THE E-WASTE INVENTORY PROJECT IN MALAYSIA

Prepared By:

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For & on behalf of:

Department of Environment, Malaysia

EX-Corporation, Japan

Funded by:

Ministry of Environment, Japan

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EXECUTIVE SUMMARY

Introduction

The purpose of this survey is to obtain an indication of the volume of e-waste generation in Malaysia and the ways in which waste electrical and electronic equipment (WEEE) are managed in Malaysia. This survey is focused on seven (7) selected types of electrical and electronic equipments (EEE) only i.e. television sets, personal computers, mobile phones, refrigerators, air conditioners, washing machines and rechargeable batteries. The survey is also intended as a basis for the relevant government agencies to formulate further solutions for the environmentally sound management of used and end-of-life EEE.

The survey is a project funded by the Ministry of Environment Japan and administered via EX Corporation Japan who also designed the project methodology. The survey was managed by the Department of Environment Malaysia (DOE) and executed by Perunding Good Earth Sdn Bhd who was responsible for the data collection, data analysis and reporting of the results.

A total of 1200 respondents from various segments of the society i.e. household, business entities and institutions, WEEE recyclers and EEE manufacturers as well as exporters and importers were required for this survey. The respondents were sourced from 11 main cities which were selected based on the population density and socioeconomic level. Questionnaires were designed for various respondent groups for data collection purposes. Data was captured and analyzed in Excel worksheets.

Results

A total of 945 questionnaires were answered and returned. The number of questionnaires returned for the household and business entities/institutions group met

the target numbers set for both groups however, the returns from the recycler and manufacturer group did not meet the target numbers and in fact were substantially lower. The Klang Valley area produced the highest number of returned questionnaire for household and business entities and institutions groups.

Generally, the household ownership of the EEE was seen to cut across all income segments. However the number of multiple units owned was higher in the high income segment with the exception of mobile phones. The duration of EEE ownership was also shorter in the high income segment as they could afford to replace their EEE at a faster rate. Business ownership of EEE increases with the size of the business but not for all the EEE types for e.g. refrigerators and washing machines which are not necessary equipment for most business operations.

Based on the projection for the total amount of discarded used EEE, the amount of e-waste will be increasing by an average of 14% annually and by the year 2020, a total of 1.17 billion units or 21.38 million tons of e-waste will be generated. Televisions sets and mobile phones are the largest contributors of WEEE in terms of volume of units.

For each unit of WEEE, around 35.45% - 77.85% of reusable and recyclable materials can be obtained from the repair or reassembling processes, 50% - 92.65% can be obtained from the dismantling process while 70.3% to 99.92% from the recovery process. Non-hazardous residues generated from the repair or reassembling process, dismantling process and recovery process are disposed to municipal landfills or other means while hazardous residues are disposed to DOE-licensed scheduled waste contractors. The recovered materials are sold as raw materials for re-processing into new components.

Discussion

Factors were identified that may contribute to the increase of e-waste generation. Those factors are increasing purchasing power, affordability and the rapid technological innovations in EEE which cause the EEE to become obsolete faster than ever.

There are a number of stakeholders involved in the WEEE lifecycle who for the most part are involved in the WEEE flow independently of each other. A few of them are controlled by regulatory requirements for example, industrial facilities and DOE-licensed contractors involved in the WEEE transport, recycling dismantling, and recovery process. However, the remaining stakeholders such as household and business consumers, scrap collectors, local councils, EEE manufacturers and exporters and importers are not regulated.

The principle regulation to manage e-waste is the Environmental Quality (Scheduled Waste) Regulation 2005, enforced by the DOE, where specific categories of e-waste are defined and coded. There are 107 DOE-licensed e-waste contractors which are registered to collect and process e-waste, of which eleven are full recovery processors. Full recovery processors are able to extract the metals such as aluminium, gold, silver, and platinum, via chemical process.

The DOE-licensed contractors mostly collect from industrial facilities in a regulated manner. This means that the bulk of WEEE generated by households and business entities/institutions are not collected by the DOE-licensed e-waste contractors even though DOE has the jurisdiction of e-waste generated from the households and commercials. There are however, scrap collectors who are currently taking WEEE but it cannot be ascertained whether they repair or dismantle and recover in Malaysia or elsewhere because information was not forthcoming from the collectors.

The Ministry of Local Government and Housing has the jurisdiction over households and business entities/institutions and has enacted the Solid Waste Management and Public Cleansing Act 2007. The National Solid Waste Management Department (NSWMD) within this Ministry is planning to release the implementation guidelines which will allow WEEE to be collected and properly treated from households and business entities/institutions. The NSWMD and the DOE are also in discussions on aligning their respective WEEE management strategies to ensure that WEEE will be managed smoothly.

The Royal Malaysian Customs (RMC) enforces transboundary movements of hazardous waste under the Customs Act, 1967, Customs (Prohibition of Import) Order 2008 and Customs (Prohibition of Export) Order 2008.

Small scale Take-Back Programs (TBP) are one of the initiatives taken by several EEE manufacturers to reduce the number of used EEE from being disposed to landfills and also to increase community awareness about the hazards of WEEE and the negative impacts of improper disposal.

Conclusion

In this era of rapidly advancing technologies, EEE has become a necessity for all segments of society ranging from the average person on the street to business entities, institutions and industry. Combined with the increasing population growth and economic projections of continued GDP growth, the volume of WEEE in Malaysia is going to increase in the future and will require a concerted effort to properly manage the flow of WEEE. The management of WEEE must involve all stakeholders to avoid the environmental damage from unregulated processing of WEEE seen in some parts of the world.

1.0 INTRODUCTION

1.1 Project Background

The management of the waste of electrical and electronic equipments (WEEE) is a global environmental problem that has created significant environmental damage in some parts of the world. Given the high value of the recoverable content in WEEE and the high volume of used equipment that are being discarded the recycling and recovery of materials from WEEE has become a business opportunity of increasing significance. The WEEE are frequently moved from the developed countries to the developing countries for processing. In the case of countries such as China, India and Nigeria, there is ample evidence that WEEE has been imported into these countries and processed in an unregulated manner for recycling and recovery purposes.

Given the high toxicity of the component materials in WEEE especially when burned or recycled in an uncontrolled manner, the Basel Convention has therefore identified WEEE as a hazardous substance and has developed a framework for controls on transboundary movements of such wastes.

Malaysia has ratified the Basel Convention and has in accordance, put in place several measures to control the handling and disposal of WEEE which is also referred to as e-waste. However, the rate of e-waste generation in Malaysia is not well understood and an inventory would be helpful in obtaining a perspective to determine further measures that may be necessary to ensure environmentally sound management of e-waste.

1.2 Project Parties

The development of the e-waste inventory in Malaysia was carried out as a part of the Basel Project on Environmentally Sound Management of E-waste in the Asia-Pacific Region and funded by the Ministry of Environment Japan. The fund was administered by EX Corporation (Japan) for the execution of the project.

In Malaysia, the project is managed by the Department of Environment, Malaysia (DOE) with the support of other government agencies such as the Department of Statistics, Customs Department, the Penang Municipal Council and Ministry of Housing and Local Government serving as the members of the Technical Committee. In addition, members from the Ministry of Environment Japan, the Secretariat of the Basel Convention (SBC) and BCRC-SEA are included in the Steering Committee.

The task of developing the e-waste inventory was assigned to Perunding Good Earth Sdn Bhd (PGE) who shall conduct the survey and report the results to the DOE and EX Corporation. EX Corporation provided the technical advice on the project.

1.3 Project Scope

The objective of this project is to gather information, establishing a database required to address the needs and finding solutions for the environmentally sound management strategy of used and end-of-life EEE. This project covers the seven types of EEE as selected by DOE Malaysia and requires 1200 respondents from various socioeconomic levels as well as the wide scale of business entities and institutions group.

1.4 Information Resource

This report resides with the Department of Environment Malaysia. All queries pertaining to the contents of this report may be forwarded to:

Director,
Division of Hazardous Waste
Department of Environment,
Ministry of Natural Resources and the Environment
Level 1-4, Podium 2 and 3
Wisma Sumber Asli
No 25, Persiaran Perdana
Precinct 4, Federal Government Administrative Centre
62574 Putrajaya.

Tel: 03-8871 2000
Fax: 03-8888 6120
Email: ara@doe.gov.my

2.0 PROJECT METHOD

2.1 Overview

This project is a questionnaire-based survey followed up with interviews where the target respondent groups and e-waste categories were predetermined by the project coordinator, EX Corporation. Consultations were made with DOE and EX-Corporation on the survey method and the data analysis method to determine the e-waste flow purchasing pattern, recycling and disposal practices, and to understand the existing measures for e-waste management in Malaysia.

2.2 Study Subject

2.2.1 Target Respondents

There are three (3) main target respondents included in the survey study subject as defined in the project contract. The three (3) main categories are:

- Households
- Offices (business entities and institutions)
- Recyclers (Including importers and exporters, manufacturers, collectors, second-hand shops, repair shops, dismantlers, and processors of recyclable materials from used EEE).

As defined in the project contract, a total of 1200 returned and answered questionnaires need to be collected from the target respondents where the minimum target for each category is:

- 400 household questionnaires
- 400 business entities and institutions questionnaires
- 400 recyclers questionnaires

2.2.2 *Target Electrical and Electronic Equipments*

There are seven types of electrical and electronic equipment (EEE) targeted in this survey to determine the e-waste disposal patterns which are:

- Television sets
- Computer sets with CRT monitors or LCD Monitors and Notebook.
- Washing Machines
- Mobile Phones
- Refrigerators
- Air Conditioners
- Rechargeable batteries (mobile phones)

2.3 Geographic Distribution

The respondents were required to be geographically diverse and to cover the socio-economic spectrum to reflect as closely as possible the potential e-waste generation trend in Malaysia. A total of 11 major urban areas/cities from nine (9) states and one (1) Federal Territory were selected. The basis for the selection of the survey location is based on the population density and also the socioeconomic status of the areas. **Table 1** shows the selected states and cities covered while **Figure 1** shows the geographical location of the selected states and the 11 major cities.

Table 1: States and cities covered in the survey.

No	States	Cities/ Urban Areas
1	Penang	Penang
2	Perak	Ipoh
3	Pahang	Kuantan
4	Selangor	Klang Valley Area - Petaling Jaya, Shah Alam , Klang
5	Federal Territory of Kuala Lumpur	Kuala Lumpur
6	Negeri Sembilan	Seremban
7	Melaka	Melaka City
8	Johor	Johor Bahru
9	Sarawak	Kuching and Miri
10	Sabah	Kota Kinabalu

The target number of returned and answered questionnaires required for the selected cities and state was determined after close consultation with the Department of Environment, Malaysia (DOE). The number was obtained after taking into account the population size of the selected areas, the socioeconomic status and also the urbanization factor.

Table 2 shows the geographical distribution of the target number of questionnaires required for the household category and business entities and institution category according to the selected cities. The recycler group was not specifically distributed in the same manner as it could not be confidently estimated whether a specified number of recyclers could be obtained from these cities.

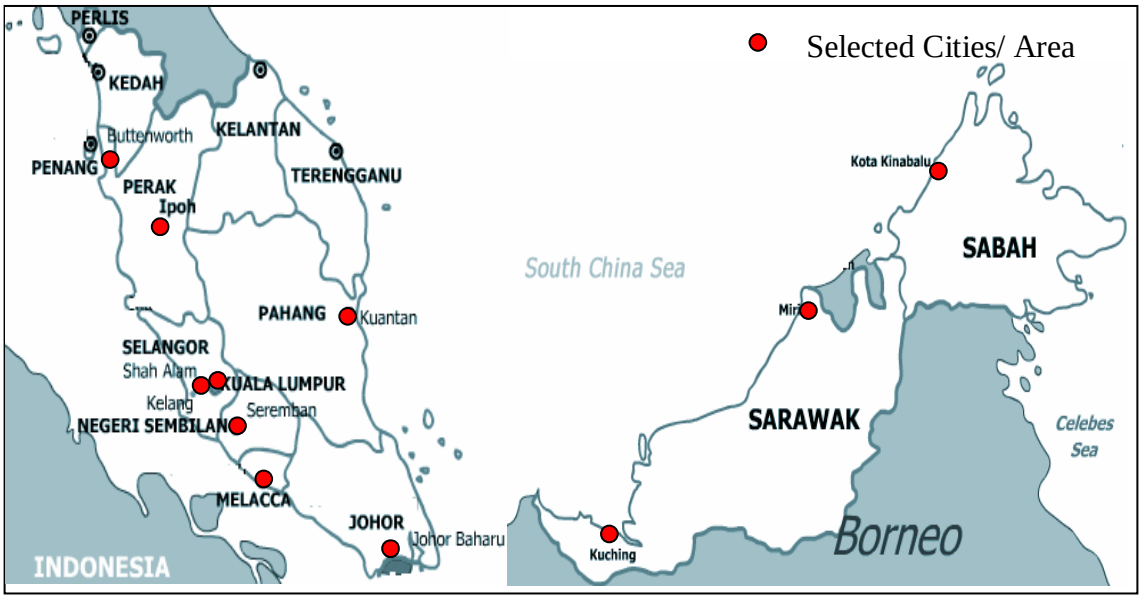


Figure 1: Geographical location of states and cities covered in the survey

Table 2: Number of questionnaires in each city/area targeted for the survey

No	Cities	Households	Business Entities and Institutions
1	Klang Valley	100	120
2	Penang	60	60
3	Johor Bahru	60	60
4	Kuantan	40	40
5	Malacca	40	40
6	Ipoh	20	20
7	Seremban	20	20
8	Kota Kinabalu	30	30
9	Miri	20	20
10	Kuching	30	30
Total		**420**	**440**

2.4 Questionnaires

Five (5) principal types of questionnaire were designed by the Project Coordinator, EX Corporation, for data collection purposes. The questionnaires were designed with different content and format depending on the respondent group. The types of questionnaires are as follows:

- Annex A – Household (*Appendix 1*)
- Annex B – Business Entities and Institutions (*Appendix 2*)
- Annex C – Importers and Exporters (*Appendix 3*)
- Annex D (i-iv) – Collectors, Repair Shops, Second-hand Shops, Dismantlers and Processors (*Appendix 4*)
- Annex E – Manufacturers (*Appendix 5*)

Before the questionnaires were distributed to the respective target groups, a pre-test was conducted to ensure the suitability and the relevance of the questions to this survey. Some questions were removed from the original questionnaires that were deemed to be redundant or that would not be useful in the data analysis. Where it is relevant, additional information was included in the questionnaires to enable the analysis to reflect the socioeconomic status of Malaysia.

For the household questionnaire, a version translated into Bahasa Malaysia was developed for households which would have difficulties in understanding the questions in English.

The recycler's questionnaire was directed at the scrap metal collectors, second hand / repair shops and DOE-licensed e-waste contractors comprising collectors, dismantlers and processor.

2.5 Data Collection Activities

A total of 2645 sets of questionnaires were sent out in the various respondent categories. This was followed up with personal interviews where possible. The interviews proofed to be the main method of obtaining and collecting data from the target respondents. The interview data was recorded in the questionnaire. All data collection methods were applied to all respondent groups.

Besides the data obtained from the target respondents, other sources were also investigated to gather more information and data related to this survey such as economic statistics data, private sector initiatives, DOE waste management measures for example.

2.5.1 Personal Interviews

The interview activities were conducted during the site visits to the selected cities. The site visits were started on the 30th of June in the Klang Valley and ended on the 23rd of November 2007 in Kuching.

Interview techniques were developed and tested before the interviews were actually carried out. The purpose was to ensure that the interview could be conducted in a proper way so that the target respondent would understand the questions asked during the interview and would be able to return reliable information.

2.5.2 E-mailing Questionnaire

Distributing questionnaire via e-mails is the most convenient method in conducting data collection of this scale. For that, a standardized e-mail

template was developed so that it would attract the recipient to read the e-mail and participate in answering the questionnaire.

In the e-mail templates, selected information has been included. This is to ensure that the recipient can understand the survey and visualize the current issues in WEEE. The e-mail contents are:

- A newspaper article about the WEEE issues
- A brief information about the survey
- The purpose of the survey
- The type of EEE covered

Together with the e-mail, a cover letter issued by the DOE supporting the project and also the questionnaire itself are attached. The recipients are given a deadline by which the questionnaire shall be returned.

2.5.3 Statistics Data

Statistics data and other relevant information are very important in describing the current situation related to the environmentally sound management of WEEE. The main source of statistical data was from the government agencies such as Department of Statistic Malaysia (DOS). According to the Royal Malaysian Customs (RMC), importation of used electronic items cannot be identified as the tariff code number does not signify whether the said electronic item is used or new.

Monthly or annual publications from the Department of Environment Malaysia (DOE), the Malaysian Communications and Multimedia Commission (MCMC), and the Ministry of Finance were also reviewed to

obtain additional statistics on WEEE. These publications were available in soft or hard copies and accessible to the public.

2.5.4 Other Relevant Information

Other relevant information in this survey means any quantitative or qualitative information or activities related to WEEE in Malaysia. Information such as incidents or cases related to WEEE, e-waste processors (DOE-licensed contractors), transboundary movements of e-wastes, recycling activities, take back programs and others will be gathered and included in this report. The sources of such information are mainly from newspaper articles, electronic publications and the government agencies.

For exporters and importers, second-hand shops and repair shops, the information of their contacts and location are obtained from the Malaysia External Trade Development Corporation (MATRADE) and online Malaysia Yellow Pages.

The information of contacts and location for the e-waste processors were obtained from the Department of Environment (DOE), Malaysia. There are currently 107 processors (DOE licensed e-waste contractors) who are registered with DOE and the information can be found in their website at www.doe.gov.my. **Table 3** shows the number of processors (e-waste contractors) licensed by DOE according to the states in Malaysia.

Table 3: Number of DOE-licensed e-waste contractors according to states*

No	State	Partial Recovery	Full Recovery
1	Johor	8	2
2	Melaka	10	2
3	Negeri Sembilan	3	1
4	Selangor	23	1
5	Perak	2	-
6	Penang	25	4
7	Kedah	16	1
8	Sarawak	5	-
9	Kuala Lumpur	4	-
	Total	**96**	**11**

* According to DOE e-waste contractors list issued on the 21st January, 2008.

2.6 Data Compilation and Analysis

A database was designed by using the Microsoft Office-Excel software for data analysis. The obtained data from returned questionnaires are compiled according to study location and group of target respondents. A serial number is used to control data from being entered twice into the database. Coded values were used for non-numerical data provided by the respondents.

For data analysis, EX Corporation have developed and provided PGE with the analytical method which will be used to analyze the various categories of respondents, EEE type and equations for summarizing and calculating the data.

2.7 Report Output

The report of e-waste inventory shall compose of the following summarized information:

1. Identification of how used EEE are collected, imported/exported, repaired, sold, dismantled and recycled.
2. Identify the status of implementation of measures for environmentally sound management of used and waste EEE.
3. Estimate the amount of used and waste EEE generated.

Table 4 details the methodologies for summarizing information extracted from the contract guidelines.

Table 4: Methodologies for summarizing information

Contents of E-waste Inventory Report		Methodologies for Summarizing Information
1. Identify how used EEE are collected, imported/exported, repaired, sold, dismantled, and recycled.	1.1 Flow of used EEE	- Flow Chart With explanation of entities who collect, process, repair, and dismantle used EEE and recycle materials recovered from used EEE
	1.2 Stakeholders involved in collection, import/export, repair/reassembling, dismantling, and recycling process of used EEE	- List of stakeholders, including; *Name/ Address/ Types of used EEE handled/ Amount of used EEE handled per year/ Contact information
	1.3 Level of repair/ refurbishment necessary for reuse or recycling	- Description of repair/reassembling process, including; *Type of used EEE/ Operation process/ Required technology and equipment
	1.4 Level of dismantling and recycling	- Description of dismantling and recycling process, including; *Type of used EEE/ Operation process/ Required technology and equipment

Contents of E-waste Inventory Report		Methodologies for Summarizing Information
	1.5 Disposal method for residues from dismantling and recycling operation (in particular plastic casing).	- Description of disposal method for residues by type and specific list of facilities, including; *Location/ Acceptable items/ Amount of annually disposed
	1.6 Environmental problems due to reuse/recycling and disposal of used EEE	- Description of incidents regarding environmental problems due to environmentally unsound reuse/recycling or disposal of used EEE, including; *Date of Incident/ Type of problem/ Cause of problem/ Damages (human health, environmental, economic)
2. Identify the status of implementation of measures for environmentally sound management of used and waste EEE	2.1 Regulatory regimes and guidelines for used and waste EEE management (i.e., collection, transportation, dismantling, recycling, residues management, import/export)	- List of legislations and guidelines, including; *Name of regulations/ Target type, activity, and facility of used and waste EEE management/ Legal requirements/ Competent authorities
	2.2 Management status of WEEE considered as hazardous wastes	- List of WEEE defined as hazardous waste, including; *Type of WEEE/ Criteria for identification of hazardous waste/ Legal basis
	2.3 Management status of import of WEEE	- List of procedures and documents required for import, including; *Name/ Type of WEEE/ Requirement/ Authorities in charge of import permitting - Description of importation status, including; *Type of documents accompanied by importers/ Explanation reasons why documents required by the Basel Convention are not accompanied - List of illegal transboundary movement, including; *Date/ Type and quantities of WEEE, Countries concerned/ Name of importer
	2.4 Actions taken by manufactures	- Description of practices or plans for take-back or collection systems of used EEE, including;

Contents of E-waste Inventory Report		Methodologies for Summarizing Information
		*Participating companies/ Started or target year/ responsibilities of manufactures and other stakeholders/ Obstacles to establish take-back/collection systems
3. Estimate amount of used and waste EEE generated	3.1 Amount of brand-new EEE domestically produced/shipped and imported/exported	- Table and graph of amount of brand-new EEE domestically produced/ shipped and imported/exported for the years for which data exist.
	3.2 Purchase / use pattern	- Table of purchase / use pattern by income class/number of employees, including; *Type of EEE/ Number of EEE owned/ Ratio between second-hand and new ones/ Average duration for use/ Disposal method
	3.3 Amount of used EEE discarded at present and in future	- Table and graph of used EEE discarded by type of EEE
	3.4 Amount of used EEE exported, repaired/reassembled and dismantled	- Table of ratio and amount of repaired/reassembled and dismantled by type of EEE
	3.5 Generation and management of residues generated from repair/reassembling, dismantling, and processing	- Table of ratio and amount of residues generated from repair/reassembling and dismantling by type of EEE Chart of ratios of treatment practices of residues by dischargers and by treatment facilities with identification of problems

2.8 Reporting Method

The reports of this survey will be given to the Coordinator of the project and DOE. A total of three (3) reports are required to be submitted to the technical committee and steering committee of DOE as defined in the scope of work for this survey project which is:

1. Interim Report in an electronic file
2. Draft Final Report in an electronic file

3. Final Report in an electronic file

After the approval of the Final Report by the Technical Committee and Steering Committee of DOE, the reports will be sent to the Coordinator and also to DOE according to the requirements as follows:

1. Two copies of the Final Report in English in CD-Rom as well as printed material.
2. Two copies of the executive summary in Bahasa Malaysia in CD-ROM as well as printed material.
3. One copy of original questionnaire used for the interview survey and all other printed materials used for the survey
4. The data collected and compiled in electronic files as the result of the survey work.

3.0 RESULT AND FINDINGS

3.1 Malaysia Relevant Statistics

Malaysia consists of two geographical regions divided by the South China Sea and comprises of thirteen states and three federal territories. In 2007, the total population of Malaysia according to the Department of Statistics (DOS) is 27.17 million.

In terms of population distribution by state, Selangor is the most populous state (4.850 million) followed by Johor (3.170 million), Sabah (2.997 million), Sarawak (2.071 million), Perak (2.051 million), Kedah (1.650 million), Kuala Lumpur (1.379 million), Penang (1.313 million), Kelantan (1.313 million), Pahang (1.288 million), Terengganu (0.899 million), Negeri Sembilan (0.860 million), Malacca (0.636 million). The least populated state/territory were the Federal Territory of Labuan (0.08 million or 0.3%) and Perlis (0.228 million or 0.85%).

In respect to urbanization, it was observed that the proportion of urban population had increased to 62.0% in Census 2000 from 50.7% in 1991. States with very high proportions of urban population in Census 2000 were the Federal Territory of Kuala Lumpur (100%), Selangor (87.6%) and Pulau Pinang (80.1%). Conversely the states with low urbanization levels were Kelantan (34.2%), Perlis (34.3%) and Kedah (39.3%).

Malaysia's total gross domestic production (GDP) for various types of industries has increased from RM 165.724 billion in the third quarter of 2007 to RM177.423 billion in the fourth quarter of 2007. The economy growth has also increased Malaysia's per capita income from RM 18, 040 (USD 4,747) in 2005 to RM 19,740 (USD 5,159) in 2006 based on the prevailing exchange rate

in those years. According to the DOS, the growth of the electrical and electronic industries has also increased 13% from 2000 to 2006 in terms of domestic production with a gross value of RM 465.684 billion.

3.2 Returned Questionnaires

The distribution of the e-waste survey questionnaires was started on the 30th of June 2007 and ended on the 30th of November 2007. A total of 2469 sets of questionnaires were sent out to all target subjects through e-mails and site visit interviews. Of these, 860 questionnaires were sent out to household respondents, 1337 to business entities and institutions respondents and 272 to recyclers. In most cases, the employees in the business and institutions respondents were also given the household questionnaire to answer as an individual.

3.2.1 Household Questionnaire

For the household category, 400 responses are required in this survey. The target for this category was met with a total of 440 answered and completed questionnaires returned. The questionnaires were received either by e-mails or directly by the interviewer during the personal interviews. **Table 5** shows the total number of household questionnaires distributed for all target areas and the numbers of questionnaire returned.

Table 5: Total Number of Questionnaires Distributed For Household

The number of response from 3 locations met or exceeded the target while the responses from the remaining locations were 80% – 98% of the target needed. The number of returned questionnaires is considered to be representative of the socioeconomic status and geographical distribution which influence the e-waste generation from households.

Difficulties encountered in collecting data from the household category are:

i. Individuals were not concerned enough about e-waste to make the time to fill in the form.
ii. Individuals were reluctant to disclose their ownership level of electrical/electronic appliances.
iii. Many people do not keep track of the various electrical/electronic appliances that they dispose and were reluctant to spend the time to recall the information.
iv. General public apathy.

The number of responses that were returned indicated that the questionnaire was reasonably easy to complete. The interviewers also indicated that it was quite easy to obtain the data during the personal interviews and to record it in the questionnaire. **Figure 2** shows the target number of returned questionnaires against the total numbers of questionnaires sent out and questionnaires returned for each target city.

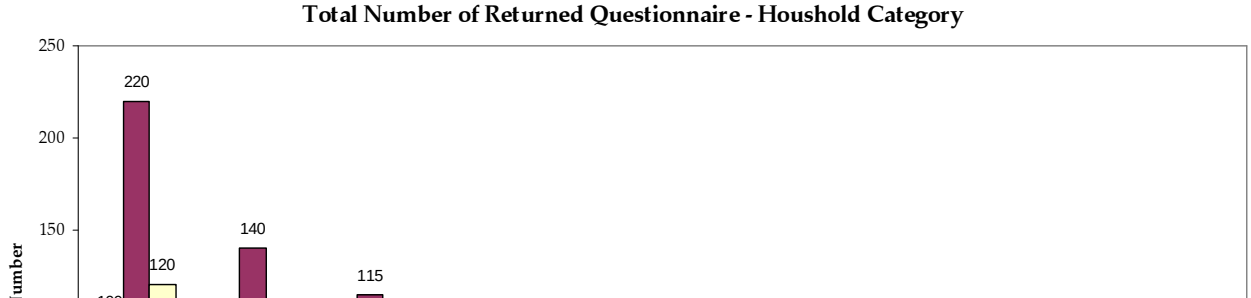


Figure 2: Total number of returned questionnaires – household category

3.2.2 Business Entities and Institution Questionnaire

There are 400 completed responses required for the business entities and institutions category. A total of 1,337 sets of questionnaires were distributed. **Table 6** shows the total number of target questionnaires, sent-out and returned for business entities and institution category.

Table 6: Total Number of Questionnaires Distributed for Business Entities and Institutions

Cities	Target	Sent Out	Returned
Klang Valley	120	653	126
Penang	60	172	55
Johor Bahru	60	87	41
Melaka	40	59	30
Kuantan	40	106	41
Kuching	30	74	25
Kota Kinabalu	30	45	23
Seremban	20	70	19
Miri	20	21	18
Ipoh	20	50	22
Total	**440**	**1337**	**400**

The number of returned questionnaires from 3 locations met or exceeded the target while the returns from the remaining locations were between 90-95% of the target needed.

Difficulties encountered in collecting data from this category are:

i. Businesses entities have a great reluctance to divulge information about their internal operations.
ii. Many businesses do not keep track of their disposal; therefore there are no records which area easily retrievable.

The total returned questionnaire and the target number of questionnaire for each city is shown in **Figure 3**.

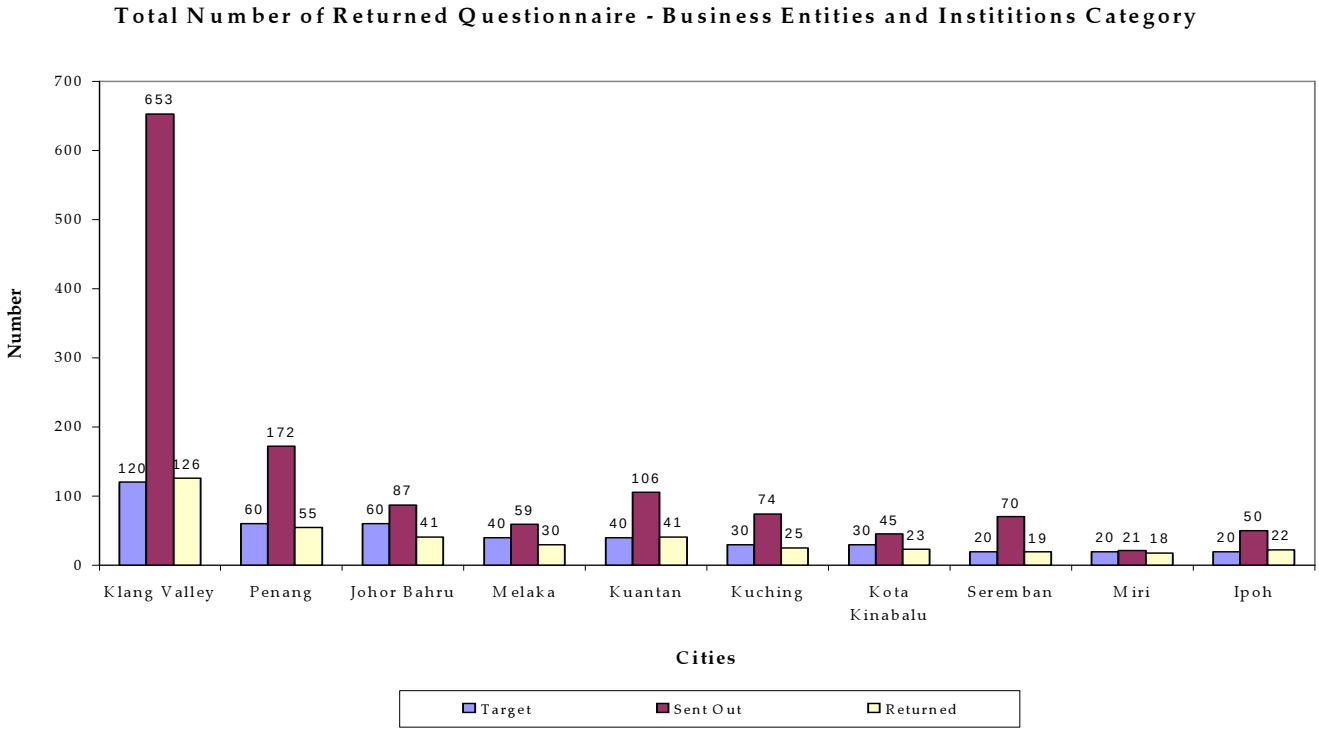


Figure 3: Total number of returned questionnaires - business and institutions category

3.2.3 *Recyclers Questionnaire*

There are 3 sub-categories in the recyclers group which are the scrap metal collectors, the second-hand / repair shops, and the DOE licensed e-waste contractors (collectors, dismantlers, processors). Most of the returned questionnaires are obtained through site visits and only a few questionnaires were returned by e-mail.

The overall number of questionnaires sent to the target locations are 272 sets. A total of 105 (38.6%) sets of questionnaire were answered and returned in the recyclers category and mainly are from the second-hand shops and repair shops with the total of 75 sets (71.4%), 11 sets from collectors (6 sets from

DOE licensed e-waste contractors and 5 from non-DOE licensed facilities)(10.5%), 11 sets from the DOE-licensed processors (9 sets from DOE licensed e-waste contractors and 2 sets from non DOE licensed facilities) (10.5%) and 8 sets are from the dismantlers (3 sets from scrap collectors and 5 sets from DOE licensed e-waste contractors) (7.6%). **Table 7** below shows the numbers of questionnaire sent out and returned for the Recyclers category according to target location.

Table 7: Number of questionnaire sent out and returned for Recyclers Category

Cities	Sent Out	Returned
Klang Valley	132	10
Penang	71	41
Johor Bahru	14	11
Melaka	23	21
Kuantan	8	8
Kuching	6	-
Kota Kinabalu	1	1
Seremban	7	3
Miri	-	-
Ipoh	10	10
Total	**272**	**105**

Difficulties encountered in collecting data from the recycler category are:

i. Most secondhand and repair shops were not willing to participate in the survey and most were not willing to reveal who collects the WEEE from them.

ii. Most of the processors (DOE licensed contractors) were reluctant to divulge the specific type of e-waste that they collect and the volume collected. It was not possible to alternatively collect the processor's data from DOE which is the agency responsible for monitoring the processors.

iii. Most of the independent scrap metal collectors interviewed were not willing to participate in the survey.

Figure 4 shows the overall number of questionnaires sent out and returned for recyclers. Penang shows the highest number of returned questionnaires with 40 sets (42.1%) followed by Johor Bahru (14 sets, 14.7%) and Kuantan (11 sets, 10.5%). For Kuching and Miri, there were no returned questionnaires for the recycler category because the recyclers were difficult to locate.

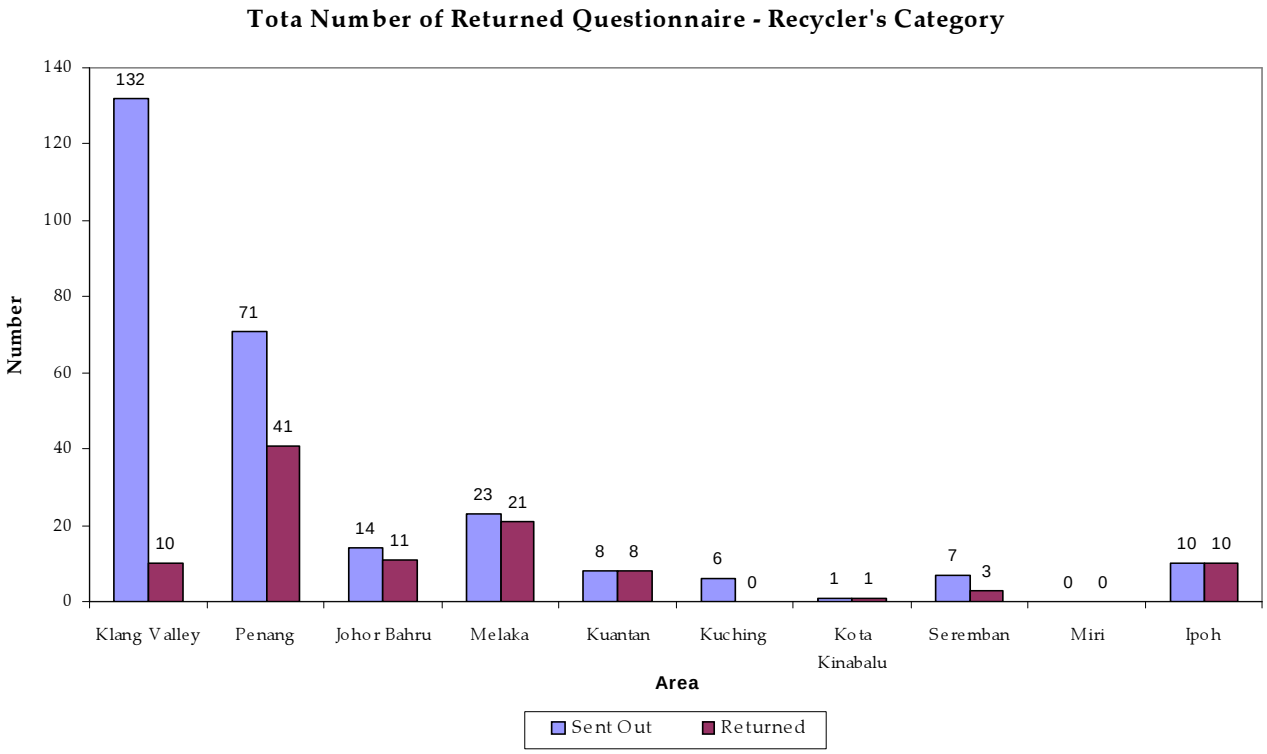


Figure 4: Total number of returned questionnaires - recycler's category

3.2.4 Manufacturers and Exporter and Importers Questionnaires

For the manufacturer's category, DOE assisted in distributing the questionnaires to over 60 manufacturers in the electrical and electronic sector. However, only two questionnaires were answered and returned from the electrical and electronic manufacturers. Unfortunately, the two returned questionnaires were incompletely filled out and therefore did not provide the appropriate information for analysis. Similarly, in the exporters and importers questionnaire which were distributed to 103 respondents, none of the respondents in that category answered and returned the questionnaire.

3.3 Consumption of EEE and Generation of WEEE

3.3.1 Domestic Consumption of Brand New EEE

The DOS was able to provide complete data (i.e. four parameters - the domestic production volume, import volume, export volume, and domestic consumption volume in units of EEE) for three (3) types of EEE i.e. television sets (**Table 8.1**), refrigerators (**Table 8.2**) and washing machines (**Table 8.3**). The data however were only available from the year 1995 to 2004. The domestic consumption volume (EEE sold in Malaysia) provided by DOS seems to have been calculated by adding the domestic production volume to the import volume and then subtracting the export volume (*Domestic Shipment = (Domestic Production + Import) – Export*).

The data obtained from DOS for the volume of EEE exported or imported for television sets, refrigerators and washing machines does not differentiate for brand new or used EEE. There is no other published source of data to verify

the proportions of brand new or used EEE in the import / export volumes. Therefore it is assumed that all the import/export volumes are for brand new EEE.

The DOS were able to provide only the domestic shipment data for air-conditioners and personal computers for the period 1995 to 2004. For mobile phones, the data from the period 1995 to 2004 was obtained from the MCMC's annual reports are only for domestically sold equipment. The domestic consumption data for mobile phones was available for 2005 to 2007 but not included in this study to make the data period consistent with the other WEEE in this study.

There are no other formal sources available to verify the domestic production, import and export volume for air-conditioners, personal computers, mobile phones and mobile phone rechargeable batteries.

Television sets

Between the years 1995 – 2004, a total of 104.2 million television sets were domestically produced, 90.90 million sets were imported, and 159.3 million sets exported as well as 46.1 million units for domestic consumption in Malaysia (see **Table 8.1**).

Table 8.1: Amount of brand-new television sets domestically produced/ shipped and imported/ exported.
Error! Not a valid link.*Source: Department of Statistic, Malaysia (2007).*

Refrigerators

In the data provided by DOS, there was a significant jump in the number of refrigerators produced in 1999. The reason for the jump could not be determined.

The total number of refrigerators exported from Malaysia from 1995 to 2005 is only 82,221 units or 0.12% from the total domestic production and import (69.999 million units). This means that the domestic consumption volume is about 69.917 million units in the span of about 10 years. This far exceeds the estimated 5.6 million households currently recorded. Clarifications made with the DOS confirm that their data is accurate. A plausible reason may be that the refrigerator data also includes refrigerators sold to offices, hotels (minibars in the room), restaurants, supermarkets, grocery shops, among others.

Table 8.2 shows the amount of domestic production, import, export and domestic shipment for refrigerators.

Table 8.2: Amount of brand-new refrigerator domestically produced/ shipped and imported/ exported.
Error! Not a valid link.*Source: Department of Statistic, Malaysia (2007).*

Washing machines

Between the years 1995 to 2004, the total number of washing machines domestically produced was 4.956 million units with the highest number in the year 2004 (1.019 million units). The number of washing machines that entered the domestic market was 5.611 million units and the total export volume was 13,483 units (0.013 million units). The export numbers of washing machines are very low and the reason could not be ascertained.

Table 8.3: Amount of brand-new washing machines domestically produced/ shipped and imported/ exported.
Error! Not a valid link.*Source: Department of Statistic, Malaysia (2007).*

Domestic Consumption Data for Air Conditioner, Personal Computer and Mobile Phone

The domestic consumption data for air conditioner and personal computer was available for the year 1995 to 2006 with a total of 22.319 million units of air conditioner and 42.792 million units of personal computer domestically consumed. For mobile phone, the domestic consumption data is only available for year 1995 to 2005. A total of 93.353 million units of mobile phone have been sold since 1995 to 2005. The domestic consumption data is shown in **Table 9**.

Table 9: Domestic Consumption data for Air Conditioner, Personal Computer and Mobile phone

Error! Not a valid link.*Source: Department of Statistic, Malaysia (2007).*
Malaysian Communication and Multimedia Commission (2007)
Department of Treasury, Ministry of Finance Malaysia (2007)

Figure 5 shows the domestic production for television sets, refrigerators and washing machines from the year 1995 to 2004/05. For refrigerator, the domestic production was found to be low between the years of 1995 to 1998 and in 1999 to 2005; the production has increased to the range of 9 to 10 million units per year. The domestic production for washing machine indicates a steady increase from the year 2000 onwards. Statistical data for the year 2005 to 2006 was not included due to unavailability of such information during the study.

The imports of television sets in Malaysia are at a steady level from the year 1995 to 2004 (see **Figure 6**). On the other hand, the import trends for refrigerators and washing machines fluctuate every year (1995 to 2004).

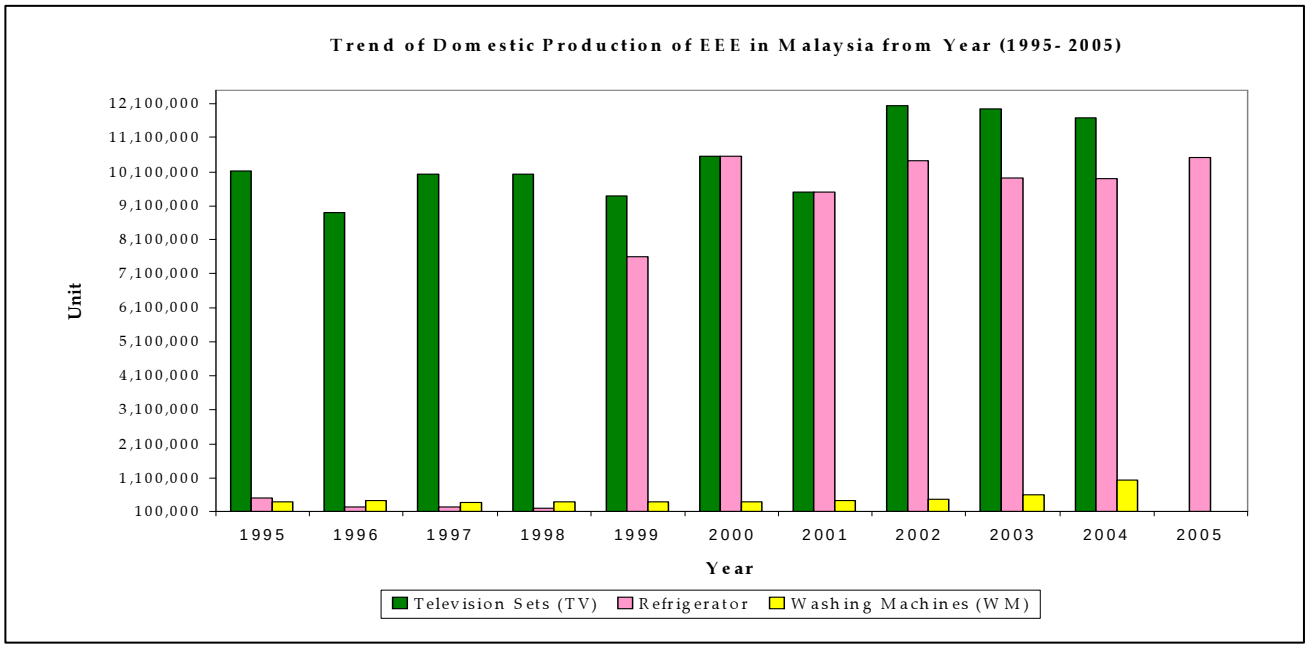
The export of television sets was at a steady level between 1995 and 2004 (see **Figure 7**). Refrigerators exports have been at a steady level since the year 1995 to 2004 with the exception of a large exponential increase in 1998. The export of washing machines fluctuates from year to year.

For domestic consumption, all six types of EEE (television sets, air conditioners, refrigerators, washing machines, computer and mobile phones) exhibited different trends (see **Figure 8**). The mobile phone domestic shipment data was obtained using the number of registered mobile phone users as the proxy. The number of registered mobile phone users was

obtained from the MCMC annual report that was published on their website. Unfortunately, there was no data available to show the domestic shipment of rechargeable batteries for mobile phones.

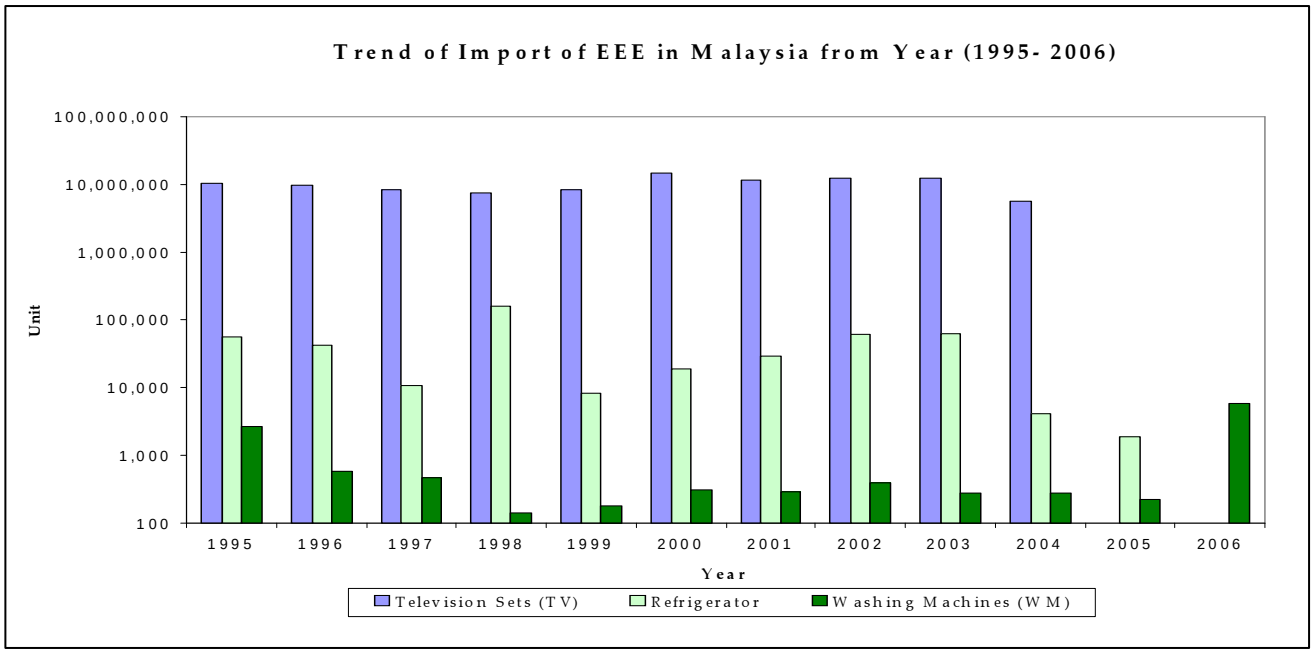
The domestic shipment for television sets, air conditioner, refrigerator and mobile phone shows a slight dip between 1997 and 1998 which reflects the aftermath of the 1997 economic crisis. After 1998, the domestic shipment has increased slowly for television and air conditioner before it dropped in 2003. Domestic shipments for refrigerators jumped in the year 1999 and the annual volume is consistent until the year 2004. For computer and washing machine the figure shows a steady increase of domestic shipment from year to year.

Figure 5: Trend of Domestic Production for EEE in Malaysia



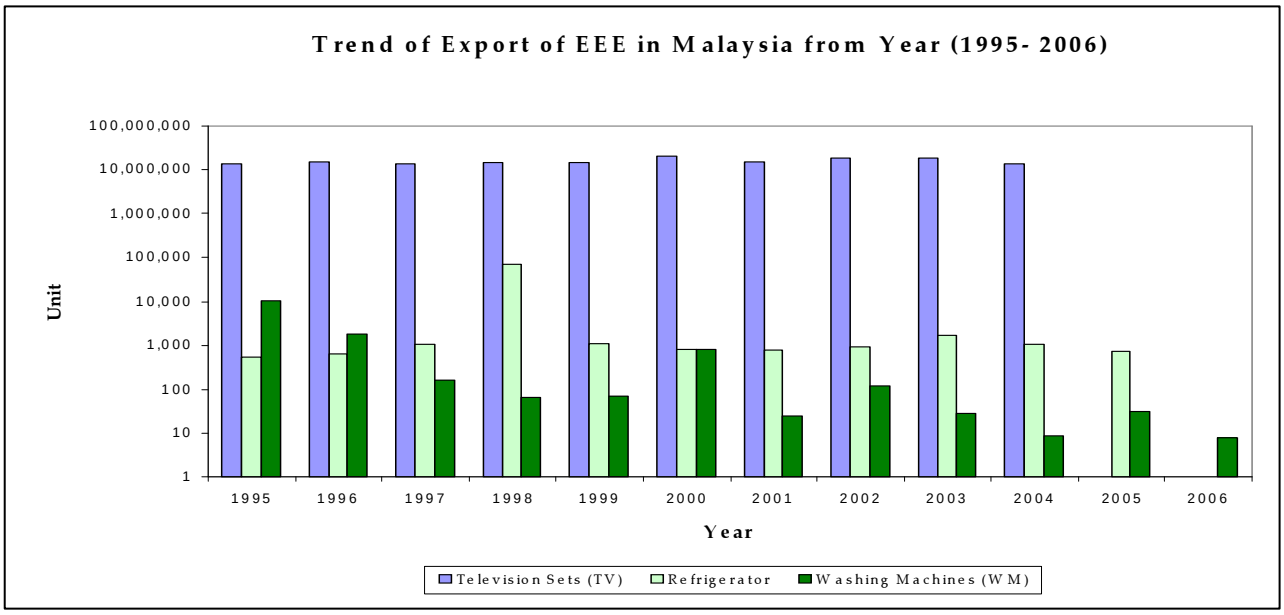
Source: Department of Statistic, Malaysia (2007).

Figure 6: Trend of Import for EEE in Malaysia



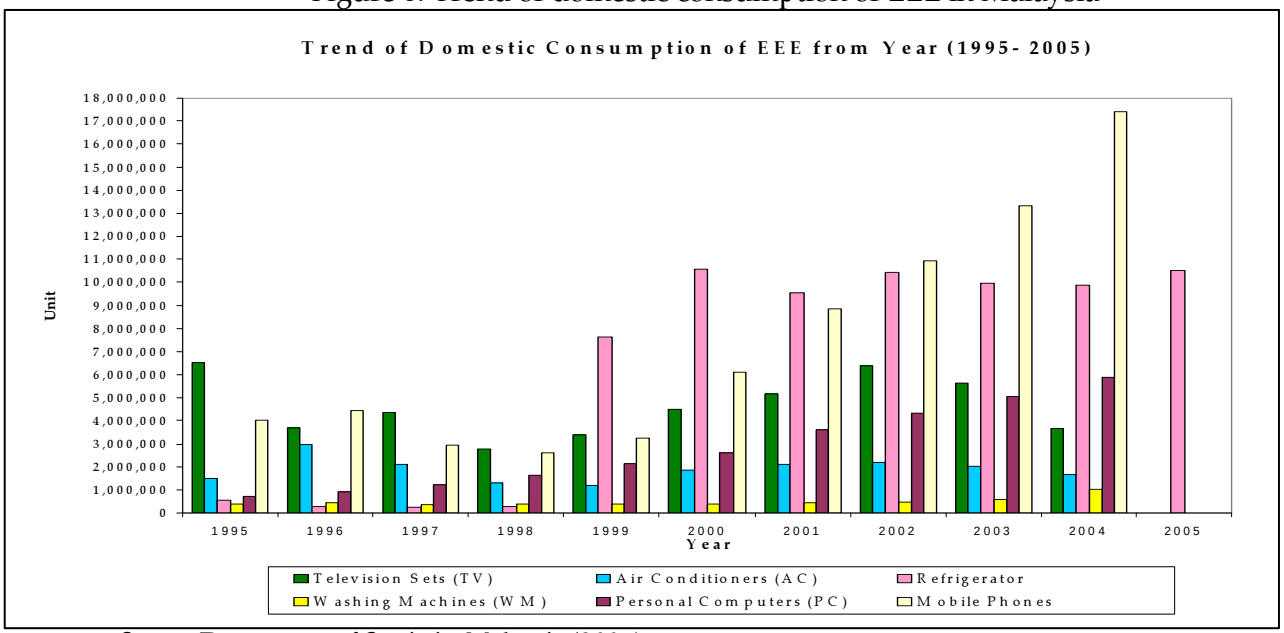
Source: Department of Statistic, Malaysia (2007).

Figure 7: Trend of Export for EEE in Malaysia



Source: Department of Statistic, Malaysia (2007).

Figure 8: Trend of domestic consumption of EEE in Malaysia



Source:Department of Statistic, Malaysia (2007).
Malaysian Communication and Multimedia Commission (2007)
Department of Treasury, Ministry of Finance Malaysia (2007)

3.3.2 *Purchase / Use Pattern for Households*

An analysis was conducted to obtain the purchase pattern for household. The purchase pattern was analyzed according to their income categories which area are high income (> RM5000), upper middle income (RM3500 to RM4999), lower middle income (RM1200 to RM3499) and lower income (< RM1199).

However, for the purpose of this analysis, the upper middle income and lower middle income will be categorized as the middle income category. The reason is to show the difference of purchase or use pattern for all three main categories (low, middle and high income levels).

All data presented in the tables in this section are derived from the questionnaire data and calculated according to the formulas established in the project guidelines (Guidelines for Development of E-waste Inventory).

Generally, the most preferred method to obtain EEE is by purchase of new items with percentages ranging between 93% - 97.2%. From the data, most of the respondents disposed 76% of their WEEE rather than keeping it in their possession.

Television sets

From the data compiled in **Table 10.1**, the average number of television sets currently possessed by the high income category is 1.7 sets, 1.2 sets for middle income and 1 set for low income level households. A total of 92.6% of the respondents owned colour CRT television and another 7.4% owned LCD television. The result indicates that 95.6% of the television sets currently possessed are bought from shops, followed by television sets which is given (3.5%) and obtained by other means (0.9%). The ratio for brand new and second-hand television possessed by the respondents is 20:1. Approximately 33% of the television sets that are discarded are still possessed by the respondents.

Table 10.1: Purchase pattern for television sets in households

Purchase use of Pattern Television Sets (TV)				
Item \ User		Household (by income level)		
		High	Middle	Low
Average of TVcurrently possessed		1.7	1.2	1.0
Type Television Sets currently possessed	Colour CRT	505 (92.7%)		
	LCD	40 (7.3%)		
Average duration for use of discarded Television Sets (in year)	Brand-new	10.8	9.2	9.9
	Second-hand	7.8	8.6	14.5
Way to obtain Television Sets currently possessed	Bought	521 (95.6%)		
	Given	19 (3.5%)		
	Other	5 (0.9%)		
Ratios of second hand and brand-new Television Sets possessed	Brand New	519 (95.2%)		
	Second Hand	26 (4.8%)		
Disposal method	Discarded	118 (75.2%)		
	Currently possessed	39 (24.8%)		

Computers

For the average number of computers currently possessed, the high income groups owned an average of 1.7 computers while the middle and low income level owned 1 and 0.7 each (see **Table 10.2**). In this category, 54.6% of the respondents owned desktop computers with CRT monitor, followed by notebook computer (36.2%) and only 9.2% owned computer with LCD monitor. Of these, 93% of the computers owned were obtained via purchase while 6% were given and only 1% obtained by other means. The ratio for brand new and second-hand computer possessed is 66:1. Only 18.7% of computers discarded were still possessed by the respondents.

Table 10.2: Purchase pattern for computers in households

Purchase use of Pattern Personal Computer (PC)				
Item \ User		Household (by income level)		
		High	Middle	Low
Average of Personal Computer currently possessed		1.7	1.0	0.7
Type Personal Computer currently possessed	CRT	256 (55%)		
	LCD	43 (9.2%)		
	Notebook	170 (36.2%)		
Average duration for use of discarded Personal Computer (in year)	Brand-new	5.2	4.7	1.3
	Second-hand	1.7	3.8	5.0
Way to obtain Personal Computer currently possessed	Bought	436 (93%)		
	Given	26 (6%)		
	Other	5 (1%)		
Ratios of second hand and brand-new Personal Computer possessed	Brand New	462 (98.5%)		
	Second Hand	7 (1.5%)		
Disposal method	Discarded	61 (81.3%)		
	Currently possessed	14 (18.7%)		

Mobile phone

The purchase/use pattern for mobile phones indicates that the average mobile phone currently possessed for high income respondents were found to be lower than the middle and low income respondents which doesn't reflect the trend of greater material ownership with rising income (see **Table 10.3**). Generally across all income brackets, the average usage duration of mobile phones averages 3 years for brand new mobile phones and 3.3 years for second-hand phones. The exception was the low income respondents which used second-hand phones for an average duration of 4 years. From the data obtained, 94% of mobile phones were bought from mobile phone shops and the ratio for brand new and second-hand mobile phone is 10:1. A total of 29.9% of unwanted mobile phones are still in the possession of the owners.

Table 10.3: Purchase pattern for mobile phones in household

Purchase use of Pattern Mobile Phone (MP)				
Item / User		Household (by income level)		
		High	Middle	Low
Average of Mobile Phone currently possessed		1.5	1.9	1.5
Average duration for use of discarded Mobile Phone (in year)	Brand-new	2.9	3.1	3.1
	Second-hand	3.3	2.5	4.2
Way to obtain Mobile Phone currently possessed	Bought	720 (94.1%)		
	Given	45 (5.9%)		
	Other	n.a		
Ratios of second hand and brand-new Mobile Phone possessed	Brand New	698 (91.2%)		
	Second Hand	67 (8.8%)		
Disposal method	Discarded	225 (70.1%)		
	Currently possessed	96 (29.9%)		

Refrigerators

For refrigerators, all income groups possessed an average of 1.3 (high income), 1.0 (middle income) and 0.9 (low income) unit of refrigerators as shown in **Table 10.4**. Most of the refrigerators possessed by the respondents were bought (96.4%). The ratio for brand new and second-hand refrigerator possessed by the respondents is 4:1. The average usage duration for second-hand refrigerators was found to be longer (9.7 years) compared to the brand new units (9 years). For disposal method, only 10.4% of the unwanted refrigerators are still in possession.

Table 10.4: Purchase pattern for refrigerator in households

Purchase use of Pattern Refrigerator				
Item \ User		Household (by income level)		
		High	Middle	Low
Average of Refrigerator currently possessed		1.3	1.0	0.9
Average duration for use of discarded Refrigerator (in year)	Brand-new	8.2	8.1	10.8
	Second-hand	9.9	7.6	11.0
Way to obtain Refrigerator currently possessed	Bought	429 (96.4%)		
	Given	15 (3.4%)		
	Other	1 (0.2%)		
Ratios of second hand and brand-new Refrigerator possessed	Brand New	421 (94.6%)		
	Second Hand	24 (5.4%)		
Disposal method	Discarded	69 (89.6%)		
	Currently possessed	8 (10.4%)		

Air conditioners

The average possession of air conditioner is high among the high income respondents (1.7 units) compared to the middle income (0.7 unit) and lower income respondents (0.2 unit). The average use duration for second-hand air conditioner was found to be longer (9 years) compared to the brand new units (6.7 years). It was found that 96.6% of the air conditioners owned by the respondents were bought. The ratio for brand new and second-hand EEE is 2:1 for air conditioner. From 32 units of unwanted air conditioners recorded in this survey, only 34.4% were still possessed by the respondents.

Table 10.5: Purchase pattern for air conditioner in households

Purchase use of Pattern Air Conditioner				
Item \ User		Household (by income level)		
		High	Middle	Low
Average of Air Conditioner currently possessed		1.7	0.7	0.2
Average duration for use of discarded Air Conditioner (in year)	Brand-new	9.2	5.2	5.7
	Second-hand	8.1	7.5	11.0
Way to obtain Air Conditioner currently possessed	Bought	341 (96.6%)		
	Given	10 (2.8%)		
	Other	2 (0.6%)		
Ratios of second hand and brand-new Air Conditioner possessed	Brand New	310 (87.8%)		
	Second Hand	43 (12.2%)		
Disposal method	Discarded	21 (65.6%)		
	Currently possessed	11 (34.4%)		

Washing machines

The average number of washing machine currently possessed by the respondents is 1 (high income), 0.9 (middle income) and 0.8 (low income) units for the household groups. Brand new washing machines were found to be used longer than the second-hand units with the average possession of 7.7 years and 7.3 years respectively. The table indicates that the respondents obtained the washing machines by two ways which is by purchase (97.2%) or given (2.8%). The ratio for brand new and second-hand washing machine is 20:1. From the total unwanted washing machines, only 14.3% are still in possession.

Table 10.6: Purchase pattern for washing machines in households

Purchase use of Pattern Washing Machine				
Item / User		Household (by income level)		
		High	Middle	Low
Average of Washing Machine currently possessed		1.0	0.9	0.8
Average duration for use of discarded Washing Machine (in year)	Brand-new	8.7	5.7	7.6
	Second-hand	9.4	5.0	8.0
Way to obtain Washing Machine currently possessed	Bought	387 (97.2%)		
	Given	11 (2.8%)		
	Other	n.a		
Ratios of second hand and brand-new Washing Machine possessed	Brand New	384 (96.5%)		
	Second Hand	14 (3.5%)		
Disposal method	Discarded	84 (85.7%)		
	Currently possessed	14 (14.3%)		

3.3.3 Purchase / Use Pattern for Business Entities and Institutions

The purchase patterns were analyzed for business entities which were subdivided into 3 business scales using the total number of employees as the criteria. The business scales are large scale (> 150 employees), medium scale (51 – 150 employees), and small scale businesses (< 50 employees). In addition, to ensure that the results obtained from the data analysis represents the business entities in Malaysia, hotels have been transferred to the institution category due to the large number of EEE (television sets) that they possess as it will skew the average possession of EEE in the business category. There were a total of 309 respondents in the business category.

For institutions, the respondents were mainly from learning institutions, government departments and agencies, associations, non profit organizations and hotels. A total of 109 respondents were categorized as institutions.

Business entities

From the analysis, the average numbers of EEE types possessed by business entities generally increase with the increasing business scale. However, the results for refrigerators and washing machines were different where the small scale businesses possessed equal or higher numbers than the middle scale and large scale businesses.

Computer ownership far exceeds the ownership of the other types of EEE in the business category. The ratio of ownership by EEE type is 105 (computers): 27.7 (air conditioners): 7.7 (mobile phones): 5.5 (refrigerators): 3.7 (television sets): 1 (washing machines). This ratio is a reasonably accurate

reflection of business entities as most do not need refrigerators, washing machines or television sets in their business operations.

Most of the business entities obtain their currently possessed EEE by purchase and by lease as well as by other means. The percentage of EEE obtained by purchase according to type of EEE is 95.7% (television sets), 65.7% (computer), 99.8 (mobile phone), 85% (refrigerator), 93.5% (air conditioner) and 92.4% (washing machines).

For television sets possessed by business entities, 92.7% are color CRT and 7.8 % are LCD television. For computer ownership, 52% owned are desktop computer with CRT monitors while 34 % are computer with LCD monitors and the least owned are notebook computers at 14%.

The average use duration for television sets and refrigerators were found to be longer for second-hand EEE. An average duration of 6.3 years was found for second-hand television sets and 5.3 years for brand new sets while for refrigerator is 7.3 years for second-hand sets and 7 years for brand new.

The most preferred disposal method is by discarding the used EEE with the percentage of 56% (television sets), 78.7% (computers), 86.7% (refrigerators), 88.9% (air conditioners) and 85.7% (washing machines) for types of EEE. Mobile phone is the only EEE where the preferred method of disposal is by keeping it.

Institution

For television sets possessed by institutions, 99.9% are color CRT and 0.1% are LCD television. The large number of television sets in this category is contributed mostly from hotels. For computer ownership, 89.3% owned are desktop computer with CRT monitors while 9.3 % are computer with LCD monitors and the least, 1.4% owned notebook computers.

The average possession duration for second-hand refrigerators was found to be longer than the brand new equipment with the average of 7.8 years and 5.2 years respectively. For other EEE types, the average possession is high for the brand new equipments.

The method to obtain for all types of EEE that is currently possessed is mostly via purchase followed by by-lease and by other means. The percentage of EEE obtained by purchase is 93.9% (television set), 96.4% (computer), 99.1% (refrigerator), 98.5% (air conditioner) and 85.7% (washing machine). All mobile phones possessed by the institution respondent were obtained via purchase.

The ownership ratio of brand new to second-hand EEE ownership of the various type of EEE in the institutions category is 7:1 (television set), 33:1 (computer), 3:1 (mobile phones), 9:1 (refrigerator) and 4:1 (air conditioner). For washing machines, there was no second-hand equipment possessed by the institutions respondents.

Discarding the used EEE is the most preferred disposal method for television (64%), computers (92.2%) and refrigerators (66.6%). For air conditioner and washing machine, both types of EEE are either discarded or still owned by

the respondents. None of the mobile phones possessed by the institutions are disposed.

Business Entities, Institution - Summary

Similar to household respondents, the most preferred method to obtain EEE was via purchase where the percentage is between 74.2% - 99.8% for all types of EEE followed by lease and by other means.

The ratio for business entities and institution respondents for brand new and second-hands according to type of EEE is 7:1 (television set), 27:1(computer), 44:1 (mobile phone), 8:1 (refrigerator), 4:1 (air conditioner) and 40:1 (washing machines). 33.3% - 85% of business entities and institutions discard the unwanted EEE. The purchase pattern details for business entities and institutions are shown in **Table 11.1** to **Table 11.6**.

Table 11.1: Purchase pattern for television sets – Business entities and Institutions

Purchase use Pattern of Television Sets					
Item \ User		Business Entity & Instituition			
			Commercial (by # of employees)		
		Instituition	Small (5-50 employees)	Medium (51-150 employees)	Large(>150 employees)
Average of TV currently possessed		36.6	1.1	2.0	5.3
Purchase use Pattern of TV	Colour CRT	4053 (99.9%)	227 (92.7%)		
	LCD	5 (0.1%)	18.0 (7.3%)		
Average duration for use of discarded TV(in year)	Brand-new	5.9	6.8	5.5	3.0
	Second-hand	4.5	7.9	2.5	8.0
Way to obtain TV currently possessed	Bought	3772 (93.8%)	246 (95.7%)		
	Lease	245 (6%)	n.a.		
	Other	1 (0.2%)	11 (4.3%)		
Ratios of second hand and brand-new TV possessed	Brand New	234 (91.1%)	234 (91.1%)		
	Second Hand	23 (8.9%)	23 (8.9%)		
Disposal method	Discarded	17 (56.7%)	17 (56.7%)		
	Currently possessed	13 (43.3%)	13 (43.3%)		

Table 11.2: Purchase pattern for personal computer – Business entities and Institutions

Purchase use Pattern of Personal Computers					
Item \ User		Business Entity & Instituition			
			Commercial (by # of employees)		
		Instituition	Small (5-50 employees)	Medium (51-150 employees)	Large(>150 employees)
Average of PC currently possessed		21.4	9.6	68.1	220.4
Type PC currently possessed	CRT	2374 (89.3%)	3605 (52%)		
	LCD	248 (9.3%)	2563 (37%)		
	Notebook	36 (1.4%)	766 (11%)		
Average duration for use of discarded PC(in year)	Brand-new	5.3	5.4	4.6	6.2
	Second-hand	5.0	5.3	1.0	2.5
Way to obtain PC currently possessed	Bought	2562 (96.4%)	4557 (65.7%)		
	Lease	60 (2.2%)	2219 (32%)		
	Other	36 (1.4%)	158 (2.3%)		
Ratios of second hand and brand-new PC possessed	Brand New	2580 (97.1%)	6693 (96.5%)		
	Second Hand	78 (2.9%)	241 (3.5%)		
Disposal method	Discarded	412 (92.2%)	1126 (78.7%)		
	Currently possessed	35 (7.8%)	304 (21.3%)		

Table 11.3: Purchase pattern for mobile phones – Business entities and Institutions

Purchase use Pattern of Mobile Phones					
Item \ User		Business Entity & Instituition			
			Commercial (by # of employees)		
		Instituition	Small (5-50 employees)	Medium (51-150 employees)	Large(>150 employees)
Average of MP currently possessed		7.0	3.3	10.7	77.8
Average duration for use of discarded MP (in year)	Brand-new	4.3	3.8	5.5	3.0
	Second-hand	4.0	3.0	5.0	5.0
Way to obtain MP currently possessed	Bought	35 (100%)	507 (99.8%)		
	Lease	n.a.	n.a.		
	Other	n.a.	1 (0.2%)		
Ratios of second hand and brand-new MP possessed	Brand New	25 (71.4%)	506 (99.6%)		
	Second Hand	10 (28.6%)	2 (0.4%)		
Disposal method	Discarded	n.a.	2 (33.3%)		
	Currently possessed	n.a.	4 (66.7%)		

Table 11.4: Purchase pattern for refrigerator – Business entities and Institutions

Purchase use Pattern of Refrigerator					
Item \ User		Business Entity & Instituition			
			Commercial (by # of employees)		
		Instituition	Small (5-50 employees)	Medium (51-150 employees)	Large(>150 employees)
Average of Refrigerator currently possessed		34.6	1.6	2.0	0.1
Average duration for use of discarded Refrigerator (in year)	Brand-new	5.2	6.4	7.0	8.0
	Second-hand	7.8	7.0	8.3	6.0
Way to obtain Refrigerator currently possessed	Bought	3457 (99%)	310 (85.2%)		
	Lease	30 (0.9%)	30 (8.2%)		
	Other	3 (0.1%)	24 (6.6%)		
Ratios of second hand and brand-new Refrigerator possessed	Brand New	3123 (89.5%)	314 (86.3%)		
	Second Hand	367 (10.5%)	50 (13.7%)		
Disposal method	Discarded	2 (66.7%)	13 (66.7%)		
	Currently possessed	1 (33.3%)	2 (13.3%)		

Table 11.5: Purchase pattern for air conditioner – Business entities and Institutions

Purchase use Pattern of Air Conditioner					
Item \ User		Business Entity & Instituition			
			Commercial (by # of employees)		
		Instituition	Small (5-50 employees)	Medium (51-150 employees)	Large(>150 employees)
Average of Air Conditioner currently		14.6	3.9	13.8	14.5
Average duration for use of discarded Air Conditioner (in year)	Brand-new	2.8	6.1	1.0	5.3
	Second-hand	2.7	4.3	n.a	7.0
Way to obtain Air Conditioner currently possessed	Bought	1673 (98.5%)	1709 (93.5%)		
	Lease	9 (0.5%)	5 (0.3%)		
	Other	16 (0.9%)	114 (6.2%)		
Ratios of second hand and brand-new Air Conditioner possessed	Brand New	1363 (80.3%)	1488 (81.4%)		
	Second Hand	335 (19.7%)	340 (18.6%)		
Disposal method	Discarded	1 (50%)	16 (88.9%)		
	Currently possessed	1 (50%)	2 (11.1%)		

Table 11.6: Purchase pattern for washing machine – Business entities and Institutions

Purchase use Pattern of Washing Machine					
Item \ User		Business Entity & Instituition			
			Commercial (by # of employees)		
		Instituition	Small (5-50 employees)	Medium (51-150 employees)	Large(>150 employees)
Average of Washing Machine currently		4.0	2.9	1.0	1.5
Average duration for use of discarded Washing Machine (in year)	Brand-new	11.0	7.3	11.0	4.5
	Second-hand	7.0	8.0	6.5	6.0
Way to obtain Washing Machine currently possessed	Bought	48 (85.7%)	61 (92.4%)		
	Lease	6 (10.7%)	2 (3%)		
	Other	2 (3.6%)	3 (4.5%)		
Ratios of second hand and brand-new Washing Machine possessed	Brand New	56 (100%)	63 (95%)		
	Second Hand	n.a	3 (5%)		
Disposal method	Discarded	1 (50%)	6 (85.7%)		
	Currently possessed	1 (50%)	1 (14.3%)		

3.3.4 Projection of Used EEE

The amount of discarded used EEE that is and will be generated in Malaysia has been determined for the EEE types in this study.

Source of Data

The projection data was derived from the statistical data of EEE domestic shipments in Malaysia obtained from the DOS, MCMC and Ministry of Finance for the period 1995 to 2004 only.

Assumptions for projections

Assumption No.1

From the previous domestic shipment/sales figure, an assumption was made that only 80% of this total translated into actual sales in the domestic markets. This assumption was made based on the understanding that there will be a portion of unsold EEE due to sales competition among the manufacturers, models which do not suit the consumer's desires and needs, and/or unattractive pricing. This 'assumed total domestic sales' does not take into account any EEE that may be imported by unauthorized importers, commonly known as grey imports. This moderating figure of 0.8 applied to the domestic shipment data could be varied up to 1.0 to show the upper limit of WEEE generated.

The 'assumed total domestic sales' was used as the input parameter in the Weibull statistical inference provided by EX Corporation (the Project Coordinator) to estimate the discarded used EEE. The result of the estimated number of discarded used EEE that was calculated from the year 1981 to 2020 is shown in **Table 12**. The projection of used EEE could not be derived from

the year of the oldest EEE recorded in the survey due to limited statistical information available going that far back. Therefore the earliest year of discard that was chosen is year 1995.

Assumption No.2

In estimating the future WEEE generation, an assumption was made where the future domestic sales growth from the year 2005 until 2020 was based on Malaysia's average annual population growth rate of 2.2% from 2003 to 2005.

Assumption No.3

Since there was no reliable data for domestic shipment of rechargeable batteries for mobile phones, the data mobile phones was used as a proxy wherein one mobile phone unit equates to one unit of rechargeable battery. In addition, the accepted lifespan of mobile phone batteries is about two years. Therefore, the proxy number is multiplied by 1.5 as the average replacement unit of batteries for the average duration of mobile phone use recorded in Table 9.3.

Assumption No.4

In estimating the future WEEE generation, an assumption was also made for the domestic sales of EEE from the year 1981 until 1994 based on Malaysia's average annual population growth rate of 2.6% within this period. The cutoff year of 1981 was agreed with the Project Coordinator.

Assumption No.5

In estimating the future WEEE generation according to the respondent categories, it is necessary to separate the domestic sales data for each of the categories. The purpose is to indicate the target number of EEE that is

previously sold or will be sold to these two categories. The assumption was made based on the ownership ratio for each of the equipment by households and business entities and institutions

Assumption No. 6

To indicate the total volume weight for WEEE generation, an average weight for each EEE was assigned. The average weights are 35kg per television set, 30kg per computer unit, 0.1kg per mobile phones, 70kg per refrigerator, 60kg per air conditioner, 50 kg per washing machines and 0.01kg per rechargeable mobile phone batteries. The result of the calculation is presented in metric tonnes.

Projection of Future WEEE in Million Units

Based on the data obtained from the previous years (1981 -2007), it is projected that a cumulative total of 403.590 million units of WEEE in the seven categories will have been generated in Malaysia by the year 2008. For the year 2008 alone, the calculations estimated that a total of 31.3 million units of WEEE would be discarded in that year itself.

From the year 2008 to 2020, it is projected that a cumulative total of 761.507 million units of WEEE in the seven categories will have been generated. In this period, the mobile phone rechargeable batteries (MPRB) show the highest contribution with a cumulative total of 257.168 million units followed by mobile phones with 199.594 million units. The least contributor to the WEEE projection between the years 2008 to 2020 is washing machines with a cumulative total of 10.245 million units only.

The projection shown in Figure 9 indicates that all WEEE included in this study generally increased from year to year since 1981 to 2020 with the exception of television sets and refrigerator.

Mobile phone rechargeable batteries, computers and mobile phones show an increase pattern which reflects the standard population growth pattern in Malaysia. For mobile phones rechargeable batteries and mobile phones, both WEEE indicate a similar pattern as shown in **Figure 9**. The rapid increase of discarded mobile phone rechargeable and mobile phones is influenced by the rapid replacement factor and also the pattern of continuous increase in the domestic sales. For computer waste, the generation pattern shows an increase in each year until the year 2020 reflecting the continuous increase pattern of computer purchase and ownership in the period between the years 1995 to 2005.

From the projection figure, the future projection of WEEE for television sets and refrigerator show a fluctuating pattern in waste generation. For television sets, the WEEE generation was found to be increasing before it dropped in 2009 and then fluctuating from there on until 2020. This fluctuating pattern is strongly influenced by the wide fluctuations in the domestic sales data that was provided by the DOS. The Weibull distribution function has limited ability to modify the large fluctuations to produce a smooth projection pattern. The future generation of WEEE for refrigerators also shows a similar pattern of fluctuation because of the fluctuating domestic sales data.

For the rest of the WEEE in this study (air conditioners and washing machines), the Weibull projection charts indicate that the WEEE generated are in a steady level and maintained its pattern until the year 2020.

Projection of Future WEEE in Metric Tonnes

The total volume weight of WEEE produced is shown in **Table 13** and Figure **10**. The total volume weight for the seven categories of WEEE in this study between the years 2008 to 2020 is expected to be 11.199 million metric tones.

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Table 12: Overall amount of WEEE discarded by the household and business entities and institutions

FUTURE PROJECTION OF WEEE IN MALAYSIA FOR THE YEAR 1981-2020 ('000 unit)							
YEAR	TV	PC	MP	REF	AC	WM	MPRB
1981	0	0	0	0	0	0	0
1982	65	19	0	0	0	0	5
1983	198	58	1	0	1	0	32
1984	397	112	4	0	3	0	108
1985	658	176	20	0	11	0	264
1986	970	245	69	0	29	0	529
1987	1,323	312	188	0	65	0	923
1988	1,705	375	429	0	129	1	1,449
1989	2,104	431	842	0	232	3	2,085
1990	2,509	477	1,426	1,845	379	8	2,783
1991	2,909	516	2,075	1,896	573	16	3,481
1992	3,297	548	2,603	1,954	805	32	4,114
1993	3,665	597	2,903	2,024	1,055	58	4,638
1994	6,194	1,277	3,040	2,084	1,281	222	5,040
1995	6,572	1,316	3,128	2,140	1,437	284	5,337
1996	6,928	1,353	3,211	2,197	1,519	364	5,560
1997	7,218	1,397	3,297	2,256	1,570	455	5,742
1998	7,452	1,458	3,385	2,316	1,579	545	5,908
1999	7,608	1,551	3,476	2,378	1,660	614	6,065
2000	7,701	1,689	3,568	2,441	1,712	653	6,213
2001	7,754	1,880	3,660	2,506	1,773	664	6,349
2002	7,788	2,148	3,743	2,573	1,845	661	6,474
2003	7,830	2,497	3,804	2,642	1,932	653	6,600
2004	7,879	2,929	3,830	2,713	2,033	644	6,758
2005	7,911	3,441	3,823	1,273	2,144	637	7,008
2006	7,930	4,032	3,837	1,245	2,255	629	7,438
2007	7,941	4,697	4,036	1,482	2,354	623	8,145
2008	7,948	5,409	4,682	1,012	2,423	617	9,209
2009	6,514	6,337	5,993	168	2,437	624	10,671
2010	6,766	7,427	7,948	1,049	2,383	586	12,510
2011	5,907	8,566	10,300	871	2,325	594	14,635
2012	6,148	9,811	12,764	844	2,349	593	16,898
2013	6,621	10,949	15,140	870	2,426	590	19,123
2014	6,923	12,638	17,256	894	2,470	624	21,149
2015	7,481	13,963	18,915	916	2,448	663	22,868
2016	7,115	15,253	20,040	939	2,391	756	24,245
2017	6,154	16,674	20,779	964	2,347	996	25,316
2018	6,222	18,231	21,363	989	2,342	1,087	26,161
2019	6,306	19,745	21,922	1,015	2,373	1,197	26,870
2020	6,406	20,273	22,492	1,041	2,425	1,317	27,513
Total	**211,017**	**200,811**	**259,992**	**49,536**	**59,516**	**18,010**	**366,216**

Table 13: Overall weight (metric tonnes) of WEEE discarded by the household and business entities and institutions

FUTURE PROJECTION OF WEEE IN MALAYSIA FOR THE YEAR 1981-2020 (Metric Tonnes)							
YEAR	**TV**	**PC**	**MP**	**REF**	**AC**	**WM**	**MPRB**
1981	0	0	0	0	0	0	0
1982	2,260	585	0	0	2	0	0
1983	6,922	1,739	0	0	32	0	0
1984	13,911	3,357	0	0	181	0	1
1985	23,020	5,282	2	0	638	1	3
1986	33,942	7,341	7	0	1,726	6	5
1987	46,299	9,374	19	0	3,909	22	9
1988	59,676	11,258	43	0	7,769	66	14
1989	73,649	12,917	84	4	13,903	169	21
1990	87,817	14,324	143	129,117	22,751	388	28
1991	101,829	15,490	207	132,696	34,383	815	35
1992	115,392	16,454	260	136,776	48,316	1,588	41
1993	128,292	17,911	290	141,647	63,287	2,891	46
1994	216,773	38,314	304	145,904	76,889	11,078	50
1995	230,034	39,470	313	149,799	86,246	14,182	53
1996	242,470	40,599	321	153,798	91,153	18,188	56
1997	252,635	41,909	330	157,904	94,179	22,772	57
1998	260,806	43,755	339	162,119	94,739	27,232	59
1999	266,281	46,524	348	166,446	99,612	30,702	61
2000	269,528	50,659	357	170,889	102,720	32,641	62
2001	271,386	56,412	366	175,451	106,363	33,208	63
2002	272,573	64,434	374	180,135	110,727	33,030	65
2003	274,048	74,924	380	184,943	115,942	32,632	66
2004	275,758	87,870	383	189,877	121,996	32,218	68
2005	276,884	103,224	382	89,083	128,630	31,828	70
2006	277,556	120,951	384	87,180	135,295	31,469	74
2007	277,934	140,922	404	103,759	141,214	31,147	81
2008	278,173	162,263	468	70,836	145,359	30,874	92
2009	228,000	190,119	599	11,766	146,201	31,195	107
2010	236,817	222,820	795	73,457	142,982	29,299	125
2011	206,739	256,981	1,030	60,990	139,516	29,710	146
2012	215,176	294,339	1,276	59,057	140,935	29,633	169
2013	231,750	328,479	1,514	60,889	145,559	29,497	191
2014	242,320	379,142	1,726	62,554	148,226	31,205	211
2015	261,837	418,897	1,892	64,100	146,878	33,153	229
2016	249,030	457,581	2,004	65,756	143,483	37,805	242
2017	215,387	500,212	2,078	67,465	140,810	49,818	253
2018	217,758	546,937	2,136	69,219	140,501	54,362	262
2019	220,712	592,359	2,192	71,019	142,402	59,847	269
2020	224,226	608,191	2,249	72,866	145,495	65,853	275
Total	**7,385,597**	**6,024,320**	**25,999**	**3,467,503**	**3,570,947**	**900,525**	**3,662**

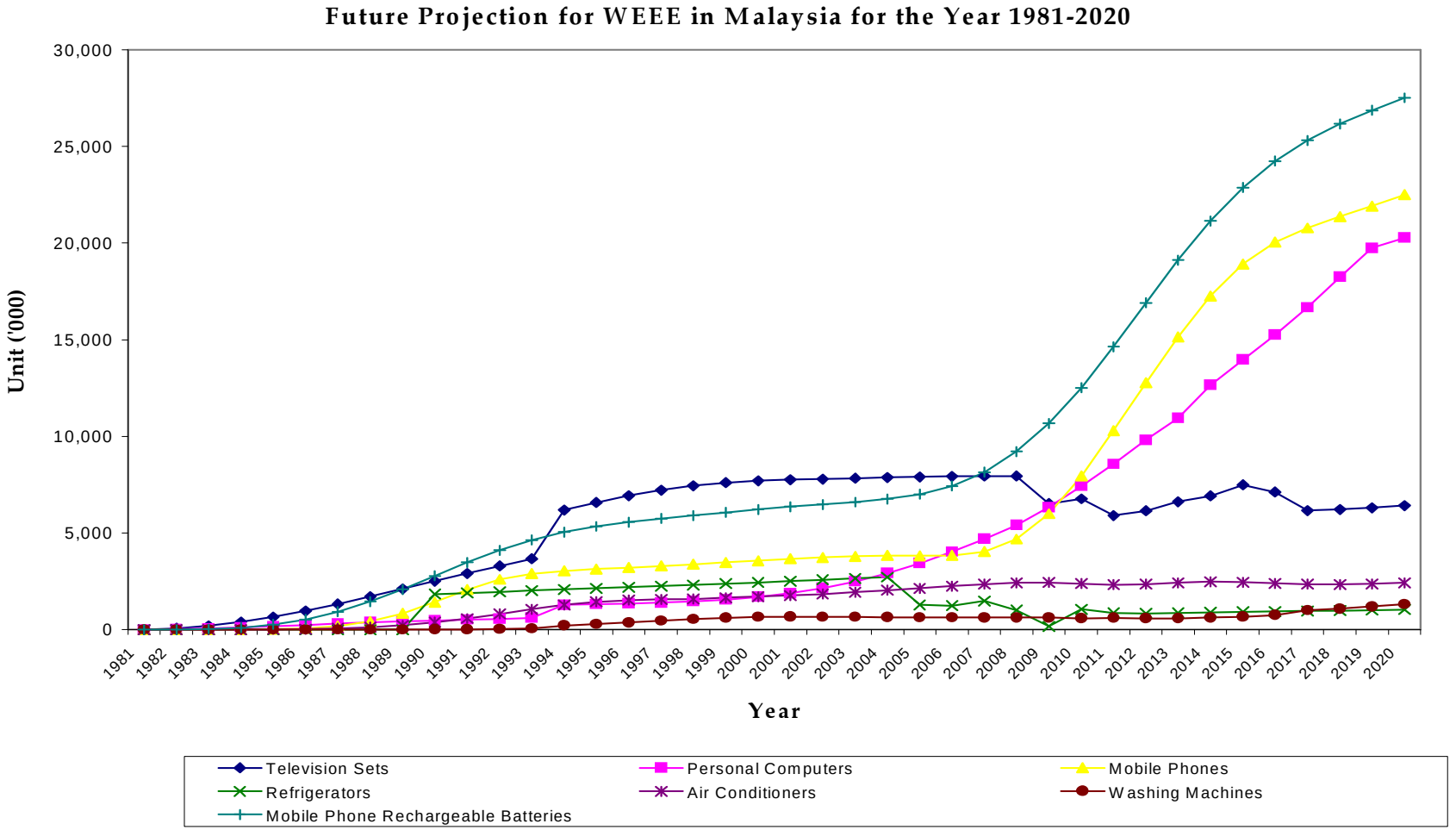

Figure 9: Projection of WEEE in Malaysia ('000 Units)

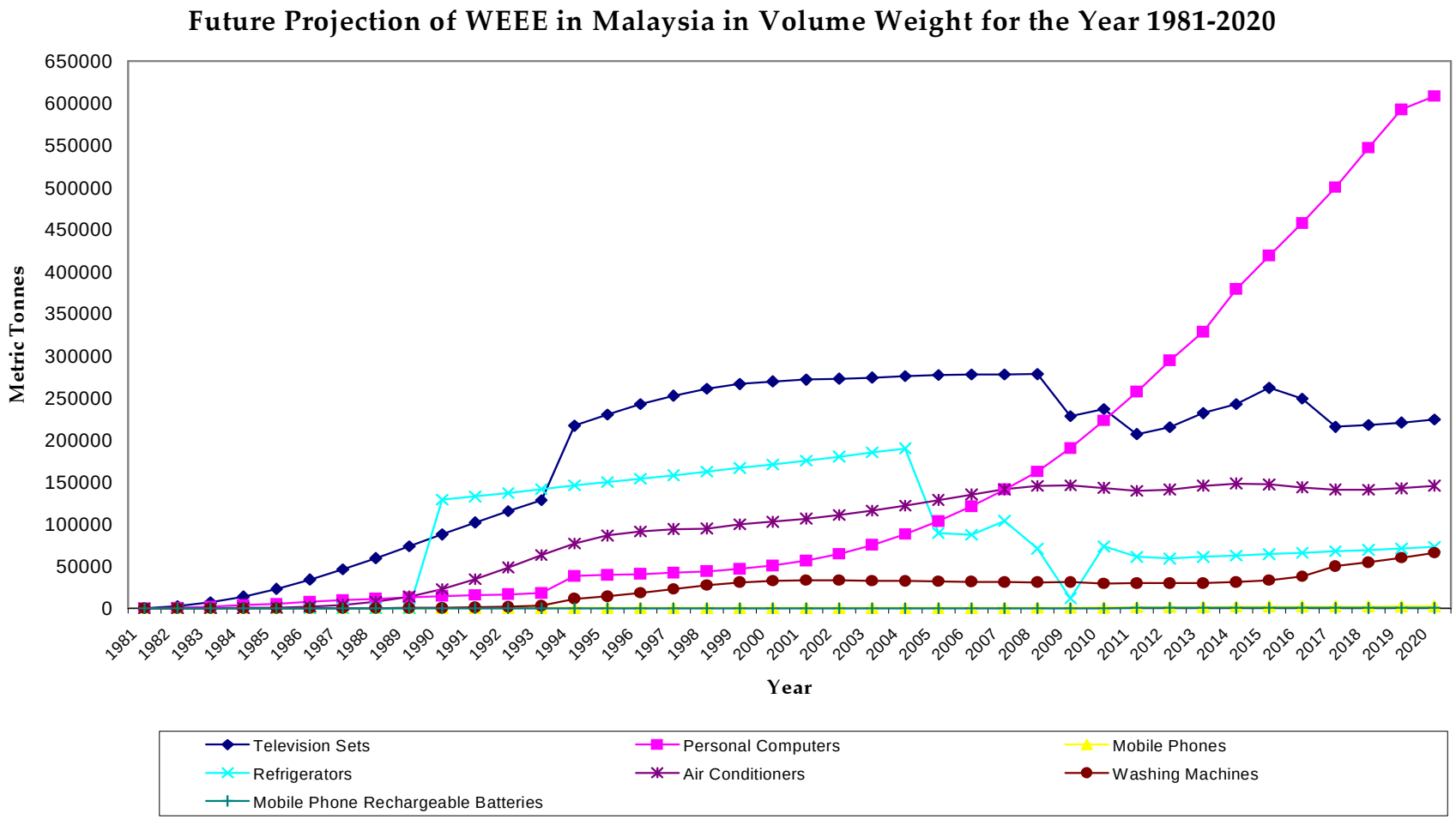

Figure 10: Projection of WEEE in Malaysia (Metric Tonnes)

3.3.5 *Amount of Used EEE Exported / Repaired / Reassembled and Dismantled*

Export of Used EEE

To date, there are no reports or statistics data available on the exports of used EEE from Malaysia. However, DOE has approved exports of some items of WEEE which cannot be treated in Malaysia for e.g. mobile phone rechargeable batteries. The WEEE that the DOE-licensed e-waste contractors collect are supposed to remain in Malaysia. It cannot be ascertained from the interview data whether the WEEE collected by local metal scrap recyclers/collectors are exported.

3.3.6 *Weight Percentage and Ratio of Reusable Parts, Recyclable Materials and Residues of Used EEE*

All WEEE will be analyzed to identify the ratios and amount of reusable parts, recyclable materials and residues generated from the repair/reassemble or dismantle processes. The amounts generated are analyzed to obtain the percentage weight and also the ratios of reusable and recyclable materials to residues based on the kilograms per units value (kg/units).

The ratios of reusable parts, recyclable materials and residues generated from the repair/reassemble or the dismantling process are identified by using the weight percentage of residues generated as the denominator and the weight percentage of reusable parts and recyclable materials as the numerator. The purpose of this calculation is to show the amount of reusable parts and recyclable parts that will be generated from both processes in comparison with 1 kg/ units of generated residues. Caution should be exercised when interpreting this data for policy

purpose because the data was assembled from a small number of questionnaire that were returned by the recyclers category

Used Television Sets

For the repairing and reassembling process, a total of 48.4% of the weight percent is reusable and recyclable materials while the reusable and recyclable materials obtained from the dismantling process for used television sets are 59.9% by weight.

The ratio for reusable and recyclable materials to residues on the basis of kg/units is shown in **Table 14.1**. From the repair/reassembling process, the obtained ratios are 4.397 (reusable parts) and 1.405 (recyclable materials). For dismantling, the ratios are 1.983 (reusable parts) and 1.009 (recyclable materials).

Table 14.1: Weight percentage and ratio of reusable parts, recyclable materials and residues generated from repair/reassembling and dismantling of used television

Process / Material	Repair/Reassembling of Used Television Sets		Dismantling of Used Television Sets	
	Weight (%)	Unit Generation (Kg/units)	Weight (%)	Unit Generation (Kg/units)
Reusable Parts	11.73	4.397	20.21	1.983
Recyclable Materials	36.71	1.405	39.72	1.009
Residues	51.56	1	40.07	1

Reusable parts generated from the repairing and dismantling process of televisions are mostly CRT panel glasses, CRT funnel glasses and electron guns. Recyclable materials that can be recovered from television usually consist of steel, plastic, copper and aluminum that can be obtained from various parts of

the television such as from the reinforced band, shadow mask, printed circuit board, deflection yoke and from the casing of the television itself.

Used Computers

A total of 79.61% by weight from the repair/reassembling process are reusable parts (52.37%) and recyclable materials (27.24%). The weight percentage for residues for both repair/reassembling and dismantling process seems to be similar which is 20.39% and 20.83%. Based on the table provided, 38.54% of the total computer weight from the dismantling process is reusable parts while 40.63% is recyclable materials (see **Table 14.2**).

The ratio for reusable and recyclable materials to residues generated from the repair/reassembling process are 0.389 (reusable parts) and 0.748 (recyclable materials). For dismantling process, the ratios obtained are 0.541 (reusable parts) and 0.513 (recyclable materials).

Table 14.2: Weight percentage and ratio of reusable parts, recyclable materials and residues generated from repair/reassembling and dismantling of used computers

Process / Material	Repair/Reassembling of Used Personal Computer		Dismantling of Used Personal Computer	
	Weight (%)	Unit Generation (Kg/ units)	Weight (%)	Unit Generation (Kg/units)
Reusable Parts	52.37	0.389	38.54	0.541
Recyclable Materials	27.24	0.748	40.63	0.513
Residues	20.39	1	20.83	1

Obsolete computers contain significant amounts of recoverable materials including metals, glass, and plastics. The metals contained in computers commonly include aluminum, antimony, arsenic, barium, beryllium, cadmium,

chromium, cobalt, copper, gallium, gold, iron, lead, manganese, mercury, palladium, platinum, selenium, silver, and zinc. These materials can be processed, concentrated, and refined to produce brand new valuable metal.

Plastics derived from computer casings can be remelted and transformed into different household electronic devices. The plastic will be melted down and processed for use as raw materials for new products, or used as fuel. CRT glass from the computer can also be recycled, but due to its lead content, the CRT glass is classified as hazardous waste, and it must be handled, processed, and disposed of according to the regulatory requirements.

Used Mobile Phones

For used mobile phones, the repair/reassembling process indicates that 55% is reusable parts (15%) and recyclable materials (39.96%) as shown in **Table 14.3**. Meanwhile, the weight percentage obtained from the dismantling of used mobile phones is 25% (reusable parts) and 60% (recyclable materials).

The ratios of reusable and recyclable materials to residue generated from the repair/reassembling process are 2.989 (reusable parts) and 1.126 (recyclable materials). However, dismantling of used mobile phones shows that the generation is high towards the reusable and recyclable materials with the ratio of 0.6 (reusable parts) and 0.25 (recyclable materials).

Table 14.3: Weight percentage and ratio of reusable parts, recyclable materials and residues generated from repair/reassembling and dismantling of used mobile phones

Process / Material	Repair/Reassembling of Used Mobile Phones		Dismantling of Used Mobile Phones	
	Weight (%)	Unit Generation (Kg/units)	Weight (%)	Unit Generation (Kg/ 100 units)
Reusable Parts	15.05	2.989	25.00	0.600
Recyclable Materials	39.96	1.126	60.00	0.250
Residues	44.99	1	15.00	1

Mobile phones contain plastic and metal as the primary materials. Metals like copper, iron, nickel, silver, and zinc, aluminum, gold, lead, manganese, palladium, platinum, and tin are categorized as valuable recoverable metals. These valuable metals can be recovered by further process for reuse as a raw material for new metal products.

Used Refrigerators

The weight percentage of reusable and recyclable materials from used refrigerators is nearly 56% (recyclable materials) and 13.6% (reusable parts) for repair/reassembling process. For dismantling, the weight percentage for recyclable materials was found to be similar with the generated residues (48.2%). The reusable parts have only 3.6% from the total weight of a used refrigerator (see **Table 14.4**).

The ratios for processed materials obtained from the repair/reassembling process are 2.269 (reusable parts) and 0.56 (recyclable materials). Similar with the weight percentage of used refrigerator, the ratio for recyclable materials and residues

from the dismantling process was also similar (1). The ratio for reusable parts is 13.33 to the residues generated.

Table 14.4: Weight percentage and ratio of reusable parts, recyclable materials and residues generated from repair/reassembling and dismantling of used refrigerators.

Process / Material	Repair/Reassembling of Used Refrigerator		Dismantling of Used Refrigerator	
	Weight (%)	Unit Generation (Kg/units)	Weight (%)	Unit Generation (Kg/units)
Reusable Parts	13.59	2.269	3.61	13.333
Recyclable Materials	55.59	0.555	48.19	1.000
Residues	30.82	1	48.19	1

Reusable parts generated from refrigerator repairing and dismantling process mostly is the blower fan. Recyclable materials that can be recovered from refrigerator usually consist of steel, plastic, copper and aluminum that can be obtained from various parts of the refrigerator such as the compressor, insulation, evaporator, motor, evaporator and the cabinet parts.

Used Air Conditioner

A total of 78.52% of used air conditioner is reusable parts (35.78%) and recyclable materials (42.74%) from the repair/reassembling process. Based on the ratio obtained, the unit generation of reusable parts and recyclable materials from the repair/reassembling process is two times greater than the residues. The ratio of reusable and recyclable materials to residue is 0.6 (reusable parts) and 0.5 (recyclable materials).

Table 14.5: Weight percentage and ratio of reusable parts, recyclable materials and residues generated from repair/reassembling and dismantling of used air conditioner.

Process / Material	Repair/Reassembling of Used Air Conditioner		Dismantling of Used Air Conditioner	
	Weight (%)	Unit Generation (Kg/ units)	Weight (%)	Unit Generation (Kg/units)
Reusable Parts	35.78	0.600	18.52	0.800
Recyclable Materials	42.74	0.502	66.67	0.222
Residues	21.48	1	14.81	1

As seen in **Table 14.5**, a total of 85.19% weight from dismantling of used air conditioner is reusable parts (18.52%) and recyclable materials (66.67%). The ratios for reusable and recyclable materials to the residues generated from the process are 0.8 (reusable parts) and 0.2 (recyclable materials).

Recyclable materials that can be recovered from refrigerators usually consist of steel, plastic, copper and aluminum such as the interior and exterior heat exchanger, interior grill, compressor, interior and exterior fan and the cabinet parts.

Used Washing Machines

Based on the data obtained, **Table 14.6** indicates that 46.23% of used air conditioner's weight from the repair/reassembling process is reusable and recyclable materials. The ratio for the generation of reusable and recyclable materials to the residues from the same process is 4.325 (reusable parts) and 1.591 (recyclable materials).

From the dismantling process, a total of 90.4% of used washing machines are reusable parts (12.97%) and recyclable materials (77.43%). As for ratio, the table indicates that the generation of reusable parts to residues is 0.741 while the generation of recyclable materials to residues is 0.124.

Table 14.6: Weight percentage and ratio of reusable parts, recyclable materials and residues generated from repair/reassembling and dismantling of used washing machines.

Process / Material	Repair/Reassembling of Used Washing Machines		Dismantling of Used Washing Machines	
	Weight (%)	Unit Generation (Kg/ units)	Weight (%)	Unit Generation (Kg/units)
Reusable Parts	12.43	4.325	12.97	0.741
Recyclable Materials	33.80	1.591	77.43	0.124
Residues	53.77	1	9.61	1

Reusable parts that are generated from washing machine repairing and dismantling process is mostly the pulsate and polypropylene receiver. As for the recyclable materials that can be recovered from washing machines, they usually consist of steel, plastic, copper and aluminum that can be obtained from various parts of the washing machine such as from the internal tank, body of the washing machine, motor, and the mechanical casing.

3.4 Treatment Practices and Disposal Method of Residues

3.4.1 Treatment Practices of Residues by Full Recovery Processors

Residues are generated in the pre-process activities (segregation) and also from the use of chemicals for the recycling and recovery process. From the few data

sets that were returned, a total of 2,217kg of residues was reported for 194,435.6kg of recyclable materials on a monthly basis.

Overall, there are four (4) categories of processed materials that can be recovered from the main recycling and recovering process which is plastic, metal, glass and other mixed materials (cable wires, wood pallets, oils, containers, etc). On a monthly basis, an average of around 58,899.6kg of plastic materials (15.19%), 132,922kg of metal materials (34.27%), 1,614kg of glass (0.42%) and 1,000kg of other mixed materials (50.13%) are recovered.

For plastics, there are 3 types of method used to recover the materials which is by crushing, palletizing and by other methods. The processed glass material is a mixture of recyclable glass and recyclable glass with lead (CRT). Basically, the processes involved are the sorting of the CRT according to its quality and washing the CRT before it is crushed and melted. There is only one full recovery facility for CRT in Malaysia. In metal recovery, the process starts by sorting the metals according to ferrous and non-ferrous components and then smelted or extracted chemically. The specific metal recovery process however was not described by the processors in the returned questionnaires (see **Table 15**).

Table 15: Amount of residues generated from processed materials

Material / Material	Residues			Processed Materials		
	Weight (kg/month)	Weight %	Unit Generation	Weight (kg/month)	Weight %	Unit Generation
Plastics	0	0.00	0	58899.6	15.19	0
Metals	0	0.00	0	132922	34.27	0
Glass	0	0.00	0	1614	0.42	0
Other	2217	100	0.0114022	194435.6	50.12891	0.01140223

3.4.2 Disposal Method for Residues Generated

Repair and Second-Hand Shops

There are nine (9) types of residues generated from repair shops and second-hand shops. The largest quantities of residues generated are metals (36.11%) and followed by plastic (32%). The smallest amount of waste generated from the repair shops and second-hand shops are waste oil (0.58%) and also rechargeable batteries (1.98%). The percentage of residues generated from the processes is shown in **Figure 11**.

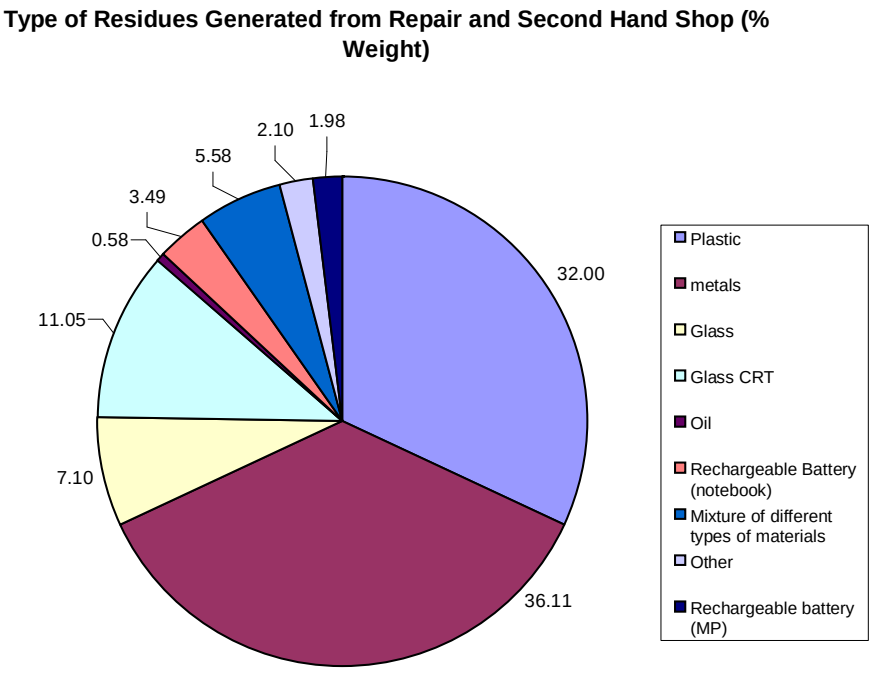

Figure 11: Type of residues generated from the repair shops and second-hand shops.

In identifying the type of method used in disposing residues generated from the processes, a list of disposal methods were provided in the questionnaire and the data received are shown in pie charts which were developed to show the residue disposal in percentages (see **Figures 12 to 20**).

The preferred method for plastic disposal is by "other means" which is 41% from the total plastic residues generated. Similarly, disposal by "other means" is also the preferred method for CFC (62%), metals (56%), notebook rechargeable batteries (50%) and mobile phone rechargeable batteries (50%). Examples of "other means" according to the respondents are by selling to scrap collectors or to fabrication shop for reuse.

For residues such as glass and glass with lead, the preferred method of disposal is by giving the residues to collectors or other parties. The rest of the residues generated as a mixture of different materials and other materials are disposed as municipal waste.

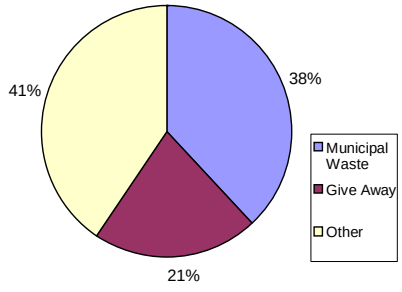

Figure 12: Disposal method of plastic for repair and second hand shops

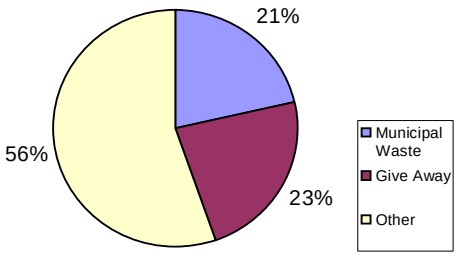

Figure 13: Disposal method of metal for repair and second hand shops

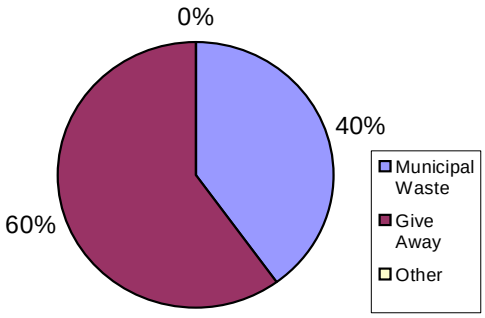

Figure 14: Disposal method of glass for repair and second hand shops

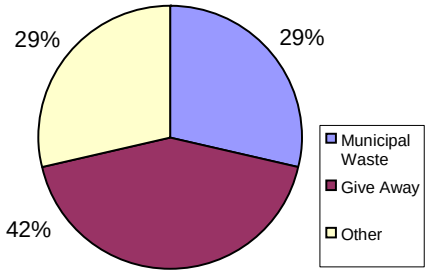

Figure 15: Disposal method of glass with lead (CRT) for repair and second hand shops

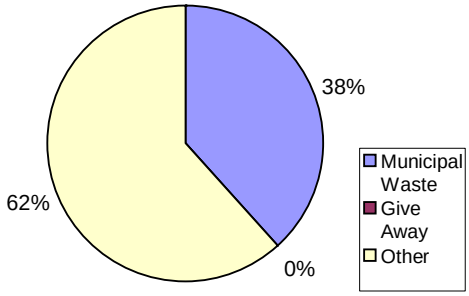

Figure 16: Disposal method of CFC for repair and second hand shops

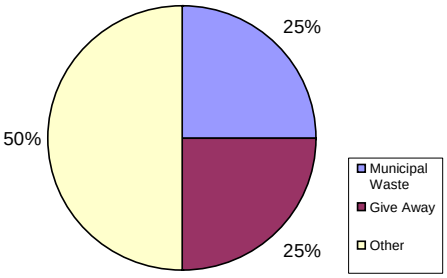

Figure 17: Disposal method of rechargeable battery (notebook) for repair and second hand shops

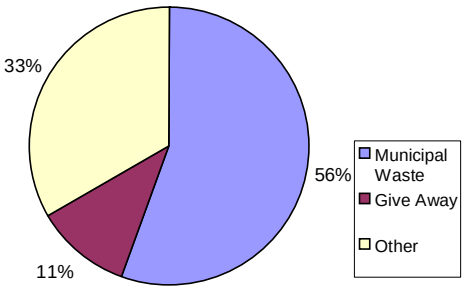

Figure 18: Disposal method of mixture of different types of materials for repair and second hand shops

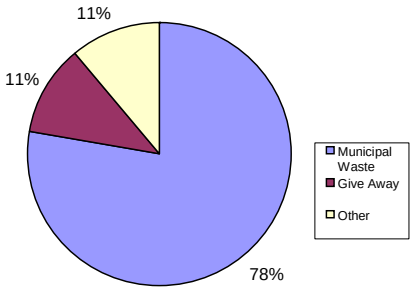

Figure 19: Disposal method of other wastes for repair and second hand shops

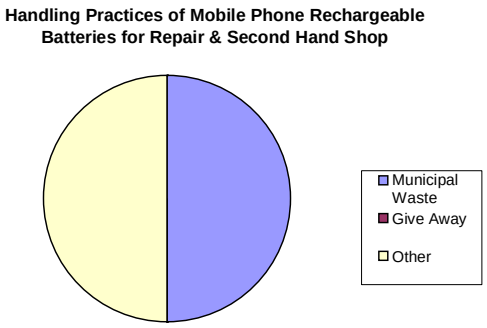

Figure 20: Disposal method of mobile phone rechargeable batteries for repair and second hand shops

Dismantlers

A total of 8 types of residues are generated from dismantling activities by DOE-licensed e-waste collectors and metal scrap collectors. The highest residues generated are metals (45.31%) followed by plastics (35.5%). The two (2) least residues generated are CFC (0.22%) and mixture of different types of materials (0.54%). **Figure 21** shows the total percentage of all residues generated from dismantling activities.

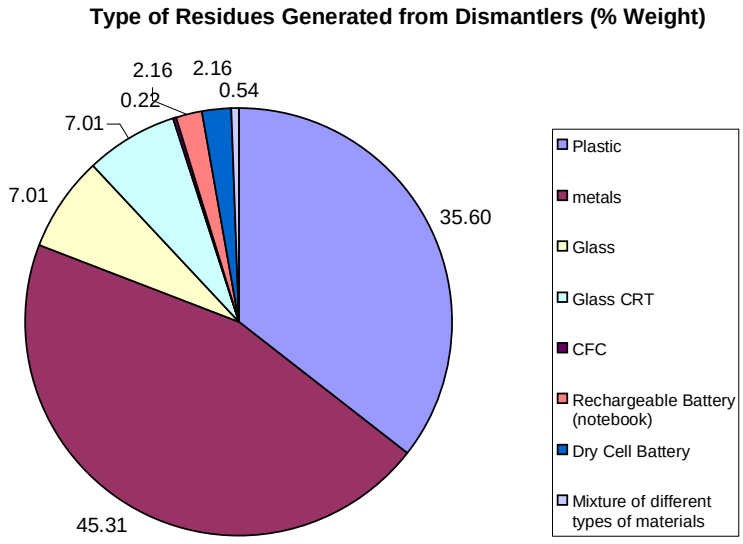

Figure 21: Type of residues generated from dismantlers

In **Figures 22 to 24**, the various disposal practices of only three types of residues are presented. The residues such as plastics, oils, CFCs, rechargeable battery (notebook) and mixture of different residues are usually disposed either as municipal waste; pay for disposal or by other means.

Metal residues are mainly disposed by other means (83%) while the balance is disposed as municipal waste. Glass residues are also mostly disposed by other means (60%) with 20% of the glass residues disposed by giving away to scrap collectors, and the balance of glass residues disposed as municipal waste.

For glass with lead, the main preferred disposal method is by appointing other companies (67%) to collect and dispose the residues. A total of 33% glass with lead residue is disposed by other means. Examples of other means of disposal method are by selling residues to scrap collectors, throw into water drains, sell to recycling facilities, etc.

Disposing the residues as municipal waste is the only disposal method applied for CFC residues generated from the dismantling process. Unfortunately, there was insufficient information provided by the dismantlers regarding the handling process of CFC as municipal waste.

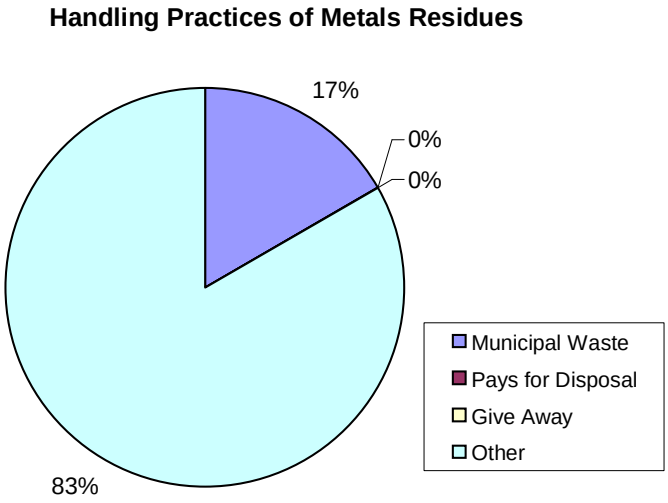

Figure 22: Handling practices of metal residues

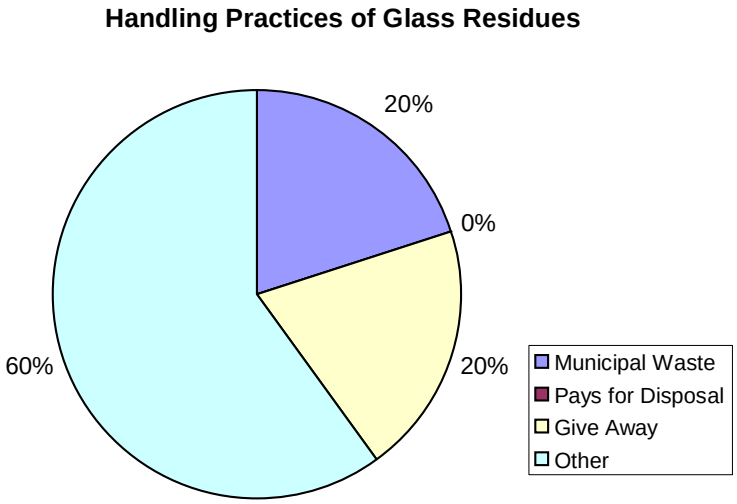

Figure 23: Handling practices of glass residues

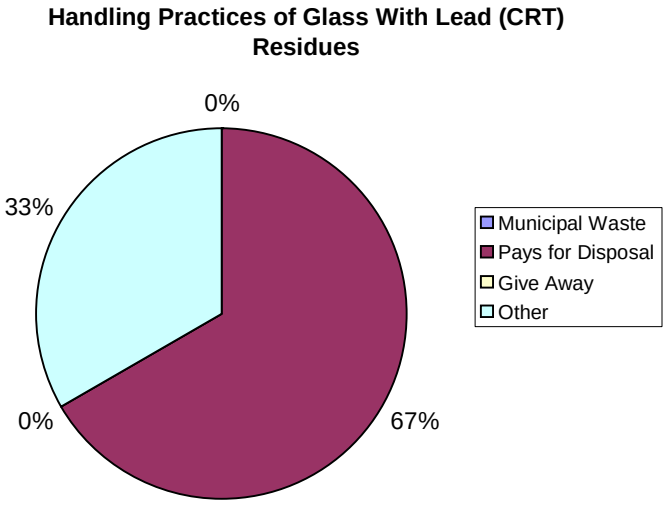

Figure 24: Handling practices of glass with lead residues

Processors

There are three (3) types of disposal methods used to dispose the residues generated by the processors which are dispose as municipal wastes, pay for disposal or by other means as shown in **Figure 25**. The main disposal method used by the processor to dispose is by other means (50%) followed by pay disposal (40%) and dispose as municipal waste (10%). The residues which are hazardous in nature will be disposed as scheduled waste in Malaysia.

There were no residues generated from plastics, metals and glass recovery processes. The percentage shown in **Figure 25** was based on the data submitted by only 10 processors in this survey.

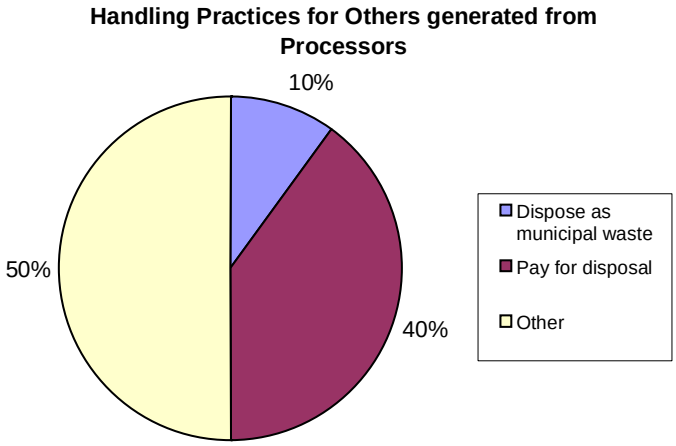

Figure 25: Selected disposal method preferred by the recovery process facilities

4.0 DISCUSSION AND RECOMMENDATION

4.1 Response from the Target Subject

Generally, the respondents from the household were most cooperative in providing information about the WEEE generation with moderate cooperation from business entities and institutions. However, the co-operation given by the recyclers, manufacturers, export and import agencies was poor. The factors that affected the process of data collection are:

i. The survey forms require a lot of information and this is a deterrent for the respondents particularly to do the grouping of EEE.
ii. Business entities, large and small, do not normally entertain this type of survey as it requires business sensitive data and they do not perceive it as providing any tangible benefits to their business
iii. Business entities also do not normally track their WEEE generation nor the purchasing of electrical and electronic appliances and it requires a great effort to trace the purchasing records for the data.
iv. A number of the respondents in the recycler category were difficult to locate or unable to be contacted, particularly the DOE-licensed collectors and dismantlers.
v. The recycler category respondents were not comfortable providing information about their business to a government agency, in this case the DOE.

4.2 Purchase/Use Pattern of EEE

The purchase/use pattern of EEE was analyzed to determine the possession of EEE, the duration of use, the ratios of second-hand and brand new EEE and also the disposal method for households respondents and the business entities and institutions respondents as a whole.

4.2.1 The trend of EEE Possessed in Households

In this study, the household category was divided into the various income levels. The purpose of categorizing the household according to their income level is to study the effect of discretionary income on the rate of possession of EEE and the average duration for the usage of the EEE. Discretionary income is income after subtracting taxes and essentials (such as rent or mortgage, food, clothing, car payments, and insurance) to maintain a certain standard of living and is the amount of an individual's income available for spending after the essentials have been taken care of.

Increasing per capita income combined with controlled inflation has allowed the discretionary income of the average Malaysian to increase. With increasing purchasing power and the generally affordable prices of EEE, Malaysians are able to own more types of EEE and also own multiple units of the same type of EEE. The types of EEE that used to be possessed by only high income level households in the past are now just as equally possessed by the medium and some low income households.

For example, the possession of air conditioner has spread from the high income households to the medium and low income household. This pattern has been

significant for the domestic sales volume and is seen in the steady increase of production and sales from the year 1995 to 2006 as provided by the Department of Statistic Malaysia (DOS). This is also evident for television sets and personal computers.

The other types of EEE such as refrigerators and washing machines show approximately the same average number of units possessed i.e. one unit regardless of the income level. This may be due to what we term as the 'necessity and practicability factor' where refrigerators and washing machines are considered necessities but owning more than one unit is considered impractical.

For mobile phones, the trend of number of units possessed was reversed in that the middle and low income groups had averages of 2 units versus an average of 1 unit for the high income group. This is not a logical trend as it has been observed that in many middle and high income households, even children own mobile phone units. Therefore, there is no apparent reason for the reverse trend in mobile phone ownership except that the household respondents may have not considered the mobile phones owned by their family members when they submitted the questionnaire.

4.2.2 The trend of EEE Possessed in Business Entities and Institutions

In the commercial sector (business entities), it is clear that large scale businesses tend to possess higher numbers of the EEE types which are necessary for running their businesses effectively and efficiently, compared to the medium scale and small scale business. This is evident in the ownership trend for personal computers and air conditioners.

The EEE types which are less relevant to the running of a business entity or an institutions show up in smaller volumes in the data. For example, refrigerators are not suitable and practical for large scale business to provide cold drinking water due to the large number of employees so other alternatives such as a water cooler/heater is more preferable. For air conditioners, the necessity and the practicability depends on the type of office or building where for small offices or buildings, the split unit air conditioner may suit the need but not for large buildings where a centralized air conditioning system is preferable.

In the institutions category, the numbers of EEE for were found to be higher than the business sectors for certain types of EEE such as television sets. This is due to the types of institutions that were included in the survey for e.g. hotels, hospitals, etc. In Malaysia, the number of hotel rooms is estimated at 157,000 in the year 2006 (www.tourism.gov.my/statistics). It can be assumed that nearly 90 of these hotel rooms will have one unit of television set.

4.2.3 Disposal Method for Households and Business Entities and Institutions

Based on the purchase/use pattern tables, a significant number of respondents kept their discarded/unwanted EEE in the house or premises. The percentage of unwanted EEE currently possessed by the households is 23.95% and 20.96% for business entities and institutions. From the interviews, it was determined that the respondents who kept their WEEE do not know how to dispose the WEEE. Besides that, other factors also contribute to the keeping of unwanted EEE which are:

i. Some of the internal parts of the equipments can still be used for example the computer's central processors unit (CPU) and therefore kept for future cannibalization of parts.

ii. The owners are not certain that the WEEE is irreparable and believe that it might work again if it is sent to repair shops.
iii. The owner's are reluctant to throw away their WEEE which was bought at a high price.
iv. The owners are waiting for collectors to buy from them to dispose the discarded WEEE rather than having to pay someone to collect the WEEE.

4.3 Future Projection of Discarded EEE

Two factors significantly influence the increasing numbers of e-waste that were projected until the year 2020 i.e. the EEE domestic shipment data between 1995 and 2004 and the approximate duration of use of the EEE. For example, the mobile phone rechargeable batteries and mobile phones were found to be the biggest contributor for the overall e-waste generation compared to other e-wastes. The data seems realistic as the ownership level for mobile phones is high coupled with the average replacement duration of two and a half years for new rechargeable batteries for mobile phones.

For the projection of future WEEE for television sets and refrigerator, the figures are lower than for mobile phones primarily because the duration of use is much longer.

The other types of WEEE lag behind in the volume generated for various reasons. In the case of personal computers, although the replacement rate is fast, the penetration rate of computers in households is lower than for television sets because personal computers were introduced much later than televisions and the rate of take-up has not been as fast. It is likely that this current projection will

change with the continued government drive to increase ownership of personal computers. Similarly for business entities and institutions, computer use has been increasing but not at levels that were significant enough to cause the WEEE projection for computers to match the WEEE projections for mobile phones.

Other factors that could influence the generation of WEEE are the rapid evolution of technology which creates new products which feature these technologies as well as the advances in manufacturing efficiencies. Both factors combine to produce products which are attractive to consumers in terms of technology adoption and affordability. This will cause the replacement of EEE to increase as purchasers are attracted by the new, affordable models which in turn will create more unwanted or discarded EEE.

4.4 The Fate of E-waste

The fate of e-waste depends on how it is collected from its sources and then treated. Based on the information that has been obtained, there are a number of parties involved in the collection of e-waste. These are discussed in the following section.

According to the DOE, Malaysia has generated 40,000 tons of e-waste in 2006 (NST Online, 2007). This data only reflects the e-waste that is collected as disassembled components from industries and is much less than the projected value of WEEE for 2006. Based on the projection table, the total weight of WEEE will be expected to reach 688,066 tonnes just for the year 2008 and in the year 2020, the amount will be 1.119 million tonnes of WEEE.

4.4.1 Flow of Used Electrical and Electronic Equipment (WEEE) in Malaysia

Used EEE (WEEE) is normally generated from the household and also from the business entities and institutions as whole unit of equipments or sub unit of functional equipments. These whole units of WEEE have been categorized as e-waste by the DOE but are presently not collected as e-waste by the DOE licensed e-waste contractors. On the other hand for many electrical and electronic manufacturers, their e-waste generated is not whole units of WEEE but disassembled components such plastic fittings, chipboards, metal parts and cables which are collected by DOE licensed e-waste contractors.

At present, a regulated infrastructure is being enhanced for whole units of WEEE to be collected from households and the business entities and institutions. Given the current high price of metals and plastics, the potential for the scrap collectors to profit from collecting and disposing WEEE for recycling is high which would explain why most of the non-DOE licensed scrap collectors (see **Appendix 6**) were unwilling to divulge information about this business.

Figure 26 shows the general flow of WEEE from the source of generation until the location of disposal identified in Malaysia. It shows a significant disconnect between the largest sources of WEEE and the DOE-licensed e-waste collectors and processors. The exception is a very small flow of used computers from business entities/institutions back to manufacturers who have recently practiced a take back policy in exchange for new computers that are bought, as well as small volume of used computers collected by the solid waste concessionaires in recent years.

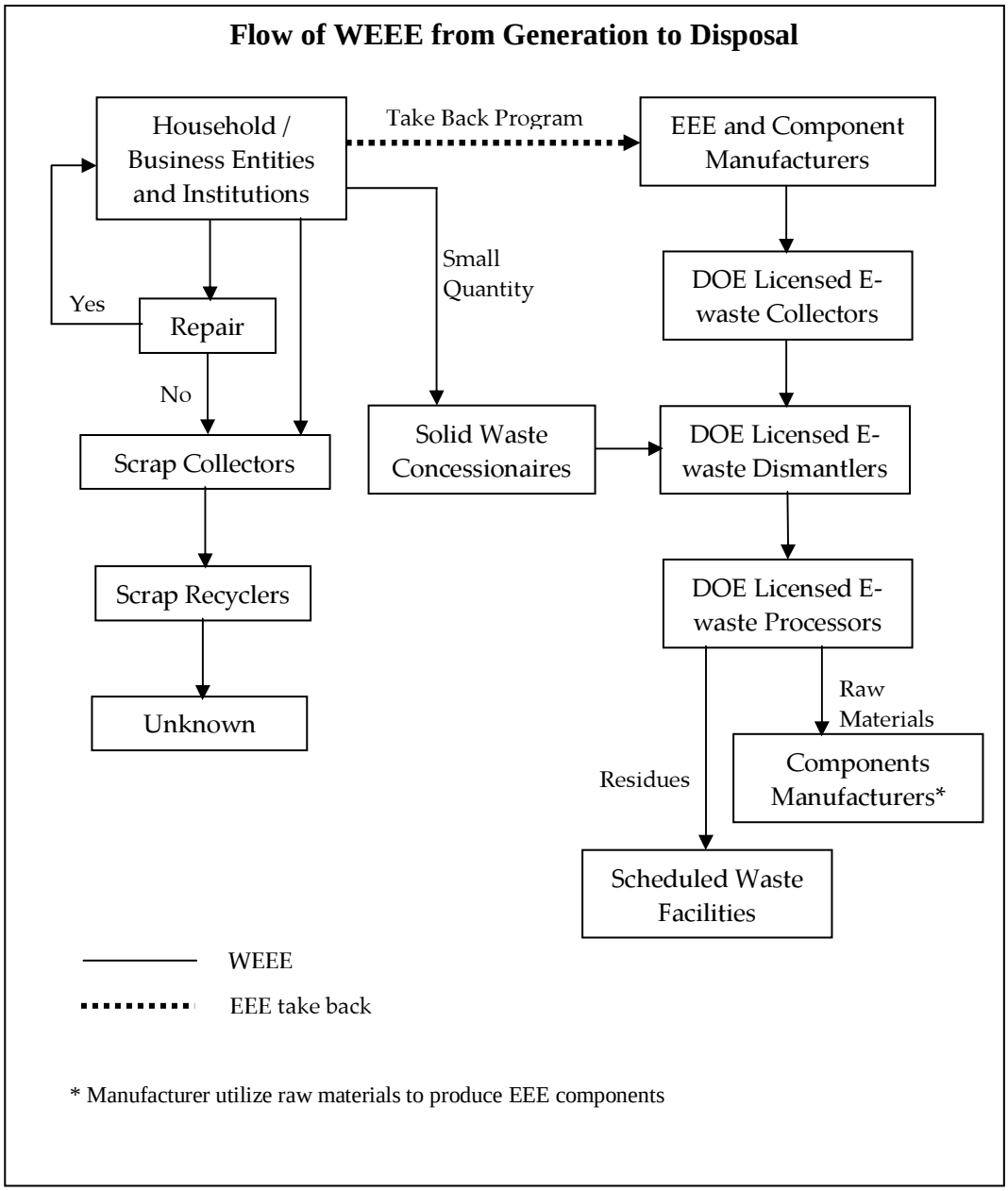

Figure 26: General flow of WEEE from the generation until disposal

4.4.2 Stakeholders in WEEE management

In e-waste management, there are a number of stakeholders who have an interest in the collection and treatment of WEEE:

- Manufacturers of electrical and electronic products
- Importers of electrical and electronic products (new and secondhand)
- Retailers of electrical and electronic products
- Local councils
- Charities and NGOs
- Consumers
- DOE licensed e-waste contractors
- Scrap collectors
- Department of Environment, Ministry of Natural Resources and the Environment
- National Solid Waste Management Department (NSWMD), Ministry of Housing and Local Government Malaysia (MHLG).

Some of these stakeholders do not presently appear in the flow of WEEE from generation to disposal shown in **Figure 26**, notably, the importers of secondhand products, retailers, the local councils and the NSWMD. At the same time, the other stakeholders seem to be operating in quite separate spheres in the collection and processing of e-waste.

There are also charities and NGOs who conduct charity drives to collect old computers for repair and donation to under-privileged homes but these are small volumes. The volume of secondhand imports of used EEE into Malaysia is not

known but a perusal of the Internet reveals a number of companies involved in the importation of used EEE.

The solid waste concessionaires, Alam Flora Sdn Bhd and SWM Environment Sdn Bhd, have also conducted an e-waste collection program which started in 2005. The e-waste collection program forms part of their corporate social responsibilities (CSR) to the community and the environment as well as to assist DOE Malaysia in their effort to manage e-waste. A total of 4,827 units of computers have been collected since the program started.

4.4.3 Level of Repair/Refurbishment Necessary for Reuse or Recycling

For the repairing process done by repair and secondhand shops, most of the activities were done manually and only uses common repair tools such as screw drivers, wire cutter and soldering tools. The process starts by conducting tests to identify the problem with the equipment. The repairer disassembles the equipment's casings to expose the internal components that need to be repaired or changed. When the repair has been done, the equipment is then tested before being assembled to be returned to the owner. If the equipment cannot be repaired and the owner is not willing to take the equipment back, the repair shops will sell it as second-hand equipment in the second-hand shops or to scrap collectors (**Figure 27**).

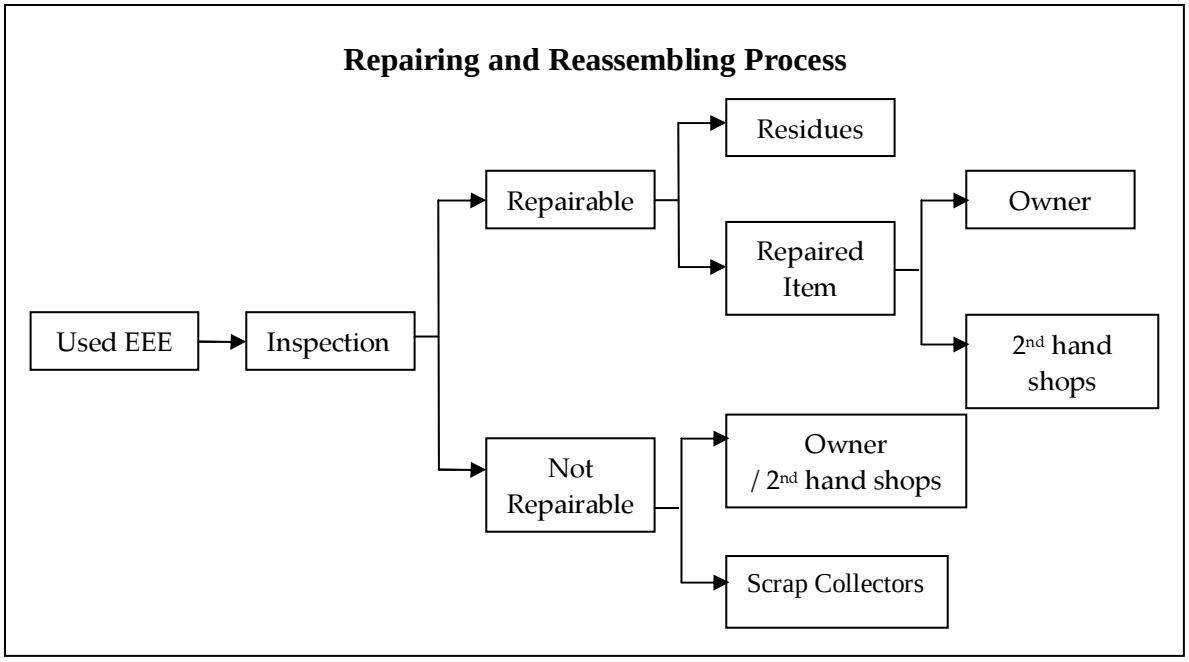

Figure 27: Repairing and reassembling process flow chart

4.4.4 Level of Dismantling and Recycling of Used EEE or WEEE

The dismantling and recycling of WEEE that was investigated in this study is mostly conducted by the DOE licensed e-waste collectors. The non-DOE licensed scrap collectors were unwilling to release information on whether they do the dismantling and recycling here in Malaysia or elsewhere. There are two levels of e-waste dismantling and recycling based on the material flow which is manual dismantling and segregation and a mechanical dismantling process (see **Figure 28**). Both types of operations are dry processes, which do not require the usage of water.

The first treatment process undertaken in dismantling WEEE is to decontaminate WEEE and render it non-hazardous or to separate parts of WEEE which are unwanted in the recovery process. This involves the removal of all types of

liquids, wires, gases, etc. The manual dismantling process is conducted to segregate parts to residues and recyclable/recoverable materials.

Segregated parts such as plastics, CRT, circuit boards, metals and cables will continue into the second level process which is the mechanical dismantling. In the mechanical dismantling process, two major unit operations are hammering and shredding. The main objective of these unit operations is to reduce the sizes of the parts. Crushed and shredded parts are sold to the DOE-licensed full recovery facilities for further processing. The full recovery facilities can recover the metals in a process that involves the smelting or chemical extraction of the metals while glass parts are melted into new products.

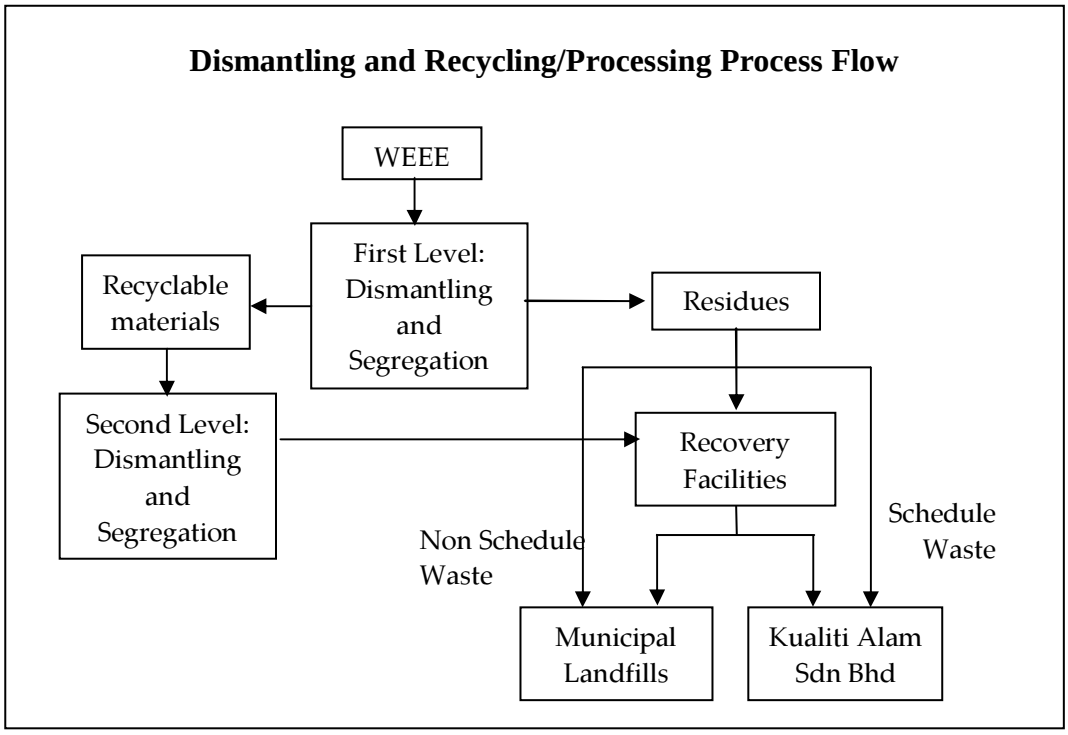

Figure 28: Dismantling and recycling/processing process flow chart

4.4.5 Disposal Method for Residues from Dismantling and Recycling Operation

The dismantling process generates a number of residues which can be either non-hazardous materials or scheduled wastes. Residues such as the refrigerant tanks, batteries and capacitors were sold to unknown collectors or sent to the municipal landfills, particularly for non-DOE licensed contractors.

The following items are the typical residues generated from the dismantling and recycling operations:

1. Plastics
2. Mixed metals
3. Glass
4. Glass with CRT,
5. CFCs,
6. Rechargeable batteries and dry batteries
7. Mixture of different types of discarded parts.
8. Box cartons, wooden pallets

The results from the small number of questionnaires returned from the DOE-licensed collectors show that they dispose around 146 tonness of residues (hazardous and non hazardous residues) per month from the dismantling and recycling process which are sent either to municipal landfills (wood pallets, box cartons) or to other DOE licensed scheduled waste contractors if the WEEE is contaminated with hazardous chemical compounds.

4.4.6 Environmental Problems Due to Reuse/Recycling and Disposal of Used EEE

The DOE has no record to date, describing any incidents of environmental problems due to environmentally unsound reuse/recycling or disposal of WEEE in Malaysia. There have been no media reports of any location in Malaysia with environmental damage from e-waste processing which resembles locations such Guiyu in China.

However, in 2005 there was one incident which was reported in the media of a person with severe skin damage from exposure to acids in a facility that was stripping computer parts (The Malay Mail, April 2005).

4.5 Implementation of Measures for Environmentally Sound Management of WEEE

4.5.1 Regulations and guidelines

Department of Environment

Presently, the government agency responsible for the planning and enforcement of regulatory requirements pertaining to e-waste is the Department of Environment (DOE) within the Ministry of Natural Resources and the Environment (NRE). The management of e-waste is subsumed within the Environmental Quality (Scheduled Waste) Regulations 2005 (SWR 2005) which is applicable to the industrial and construction sector as well as the household / commercial sector.

In the SWR 2005, several forms of e-waste are categorized and coded as shown in **Table 16**.

Table 16: E-waste codes according to Environmental Quality (Scheduled Waste) Regulations 2005

CATEGORY CODES	DESCRIPTION
SW 102	Waste of lead acid batteries in whole or crushed form
SW 103	Waste of batteries containing cadmium and nickel or mercury or lithium
SW 109	Waste containing mercury or its compound
SW 110	Waste from electrical and electronic assemblies containing components such as accumulators, mercury-switches, glass from cathode-ray tubes and other activated glass or polychlorinated biphenyls-capacitors, or contaminated with cadmium, mercury, lead, nickel, chromium, copper, lithium, silver, manganese or polychlorinated biphenyl.

In January 2008, the Department of Environment (DOE) issued the '*Guidelines for The Classification of Used Electrical and Electronic Equipment in Malaysia*' for the purpose of assisting all parties involved in e-waste management to identify and classify the used EEE or components accurately according to the regulatory codes. The parties involved are waste generators, waste transporters, importers and exporters of wastes, and relevant authorities involved in the management of e-waste.

The guideline (see **Appendix 7**) provides a list of the types of electrical and electronic waste which may contain the hazardous compounds or materials mentioned above. Such electrical and electronic equipment or components that are destined for recycling, recovery or disposal are considered as e-waste and are listed below.

- Used television
- Used air-conditioner unit
- Used computer
- Used refrigerator
- Used washing machine
- Used video recorder
- Used telephone
- Used Photocopy Machine
- Use facsimile machine
- Used microwave/ oven
- Used Radio
- Used printers
- Used waste metal, contaminated with heavy metals such as cadmium, mercury, lead, nickel, chromium, copper, lithium, silver and manganese.
- Used cathode ray tube
- Used electric cable
- Used mobile phone
- Used motherboard
- Used hard disk drive
- Used printed circuit board
- Used lead frame
- Used patterned wafer
- Used ink cartridges
- Used or rejected or waste of integrated circuit
- Used audio amplifier
- Used electrical and electronic equipment/product imported form other countries
- Wastes or products processed out of the partial recovery facilities.

This guideline further defines that e-waste also includes waste from the assembly of electrical or electronic appliances that consist of components such as:

- Accumulators
- Mercury-switches
- Glass from cathode-ray tubes
- Activated glass or polychlorinated biphenyls-capacitors contaminated with Cadmium, Mercury, Lead, Nickel, Chromium, Copper, Lithium, Silver, Manganese or polychlorinated biphenyls

On the 18th of January 2008, the DOE announced that a draft regulation specifically focused on controlling and managing e-wastes is currently in preparation. The draft regulation will be known as the Environmental Quality (Recycling and Disposal of End-of Life Electrical and Electronic Equipment) Regulations. The purpose of the regulation is to compel manufacturers or importers to design equipment to minimize hazardous components and facilitate ease of recycling, and to require the manufacturers and importers to take back end-of-life equipment for the purpose of recycling or safe disposal.

Other associated regulations and guidelines related to e-wastes under the jurisdiction of DOE are shown below:

1. Environmental Quality Act 1974
2. Environmental Quality (Licensing) Regulations 1977
3. Environmental Quality (Schedule Waste) Regulations 2005
4. Environmental (Scheduled Waste) Regulations 2005 (Amendment) 2007
5. Environmental Quality (Prescribed Premises)(Scheduled Waste Treatment And Disposal Facilities) Order 1989
6. Environmental Quality (Prescribed Premises)(Scheduled Waste Treatment And Disposal Facilities) Regulations 1989
7. Environmental Quality (Refrigerant Management) Regulations 1999
8. Environmental Quality (Prescribed Conveyance) (Schedule Wastes) Order 2005
9. Guidelines on Import of Scheduled Waste EG4/94, Department of Environment
10. Guidelines on Export of Scheduled Waste EG1/93, Department of Environment

11. Guidelines for the Classification of Used Electrical and Electronic Equipment in Malaysia. Department of Environment. January 2008.

The DOE, as allowed for in the Environmental Quality (Prescribed Premises) (Scheduled Waste Treatment and Disposal Facilities) Regulations 1989, has established a separate group of contractors that are specifically licensed for the collection, transport, processing and disposal of e-waste. An updated list of these contractors can be obtained from the DOE website, www.doe.gov.my. To date, there are 96 partial recovery contractors and 11 full recovery contractors licensed by the DOE located in various parts of the country.

Royal Malaysian Customs (RMC)

The Royal Malaysian Customs (RMC) also play its role in controlling the transboundary movements of hazardous wastes under the Customs Act, 1967, specifically, the Customs (prohibition of Import) Order 2008 and the Customs (Prohibition of Export) Order 2008. The export and import of wastes as listed in the Orders have to be accompanied by prior written permission issued by the Director General of Environment before the RMC can issue the import or export license. Hence, the RMC plays a very important role in assisting DOE to prevent any illegal trafficking of hazardous waste through prohibition of imports and exports of waste.

National Solid Waste Management Department

The National Solid Waste Management Department (NSWMD), under the Ministry of Housing and Local Government Malaysia (MHLG) has drafted a provision under the Solid Waste and Public Cleansing Management Act 2007 (SWPCMA 2007) titled "Section 102 - Take Back System and Deposit Refund System".

Products for which take back systems can be implemented are as follows:

- Carpet, Sofa and mattresses
- Products in plastics, papers or cardboard containers
- Glass bottles, and
- Aluminum cans

The Minister also has the power to establish the deposit refund system and determine:

- the specified products or goods
- the deposit refund amount
- the labeling of the products or goods; and
- the obligations of the dealers of the products or goods.

When the act is fully enforced, any person who fails to comply will be liable to a fine not exceeding RM10,000.00 or imprisonment for a term not exceeding six months or both.

The forthcoming tasks that will be taken under the Act is to prepare the detailed regulations for the Take Back System and Deposit Refund System as well as to consult with all stakeholders for the systems before implementation of the regulations.

At the present moment, there are attempts between the Department of Environment and the National Solid Waste Management Department to align their regulatory strategies in order to avoid overlapping jurisdictions and conflicting regulation and guidelines. The NSWD and DOE will be establishing

a mechanism to manage and promote the e-waste collection from the households and commercial (business/institutions) sectors.

4.5.2 Management status of export and import of WEEE

Before any import or export of scheduled waste or e-waste is allowed, a written permission from the Director General of the DOE must be obtained before the RCM will allow the e-wastes export and import activities. To obtain the written permission, an application must be sent to the DOE following the procedures prescribed in the DOE's export and import guidelines.

For the import of scheduled waste, the applicant is required to fill the AS 14 form (Application for the Importation of Scheduled Waste into Malaysia) and submit it to DOE for evaluation together with relevant documents. Once submitted, DOE will evaluate the application to determine the availability of treatment or disposal facilities, the transporter's licensing status with DOE and to decide whether the import is justifiable. The DOE may reject or approve the application at this stage.

Upon approval, DOE will issue a written permission together with conditions to the applicants and will require the receiving schedule to be submitted. DOE will monitor and make compliance checks on the conditions of approval with the assistance of other regulatory departments (Custom Departments and Port Authorities). If the applicant does not comply, DOE will take further action or enforcement according to the enforcement action procedure where a compliance notice will be issued and further monitoring and compliance checks will be conducted. However, if the applicant complies with the conditions of approval, DOE will return the bank guarantee to the applicant after the approval period

has expired. The flow chart for importation process of scheduled waste is attached in **Appendix 8**.

The application for exportation of scheduled waste from Malaysia follows a similar procedure with the application for importation of scheduled waste, except that different forms are used and it requires an approval letter from the receiving country or any transit countries. The flow chart for the exportation process of scheduled waste is attached in **Appendix 9**.

Applicants must submit relevant documents together with their exportation or importation application to DOE as follows:

- Name and address of the generator
- Type and quantity of waste
- Waste Composition
- Percentage of recyclable materials
- Import justification
- Method of Handling (Collection, Packaging, Labelling, Storage, Transport and route)
- CV of the personnel who is responsible to conduct the collection, packaging, transportation and other related works with the scheduled waste handling
- Emergency Response Plan
- Copy of contract between the Exporter, Importer, Transport Agent and the waste receiver
- Insurance protection documents for the purpose of the handling of scheduled waste

In the Guidelines for the Classification of Used Electrical and Electronic Equipment in Malaysia, exporters and importers are required to fill in the Annex A form to determine the type of used electrical and electronic equipment or component proposed for export or import. Together with the Annex A form, exporters or importers are required to submit the Annex C forms to DOE. The Annex C form is used to obtained information about the exporters or importers, the details of used EEE and also their operational information. The annexes are shown as in **Appendix 10** and **Appendix 11**.

Based on information from the DOE, a number of approved transboundary movements of e-waste have been recorded in 2005 and 2006. Written permission was issued by the DOE under the Environmental Quality Act, 1974 in accordance with the Basel Convention's requirement.

1. Exported: 2005 – 90 metric tonnes to Thailand.
2. Exported 2006 – 1,925 metric tonnes to USA, Germany, Belgium and Thailand.
3. Imported 2005 – None.
4. Imported 2006 – 4,628 metric tonnes from USA.

In addition, there were two cases involving the return shipment of electrical and electronic wastes from Germany in 2006 and Australia in 2007. The materials were not allowed to clear Malaysian customs because the exporters did not have any proper consent from the importing country as required under the Basel Convention and therefore were returned back to Germany and Australia.

4.5.3 Action Taken by Manufacturers

The EEE manufacturers have a significant role to play in the environmentally sound management of WEEE. In a number of other countries, the Take Back Program (TBP) where the discarded EEE is taken back upon delivery of the new EEE is one of many initiatives taken by manufacturers to properly collect and recycle WEEE. The Take Back Programs that operate in these countries usually operate in a formal, regulated structure.

In Malaysia, a number of manufacturers and companies have taken the initiative to organize a Take Back Program (TBP) to reduce the number of used or discarded EEE from being disposed in municipal landfills and also to increase community awareness on the issue of e-waste.

The Ministry of Natural Resources and Environment (MNRE) has urged the manufacturers to increase their TBP for proper recycling and disposal and the manufacturers have responded by suggesting the cradle to grave program to DOE. Some of the programs have already been started on a small scale by a number of manufacturers and are described in the following sections.

Panasonic Malaysia

Panasonic Malaysia has an on-going conservation exercise on managing their electrical and electronic waste within the company. Unwanted used computers, printers and other electronic components are collected and handed over to the Association of the Computer and Multimedia Industry Malaysia (PIKOM) as well as to their solid waste management contractor, Alam Flora Sdn. Bhd., for proper disposal.

According to Panasonic Malaysia's corporate communications and branding manager, Alam Flora will then sift through the discarded items and look for any devices which are still in good and working condition before sending for disposal. All the equipment that is in good working condition will be donated to organizations in need of them.

However, Panasonic does not yet operate a Take Back Program for the return of EEE from its customers.

Motorola (M) Sdn Bhd

Motorola Malaysia started its recycling efforts by recycling batteries for walkie-talkies in 1998 in Penang and this has grown further by the launching of the "ECOMOTO Take-back" campaign. This take-back campaign includes products ranging from mobile phones, two-way radios, batteries, broadband devices, and network equipment to accessories such as chargers, hands-free units and cables.

Take-back bins were placed at selected Motorola outlets and the company's manufacturing plant in Penang as well as other locations such as in Cyberjaya, Petaling Jaya and Kuala Lumpur to promote recycling among its employees and to raise public awareness. To encourage more participation, the company had initiated its "20-to-1" trade-in program where the dealers or its employees will get one free battery for every 20 units of used or discarded rechargeable batteries returned. However, this program only applies to Motorola's dealers and employees only. Motorola could not offer a date for when this initiative will be introduced to the public.

Nokia Malaysia

Nokia Malaysia is another company that encourages users to return their old mobile phones of any brand into one of its 30 recycling bins in Peninsular Malaysia located at Nokia centers, retail outlets and in some offices of mobile phone network operators such as Celcom and Maxis.

Similar to Motorola Malaysia, Nokia not only accepts mobile phones but also chargers, rechargeable batteries and other phone accessories. Nokia's "Take-back" campaign which has been running since 2001 has been able to collect about 900 kg of recyclable materials in 2007 alone.

Nokia has started their awareness campaign by offering a 20% discount voucher for all their accessories at any service centers or dealer in exchange for the return of used charged batteries and other phone accessories. Nokia publicized their program through the local newsprint media and also through radio broadcasts in December 2007.

Dell Malaysia

Dell Malaysia has opened their recycling centre doors to IT products produced by their own company as well as those manufactured by their competitors. Whenever a customer orders a new computer from Dell, an option is provided for the old computer to be collected when the new computer is delivered. Since April 2007, Dell Malaysia has collected used monitors, desktop and notebook computers, printers and accessories weighing 6.5 tones.

In Penang, a total of 3,827 kg of computers and accessories was collected under the State MPPP/ Dell Computer Recycling Program from April to September

2007. The total weight was made up of 128 desktop computers, 150 monitors, 411 accessories and 18 notebook computers.

According to Dell, computers that they collected that are still functioning may be sold to second hand dealers or donated to charitable efforts while precious metals inside non-functioning computers can be salvaged.

HP-Compaq

The HP Planet Partners Hardware Return and Recycling Programme is an initiative to provide HP corporate customers with an easy way to dispose of used computing equipment in a socially and environmentally responsible manner. The program is available on an ad hoc basis in Malaysia, Indonesia, Phillipines and Thailand. The program offers take-back for end-of-life HP and non-HP products such as scanners, fax machines, personal computers, servers, monitors, hand-held devices, printers, and associated external components such as cable, mouse, and keyboards.

5.0 CONCLUSION

Waste electrical and electronic equipment (WEEE) has surfaced as a major concern in most countries in the world especially in those countries where WEEE is imported and processed in an unregulated fashion creating significant adverse environmental impacts. The indications are that the volume of WEEE will continue to rise year on year and Malaysia is no exception. The analysis from this study shows that by 2020, the cumulative total WEEE from the seven categories of WEEE that will be discarded in Malaysia is estimated to be about 1.165 billion units (21.379 million metric tonnes).

The affordability factor of EEE and the increasing need for EEE to fit the lifestyle demands are the factors that cause the rate of possession of EEE to increase which in turn will increase the generation of WEEE.

According to the information provided by the DOE Malaysia, there were 107 licensed contractors (updated 21st Jan 2008) who are responsible to collect and process the e-waste. However, these licensed contractors only collect disassembled components or whole units of WEEE from manufacturers and not whole units of WEEE from households or the business/institution sector.

Malaysia is in the process of developing specific rules and regulations for the take back of WEEE. There are several recycling and reuse activities being conducted by some of the manufacturers however, the scope of the materials collected is limited. Community awareness on sound management of WEEE is limited but increasing. Many households are not sure how to dispose of their WEEE however a number of them have been disposing to scrap collectors who pay them for the WEEE.

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QUESTIONNAIRE FOR HOUSEHOLDS

Date			
Interviewer			
Respondent	Name		
	Address		Postcode

Household Information

1.1 How many family members are living in your house? [_____]

Age group	Number of person
(a) 0 to 3 (Baby)	
(b) 4 to 12 (Child)	
(c) 13 to 19 (Teenager)	
(d) 20 to 59 (Adult)	
(e) 60 and over (Senior)	
Total	

1.2 Into which category does your monthly income (as a total household) fall? (please select one):

a) Low income (RM1199 and below)
b) Middle income (RM1200 – RM3499)
c) Upper middle income (RM 3500 and RM4999)
d) High income (RM 5000 and above)

Reference for monthly income range (item a, b and c):

1. Statistic Handbook of Malaysia 2006
2. Report on Household expenditure Survey 2004/05
3. Ministry of Housing and Local Government (*Garis Panduan Bahagian Skim Pinjaman Perumahan)*

Item (d) is included to reflect the socio-economic condition in Malaysia

Electrical and Electronic Equipment in Your House

Television Sets

Q1 Do you have television sets in your house?

1) Yes → Please answer Q1-1 and Q1-2 and then go to Q2
2) No → Please go to Q2

Q1-1 How many television sets (TVs) did you discard during the past five years and how many TVs do you currently have in your house?

1) TVs discarded during the past five years [_____]
2) TVs currently in your house [_____]

Q1-2 Please answer the following questions for each TV that you discarded during the past five years or currently have in your house. If you had/have more than three TVs in total, please answer about only three TVs that you discarded and/or have had for a longer term.

	Question	TV#1	TV#2	TV#3
1-2-1	Did you discard the TV during the past five years or do you currently have it?	1) Currently have a) Yes b) No 2) Discarded When? [ ]	1) Currently have a) Yes b) No 2) Discarded When? [ ]	1) Currently have b) Yes b) No 2) Discarded When? [ ]
1-2-2	What type of TV is it?	1) Color CRT 2) LCD	1) Color CRT 2) LCD	1) Color CRT 2) LCD
1-2-3	Who is the maker of the TV?			
1-2-4	In which year did you get the TV?			
1-2-5	How did you get the TV?	1) Bought 2) Given 3) Other	1) Bought 2) Given 3) Other	1) Bought 2) Given 3) Other
1-2-6	Was the TV brand-new or second-hand when you got it?	1) Brand-new 2) Second-hand	1) Brand-new 2) Second-hand	1) Brand-new 2) Second-hand
1-2-7	How did you discard the TV? Please answer 'Yes' or 'No'.	1) Discard together with the other wastes for municipal waste collection? 2) Give / sell to the collectors? → Collector's name and location/contact [_____] 3) Pay to the collector? → Collector's name and location/contact [_____] 4) Give / sell to friends or relatives? 5) Bring to the recycling station / centre etc.? → Station's name and location/contact [_____]		

	Question	TV#1	TV#2	TV#3
		6) Others [e.g. keep at home_____]		

Personal Computers

Q2 Do you or did you have personal computers in your house?

1) Yes → Please answer Q2-1 and Q2-2 and then go to Q3
2) No → Please go to Q3

Q2-1 How many personal computers (PCs) did you discard during the past five years and how many PCs do you currently have in your house?

PCs discarded during the past five years [_____]
PCs currently in your house [_____]

Q2-2 Please answer the following questions for each PC that you discarded during the past five years or currently have in your house. If you had/have more than three PCs in total, please answer about only three PCs that you discarded and/or have had for a longer term.

	Question	PC#1	PC #2	PC #3
2-2-1	Did you discard the PC during the past five years or do you currently have it?	1) Do you still use it as PC? a) Yes b) No 2) Discarded When? [ ]	1) Do you still use it as PC? a) Yes b) No 2) Discarded When? [ ]	1) Do you still use it as PC? b) Yes b) No 2) Discarded When? [ ]
2-2-2	What type of PC is it?	1) Desktop with CRT display 2) Desktop with LCD display 3) Notebook	1) Desktop with CRT display 2) Desktop with LCD display 3) Notebook	1) Desktop with CRT display 2) Desktop with LCD display 3) Notebook
3-2-3	Who is the maker of the PC?			
2-2-4	In which year did you get the PC?			
2-2-5	How did you get the PC?	1) Bought 2) Given 3) Other	1) Bought 2) Given 3) Other	1) Bought 2) Given 3) Other
2-2-6	Was the PC brand-new or second-hand when you got it?	1) Brand-new 2) Second-hand	1) Brand-new 2) Second-hand	1) Brand-new 2) Second-hand
2-2-7	How did you discard the PC?	1) Discard together with the other wastes for municipal waste collection? 2) Give / sell to the collectors?		

	Question	PC#1	PC #2	PC #3
	Please answer 'Yes' or 'No'.	→ Collector's name and location/contact [_____] 3) Pay to the collector? → Collector's name and location/contact [_____] 4) Give / sell to friends or relatives? 5) Bring to the recycling station / centre etc.? → Station's name and location/contact [_____] 6) Others [Pls.specify] [_____]		

Mobile Phones

Q3 Do your family members or did your family members have mobile phones?

1) Yes → Please answer Q3-1 and Q3-2 and then go to Q4
2) No → Please go to Q4

Q3-1 How many mobile phones (MPs) did your family members discard during the past five years and how many MPs do your family members currently have?

MPs discarded during the past five years [_____]
MPs that your family members currently have [_____]

Q3-2 Please answer the following questions for each MP that your family members discarded during the past five years or currently have. If your family members had/have more than three MPs in total, please answer about only three MPs that your family members discarded and/or have had for a longer term.

	Question	MP#1	MP #2	MP #3
3-2-1	Did your family member discard the MP during the past five years or does s/he currently have it?	1) Do you still use it as MP? a) Yes b) No 2) Discarded When? [ ]	1) Do you still use it as MP? a) Yes b) No 2) Discarded When? [ ]	1) Do you still use it as MP? b) Yes b) No 2) Discarded When? [ ]
3-2-2	Who is the maker of the MP?			
3-2-3	In which year did s/he get the MP?			
3-2-4	How did s/he get the MP?	1) Bought 2) Given 3) Other	1) Bought 2) Given 3) Other	1) Bought 2) Given 3) Other
3-2-5	Was the MP brand-new or second-hand when s/he got it?	1) Brand-new 2) Second-hand	1) Brand-new 2) Second-hand	1) Brand-new 2) Second-hand

	Question	MP#1	MP #2	MP #3
3-2-6	How did s/he discard the MP? Please answer 'Yes' or 'No'.	1) Discard together with the other wastes for municipal waste collection? 2) Give / sell to the collectors? → Collector's name and location/contact [_____] 3) Pay to the collector? → Collector's name and location/contact [_____] 4) Give / sell to friends or relatives? 5) Bring to the recycling station / centre etc.? → Station's name and location/contact [_____] 6) Others [Pls. specify] [_____]		

2.4 Refrigerators

Q4 Do you or did you have refrigerators in your house?

1) Yes → Please answer Q4-1 and Q4-2 and then go to Q5
2) No → Please go to Q5

Q4-1 How many refrigerators did you discard during the past five years and how many refrigerators do you currently have in your house?

Refrigerators discarded during the past five years [_____]
Refrigerators currently in your house [_____]

Q4-2 Please answer the following questions for each refrigerator (fridge) that you discarded during the past five years or currently have. If you had/have more than three fridges in total, please answer about only three fridges that you discarded and/or have had for a longer term.

	Question	Fridge#1	Fridge #2	Fridge #3
4-2-1	Did you discard the fridge during the past five years or do you currently have it?	1) Do you still use it as fridge? a) Yes b) No 2) Discarded When? [ ]	1) Do you still use it as fridge? a) Yes b) No 2) Discarded When? [ ]	1) Do you still use it as fridge? a) Yes b) No 2) Discarded When? [ ]
4-2-2	Who is the maker of the fridge?			
4-2-3	In which year did you get the fridge?			
4-2-4	How did you get the fridge?	1) Bought 2) Given 3) Other	1) Bought 2) Given 3) Other	1) Bought 2) Given 3) Other
4-2-5	Was the fridge brand-new or second-hand	1) Brand-new 2) Second-hand	1) Brand-new 2) Second-hand	1) Brand-new 2) Second-hand

	Question	Fridge#1	Fridge #2	Fridge #3
	when you got it?			
4-2-6	How did you discard the fridge? Please answer 'Yes' or 'No'.	1) Discard together with the other wastes for municipal waste collection? 2) Give / sell to the collectors? → Collector's name and location/contact [_____] 3) Pay to the collector? → Collector's name and location/contact [_____] 4) Give / sell to friends or relatives? 5) Bring to the recycling station / centre etc.? → Station's name and location/contact [_____] 6) Others [Pls. specify] [_____]		

2.5 Air Conditioners

Q5 Do you or did you have air conditioners in your house?

1) Yes → Please answer Q5-1 and Q5-2 and then go to Q6
2) No → Please go to Q6

Q5-1 How many air conditioners (ACs) did you discard during the past five years and how many ACs do you currently have in your house?

ACs discarded during the past five years [_____]
ACs currently in your house [_____]

Q5-2 Please answer the following questions for each AC that you discarded during the past five years or currently have. If you had/have more than three ACs in total, please answer about only three ACs that you discarded and/or have had for a longer term.

	Question	AC#1	AC#2	AC #3
5-2-1	Did you discard the AC during the past five years or do you currently have it?	1) Do you still use it as AC? a) Yes b) No 2) Discarded When? [ ]	1) Do you still use it as AC? a) Yes b) No 2) Discarded When? [ ]	1) Do you still use it as AC? a) Yes b) No 2) Discarded When? [ ]
5-2-2	Who is the maker of the AC?			
5-2-3	In which year did you get the AC?			
5-2-4	How did you get the AC?	1) Bought 2) Given 3) Other	1) Bought 2) Given 3) Other	1) Bought 2) Given 3) Other

	Question	AC#1	AC#2	AC #3
5-2-5	Was the AC brand-new or second-hand when you got it?	1) Brand-new 2) Second-hand	1) Brand-new 2) Second-hand	1) Brand-new 2) Second-hand
5-2-6	How did you discard the AC? Please answer 'Yes' or 'No'.	1) Discard together with the other wastes for municipal waste collection? 2) Give / sell to the collectors? → Collector's name and location/contact [_____] 3) Pay to the collector? → Collector's name and location/contact [_____] 4) Give / sell to friends or relatives? 5) Bring to the recycling station / centre etc.? → Station's name and location/contact [_____] 6) Others [Pls. specify] [_____]		

2.6 Washing Machines

Q6 Do you or did you have washing machines in your house?

1) Yes → Please answer Q6-1 and Q6-2 and then go to Q7
2) No → Please go to Q7

Q6-1 How many washing machines (WMs) did you discard during the past five years and how many WMs do you currently have in your house?

WMs discarded during the past five years [_____]
WMs currently in your house [_____]

Q6-2 Please answer the following questions for each WM that you discarded during the past five years or currently have. If you had/have more than three WMs in total, please answer about only three WMs that you discarded and/or have had for a longer term.

	Question	WM#1	WM#2	WM #3
6-2-1	Did you discard the WM during the past five years or do you currently have it?	1) Do you still use it as WM? a) Yes b) No 2) Discarded When? [ ]	1) Do you still use it as WM? a) Yes b) No 2) Discarded When? [ ]	1) Do you still use it as WM? a) Yes b) No 2) Discarded When? [ ]
6-2-2	Who is the maker of the WM?			
6-2-3	In which year did you get the WM?			

	Question	WM#1	WM#2	WM #3
6-2-4	How did you get the WM?	1) Bought 2) Given 3) Other	1) Bought 2) Given 3) Other	1) Bought 2) Given 3) Other
6-2-5	Was the WM brand-new or second-hand when you got it?	1) Brand-new 2) Second-hand	1) Brand-new 2) Second-hand	1) Brand-new 2) Second-hand
6-2-6	How did you discard the WM? Please answer 'Yes' or 'No'.	1) Discard together with the other wastes for municipal waste collection? 2) Give / sell to the collectors? → Collector's name and location/contact [_____] 3) Pay to the collector? → Collector's name and location/contact [_____] 4) Give / sell to friends or relatives? 5) Bring to the recycling station / centre etc.? → Station's name and location/contact [_____] 6) Others [Pls. specify] [_____]		

2.7 Waste Batteries

Q7 Have you ever changed rechargeable batteries in electrical and electronic equipment such as mobile phones, notebook computers, digital cameras, facsimile machines, and video cameras?

1) Yes → Please answer Q7-1
2) No

Q7-1 How did you handle the mobile phone batteries that you do not use as battery anymore?

1) Discard together with the other wastes for municipal waste collection

2) Give / sell to the collectors
→ Collector's name and location/contact
[_____]

3) Pay to the collector for disposal
→ Collector's name and location/contact
[_____]

4) Bring to the recycling station / centre etc.
→ Station's name and location/contact
[_____]

5) Others [Pls. specify _____]

This is the end of questionnaire. Thank you for your kind cooperation!!

Please return the Questionnaire to:

Perunding Good Earth Sdn Bhd
2nd Floor, No 21, Jalan Astaka U8/84,
Bukit Jelutong Business & Technology Centre,
40150 Shah Alam, Selangor.

Tel: 03-7845 9693 Fax: 037845 4070

Email:goodearth@top.net.my

Email response is preferred to reduce paper consumption to save the trees.

QUESTIONNAIRE FOR BUSINESS ENTITIES & INSTITUTIONS

Company Profile

Date			
Name of Company / Institution			
Type of Business / Institution			
Office Address		Phone	
		Fax	
		E-mail	
Annual Sales / Turnover (for Business entities only)	~ RM_____ / year	Number of Employees	

NOTE

For answering questions in Tables, please group target electrical and electronic equipment (EEE) by similar characteristics. For example, if your company/institution purchased 15 color TVs about 5 years ago and are still using them as TV, and purchased 15 mono-color TVs 20 years ago and most of them were discarded three years ago, please consider these color TVs as group #1, and mono-color TVs as group #2.

Electrical and Electronic Equipment (EEE) on the Premises

Television Sets

Q1 Does or did your company/institution have television sets on the premises?
1) Yes → Please answer Q1-1 and Q1-2 and then go to Q2
2) No → Please go to Q2

Q1-1 How many television sets (TVs) did your company/institution discard during the past five years, and how many TVs does it currently have on the premises?

TVs discarded during the past five years [_____]
TVs currently on the premises [_____]

Q1-2 Please group the TVs by similar characteristics (age of TVs, discarded or currently held), and then answer the following questions for each group of TVs. If there are more than three groups, please answer only three groups of the TVs that your company/institution discarded and/or have on the premises for a longer term.

	Question	TV Group#1	TV Group#2	TV Group#3
1-2-1	About how many TVs are in the group?			
1-2-2	Did your company/institution discard the TVs during the past five years or does it currently have them?	1) Currently use a) Yes b) No 2) Discarded When? [ ]	1) Currently use a) Yes b) No 2) Discarded When? [ ]	1) Currently use a) Yes b) No 2) Discarded When? [ ]
1-2-3	What type of TVs are they?	1) Color CRT 2) Mono-color CRT 3) LCD	1) Color CRT 2) Mono-color CRT 3) LCD	1) Color CRT 2) Mono-color CRT 3) LCD
1-2-4	Who is the maker of the TVs?			
1-2-5	In which year did your company/institution get the TVs?			
1-2-6	How did your company/institution get the TVs?	1) Bought 2) By lease 3) Other	1) Bought 2) By lease 3) Other	1) Bought 2) By lease 3) Other
1-2-7	Were the TVs brand-new or second-hand when your company/institution got them?	1) Brand-new 2) Second-hand	1) Brand-new 2) Second-hand	1) Brand-new 2) Second-hand
1-2-8	How did your company/institution discard the TVs? Please answer 'Yes' or 'No'.	1) Discard together with the other wastes for municipal waste collection 2) Give / sell to the collector → Collector's name and location/contact [_____] 3) Pay to the collector → Collector's name and location/contact [_____] 4) Donate to schools/other organizations or give away to employees 5) Bring to the recycling station / centre etc. → Station's name and location/contact [_____] 6) Others [Pls. specify] [_____]		

Personal Computers

Q2 Does or did your company/institution have personal computers on the premises?

1) Yes → Please answer Q2-1 and Q2-2 and then go to Q3
2) No → Please go to Q3

Q2-1 How many personal computers (PCs) did your company/institution discard during the past five years, and how many PCs does it currently have on the premises?

PCs discarded during the past five years [_____]
PCs currently on the premises [_____]

Q2-2 Please group the PCs by similar characteristics (age of PCs, discarded or currently held), and then answer the following questions for each group of PCs. If there are more than three groups, please answer about only three groups of the PCs that your company/institution discarded and/or has had for a longer term.

	Question	PC Group#1	PC Group#2	PC Group#3
2-2-1	About how many PCs are in the group?			
2-2-2	Did your company/institution discard the PCs during the past five years or does it currently have them?	1) Currently use a) Yes b) No 2) Discarded When? [ ]	1) Currently use a) Yes b) No 2) Discarded When? [ ]	1) Currently use a) Yes b) No 2) Discarded When? [ ]
2-2-3	What type of PCs are they?	1) Desktop with CRT display 2) Desktop with LC display 3) Notebook	1) Desktop with CRT display 2) Desktop with LC display 3) Notebook	1) Desktop with CRT display 2) Desktop with LC display 3) Notebook
3-2-4	Who is the maker of the PCs?			
2-2-5	In which year did your company/institution get the PCs?			
2-2-6	How did your company/institution get the PCs?	1) Bought 2) By lease 3) Other	1) Bought 2) By lease 3) Other	1) Bought 2) By lease 3) Other
2-2-7	Were the PCs brand-new or second-hand when your company/institution got them?	1) Brand-new 2) Second-hand	1) Brand-new 2) Second-hand	1) Brand-new 2) Second-hand
2-2-8	How did your company/institution discard the PCs? Please answer 'Yes' or 'No'.	1) Discard together with the other wastes for municipal waste collection 2) Give / sell to the collector → Collector's name and location/contact [_____] 3) Pay to the collector → Collector's name and location/contact [_____] 4) Donate to schools/other organizations or give away to employees 5) Bring to the recycling station / centre etc. → Station's name and location/contact [_____] 6) Others [Pls. specify] [_____]		

	Question	PC Group#1	PC Group#2	PC Group#3

Mobile Phones

Q3 Does or did your company/institution provide its employees with mobile phones for business use?

1) Yes → Please answer Q3-1 and Q3-2 and then go to Q4
2) No → Please go to Q4

Q3-1 How many mobile phones (MPs) did your company/institution discard during the past five years, and how many MPs does it provide to its employees or have on the premises?

MPs discarded during the past five years [_____]
MPs currently provided to employees or on the premises [_____]

Q3-2 Please group the MPs by similar characteristics (age of MPs, discarded or currently provide/have), and then answer the following questions for each group of MPs. If there are more than three groups, please answer about only three groups of the MPs that your company/institution discarded and/or has provided to employees or had on the premises for a longer term.

	Question	MP Group#1	MP Group#2	MP Group#3
3-2-1	About how many MPs are in the group?			
3-2-2	Did your company/institution discarded the MPs during the past five years or does it currently provide to employees or have on the premises?	1) Currently provide/use a) Yes b) No 2) Discarded When? [ ]	1) Currently provide/use a) Yes b) No 2) Discarded When? [ ]	1) Currently provide/use a) Yes b) No 2) Discarded When? [ ]
3-2-3	Who is the maker of the MPs?			
3-2-4	In which year did your company/institution get the MPs?			
3-2-5	How did your company/institution get the MPs?	1) Bought 2) By lease 3) Other	1) Bought 2) By lease 3) Other	1) Bought 2) By lease 3) Other
3-2-6	Were the MP brand-new or second-hand when your company/institution got them?	1) Brand-new 2) Second-hand	1) Brand-new 2) Second-hand	1) Brand-new 2) Second-hand

	Question	MP Group#1	MP Group#2	MP Group#3
3-2-7	How were the MPs discarded? Please answer 'Yes' or 'No'.	1) Discard together with the other wastes for municipal waste collection 2) Give / sell to the collector → Collector's name and location/contact [_____] 3) Pay to the collector → Collector's name and location/contact [_____] 4) Donate to schools/other organizations or give away to employees 5) Bring to the recycling station / centre etc. → Station's name and location/contact [_____] 6) Others [Pls. specify] [_____]		

2.4 Refrigerators

Q4 Does or did your company/institution have refrigerators on the premises?

1) Yes → Please answer Q4-1 and Q4-2 and then go to Q5
2) No → Please go to Q5

Q4-1 How many refrigerators did your company/institution discard during the past five years, and how many refrigerators does it currently have on the premises?

Refrigerators discarded during the past five years [_____]
Refrigerators currently on the premises [_____]

Q4-2 Please group the fridges by similar characteristics (age of fridges, discarded or currently have), and then answer the following questions for each group of fridges. If there are more than three groups, please answer about only three groups of the fridges that your company/institution discarded and/or has had on the premises for a longer term.

	Questions	Fridge Group#1	Fridge Group#2	Fridge Group#3
4-2-1	About how many fridges are in the group?			
4-2-2	Did your company/institution discard the fridges during the past five years or does it currently have them?	1) Currently use a) Yes b) No 2) Discarded When? [ ]	1) Currently use a) Yes b) No 2) Discarded When? [ ]	1) Currently use a) Yes b) No 2) Discarded When? [ ]
4-2-3	Who is the maker of the fridges?			
4-2-4	In which year did your			

	Questions	Fridge Group#1	Fridge Group#2	Fridge Group#3
	company/institution get the fridges?			
4-2-5	How did your company/institution get the fridges?	1) Bought 2) By lease 3) Other	1) Bought 2) By lease 3) Other	1) Bought 2) By lease 3) Other
4-2-6	Were the fridges brand-new or second-hand when your company/institution got them?	1) Brand-new 2) Second-hand	1) Brand-new 2) Second-hand	1) Brand-new 2) Second-hand
4-2-7	How were the fridge discard? Please answer 'Yes' or 'No'.	1) Discard together with the other wastes for municipal waste collection 2) Give / sell to the collector → Collector's name and location/contact [_____] 3) Pay to the collector → Collector's name and location/contact [_____] 4) Donate to schools/other organizations or give away to employees 5) Bring to the recycling station / centre etc. → Station's name and location/contact [_____] 6) Others [Pls. specify] [_____]		

2.5 Air Conditioners

Q5 Does or did your company/institution have air conditioners on the premises?
1) Yes → Please answer Q5-1 and Q5-2 and then go to Q6
2) No → Please go to Q6

Q5-1 How many air conditioners (ACs) did your company/institution discard during the past five years, and how many ACs does it currently have on the premises?
ACs discarded during the past five years [_____]
ACs currently on the premises [_____]

Q5-2 Please group the ACs by similar characteristics (age of ACs, discarded or currently have), and then answer the following questions for each group of ACs. If there are more than three groups, please answer about only three groups of the ACs that your company/institution discarded and/or has had on the premises for a longer term.

	Questions	AC Group#1	AC Group#2	AC Group#3
5-2-1	About how many ACs are in the group?			
5-2-2	Did your company/institution discard the ACs during	1) Currently use a) Yes b) No	1) Currently use a) Yes b) No	1) Currently use a) Yes b) No

	Questions	AC Group#1	AC Group#2	AC Group#3
	the past five years or does it currently have them?	2) Discarded When? [ ]	2) Discarded When? [ ]	2) Discarded When? [ ]
5-2-3	Who is the maker of the ACs?			
5-2-4	In which year did your company/institution get the ACs?			
5-2-5	How did your company/institution get the ACs?	1) Bought 2) By lease 3) Other	1) Bought 2) By lease 3) Other	1) Bought 2) By lease 3) Other
5-2-6	Were the ACs brand-new or second-hand when your company/institution got them?	1) Brand-new 2) Second-hand	1) Brand-new 2) Second-hand	1) Brand-new 2) Second-hand
5-2-7	How were the ACs discarded? Please answer 'Yes' or 'No'.	1) Discard together with the other wastes for municipal waste collection 2) Give / sell to the collector → Collector's name and location/contact [_____] 3) Pay to the collector → Collector's name and location/contact [_____] 4) Donate to schools/other organizations or give away to employees 5) Bring to the recycling station / centre etc. → Station's name and location/contact [_____] 6) Others [Pls. specify] [_____]		

2.6 Washing Machines

Q6 Does or did your company/institution have washing machines on the premises?

1) Yes → Please answer Q6-1 and Q6-2 and then go to Q7
2) No → Please go to Q7

Q6-1 How many washing machines (WMs) did your company/institution discard during the past five years, and how many WMs does it currently have on the premises?

WMs discarded during the past five years [_____]
WMs currently on the premises [_____]

Q6-2 Please group the WMs by similar characteristics (age of WMs, discarded or currently held), and then answer the following questions for each group of WMs. If there are more than three groups, please answer about only three groups of

the WMs that your company/institution discarded and/or has had on the premises for a longer term.

	Questions	WM Group#1	WM Group#2	WM Group#3
6-2-1	About how many WMs are in the group?			
6-2-2	Did your company/institution discard the WMs during the past five years or does it currently have them?	1) Currently use a) Yes b) No 2) Discarded When? [ ]	1) Currently use a) Yes b) No 2) Discarded When? [ ]	1) Currently use a) Yes b) No 2) Discarded When? [ ]
6-2-3	Who is the maker of the WMs?			
6-2-4	In which year did your company/institution get the WM?			
6-2-5	How did your company/institution get the WMs?	1) Bought 2) By lease 3) Other	1) Bought 2) By lease 3) Other	1) Bought 2) By lease 3) Other
6-2-6	Were the WM brand-new or second-hand when your company/institution got them?	1) Brand-new 2) Second-hand	1) Brand-new 2) Second-hand	1) Brand-new 2) Second-hand
6-2-7	How were the WMs discarded? Please answer 'Yes' or 'No'.	1) Discard together with the other wastes for municipal waste collection 2) Give / sell to the collector → Collector's name and location/contact [_____] 3) Pay to the collector → Collector's name and location/contact [_____] 4) Donate to schools/other organizations or give away to employees 5) Bring to the recycling station / centre etc. → Station's name and location/contact [_____] 7) Others [Pls. specify] [_____]		

2.7 Waste Batteries

Q7 Has your company/institution ever changed rechargeable batteries in electrical and electronic equipment such as mobile phones, notebook computers, digital cameras, facsimile machines, and video cameras?

1) Yes → Please answer Q7-1 and then go to Q8
2) No → Please answer Q8

Q7-1 How did your company/institution handle the old rechargeable batteries?

1) Discard together with the other wastes for municipal waste collection

2) Give / sell to the collectors
→ Collector's name and location/contact [_____]

3) Pay to the collector for disposal
→ Collector's name and location/contact [_____]

4) Bring to the recycling station / centre etc.
→ Station's name and location/contact [_____]

5) Others [Pls. specify _____]

Q8 How does your company/institution usually discard dry cell batteries that you do not use anymore?

1) Discard together with the other wastes for municipal waste collection

2) Give / sell to the collectors
→ Collector's name and location/contact [_____]

3) Pay to the collector for disposal
→ Collector's name and location/contact [_____]

4) Bring to the recycling station / centre etc.
→ Station's name and location/contact [_____]

5) Others [Pls. specify _____]

This is the end of questionnaire. Thank you for your kind cooperation!!

Please return the Questionnaire to:

Perunding Good Earth Sdn Bhd
2nd Floor, No 21, Jalan Astaka U8/84,
Bukit Jelutong Business & Technology Centre,
40150 Shah Alam, Selangor.

Tel: 03-7845 9693 Fax: 037845 4070

Email:goodearth@top.net.my

Email response is preferred to reduce paper consumption to save the trees.

QUESTIONNAIRE FOR IMPORTERS & EXPORTERS

Date		
Interviewer		
Respondent	Name	
	Position	

1. Company Profile

Name of Organization			
Type of Business	1) Import 2) Export 3) Other ( )		
Address		Phone	
		Fax	
		E-mail	
Annual Sales (Turnover)		Number of Employees	

NOTE

For television sets (item #1) and computers (item #2), if information for breakdown categories (item #1.1-1.2 or item #2.1-2.3) is not available, please answer televisions or computers as a whole in the item #1 or #2 row.

2. Import of Used Electrical and Electronic Equipment (EEE)

Q1 Please specify the type, quantity, trend of import, and country of origin of used EEE currently imported by your company.

Type of used EEE	1-1 How many units are imported per month on average?	1-2 What is the average increasing /decreasing rate of import during the last 5 years?	1-3 Which country do they come from? Please list major three countries.		
1. Television set		+ -			
1.1. Color CRT		+ -			
1.2 LC		+ -			
2. Computer		+ -			

Type of used EEE	1-1 How many units are imported per month on average?	1-2 What is the average increasing /decreasing rate of import during the last 5 years?	1-3 Which country do they come from? Please list major three countries.		
2.1. Desktop		+ -			
2.2. Notebook		+ -			
2.3. Other ( )		+ -			
3. Mobile phone		+ -			
4. Refrigerator		+ -			
5. Air conditioner		+ -			
6. Washing machine		+ -			
7. Other ( )		+ -			

Q2 How is the imported used EEE going to be utilized? Please indicate the ratio of the units by destination.

Type of used EEE	Ratio (%) of Units by destination.		
	Second-hand shops (selling at the market without repair)	Repair shops (mainly for repair for selling at the market)	Dismantlers (mainly for recovering reusable parts and recyclable materials)
1. Television set			
1.1. Color CRT			
1.2. LC			
2. Computer			
2.1. Desktop			
2.2. Notebook			
2.3. Other ( )			
3. Mobile phone			
4. Refrigerator			
5. Air conditioner			
6. Washing machine			
7. Other ( )			

Q3 Please provide information about your partners by type (second-hand shops, repair shops, and dismantlers).

Type* Name	Address	Telephone

Type* Name	Address	Telephone

*Please specify with 1) second-hand shops, 2) repair shops, 3) dismantlers, and 4) other.

3. Export of Used EEE

Q4 Please specify the type, quantity, trend of export, country of destination currently exported by your company.

Type of used EEE	4-1 How many units are exported per month on average?	4-2 What is the average increasing /decreasing rate of export during the last 5 years?	4-3 Which countries do they go to? Please list the three major countries.	
1. Television set		+ -		
1.1. Color CRT		+ -		
1.2. LC		+ -		
2. Computer		+ -		
2.1. Desktop		+ -		
2.2. Notebook		+ -		
2.3. Other ( )		+ -		
3. Mobile phone		+ -		
4. Refrigerator		+ -		
5. Air conditioner		+ -		
6. Washing machine		+ -		
7. Other ( )		+ -		

This is the end of the questionnaire. Thank you for your kind cooperation!!

Please return the Questionnaire to:

Perunding Good Earth Sdn Bhd
2nd Floor, No 21, Jalan Astaka U8/84,
Bukit Jelutong Business & Technology Centre,
40150 Shah Alam, Selangor.

Tel: 03-7845 9693 Fax: 037845 4070

Email:goodearth@top.net.my

Email response is preferred to reduce paper consumption

QUESTIONNAIRE FOR COLLECTORS

Date		
Interviewer		
Respondent	Name	
	Position	

Company Profile

Name of Organization			
Type of Business (Multiple Answer)	1) Collection 2) Repair 3) Sales 4) Dismantling		
Address		Phone	
		Fax	
		E-mail	
Annual Sales (Turnover)		Number of Employees	

NOTE

For television sets (item #1) and computers (item #2), if information for breakdown categories (item #1.1-1.2 or item #2.1-2.2) is not available, please answer televisions or computers as a whole in the item #1 or #2 row.

Collection of Used Electrical and Electronic Equipment (EEE)

Q1-1 Please specify the type, quantity, and source of used EEE currently collected by your company.

Type of used EEE	1-1-1 How many units does your company collect per month?	1-1-2 Where do they come from? Please indicate the ratio (%) of the units.				
		Charity Drives	Household	Office	Leasing company	Hotel/furnished apartment
1. Television set						
1.1. CRT						
1.2. LC						
2. Computer						
2.1. Desktop, Monitor						
2.2. Notebook						
3. Mobile phone						
4. Refrigerator						

Type of used EEE	1-1-1 How many units does your company collect per month?	1-1-2 Where do they come from? Please indicate the ratio (%) of the units.				
		Charity Drives	Household	Office	Leasing company	Hotel/furnished apartment
5. Air conditioner						
6. Washing machine						

Q1-2 Please describe the collection route of used EEE from original dischargers such as households and offices to your company. Who are engaged in the collection and what transportation means are used?

Q2 What percentage of collected used EEE is going to repair shops, second-hand shops, dismantlers or exporters? Please indicate the ratio (%) of the units.

Type of used EEE	Ratio (%) of used EEE collected by your company by destination			
	Repair shop (repair used EEE)	Second-hand shop (sell used EEE without repair)	Dismantler (recover reusable parts and recyclable materials)	Exporter
1. Television set				
1.1. CRT				
1.2. LC				
2. Computer				
2.1. Desktop				
2.2. Notebook				
3. Mobile phone				
4. Refrigerator				
5. Air conditioner				
6. Washing machine				

Q3 Please provide information about your partners by type (second-hand shops, repair shops, dismantlers, and exporters).

Type*	Name	Address	Telephone

*Please specify with 1) second-hand shops, 2) repair shops, 3) dismantlers, 4) exporters, and 5) other.

This is the end of questionnaire. Thank you for your kind cooperation!!

Please return the Questionnaire to:

Perunding Good Earth Sdn Bhd
2nd Floor, No 21, Jalan Astaka U8/84,
Bukit Jelutong Business & Technology Centre,
40150 Shah Alam, Selangor.

Tel: 03-7845 9693 Fax: 037845 4070
Email:goodearth@top.net.my

Email response is preferred to reduce paper consumption

QUESTIONNAIRE FOR REPAIR & SECOND-HAND SHOPS

Date		
Interviewer		
Respondent	Name	
	Position	

Company Profile

Name of Organization			
Type of Business (Multiple Answer)	1) Collection 2) Repair 3) Sales 4) Dismantling		
Address		Phone	
		Fax	
		E-mail	
Annual Sales (Turnover)		Number of Employees	

NOTE

For television sets (item #1) and computers (item #2), if information for breakdown categories (item #1.1-1.2 or item #2.1-2.2) is not available, please answer televisions or computers as a whole in the item #1 or #2 row.

Repair of Used Electrical and Electronic Equipment (EEE)

Q1 Please specify the type, quantity, average weight and source of used EEE currently accepted by your company for repair/reassembling.

Type of used EEE	1-1 How many units do you accept per month?	1-2 How much does one unit weigh? (kg/unit)	1-3 Where do they come from? Please indicate the ratio (%) of the units.		
			Importer	Domestic collector	Directly from discharger (household, office, etc.)
1. Television set					
1.1. CRT					
1.2. LC					
2. Computer					
2.1. Desktop					
2.2. Notebook					
2.3. Other					
3. Mobile phone					
4. Refrigerator					

Type of used EEE	1-1 How many units do you accept per month?	1-2 How much does one unit weigh? (kg/unit)	1-3 Where do they come from? Please indicate the ratio (%) of the units.		
			Importer	Domestic collector	Directly from discharger (household, office, etc.)
5. Air conditioner					
6. Washing machine					

Q2 Please provide information about your partners by type (importers, domestic collectors).

Type*	Name	Address	Telephone

*Please specify with 1) importer, 2) domestic collector, and 3) other.

Q3 Please tell us your repair/reassembling process and required technology/equipment for the process.

Type of used EEE	Repair/reassembling Process (Please specify required technology and equipment)
1. Television set	
1.1. CRT	
1.2. LC	
2. Computer	
2.1. Desktop	
2.2. Notebook	
3. Mobile phone	
4. Refrigerator	
5. Air conditioner	
6. Washing machine	

Q4 Please specify quantity of final products (repaired/reassembled EEE), other sellable items (reusable parts, recyclable materials), and residues (those you cannot sell) generated from the repair/reassembling process.

Type of used EEE	1-1 How many units of repaired/reassembled EEE do you Produce per month?	1-2 What is the ratio (%) of used EEE sold at your shops?		1-3 How old is the majority of used EEE sold at your shops?	1-4 How may kilograms of reusable parts, recyclable materials and residues are generated per 100 units of final products (repaired/reassembled EEE)		
		Imported	Domestically collected		Reusable parts (kg/100units)	Recyclable materials (metals, plastics, glass etc.) (kg/100units)	Residues (kg/100units)
1. Television set							
1.1. CRT							
1.2. LC							
2. Computer							
2.1. Desktop							
2.2. Notebook							
3. Mobile phone							
4. Refrigerator							
5. Air conditioner							
6. Washing machine							

Q5 Please provide information about your partners who buy final products (repaired/reassembled EEE), reusable parts and recyclable materials.

Type*	Name	Address	Telephone

*Please specify with those who buy 1) final products (repaired/reassembled EEE), 2) reusable parts, and 3) recyclable materials.

Q6 What and how much residues do you generate from repair/reassembling process per month and how do you dispose of the residue?

Type of Residue	Quantity (kg/month)	Ways of Disposal	Name and Location of Entity that Accepts Residue
Plastics		1) Dispose as municipal waste 2) Pay for disposal 3) Give away 4) Other ( ) 5)	
Metals		1) Dispose as municipal waste 2) Pay for disposal 3) Give away 4) Other ( )	

Type of Residue	Quantity (kg/month)	Ways of Disposal	Name and Location of Entity that Accepts Residue
Glass		1) Dispose as municipal waste 2) Pay for disposal 3) Give away 4) Other ( )	
Glass with lead (CRT)		1) Dispose as municipal waste 2) Pay for disposal 3) Give away 4) Other ( )	
Oil		1) Dispose as municipal waste 2) Pay for disposal 3) Give away 4) Other ( )	
CFC (chlorofluorocarbon)		1) Destruct on the premises 2) Pay for disposal 3) Do not collect 4) Other ( )	
Rechargeable battery (from notebook computer)		1) Dispose as municipal waste 2) Pay for disposal 3) Give away 4) Other ( )	
Rechargeable battery (from mobile phone)		1) Dispose as municipal waste 2) Pay for disposal 3) Give away 4) Other ( )	
Mixture of different types of materials		1) Dispose as municipal waste 2) Pay for disposal 3) Give away 4) Other ( )	
Other ( )		1) Dispose as municipal waste 2) Pay for disposal 3) Give away 4) Other ( )	
Other ( )		1) Dispose as municipal waste 2) Pay for disposal 3) Give away 4) Other ( )	

This is the end of questionnaire. Thank you for your kind cooperation!!

Please return the Questionnaire to:

Perunding Good Earth Sdn Bhd
2nd Floor, No 21, Jalan Astaka U8/84,
Bukit Jelutong Business & Technology Centre,
40150 Shah Alam, Selangor.

Tel: 03-7845 9693 Fax: 037845 4070

Email:goodearth@top.net.my

QUESTIONNAIRE FOR DISMANTLERS

Date		
Interviewer		
Respondent	Name	
	Position	

Company Profile

Name of Organization			
Type of Business (Multiple Answer)	1) Collection 2) Dismantling 3) Other ( )		
Address		Phone	
		Fax	
		E-mail	
Annual Sales (Turnover)		Number of Employees	

NOTE

For television sets (item #1) and computers (item #2), if information for breakdown categories (item #1.1-1.2 or item #2.1-2.2) is not available, please answer televisions or computers as a whole in the item #1 or #2 row.

Dismantling of Used Electrical and Electronic Equipment (EEE)

Q1 Please specify the type, quantity, and source of used EEE currently dismantled by your company.

Type of used EEE	1-1 How many units do you dismantle per month?	1-2 How much does one unit weigh? (kg/unit)	1-3 Where do they come from? Please indicate the ratio (%) of the units.		
			Importer	Domestic collector	Directly from household/office
1. Television set					
1.1. CRT					
1.2. LC					
2. Computer					
2.1. Desktop					
2.2. Notebook					
3. Mobile phone					

Type of used EEE	1-1 How many units do you dismantle per month?	1-2 How much does one unit weigh? (kg/unit)	1-3 Where do they come from? Please indicate the ratio (%) of the units.		
			Importer	Domestic collector	Directly from household/office
4. Refrigerator					
5. Air conditioner					
6. Washing machine					

Q2 Please provide information about your partners by type (importers and domestic collectors).

Type*	Name	Address	Telephone

*Please specify with 1) importer and 2) domestic collector

Q3 Please tell us your dismantling process and required technology/equipment for the process.

Type of used EEE	Repair/reassembling Process (Please specify required technology and equipment)
1. Television set	
1.1. CRT	
1.2. LC	
2. Computer	
2.1. Desktop	
2.2. Notebook	
3. Mobile phone	
4. Refrigerator	
5. Air conditioner	
6. Washing machine	

Type of used EEE	Repair/reassembling Process (Please specify required technology and equipment)

Q4 How many kilograms of reusable parts (those you can sell), recyclable materials (those you can sell) and residues (those you cannot sell) do you generate by dismantling 100 units of used EEE?

Type of used EEE	Reusable parts (kg/100units)	Recyclable materials (kg/100units)	Residues (kg/100units)
1. Television set			
1.1. CRT			
1.2. LC			
2. Computer			
2.1. Desktop			
2.2. Notebook			
3. Mobile phone			
4. Refrigerator			
5. Air conditioner			
6. Washing machine			

Q5 Please provide information about your partners who buy reusable parts and recyclable materials.

Type*	Name	Address	Telephone

*Please specify with those who buy 1) reusable parts, and 2) recyclable materials.

Q6 What and how much residues do you generate from dismantling process per month and how do you dispose of the residue?

Type of Residue	Quantity (kg/month)	Way of Disposal	Name and Location of Entity that Accepts Residue
Plastics		1) Dispose as municipal waste 2) Pay for disposal 3) Give away 4) Other ( )	
Metals		1) Dispose as municipal waste 2) Pay for disposal 3) Give away 4) Other ( )	
Glass		1) Dispose as municipal	

Type of Residue	Quantity (kg/month)	Way of Disposal	Name and Location of Entity that Accepts Residue
		waste 2) Pay for disposal 3) Give away 4) Other ( )	
Glass with lead (CRT)		1) Dispose as municipal waste 2) Pay for disposal 3) Give away 4) Other ( )	
Oil		1) Dispose as municipal waste 2) Pay for disposal 3) Give away 4) Other ( )	
CFC (chlorofluorocarbon)		1) Destruct on the premises 2) Pay for disposal 3) Do not collect 4) Other ( )	
Rechargeable battery (from notebook computer)		1) Dispose as municipal waste 2) Pay for disposal 3) Give away 4) Other ( )	
Rechargeable battery (from mobile phone)		1) Dispose as municipal waste 2) Pay for disposal 3) Give away 4) Other ( )	
Dry cell battery		1) Dispose as municipal waste 2) Pay for disposal 3) Give away 4) Other ( )	
Mixture of different types of materials		1) Dispose as municipal waste 2) Pay for disposal 3) Give away 4) Other ( )	
Other ( )		1) Dispose as municipal waste 2) Pay for disposal 3) Give away 4) Other ( )	
Other ( )		1) Dispose as municipal waste 2) Pay for disposal 3) Give away 4) Other ( )	

This is the end of questionnaire. Thank you for your kind cooperation!!

Please return the Questionnaire to:

Perunding Good Earth Sdn Bhd
2nd Floor, No 21, Jalan Astaka U8/84,
Bukit Jelutong Business & Technology Centre,
40150 Shah Alam, Selangor.

Tel: 03-7845 9693 Fax: 037845 4070

Email:goodearth@top.net.my

QUESTIONNAIRE FOR PROCESSORS

Date		
Interviewer		
Respondent	Name	
	Position	

Company Profile

Name of Organization			
Type of Business (Multiple Answer)	1) Collection 2) Dismantling 3) Processing of recyclable materials (plastics, metals, glass, etc.) 4) Other ( )		
Address		Phone	
		Fax	
		E-mail	
Annual Sales (Turnover)		Number of Employees	

NOTE
For television sets (item #1) and computers (item #2), if information for breakdown categories (item #1.1-1.2 or item #2.1-2.2) is not available, please answer televisions or computers as a whole in the item #1 or #2 row.

Electronic Equipment (EEE)

Q1 Please specify the type, quantity, and source of waste EEE currently processed by your company.

Type of Recyclable Material	Quantity (kg/month)	Source Name	Address, Email	Telephone / Fax
Plastics (case, cover, parts, etc.)		1) 2) etc.		
Glass		1) 2) etc.		
Glass with lead (CRT)		1) 2) etc.		
Metals (electric wire, mother board, case, parts, etc.)		1) 2) etc.		

Type of Recyclable Material	Quantity (kg/month)	Source Name	Address, Email	Telephone / Fax
Other ( )		1) 2) etc.		
Other ( )		1) 2) etc.		
Etc.		1) 2) etc		

Q2 What quantity of recyclable materials recovered from used EEE or reject EEE does your company process per month? Please tell us their processing methods and buyers of the processed recyclable materials.

Type of Recyclable Material	Way of Processing	Quantity (kg/month)	Name and Location of Entity that Buys Recyclable Material
Plastics (case, cover, parts, etc.)	1) Washing 2) Crushing 3) Melting 4) Pelletizing 5) Other ( )		
Glass	1) Sorting by color/quality 2) Crushing 3) Melting 4) Other ( )		
Glass with lead (CRT)	1) Sorting by quality 2) Crushing 3) Melting 4) Other ( )		
Metals (electric wire, mother board, case, parts, etc.)	1) Sorting by metal type 2) Stripping plastic cover 3) Recover metal by burning 4) Recover metal by acidic liquid 5) Other ( )		
Other ( )			
Other ( )			

Q3 What and how much residues do you generate from processing recyclable materials per month and how do you dispose of the residues?

Type of Residue	Quantity (kg/month)	Way of Disposal	Name and Location of Entity that Accepts Residue
		1) Dispose as municipal waste 2) Pay for disposal 3) Give away 4) Other ( )	
		1) Dispose as municipal waste 2) Pay for disposal 3) Give away 4) Other ( )	
		1) Dispose as municipal waste 2) Pay for disposal 3) Give away 4) Other ( )	
		1) Dispose as municipal waste 2) Pay for disposal 3) Give away 4) Other ( )	

This is the end of questionnaire. Thank you for your kind cooperation!!

Please return the Questionnaire to:

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40150 Shah Alam, Selangor.

Tel: 03-7845 9693 Fax: 037845 4070

Email:goodearth@top.net.my

Email response is preferred to reduce paper consumption

QUESTIONNAIRE FOR MANUFACTURERS

Date		
Interviewer		
Respondent	Name	
	Position	

1. Company Profile

Name of Company			
Type of Products Manufactured by the Company (Multiple Answer)	1) Home appliances (TVs, Air Conditioners, Refrigerators, Washing Machines) 2) PCs 3) Mobile Phones 4) Batteries 5) Other ( )		
Address		Phone	
		Fax	
		E-mail	
Annual Sales (Turnover) as Industry in 2005 and 2006		Number of Workers	

NOTE

For television sets (item #1) and computers (item #2), if information for breakdown categories (item #1.1-1.2 or item #2.1-2.2) is not available, please answer televisions or computers as a whole in the item #1 or #2 row.

2. Production, Shipment and Export of Electrical and Electronic Equipment (EEE)

Q2-1 Please tell us the approximate market share for the following EEE in 2005 and 2006. In addition, please provide information about units of domestic production, shipment, and export of the following EEE manufactured by your company (or total numbers as a country) for the years for which data exist.

Type of EEE	Market Share in 2005 (%)	Market Share in 2006 (%)	Name of Reference Material for the Information		
			Production	Domestic Shipment	Export
1. Television set					

Type of EEE	Market Share in 2005 (%)	Market Share in 2006 (%)	Name of Reference Material for the Information		
			Production	Domestic Shipment	Export
1.1. CRT					
1.2. LC					
2. Computer					
2.1. Desktop					
2.2. Notebook					
3. Mobile phone					
4. Refrigerator					
5. Air conditioner					
6. Washing machine					
7. Other ( )					

Q2-2 How long are designed durable years of the following EEE manufactured during the past five years in the country? If possible, please provide information how long the consumers use the following EEE on average.

Type of EEE	Designed Durable Years	Actual Use Period by Consumers (Years)
1. Television set		
1.1. CRT		
1.2. LC		
2. Computer		
2.1. Desktop		
2.2. Notebook		
3. Mobile phone		
4. Refrigerator		
5. Air conditioner		
6. Washing machine		
7. Other ( )		

3. Environmental Impact of Reuse/Recycling/Disposal of Used EEE

Q3-1 Do you know any incidents affecting the environment due to reuse, recycling, or disposal of used EEE in your country?

1) Yes → Please answer Q3-2 and then go to Q4.
2) No → Please go to Q4.

Q3-2 Please provide the following information about the incidents that you know.

Month/Year	Location	Type of Problem	Cause of Problem

Month/Year	Location	Type of Problem	Cause of Problem

4. Recycling of Used EEE

Q4-1 Does or will your company conduct take-back/collection, reuse, or recycling of used EEE?

1) Yes → Please answer Q4-2.
2) No → Please go to Q4-3.

Q4-2 Please provide information about the take-back/collection of used EEE.

Type of used EEE	Take-back/Collection, Reuse, Recycling of Used EEE		
	Started/Target Year	Roles and Responsibility of Manufacturer	Roles and Responsibility of Others
1. Television set			
1.1. CRT			
1.2. LC			
2. Computer			
2.1. Desktop			
2.2. Notebook			
3. Mobile phone			
4. Refrigerator			
5. Air conditioner			
6. Washing machine			
7. Other ( )			

Q4-3 What would be major obstacles to establish take-back/collection, reuse, or recycling systems for used EEE? (Multiple Answer)

1) Setting up collection points (getting cooperation from retailers)
2) Coordination with existing collectors
3) Shrinking demand of products due to price increase (e.g. recycling fee on the sales price)
4) Other ( )

This is the end of questionnaire. Thank you for your kind cooperation!!

Please return the Questionnaire to:

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Tel: 03-7845 9693 Fax: 037845 4070

Email:goodearth@top.net.my

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LIST OF STAKEHOLDERS

1. Manufacturer/ Exporter/ Importer

- Mimos Smart Computing Sdn Bhd
- NEC Computers Asia Pacific Sdn Bhd
- DELL Asia Pacific Sdn Bhd
- IBM (M) Sdn Bhd
- EPSON Trading (M) Sdn Bhd
- CANON Marketing (M) Sdn Bhd
- Konica Minolta Business Solutions (M) Sdn Bhd
- Toshiba (M) Sdn Bhd
- Sharp-Roxy Sales & Services Company (M) Sdn Bhd
- Lexmark Asia Pacific Corporation Inc.
- Panasonic Malaysia Berhad
- Fujitsu (M) Sdn Bhd
- Ricoh (M) Sdn Bhd
- Apple Computer Systems (M) Sdn Bhd
- Sun Microsystems Malaysia Sdn Bhd
- O.Y.L Industries Bhd
- Group Associated (C&L) Sdn Bhd
- Pensonic Holdings Berhad
- Dunham-Bush (Malaysia) Bhd
- LG Electronic (M) Sdn Bhd
- OCE Systems (M) Sdn Bhd
- Hitachi Sales (M) Sdn Bhd
- KHIND Marketing (M) Sdn Bhd
- JVC Sales & Service (Malaysia) Sdn Bhd
- Philips Malaysia Sdn Bhd
- Electrolux Home Appliances Sdn Bhd
- Sony Malaysia Sdn Bhd
- Haier Electrical Appliances (M) Sdn Bhd
- BenQ (M) Sdn Bhd

2. Associations

- Association of the Computer and Multimedia Industry of Malaysia (PIKOM)
- Federation of Malaysian Manufacturers (FMM)
- Malaysia Cable Manufacturers Association (MCMA)
- The Electrical and Electronics Association of Malaysia (TEEAM)
- Malaysia Electrical & Electronics Industry Group (MEEIG)
- Malaysian American Electronic Industry (MAEI)
- Multimedia Development Corporation (MDC)

- Malaysian Indian Metal Traders and Recyclers Association (MIMTA)
- Malaysian Plastics Manufacturers Association (MPMA)

3. User

- Hotels
- Local and Private institutions
- Households
- Hospitals,
- Government agencies, etc.

4. Recyclers (DOE Licensed E-waste Contractors)

- Eng Son Trading
- Estalco Sdn Bhd
- Excelbond Metal Recycling Industries Sdn Bhd
- Hor Trading and Workshop
- Hydro Metal (M) Sdn Bhd
- JTS Engineering Sdn Bhd
- Kota Emas Sdn Bhd
- Mokepa Holding Sdn Bhd
- SMC Technology Sdn Bhd
- Xilmax Sdn Bhd
- C.S.Ooi Enterprise Sdn Bhd
- Dhakshinamoorthy Manufacturing Sdn Bhd
- Jivas Enterprise Sdn Bhd
- Megatrax Plastic Sdn Bhd
- Metric World Sdn Bhd
- Mutual Elite Sdn Bhd
- Natural Arrangement Sdn Bhd
- P.H. Enterprise
- Segar Bersih Maju Enterprise
- SEMS International Sdn Bhd
- Syarikat Siven Enterprise Sdn Bhd
- Taiko Metals Recycle Sdn Bhd
- Thitec Technology
- Vintage Metro Sdn Bhd
- Zentronic Technology Sdn Bhd
- H & Z Industries Sdn Bhd
- Jayabalan Enterprise
- Kim Denko (M) Sdn Bhd
- Lam Chong Trading Sdn Bhd
- LSPCM (Melaka) Sdn Bhd
- Meriah tek (M) Sdn Bhd

- Modaltech Sdn Bhd
- Sim Trading Co.
- Tan Wee Choon Sdn Bhd
- Victory Recovery Sdn Bhd
- Yean Yean Enterprise Co.
- Ega Recycling Sdn Bhd
- Pakar Dingin Sdn Bhd
- Samsung Corning (M) Sdn Bhd
- Wealth View Industries Sdn Bhd
- Delta Subur Enterprise
- Petromine (M) Sdn Bhd
- AER Worldwide Sdn Bhd
- Ajensi Viji
- Century Surf Sdn Bhd
- Comet Recycle Enterprise
- Cycle Trend Industries Sdn Bhd
- Elegree Products Sdn Bhd
- IRM Industries Sdn Bhd
- JM Smart Enterprise
- Kean Huat Enterprise
- Langges Resources Sdn Bhd
- Metech International (Penang) Sdn Bhd
- Might Vigorous Metal Enterprise Sdn Bhd
- Ming Engineering Plastic Sdn Bhd
- MMP Post Manufacturing Management Sdn Bhd
- MS Wawasan Trading (PG) Sdn Bhd
- MSV Metals Sdn Bhd
- Nitha Enterprise
- Noranda Recycling Inc (Malaysia) Sdn Bhd
- Preference Megacycle Sdn Bhd
- Rank Jaya Metals Sdn Bhd
- Shan Poornam Metals Sdn Bhd
- SKYTune Metal Corporation Sdn Bhd
- Sri Nibong Metals & Enterprise
- Teratai Gateway Enterprise
- Tes-Amm (Malaysia) Sdn Bhd
- Tian Swee Sdn Bhd
- VM Scraps & Metals Enterprise
- Y. P. Cheah Enterprise (M) Sdn Bhd
- DNS Waste Management Sdn Bhd
- Noble Global Sdn Bhd
- Pan Valley Sdn Bhd
- Specasts Recycle Sdn Bhd
- Vitapole (M) Sdn Bhd
- Ace Metal Management Sdn Bhd
- ALH Industry Sdn Bhd
- Areno Resources Sdn Bhd
- Azam Merdu Sdn Bhd
- Changkat Consolidated Sdn Bhd

- Hedaka Sdn Bhd
- Ivory Intergrated Sdn Bhd
- Jaring Metal Industries Sdn Bhd
- Karich Environmental Mgt Sdn Bhd
- Magna Capital Sdn Bhd
- Metal Recovery Industries Sdn Bhd
- ML Recycle Enterprise
- Nurachem (K.L) Sdn Bhd
- OCK Recycle Sdn Bhd
- Ohreco Sdn Bhd
- PCH Industries Recycle Sdn Bhd
- Puspha Metal Sdn Bhd
- Revlog (M) Sdn Bhd
- Sri Aman Recycle Sdn Bhd
- Sri Medan Trading
- TMC Metal (Malaysia) Sdn Bhd
- V. Chinakalea Metals Sdn Bhd
- Winner Global Metal Sdn Bhd
- WNN Technology Centre Sdn Bhd
- Bayu Quantum Sdn Bhd
- Ohgitani Kogyo (M) Sdn Bhd
- SGK Technology Sdn Bhd
- SPM Metal Recycling Sdn Bhd

5. Policy-Makers and Legislators

- Department of Environment (DOE), Ministry of Natural Resources and Environment (MNRE).
- Royal Customs and Excise Department (RCED), Ministry of Finance (MoF)
- Ministry of Housing and Local Government.
- Ministry of International Trade and Industry, Malaysia

CHARACTERISTIC OF E-WASTE (excerpts from the GUIDELINES OF THE CLASSIFICATION OF USED ELECTRICAL AND ELECTRONIC EQUIPMENT IN MALAYSIA 2008)

7. Used electrical and electronic equipment or components is defined as e-waste if it has any of the following criteria:

(a) A defect that materially affects its functionality. For example it DOES NOT:

- Power up; or
- Have a functioning motherboard; or
- Perform Basic Input / Output Systems (BIOS) or internal set-up routines or self-checks fail; or
- Communicate with the host; or
- Print / scan / copy a test page or the page is not identifiable or readable or is blurred or lined; or
- Read, write or record / burn.

(b) Physical damage that impairs its functionality or safety, as defined in the specification. Physical damage includes, but not limited to:

- A screen that has physical damage, such as burn marks, or is broken, cracked heavily scratched or marked, or that materially distorts image quality; or
- A signal (input) cable has been cut off or cannot be easily replaced without recourse to opening the case

(c) A faulty hard disc drive and a faulty Random Access Memory (RAM) and a faulty Video Card; or

(d) Batteries made with lead, mercury or cadmium or lithium or nickel that are unable to be charged or to hold power; or

(e) Insufficient packaging to protect it from damage during transportation, loading and unloading operations; or

(f) The appearance of the equipment or components are generally worn or damaged, thus reducing the marketability of the equipment; or

(g) The electrical and electronic equipment or components are destined for recycling or recovery or disposal; or

(h) The electrical and electronic equipment or components are discarded, or are intended or are required to be discarded; or

(i) There are no regular market for the used electrical and electronic equipment or components; or

(j) The used equipment or components are old and out dated, and destined for salvaging purpose; or

(k) For the importing purposes, the age of the electrical and electronic equipment or components is not more than three years (3) from the date of manufactured; or

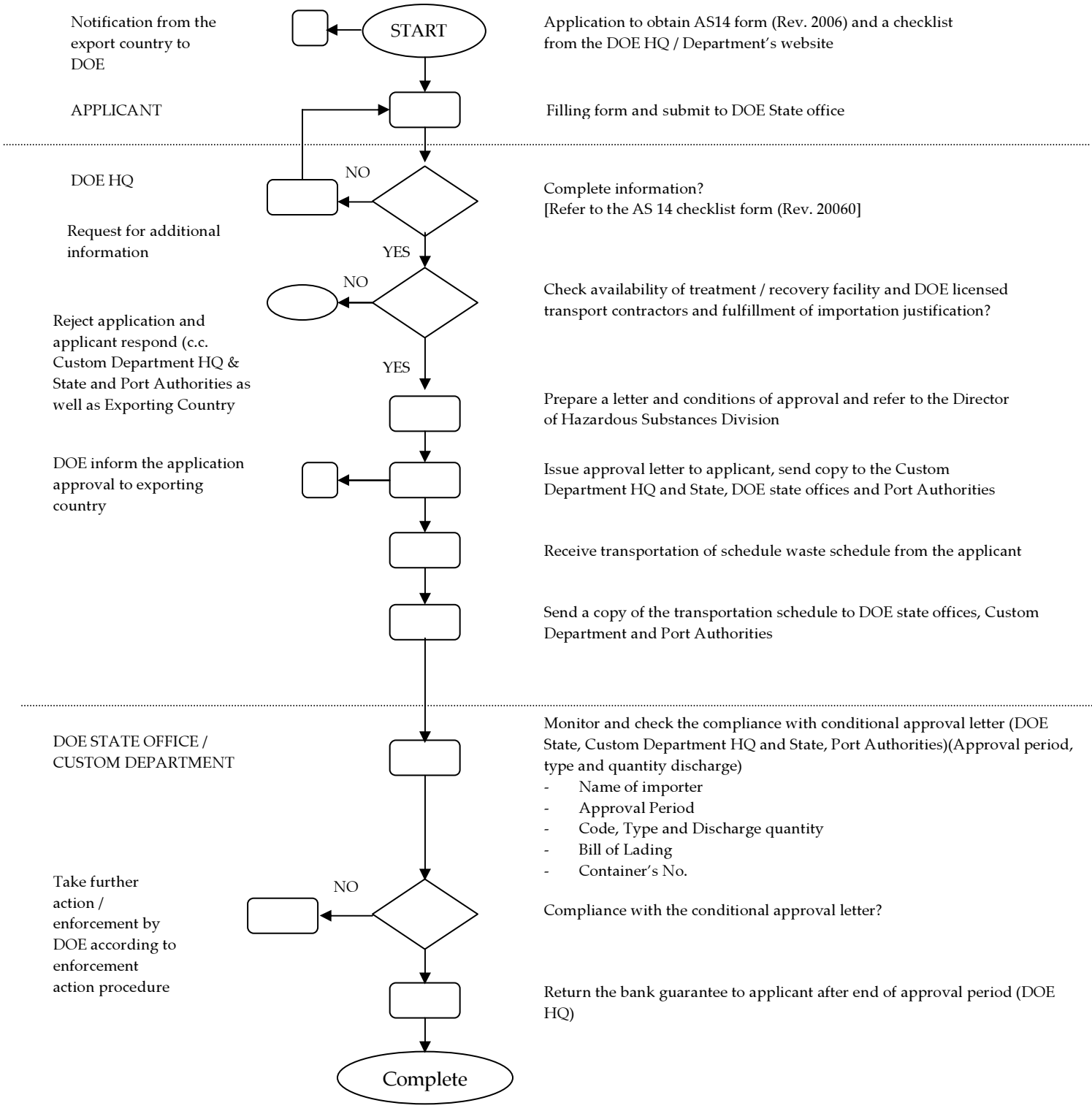
(l) Products / good produced by partially e-waste recovery facilities.

8. The SW 110 wastes category under the Regulation do not include the followings:

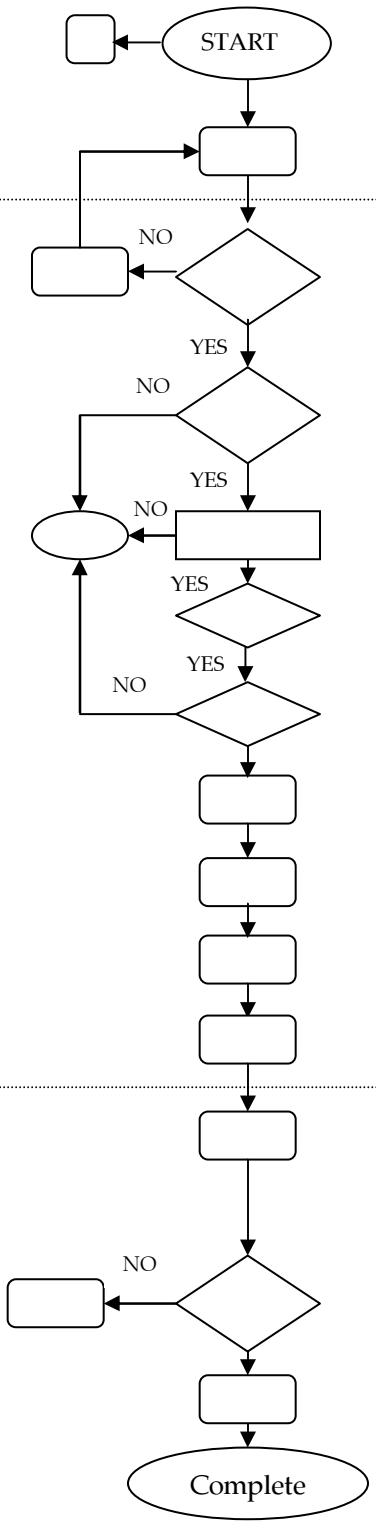
- Electrical and electronic components which are not contaminated or non dispersable form such as metal or plastic casing of computer.
- Electrical and electronic assemblies (including printed circuit boards, electronic components and wires) that are functioning and destined for direct re-use, and not for recycling or recovery or final disposal;
- New and unused electrical and electronics equipment or components made in Malaysia that re returned by the importing countries as defective items;
- New electrical and electronic equipment or components made in Malaysia that are returned to as defective batches for repair to the manufacturer (under warranty) with the intention of re-export)
- Blank wafers or non-patterned wafers or test wafers; and

- Off-cut lead or copper frames not contaminated with heavy metals such as cadmium, mercury, lead, nickel, chromium, lithium, silver and manganese or polychlorinated biphenyl.

FLOW CHART FOR THE IMPORTATION OF SCHEDULE WASTE APPLICATION



FLOW CHART FOR THE EXPORTATION OF SCHEDULE WASTE APPLICATION



Application to obtain AS15A form (Rev. 2006) and a checklist as well as the "Transboundary Movement of Waste – Notification" from the DOE HQ / Department's website http://www.doe.gov.my

APPLICANT

Filling form and submit to DOE State office

DOE HQ

Complete information?
[Refer to the AS 14 checklist form (Rev. 20060]

Request for additional information

No objection from DOE for exportation and fulfill the exportation justification?

Reject application and applicant respond (c.c. Custom Department HQ & State and Port Authorities as well as

DOE notify to importing country and transit country (if available)

Receive approval from the importing country's Authority (Receiver)

Receive approval from importing country's Authority

Prepare letter and conditional approval as well as to refer with the Director of Hazardous Substances Division.

Issue the approval letter to applicant. Send copy to Custom Department HQ and State, DOE State offices and Port Authority

Receive transportation of schedule waste schedule from applicant

Send copy of transportation schedule to DOE State office, Custom Department and Port Authority

DOE STATE OFFICE / CUSTOM DEPARTMENT

Monitor and check the compliance with conditional approval letter (DOE State, Custom Department HQ and State, Port Authorities)

- Name of importer
- Approval Period
- Code, Type and Discharge quantity, Bill of Lading, Container's No.

Take further action / enforcement by DOE according to enforcement action procedure

Compliance with approval conditions?

Return the bank guarantee to applicant after end of approval period (DOE HQ)

ANNEX A

TABLE 1: CRITERIA FOR THE DETERMINATION OF E-WASTE

QUESTIONS		ANSWER	ACTION
QUESTION 1 (Q1)	Is the equipment or component covered in paragraph 8 of this guideline?	YES	The equipment or component is not categorized as e-waste. The exporter or importer need to submit application with documents listed in ANNEX C to the Department of Environment for decision.
		NO	Go to QUESTION 2
QUESTION 2 (Q2)	Is the equipment or component destined for recycling or recovery or disposal?	YES	The equipment is categorized as e-waste. **NOT ALLOWED** to be imported. **NOT ALLOWED** to be exported for the purpose of disposal. Export for the purpose of recycling or recovery may be allowed subject to the following conditions: (a) Receiving facility agree to accept the waste and have a better technology to process the e-waste compared to current practice in Malaysia; (b) The exportation will gain better economic value; (c) The exportation is allowed and comply with the environmental requirement of the importing country; and

			(d) The exportation shall be fully complied with Basel Convention procedure.
		NO	Go to QUESTION 3
QUESTION 3 (Q3)	Is the age of equipment or component more than 3 years from the date of manufactured?	YES	The equipment is categorized as e-waste. **NOT ALLOWED** to be imported.
		NO	Go to QUESTION 4
QUESTION 4 (Q4)	Is the equipment or component destined for direct re-use?	YES	Go to QUESTION 5
		NO	The equipment is categorized as e-waste. **NOT ALLOWED** to be imported.
QUESTION 5 (Q5)	Has the equipment or component been tested and found to have any fault as listed in paragraph 7 in this guideline?	YES	The equipment is categorized as e-waste. **NOT ALLOWED** to be imported.
		NO	Go to QUESTION 6
QUESTION 6 (Q6)	Has the result of the testing been documented and do not indicate any of the fault listed as in paragraph 7, and also certified by a competent authority or certified body or relevant agency in the country of export?	YES	The equipment or component is not categorized as e-waste. The exporter or importer need to submit application with documents listed in ANNEX C to the Department of Environment for decision.
		NO	The equipment is categorized as e-waste. **NOT ALLOWED** to be imported.

ANNEX C

CHECKLIST

FOR IMPORTERS AND EXPORTERS OF USED ELECTRICAL AND ELECTRONIC EQUIPMENT/COMPONENTS

Subject	For Official Use
A. General Information	
Name of Applicant : Applicant Designation Address of Applicant: Telephone : Telefax : E-mail :	
Name of Premise : Address of Premise : Telephone : Telefax : E-mail : Custom Tariff Code(H.S Code) : Port of Entry : Country of Origin :	

B. Operational Information	
Justification for application (specify the reasons for import/export *):	
Description of production processes and the relevant flow diagrams of the imported material :	
List of final products and quantity produced per month: (Example: recovered precious metal, direct re-use etc)	
Operational licenses from relevant agencies, eg. Local Authority, MITI, DOE, ROC/ROB, etc.	
List of used electrical and electronic equipment/components and their quantities to be imported/exported * : (Inventory list should include the brand name, model, serial number, year of manufacturing, status of equipment/component and date of inspection)	
Certificate of Inspection from a competent authority or certification body or any other relevant agency for the status of the items to be imported/exported * :	
Contractual agreement with concerned parties (for purposes of re-use, recovery or recycling) :	
Method of packaging :	

Note:

(*) Delete which ever is not applicable