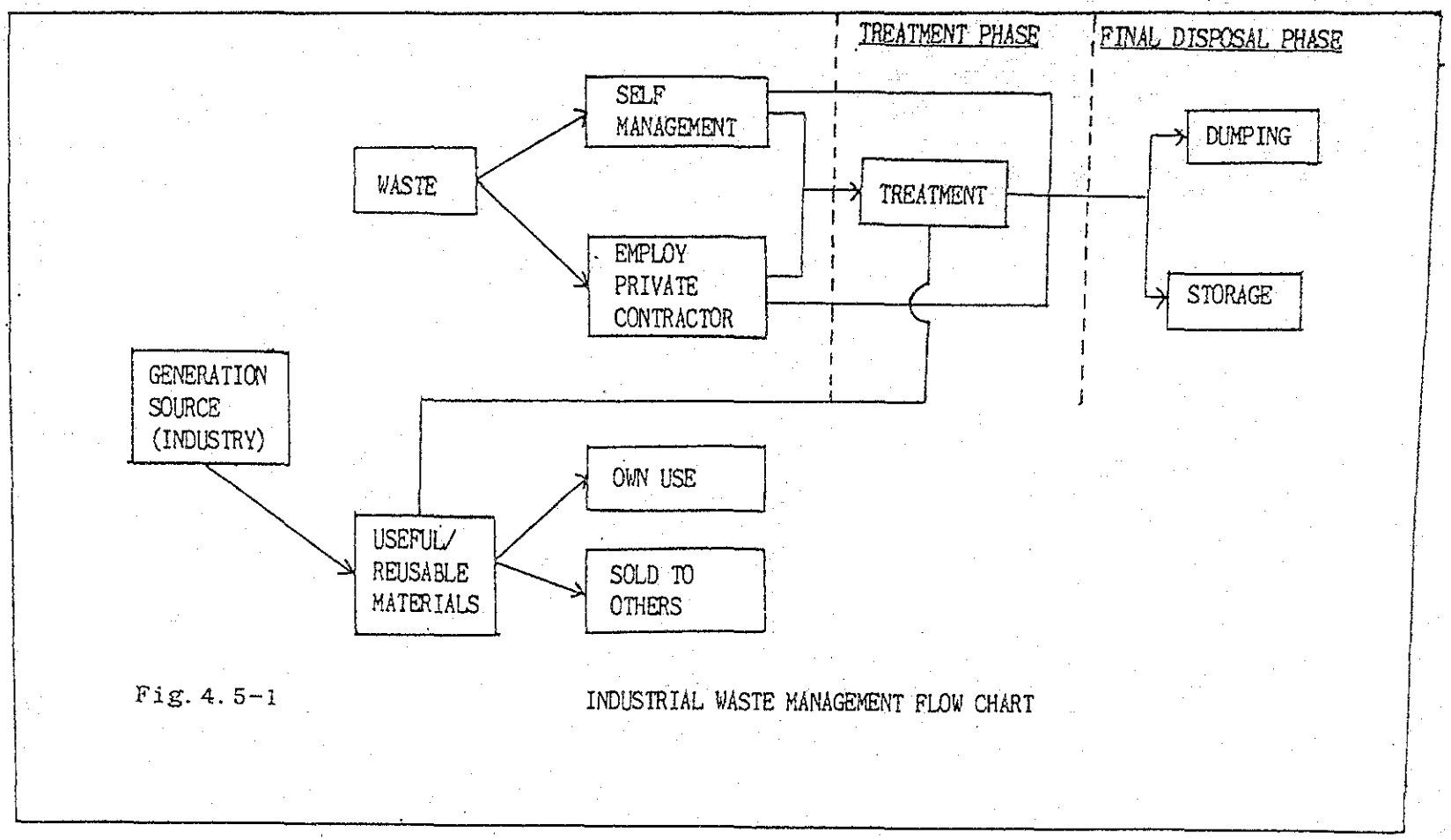


Fig. 4.5-1 INDUSTRIAL WASTE MANAGEMENT FLOW CHART

Table. 4. 5-1 Types of wastes classified for the survey

No.	Type of Waste
1.	Ash, Combustion Residue
2.	Sludge
3.	Waste Oil
4.	Waste Acid
5.	Waste Alkali
6.	Waste Plastics
7.	Waste Paper
8.	Waste Wood
9.	Waste Textile and Rag
10.	Animal Waste
11.	Vegetable Waste
12.	Rubber Scrap
13.	Metal Scrap
14.	Waste Glass and Ceramic
15.	Slag
16.	Construction and Demolition Waste
17.	Animal Manure
18.	Carcasses
19.	Dust
20.	Others (Specify)

4.6 Schedule and Duration of Survey

10 interviewers were involved in the distribution of survey questionnaires. The survey was carried out in several stages to optimise cooperation and ease to the factories. There were two visits to each factory; the initial visit being a courtesy visit and to obtain basic background and contents of the questionnaires were also explained and delivered to the factory representative. The second visit to the factories were done one week after delivery and questionnaires were collected back for further analysis.

The total duration of the survey was about 2 weeks, beginning from 11th. July and ended on 26th. July 1988.

4.7 Results on Factory Survey

(1) General Industrial Waste.

In the execution of the survey, a number of factories selected in MPPP are found in Bayan Baru, namely in the Free Trade Zone and non-Free Trade Zone. A few other factories (having more than 30 workers) which are located elsewhere in MPPP are also selected. Whilst in MPSP, most of the factories are found in the Mak Mandin and Prai Industrial Area. Altogether, there were 265 factories surveyed and from this figure, 218 factories responded to the questionnaire. From the 218 questionnaires received, 168 respondents have given very clear and complete answers and used for further analysis.

Table 4.7-1 gives the number of questionnaires received and the factories selected for further analysis on industrial waste. All results of the factory survey are based on the selected 168 respondents.

Table.4.7-1 Respondents to Factory Interview Survey

Industrial Area	No of Factories Surveyed (A)	No of Questionnaire Received (B)	B/A (%)	Factories Selected for analysis (C)	C/A (%)
Bayan Baru (FTZ)	59	47	79.66	36	61.02
Others (MPPP)	28	25	89.29	22	78.57
Prai	101	76	75.25	62	61.39
Mak Mandin	77	70	90.91	48	62.34
Total	265	218	82.26	168	63.40

Table 4.7-2 gives the quantity (tons/days) of waste generated by the factories in MPPP and MPSP.

From the data obtained, it is seen that factories in Bayan Baru discharged a total of 8.94 tons per day, while factories located elsewhere in MPPP generate 6.57 tons per day. Mak Mandin and Prai Industrial area each generate 29.27 tons per day and 50.97 tons per day respectively. This gives a total of 95.75 tons per day generated by the factories.

Table 4.7-2 Quantity of Industrial Waste Generated (tons/day)

Industrial Area	Total Amount of Industrial Waste (a) tons/day	Amount of Reusable Mat. (b) tons/day	Amount of Treatment (c) tons/day	Amount of Disposal (d) tons/day
MPP Bayan Baru	8.94	3.07	0.48	5.33
MPP Others (A)	6.57	2.17	1.18	3.21
Subtot	15.51	5.24	1.66	8.54
MPSP Mak Mandin	29.27	4.44	3.48	21.35
MPSP Prai (B)	50.97	23.59	4.77	21.70
Subtot	80.24	28.03	8.25	43.05
Total (A+B)	95.75	33.27	9.91	51.59

Details and breakdown on the types of industrial waste generated and its amount in Penang State are shown in Table 4.7-3

Table 4.7-3 The total amount of waste generated by all factories by type of waste

Type of Industrialised Waste	Generated Amt. (tons/day) MPPP	MPSP	Total
Ash Comb.	0.00	2.98	2.98
Sludge	1.10	0.26	1.36
Waste Oil	0.18	0.22	0.39
Waste Acid	0.31	0.73	1.03
Waste Alkali	0.20	0.23	0.43
Waste Plastic	1.66	3.55	5.22
Waste Paper	1.84	7.71	9.55
Waste Wood	0.85	17.71	18.56
Waste Textile	3.06	0.70	3.76
Animal Waste	0.00	-	0.00
Vet. Waste	0.00	0.88	0.88
Rubber Scrap	1.08	0.06	1.15
Metal Scrap	2.39	2.09	4.48
Waste Glass	0.04	5.83	5.87
Slag	0.00	0.23	0.23
Const. & Dem.	0.43	0.08	0.51
Animal Manure	0.00	-	0.00
Carcasses	0.00	-	0.00
Dust	0.53	8.38	8.91
Others	1.84	28.61	30.45
Total	15.51	80.24	95.75

Based on the amount disposed in the previous table, the factory wastes was further analysed. The various types of industrial waste, quantity and amount disposed at the MPPP dumpsite is as shown in Table 4.7-4

The survey has shown that 8.51 tons of industrial waste are to be disposed by the factories in MPPP daily. From this quantity 4.70 tons per day are finally discharged at the municipality dumpsite in Jelutong. This represents 55.3% from the total amount of waste to be disposed by factories in MPPP.

Table 4.7-4 Quantities and Percentage of Industrial Waste Disposed at MPPP Disposal Site

	(A)	(B)	
Type of Industrial Waste Disposal	Amount of Waste for Disposal	Amount of Waste Disposed at Municipality Site	Percentage B/A
Ash Comb.	-	-	-
Sluge	0.172	0.155	90.29
Waste Oil	0.103	0.000	0.00
Waste Acid	0.267	0.000	0.00
Waste Alkali	0.200	0.000	0.00
Waste Plasti	0.477	0.140	29.41
Waste Paper	0.503	0.169	33.57
Waste Wood	0.336	0.335	99.80
Waste Textil	2.668	0.305	11.43
Animal Waste	0.001	0.001	100.00
Vet. Waste	-	-	-
Rubber Scrap	1.000	1.000	100.00
Metal Scrap	0.425	0.407	95.69
Waste Glass	0.033	0.033	100.00
Slag	-	-	-
Const. & Dem	0.433	0.433	100.00
Animal Manur	-	-	-
Carcasses	-	-	-
Dust	0.533	0.533	100.00
Others	1.357	1.190	87.71
Total	8.54	4.70	55.04

The various types of industrial waste, quantity and amount disposed at the MPSP dumpsite is as shown in Table 4.7-5

Similarly, the total amount of waste to be disposed by the factories in MPSP is 43.04 tons per day. An amount of 42.09 tons daily from the total waste to be disposed, are finally discharged to MPSP disposal sites. This is approximately 97.78% of the total waste to be disposed by the factories found in MPSP.

Table 4.7-5 Amount and Percentage of Industrial Waste Disposed to tbe MPSP Disposal Site

	(A)	(B)	
Type of Industrial Waste Disposal	Amount of Waste for Disposal	Amount of Waste Disposed a Municipali	Percentage B/A
Ash Comb.	1.857	1.857	100
Sluge	0.073	0.071	97.47
Waste Oil	0.001	0.001	100
Waste Acid	0.725	0.667	91.95
Waste Alkali	0.062	0.003	5.41
Waste Plasti	2.912	2.840	97.53
Waste Paper	3.342	2.982	89.23
Waste Wood	7.839	7.823	99.79
Waste Textil	0.689	0.665	86.52
Animal Waste	-	-	-
Vet. Waste	0.880	0.880	100
Rubber Scrap	0.045	0.028	62.6
Metal Scrap	0.571	0.238	41.62
Waste Glass	-	-	-
Slag	-	-	-
Const. & Dem	0.008	0.008	100
Animal Manur	-	-	-
Carcasses	-	-	-
Dust	0.711	0.711	100
Others	23.327	23.317	99.96
Total	43.05	42.09	97.77

The three major types of factory waste in MPPP and MPSP, discharged at the respective disposal sites are as shown in Table 4.7-6

Table 4.7-6 Major Types of Waste Discharge at the Municipal Disposal Site.

	Material Waste		
	Major types of waste disposed to dumpsite	Quantity (ton/day)	Percentage from total waste disposed at Municipal disposal site
MPPP	Other waste	1.190	25.3%
	Rubber scrap	1.00	21.3%
	Dust	0.533	11.3%
MPSP	Other waste	23.317	55.4%
	Waste wood	7.823	16.6%
	Waste paper	3.342	7.9%

(2) Toxic and Hazardous Waste

From the survey conducted, a total of 16 factories were producing various kinds of toxic and hazardous wastes. Although no toxic and hazardous waste classifications were accompanied in the questionnaire, these wastes were voluntarily identified by the respective factories. The amount, method of treatment and disposal of these wastes were also shown by the factories.

Details on the factories that produces toxic and hazardous waste, its quantity, method of treatment and disposal are shown in Table 4.7-7

Table. 4. 7-7

Factories that produce Toxic and Hazardous waste in MPPP and MPSP

FACTORY NAME	ZONE NAME	NATURE OF BUSINESS	TYPE OF WASTE	AMOUNT OF WASTE (UNIT/MONTH)	AMOUNT OF REUSABLE MATERIALS (UNIT/MONTH)		SOLD PRICE (M$/UNIT	AMOUNT OF SELF-TREATMENT				AMT OF DISPOSAL (UNIT/MONTH)	AMT OF STORAGE (UNIT/MONTH)	CONTRACTOR		
					SELF	SOLD		INCINERATION	CRUSH & COMPOUND	DEHYDRATION	OTHERS			HAULAGE	TREATMENT	DISPSAL
HEWLETT-PACKARD	BAYAN BARU	ELECTRICAL	METAL SLUDGE	0.8 TON									0.8T (35)			
HEWLETT-PACKARD	BAYAN BARU	ELECTRICAL	SOLVENT	0.2 TON										1	1	
INTEGRATED DEVICE TECHNOLOGY(M) SDN BHD	BAYAN BARU	ELECTRICAL	M-PYROL	0.05TON							0.05TON					
PENTLEY SDN BHD	BAYAN BARU	TEXTILE & WEARING APPARELS	SLUDGE	1.7 TON									1.7TON (5-6)			
PANGKAT REFRIGERATION INDUSTRIES SDN BHD	BAYAN BARU	ELECTRICAL	POLYURETHENE TOXIC	0.05TON							0.05TON		0.05TON			
HITACHI SEMICONDUCTOR(M) SDN BHD	BAYAN BARU	ELECTRICAL	WASTE ACID	1.2TON							1.2 TON					
CONTROL DATA COMPONENT(M) SDN BHD	BAYAN BARU	ELECTRICAL	SOLVENT WASTE													

FACTORY NAME	ZONE NAME	NATURE OF BUSINESS	TYPE OF WASTE	AMOUNT OF WASTE (UNIT/ MONTH)	AMOUNT OF REUSABLE MATERIALS (UNIT/MONTH)		SOLD PRICE (M$/ UNIT	AMOUNT OF SELF-TREATMENT				AMT OF DISPO-SAL (UNIT/ MONTH)	AMT OF STORA-GE (UNIT/ MONTH)	CONTRACTOR		
					SELF	SOLD		INCINE-RATION	CRUSH & COMPOUND	DEHYDR-ATION	OTHERS			HAUL-AGE	TREAT-MENT	DISP-SAL
ARMSTRONG CYCLE PARTS SDN BHD	PRAI	TRANSPORT EQUIP.	WASTE ACID	65,000LITER								65,000 LITER				
ARMSTRONG CYCLE PARTS SDN BHD	PRAI	TRANSPORT EQUIP.	WASTE ALKALI	65,000LITER								65,000 LITER				
BORDEN CHEMICAL (M) SDN BHD	PRAI	CHEM.& OTHER CHEMICAL PRODUCTS	WASTE WATER	35 TON	35 TON											
PENFABRIC SDN BHD	PRAI	TEXTILE & WEARING APPARELS	WASTE WATER	5 TON.									5 TON			
SUZUKI ASSEMBLERS SDN BHD	PRAI	TRANSPORT EQUIP.	SLUDGE													
FEDERAL ALUMINIUM SDN BHD	PRAI	NON-FERROUS METALS	OTHERS	2 TON							2 TON		2 TON (120T)			
FEDERAL ALUMINIUM SDN BHD	PRAI	NON-FERROUS METALS	WASTE ACID	2 TON							2 TON					
FEDERAL ALIMINIUM SDN BHD	PRAI	NON-FERROUS METALS	OTHERS	5 TON							5 TON					
SITT TATT CO SDN BHD	MAK MANDIN	OTHERS	CARBITE	8 TON								8 TON			1	1

(3) Treatment Facilities

The survey has identified 35 factories that have some kind of waste treatment facilities.

Table 4.7-8 shows the various factories having the treatment facilities, as well as its functions, model, manufacturer, capacity and type of wastes it may treat.

Table. 4. 7-8 Factories Having Waste Treatment Facilities and Its Specifications

FACTORY NAME	ZONE NAME	NATURE OF BUSINESS	FUNCTION OF FACILITY	OTHER	MANUFACTURER NAME	CAPACITY/ ABILITY	TYPES OF WASTE THAT MAY BE TREATED
HEWLETT PACKARD	BAYAN BARU	ELECTRICAL	PLAYING WASTE TREATMENT	LOCAL	ENERSAVE	300 G.P.M	PLATING WASTE
INTERGRATED DEVICE TECHNOLOGY	BAYAN BARU	ELECTRICAL	PH CONTROL NEUTRALISATION		CHEMITREAT	60 G.P.M	ACIDIC/ALKALINE
INTERGRATED DEVICE TECHNOLOGY	BAYAN BARU	ELECTRICAL	HEAVY METAL PRECIPITATION		CHEMITREAT		TIN/LEAD FROM PLATING LINES
MALAYSIA CIRCUIT INDUSTRIES	BAYAN BARU	ELECTRICAL	NEUTRALIZATION, SEDIMENTATION		JAPAN	ABOUT 25M/HR	WASTE ACID & ALKALI
PENTLEY SDN. BHD.	BAYAN BARU	TEXTILE & WEARING APPAREL	TO TREAT TEXTILE INDUSTRIAL WASTE	ACTUATED SLUDGED METHOD	TORAY, JAPAN	MAX. 60M/HR	TEXTILE INDUSTRIAL WASTE
ADVANCE MICRO DEVICE (M)	BAYAN BARU	ELECTRICAL	NEUTRALIZATION AND HEAVY METAL REMOVAL	-	ANALAB SDN. BHD. (KL)	150 IGPM	-
SYARIKAT EMICO (PG) SDN. BHD.	BAYAN BARU	FABRICATED METAL PRODUCTS	CRUSHER	LOCAL	-	-	PLASTIC MATERIALS
HITACHI SEMICONDUCTOR (M) SDN. BHD.	BAYAN BARU	ELECTRICAL	PH Pb BOD Zn COD	-	HITACHI PLANT SINGAPORE	15M/HR	ACID-ALKALINE
CONTROL DATA COMPONENT (M) SDN. BHD.	BAYAN BARU	ELECTRICAL	PH ADJUSTMENTS	-	DARCHET	50 GPM	ACID-ALKALINE
SIEMENS LEKTRONIK	BAYAN BARU	ELECTRICAL	NEUTRALIZATION PLANT	-	ENERSAVE SYSTEM	10 GPM	ACID-ALKALINE
SIEMENS LEKTRONIK	BAYAN BARU	ELECTRICAL	HEAVY METAL TREATMENT PLANT	-	ENERSAVE SYSTEM	10 GPM	HEAVY METAL
EASTERN KNITTERS MFG. CO. SDN. BHD.	BAYAN BARU	TEXTILE & WEARING APPAREL	WASTE WATER TREATMENT	-	ENERSAVE ENGINEERING SDN. BHD.	2,000 M/DAY	DYE WASTE WATER
TANAKO SDN. BHD.	OTHERS(MPPP)	TEXTILE & WEARING APPAREL	WATER TREATMENT & FILTRATION SYSTEM	-	-	2,265 CU. F.T	EFFLUENT FROM LAUNDRY
INTERNATIONAL FOOTWEAR (PG) SDN. BHD.	OTHERS(MPPP)	LEATHER & FOOTWEAR	RECYCLE RUBBER WASTE	2 ROLLS OPEN MILLS (4 UNITS)	HONG KONG MANUFACTURER (OLD MACHINE)	8 BATCH OF RUBBER(50KG) PER. HOUR	RUBBER WASTE
LEE RUBBER CO.	OTHERS(MPPP)	RUBBER & PLASTICS	WATER TREATMENT	AEROTOR	POLLUTION TREATMENT & CONSTRUCTION (P.J)	-	WATER
TANJUNG ICEWORK SDN. BHD.	OTHERS(MPPP)	OTHERS	CESSPIT (ABSORB THE OIL INTO THE GROUND)	BLACK-STONE	BRITISH COMPANY MACALISTER CO.	-	WATER OIL

FACTORY NAME	ZONE NAME	NATURE OF BUSINESS	FUNCTION OF FACILITY	MODEL	MANUFACTURER NAME	CAPACITY/ ABILITY	TYPES OF WASTE THAT MAY BE TREATED
SITT TATT CO. SDN. BHD.	MAK MANDIN	OTHERS	HYDRAULIC SET	-	-	1 TON/ 8 HOURS	DRY CARBITE
KAH MOTOR CO. SDN. BHD.	MAK MANDIN	TRANSPORT EQUIPMENT	WASTE WATER TREATMENT		CHEMISTRATE	-	HEAVY METAL, OILS AND GREASE, COD & BOD
NGK SPARK PLUGS (M) BHD.	MAK MANDIN	TRANSPORT EQUIPMENT	WASTE WATER TREATMENT PLANT SYSTEM	-	-	-	-
MARAI INDUSTRIES SDN. BHD.	MAK MANDIN	RUBBER & PLASTICS	CRUSH	LSM 6	JAPAN	AC 200V	WASTE RUBBER
SANOZ PRODUCT (M) SDN. BHD.	MAK MANDIN	CHEMICAL & OTHER CHEMICAL PRODUCTS	INCINERATOR	MAXITHERM	JBAE	5 TONS/DAY	WOOD, DUST
SOUTH ISLAND PACKAGING (PG) SDN. BHD.	PRAI	PAPER, PRINTING PUBLISHING	WASTE PAPER PACKING MACHINE	-	TECHNICAL ENGINEERING	150 KG/PACK	WASTE PAPER
ARMSTRONG CYCLE PARTS SDN. BHD.	PRAI	TRANSPORT EQUIPMENT	BATCH TREATMENT	-	EBARA UDYLITE	1.5M/ REACTION	CYANIDE BEARING WASTE WATER
ARMSTRONG CYCLE PARTS SDN. BHD.	PRAI	TRANSPORT EQUIPMENT	BATCH TREATMENT	-	CONTROL PANEL	20M/ REACTION	ACID-ALKALINE BEARING WASTE WATER
ARMSTRONG CYCLE PARTS SDN. BHD.	PRAI	TRANSPORT EQUIPMENT	BATCH TREATMENT	-	-	1.5M/ REACTION	CHROME BEARING WASTE WATER
YEO HIAP SENG BBHD.	PRAI	FOOD, BEVERAGE & TOBACCO	COMPACT TRUCK	-	DOUGLAS ENGINEERING SDN. BHD.	-	-
FEDERAL FERTILIZER CO. BHD.	PRAI	CHEMICAL & CHEMICAL PROD.	DUST EXTRACTION	DUST CYCLONE	SELF MADE	15 Hp	PHOSPHATE DUST
BORDEN CHEMICAL (M) SDN. BHD.	PRAI	CHEMICAL & CHEMICAL PROD.	TREATING WASTE WATER	-	-	50-100 LITER/ MINUTE	PHENOL
MALAYAN ELECTRO CHEMICAL IND. CO	PRAI	CHEMICAL & CHEMICAL PROD.	TO TRAP FINE PVC RESIN	-	-	-	FINE PVC RESIN
PENFIBRE SDN. BHD.	PRAI	TEXTILES & WEARING APP.	INCINERATOR	1-300	IWATANI CO. LTD. JAPAN	1.74 T/D	ETHYLENE GLYCOL (EG) RESIDUES, WASTE WOOD, WASTE PAPER, LUBRICATION OIL
PENFABRIC SDN. BHD.	PRAI	TEXTILES & WEARING APP.	WASTE WATER TREATMENT PLANT	-	KURABO	13,700M/ DAY	WASTE WATER FROM TEXTILE FINISHING PLANT

FACTORY NAME	ZONE NAME	NATURE OF BUSINESS	FUNCTION OF FACILITY	MODEL	MANUFACTURER NAME	CAPACITY/ ABILITY	TYPES OF WASTE THAT MAY BE TREATED
PENFABRIC SDN. BHD.	PRAI	TEXTILES & WEARING APP.	WASTE WATER TREATMENT PLANT		KIKABO	13,700M/ DAY	WASTE WATER FROM TEXTILE FINISHING PLANT
FEDERAL ALUMINIUM SDN. BHD.	PRAI	NON-FERROUS METAL	WASTE WATER TREATMENT CAUSTIC SODA REGENERATION SYSTEM	IN-HOUSE	FEDERAL ALUMINIUM	36M/hr	ACID-ALKALINE WASTE WATER
YEW LEAN FOUNDRY & CO. SDN. BHD.	PRAI	IRON & STEEL	CRUSHING & SCREENING	SAND RECLA-MATION UNIT	LOCAL MADE	50 t/mth	USED SAND
TEXCHEM (M) SDN. BHD.	PRAI	CHEMICAL & CHEM. PRODUCT	SEDIMENTATION TANK	-	-	-	GREASE, SILT, ACID

(4) Disposal Facilities

The survey has also identified 13 factories with some kind of disposal facilities.

Table 4.7-9 shows the list of factories with disposal facilities, location of disposal facility, area and its capacity.

Table. 4. 7-9
Factories with Disposal Facilities in MPPP and MPSP

Factory Name	Zone Name	Nature of Business	Location	Area (m^2)	Capacity
MARBLE TERAZZO SDN. BHD.	MAK MANDIN	OTHER NON-METALLIC PRODUCTS	AT COMPANY'S SITE	-	-
KNITWEAR FASHION (M) SDN. BHD	MAK MANDIN	TEXTILES & WEARING APPAREL	AT THE BACK OF KNITWEAR (M) SDN. BHD	144 m	-
WODDARD TEXTILE MILLS	BAYAN BARU	TEXTILE & WEARING APPAREL	FACTORY SITE	10.8 m	-
HUP SENG JEWELLERY SDN. BHD.	BAYAN BARU	NON-FERROUS METALS	FACTORY SITE	23.8 m	116 m
PENTLEY SDN. BHD.	BAYAN BARU	TEXTILES & WEARING	FACTORY SITE	196 m	235 m
PRODELCON SDN. BHD.	BAYAN BARU	OTHER NON-METALLIC	FACTORY SITE	15 m	30 m

Factory Name	Zone Name	Nature of Business	Location	Area (m)	Capacity
LOYTAPE INDUSTRIES SDN. BHD.	PRAI	CHEMICAL & OTHER CHEMICAL PRODUCTS	AT THE BACK OF FACTORY	37.2 m^2	-
SEA MASTER TRADING CO. SDN. BHD.	PRAI	FOOD, BEVERAGE & TOBACCO	AT THE BACK OF FACTORY	144 m^2	-
EWEIN WINERY (M) SDN. BHD.	PRAI	FOOD, BEVERAGE & TOBACCO	AT THE BACK OF FACTORY	37.2 m^2	-
TEXCHEM (M) SDN. BHD.	PRAI	CHEMICAL & OTHER CHEMICAL PRODUCTS	FACTORY COMPOUND	-	-
PENFIBRE SDN. BHD.	PRAI	TEXTILES & WEARING APPAREL	INCINERATION AREA	-	3.0 m^3
SUZUKI ASSEMBLERS (M) SDN. BHD.	PRAI	TRANSPORT EQUIPMENT	AT THE BACK OF FACTORY	-	-
RHEEM (M) BHD.	PRAI	IRON & STEEL	FACTORY	10 m^2	15 m^3

(5) Management of Industrial Waste

From the total of 218 questionnaires received from factories, 70 have sections or personnels in charge of the industrial waste produced.

Table 4.7-10 lists the number of factories having waste management sections or personnels according to their locality.

Table 4.7-10 Factories with Waste Management Sections or Personnels by Locality

Industrial Area		Number of Received Factory Questionnaires	Number of Factories Having Section or Personnel in charge of Waste	Percentage (B)/(A)
MPPP	Bayan Baru	47	21	44.7
	Others	25	4	16.0
	Subtotal	72	25	34.7
MPSP	Mak Mandin	76	18	23.7
	Prai	70	27	38.6
	Subtotal	146	45	30.8
Total		218	70	32.1

A total of 67 factories have verified their waste managemment costs incurred per month. The waste management costs listed in Table 4.7-11 is an average of these 67 factories only.

Table 4.7-11 Average Waste Management Costs of Factories by Area.

Industrial Area		Ave. Management Cost of Waste (M$/month) (B)
MPP	Bayan Baru	2,965
	Others	2,793
	Sub. Average	2,879
MPSP	Mak Mandin	1,048
	Prai	5,162
	Sub. Average	3,105
Average		2,992

Questionnaire to Factory

QUESTIONNAIRE TO FACTORY

NO _____

Date : _____

Interviewer : _____

Interviewee : _____

Name : _____

Section : _____

Position : _____

1 Background of the Company

1 Name of Company : _____

2 Address : _____

3 Year of establishment : _____

4 Number of Employees :

i) Management : _____

ii) Production : _____

5 Capital :

i) Authorised Capital : M$ _____

ii) Paid-Up Capital : M$ _____

6 Nature of Business : _____

7 Main Products : _____

8 Turnover/Year : M$ _____

2 Generation of Waste

Please select the type of waste generated in your factory from the list and denote by using its Nos. Then fill in the information of each type of waste.

1) General Industrial Waste

Type of Waste	Gross Amount of Waste (t/month)	Amount of Reusable materials (t/month)		Data on Reusable Materials	
		Self or own use	Sold to others	Name of Buyer	Price (M$/unit)
Total					

No. Type of Waste

1. Ash, Combustion Residue
2. Sludge
3. Waste Oil
4. Waste Acid
5. Waste Alkali
6. Waste Plastics
7. Waste Paper
8. Waste Wood
9. Waste Textile and Rag
10. Animal Waste
11. Vegetable Waste
12. Rubber Scrap
13. Metal Scrap
14. Waste Glass and Ceramic
15. Slag
16. Construction and Demolition Waste
17. Animal Manure
18. Carcasses
19. Dust
20. Others (Specify)

2) Hazardous and Toxic Waste

Do you discharge Hazardous or Toxic Waste? _____

1 YES 2 NO

If "YES", please state details about Hazardous and toxic waste generated in your factory into Table below. Please tick the appropriate method of management of hazardous or toxic waste.

Type of Hazardous or toxic waste	Amount of waste(t/mth)	Method of Management of Hazardous or toxic waste					Total Amount of these waste stored on site(ton)
		Storage on Factory site	Storage in other site owned by factory	Disposal at own site	Treatment	Others	

If you have any problems on Hazardous and Toxic Waste Disposal, please kindly explain.

3 Treatment, Disposal and Storage of General Industrial Waste

1) Self Treatment, Disposal and Storage by Company

Please select the type of waste treated, disposed or stored in your factory from the list and denote by using the No. and fill in the information of each waste. If some types of waste are disposed by factory itself, please mention the place of disposal by denoting the No. and Type of Waste.

Type of Waste	Amount of waste (t/month)					
	Treatment				Disposal Amt. Place	Storage
	Incineration	Crushed & Compacted	Dehydrat-ion	Others specify		
Total						

No. Type of Waste

1. Ash, Combustion Residue
2. Sludge
3. Waste Oil
4. Waste Acid
5. Waste Alkali
6. Waste Plastics
7. Waste Paper
8. Waste Wood
9. Waste Textile and Rag
10. Animal Waste
11. Vegetable Waste
12. Rubber Scrap
13. Metal Scrap
14. Waste Glass and Ceramic
15. Slag
16. Construction and Demolition Waste
17. Animal Manure
18. Carcasses
19. Dust
20. Others (Specify)

Place of Disposal

1. Disposal Site of Municipality
2. Factory owned Disposal Site
3. Disposal site within factory compound/area
4. Others (specify)

2) Facility for Waste Treatment

Do you have any facility for waste treatment? If "YES", please state its functions and specify type and capacity or ability of the facility.

Functions of the facility	Model	Manufacture Name	Capacity /Ability	Types of waste that may be treated

3) Facility for Waste disposal

Do you have any facility for waste disposal? If "YES", please state its Name, Location, Area and Capacity of the facility.

Name of Disposal Site	Location	Area (m2)	Capacity (m3)

4) Treatment and Disposal by Contractor

Please select the type of waste treated or disposed by your nominated contractor from list by denoting the No. Then fill in the information of each Type of waste.
Please tick the type of work carried out by your ontractor under the scope of contractors work.

Type of Waste	Amount of Waste (t/month)	Scope of Contractors Works			Name of Contractor
		Haulage	Treatment	Disposal (Place)	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
Total					

Please select and denote the Place of Disposal number into the parenthesis.

1 Disposal Site of Municipality
2 Factory owned Disposal site
3 Disposal site within factory compound/area
4 Others (specify)

4 Management of Waste

1) Do you have a section or personnels in charge of this waste generated by your company?
   1 YES (Go to Q.2) & Q.3)
   2 NO

2) What section is responsible for waste management? (name of section). Then, please answer the following questions.
   1 Who is the section head and designation
   2 Number personnel in this section.

3) How much does the company spend in total for management of waste?
   (eg. Contract Cost + Self Treatment Cost + Total Expenditure on Waste Management Staff)