FOREWORDS

Electronic and electrical wastes or e-waste is a global issue that potentially to be Indonesia problem. The term of e-waste is not so familiar to many Indonesian that dealing with this issue should start from scratch. The first step to be conducted is to measure the size of e-waste generation and its existing management. Under the Memorandum of Understanding between the Ministry of Environment and Secretariat of the Basel Convention, Indonesia should conduct preliminary inventory of electronic and electronic waste (e-waste).

This Report presents all activities in the first phase or at preliminary stage of the four-year project which would have run since the middle of 2006 until 2009. The work plan of the whole project is as follows:

1. Design and carry out a detailed inventory;
2. Develop and implement a public awareness campaign and design the pilot project on successful collection schemes;
3. Implement collection schemes and in parallel undertake the review of the environmentally sound technologies on refurbishment and recycling of used and end-of life electrical and electronic equipment and products. This will include a preparation of guidance documents on environmentally sound refurbishment and recycling;
4. Undertake training program for refurbishment facility officials, and at the same time hold national workshop on environmentally sound practices and share the results of pilot collection schemes, inventory data and information on guidance documents with government officials and stakeholders.

This Report covers two main activities which are preliminary inventory of e-waste and workshop for raising national awareness on e-waste.

The secondary and primary data related to e-waste generation have been gathered. However, the Project itself has not giving any substantial number of e-waste generations in Indonesia. This preliminary stage might give solid information and recommendation to government for further actions.

We would like to thank the Secretariat of the Basel Convention for its continuous support to this Project. We also would like to acknowledge all representatives from stakeholders and our colleagues for their help and support in conducting the Project and finalizing the Report.
.

ABRREVIATIONS

ABE	: *Asosiasi Bengkel Elektronik*/Electronic Repair Association
BAPEDAL	: Badan Pengendalian Dampak Lingkungan
BCRC SEA	: Basel Convention Regional Center Southeast Asia
BODETABEK	: Bogor, Depok,Tangerang and Bekasi
CRTs	: Cathode Ray Tubes
EMC	: Electronic Marketer Club
EPR	: Extended Producer Responsibility
EU	: the European Union
GABEL	: Association of Electronic Manufactures
GR	: Governmental Regulation
HS	: Harmonized System
ISIC	: International Standard Industrial Code
IT	: Information Technology
LCDA	: Life Cycle Data Analysis
MOE	: Ministry of Environment
NBS	: National Board Statistic
NGOs	: Non Governmental Organizations
PBBs	: Polybrominated biphenyls
PCBs	: Printed Circuit Boards
PVCs	: Polyvinyl chlorides
PWBs	: Printed Wiring Boards
SBC	: The Secretary of Basel Convention
SNI	: *Standard Nasional Indonesia*/Indonesia National Standard
UNEP	: United Nation Environmental Program
WAKATOBI	: Wangi-Wangi, Kaledupa, Tomia and Binongko

CONTENTS

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

The objective of this Project is to perform preliminary inventory on electronic and electrical waste in Indonesia as the initial step for developing national inventory system on e-waste which is going to be a part of national inventory of hazardous waste in Indonesia. The result of this project is expected to support Indonesia in implementing environmentally sound management for electrical and electronic waste.

The scope of activities includes two main activities namely preliminary inventory of e-waste and national awareness raising workshop on e-waste. The survey was conducted to the several respondents such as traders, users, distributors, inter-islands traders and government agencies. Primary data were collected from the survey to the facility sites including electronic service centers, electronic shops selling refurbished or reconditioned goods, scrap collector companies and sites where illegal imports of e-waste are collected and or dumped. Secondary data were also collected from the various related sources such as government agencies, association of electronic manufacturers and other sources. A series of consultative meetings and discussions with relevant agencies and NGOs were also conducted, followed by discussion on the national workshop.

The most valuable data gathered were the annual production capacity and real production capacity of electronic sector which would be utilized to predict the generation of e-waste in Indonesia. It was found that, to date, Indonesia has 80 large and 150 small-medium enterprises of electronic manufacturers which are located mainly in Java Island, North Sumatera Province and Batam Island of the Kepulauan Riau Province. Electronic industries in Indonesia cover wide range of products, from household appliances to industrial electronic products. The main products include air conditioning, electronic component, fan, other electronic products, radio, radio cassette, refrigerator and its component, and television. Based on production capacity, electronic component has the biggest capacity, followed by computer component and equipment, television and air conditioning respectively.

The workshops of Electronic and Electrical Equipment (e-waste) Management in Indonesia which had been conducted by Ministry of Environment of Indonesia on 20 – 21 December 2006, identified several issues and recommendation, which expectedly would contribute the development of national policy on e-waste management in Indonesia.

From legislation aspects, Indonesia has not yet had specified criteria on e-waste, nor established specific regulation on e-waste management which will possibly cause confusion or misunderstanding in the implementation. For instance, regulation on prohibition of importing second-hand and e-waste has already been in place. However, trade of imported second-hand electronic product and product made of e-waste could be found easily in many places. It shows inconsistency in enforcing the regulation. Different interpretation among institutions and organization regarding the legislation on e-waste reflects poor coordination and communication. Confusion also has been found among local government institutions in handling e-waste that need to be clarified by relevant institutions in central level.

Regarding Technical Aspect, it was found that the technical definition on e-waste as well as second-hand equipment has not been defined yet, accurate and reliable data available were limited and hardly accessed, and the exact information on the lifetime data of each type of electronic product to calculate assumption of the volume of e-waste was difficult to obtain.

Concerning Economic Aspect, it was identified that some institutions claim that second-hand electronic, refurbished electronic or electronic equipment made from e-waste component could be of benefit to low-income society who could not afford the new ones. They also consider the advantage of using this kind of electronic to generate income at low skill and low capital.. The unclear definition on e-waste would also lead to unnecessary high cost waste management and opportunity cost to utilize the waste and second-hand product. Ministry of Industry admitted that illegal import of second-hand electronic and or e-waste reduces domestic market for 40%.

In terms of Inspection and Enforcement Aspect, it was identified that since Indonesia has hundreds of sea ports, some difficulties emerged in monitoring any illegal import of e-waste. Existing HS code, to some extent, has loop holes in order to falsify documents and to use inappropriate HS Code. Survey in Batam and Wakatobi Island showed no inspection and enforcement taking place in e-waste dumping sites. There are indications the leakage or illegal entry of recycled and refurbished electronic equipment from bounded zone to Indonesian territory

Concerning Consumers Protection Aspect, it was identified that consumers prefer to purchase low-cost product regardless of its quality and lifetime warranty. There are also limitation of information received by consumers and ability to assess the quality of the product and no legal procedure to protect the consumers from defected product of second-hand or refurbished product

Finally, several recommendations have been identified. Regarding Legislation Aspect, there was a need among related institutions such as Ministry of Trade, Ministry of Industry, Ministry of Environment and Customs to discuss the regulation on prohibiting of imported second-hand and e-waste in order to have similar legal interpretation in its implementation and enforcement**;** to discuss legislation on bounded zone facilities in order to have better understanding of export – import procedures, and environmental and health consideration in disposing of the waste; to discuss the difference definitions on export-import of e-waste, for example PCB scrap, with refer to relevant HS Code. Those recommendations mentioned aim to prevent and control falsifying of export-import document; and to calculate the amount of the e-waste for evaluating occurred problem and providing the solution.

Concerning Institutional Aspect, it was recommended to enhance coordination and communication among all involved institutions and organizations; Awareness and capacity of local government officers on managing hazardous waste include e-waste, have to be increased in order to handle tricky and false promise of local revenue.

In terms of Technical Aspect there were several needs identified i.e. Technical criteria needs to be agreed by all parties, including universities and researchers, to prepare definition and specific legislation on e-waste and second-hand electronic and manufacturers need to be encouraged to implement cleaner production and apply other approaches such as eco-design, extended producers' responsibility and take-back mechanism. Technical discussion should be convened among authorities and manufacturers to set up a comprehensive management of e-waste including data collection and exchange.

Concerning Economic Aspect, it was recommended that the cost of environmental recovery and health impact due to exposure of hazardous waste which was contained in the e-waste or low safety of refurbished electronic product should be taken community's net revenue into account; Refurbishment of electronic product activities conducted by mostly small and unauthorized enterprises or informal sector should not be prohibited as long as they use domestic second-hand electronic or e-waste; The government has to increase their technology capacity to operate in environmentally sound manner while the calculation of economic benefit which compares environmental and health cost to reduction of domestic market share should be conducted to give stakeholders clear pictures of the e-waste problems.

In terms of Inspection and Enforcement Aspect several recommendations have been raised i.e. Inspection and enforcement on illegal import of e-waste, refurbishment production process and export-import of e-waste, need to be increased particularly in the area surveyed where illegal dumping sites have been found; Customs was encouraged to increase the effort in inspection and enforcement of illegal import of e-waste by building capacity of its fleet to monitor Indonesia's coast line, by increasing capability of its officers in identifying technical specification of illegal imported products, falsified document and inappropriate HS Code and by examining the leakage of the export-import flows to Indonesia territory.

Concerning Consumers Protection Aspect, it was recommended that the government should facilitate consumers awareness raising on product quality, technical specification and safety of refurbished electronic product. consumers rights to have good quality and safe product and should encourage manufacturers to disclose all relevant information regarding their products quality and to provide mechanism to protect consumers from sub-standardized products.

I. INTRODUCTION

1.1 Background Study

1.1.1E-Waste in Indonesia

Although electronic and electrical waste or e-waste is an emerging global issue, to date it is not a common terms for many Indonesians. There is no specific definition for e-waste in Indonesian domestic regulation. However, with interpretation to the current existing regulation on wastes, especially hazardous waste regulation, e-waste might be understood as unusable and or unworkable or unwanted electronic or electric and electronic appliances due to become obsolete stuffs and need to be disposed, either in the forms of wholes or as parts.

Compare to other developing Southeast Asian countries, awareness on electronic waste in Indonesia is relatively left behind. Series of inter-institutional meetings revealed that familiarity with the term of e-waste among government institutions was still lacking. A very fundamental question such as what is “e-waste” itself becomes a frequent question that needs to be explained. As a consequence, the expected stakeholders do not have idea what the challenge they will face regarding this issue. Those who are pro-economic development argue that e-waste should be totally distinguished from second-hand electronic that still has economic value. They are also reluctant to manage e-waste as hazardous waste, as there is no specified criteria or definition about e-waste and second-hand electronic. As the authority of national environmental management involves waste management, the Ministry of Environment has a concern to raise this issue in the national level, including addresses its associated problems.

There are some limitations in Indonesia regulation on waste. While regulation on wastewater pollution control, air pollution control, and hazardous waste management have been already developed and implemented, legislation on domestic waste in the comprehensive manners has not existed yet. In the case of e-waste, especially waste of electronic appliances such as home and office appliances, might be considered as waste from domestic and offices activities. Therefore, the generators of these wastes are

exempted from liability to manage their e-waste unlike premises or industries which might be eligible under existing waste generator's regulations. For this reason, so far e-waste is not a popular term in Indonesia.

Since e-waste is still an unfamiliar terms for many parties, therefore, there is no certain institution dealing with this problem. Ministry of Environment just started to emerge this issue becoming a national concern through intensive communication with other potential stakeholders, and plan to launch national program dealing with e-waste. National inventory of e-waste is the first step to develop system by identifying resources and potential data to be collected and then calculating and or modelling them based on existing national circumstances.

E-waste in Indonesia might be considered as hazardous waste if the products contain such a hazardous components or substances. For example, the contain of Cathode Ray Tubes and tin solder in television or monitor may lead to be harmful for blood and kidney, impair children's brain and act as neurotoxin,. Electronic goods might also contain other hazardous metal such as mercury, cadmium and other harmful materials such as PVCs and PBB in its components or parts. On the other hand, e-waste also contains valuable materials such as gold, silver and rare metals which may give benefit if it is reclaimed safely. For these reasons, management of e-waste is crucial to comply with standard management of hazardous waste.

1.1.2 Domestic Consumption of Electronic Products

In the early of Indonesia's economic development, electronic appliances were considered as luxurious and unaffordable stuffs for common people. However, due to their ability to provide satisfaction and easiness in everyday life, the usage of electronic appliances becomes more and more popular in Indonesian households. Fast development in technology of electronic industries not only offers wide range of product choices but also price choices. Now some products are available in more affordable price. It gives opportunity for population to have electronic goods in their houses.

Another factor to attract consumers by providing low-end consumer product is a trade-in program. Some electronic service centers usually provide a service for their consumers who want to trade their used electronic equipment with the new one. It is also a common practice for electronic vendors to offer this kind of program in cooperation with hypermarkets to boost their sale.

The tendency of domestic consumption today shows that daily activities whether at homes or work places are more dependent on electronic equipments and this equipment becomes a necessity for Indonesians. This situation encourages vast development of electronic industries in Indonesia.

However, according to Ministry of Industry, this industry is vulnerable because more than 50% of its components are imported. Therefore, the selling price of electronics depends on the values of foreign exchange currency. For example, in year 2004 the market of electronics decreased by 20% due to this factor. The Ministry of Industry responded the situation by developing incentives for up stream electronic manufacture investment. From the market view ,, it was also reported that market for electronics in Indonesia had been growing. On the other hand, this growth was not necessarily correlated with domestic production of electronic goods. In year 2006, based on Electronic Marketer Club (EMC), production of domestic electronic appliances should be reduced by 50% due to availability of smuggled electronics goods in the market. This reduction was 10% higher than previous year.. Ironically, these smuggled goods included famous brand which has manufacture in Indonesia. The selling price of these smuggled products were 40-60% lower than the manufactured products. Unfortunately, there was no detailed explanation on how the 50% of smuggled used electronic goods were calculated.

1.1.3 Effort to Develop Inventory system of e-waste in Indonesia

In order to have better understanding about developing e-waste inventory system, checking on availability data have been conducted through a series of consultative meetings with

government institutions and private sectors. Identification of current issues concerning domestic electronics market also becomes invaluable inputs to development strategy for establishing the system. However, it is still not an easy task because in Indonesia some encouraging legislation was not in place.

In the countries where Extended Producer Responsibility (EPR) applied, electronics manufacturers have to take back their products from the market at the end of their useful life. Therefore, inventory of e-waste would be likely much easier due to the collected items would be considered as the main data of e-waste. In Indonesia, similar to other developing countries, this approach is not yet in place. In order to be able to estimate volume of generated e-waste in Indonesia annually, some variables may need to be considered such as production capacity of electronic appliances, size of export-import, domestic markets, end-of-life the domestic marketed products, and other specific situation existing in domestic situations. The first two variables are described as follow.

1.1.4 Variables to be considered

Production capacity of electronic manufacturers may correlate with number of obsolete electronic appliances generated in the country. However, this number should be corrected by volume of export and import. The problem will be faced if the measurement of volume using different values such as units, pieces, ton and sets.

End-of-life electronic appliances may vary depend on type of products and their technology employed. For example, refrigerator manufacturers may guarantee optimum usage of their products between 3 to 5 years. However, in reality, the end-of-life of electronic appliances in Indonesia may be considered longer than manufacturer's certification. The existence of numerous electronic service centers to carry out repairs, spare parts replacement and refurbishments shows the phenomenon. Their services are commonly provided to household appliances such as TV sets, Air conditioners, refrigerators, washing machines, audio-video equipments, and most recent, laptop and desktop computer. There is an exception for particular electronic product such as mobile phones, which its life time of

usage tends to reduce due to the rapid technology innovations and fashion/life style influences. Second-hand market for mobile phone in Indonesia is one of the fastest growing's market

1.1.5 End up of Indonesian E-waste

Indonesia does not have specific facility to recycle electronic and electric wastes. With assumption e-waste as domestic waste, it was expected that e-waste would be ended at domestic landfill sites. However, annual survey conducted by Ministry of Environment in more than 300 domestic landfill facilities owned by local governments throughout Indonesia has not shown e-waste found on those sites. Only in limited final disposal for domestic wastes sites a very limited amount of e-waste has been found.

If e-waste is considered as hazardous waste, then it is supposed to be ended on the secure landfill for hazardous waste. Having an intensive check, there were not any obsolete electronic appliances found in the location. Electronic wastes were landfilled usually in forms of electronic components or electronic spare parts which sent by electronic component manufacturers or electronic appliance assemblers.

These findings indicate that there is unofficial system to absorb most of e-waste in Indonesia. Further research is needed to learn how the system works, whether it is conducted environmentally friendly or not. Electronic services centers have role to identify the route of the e-waste prior to its disposal or destruction. Reports of some manufacturing companies to the Ministry of Environment (MOE) on sending obsolete PCs, printers and other electronic equipment to secured landfill facility also have to be clarified.

1.1.6 Others Possible Sources of E-waste

As an archipelago country, harbors are spread through out Indonesian islands. While formal harbors normally provide standard services for large ships with full supervision by custom officers, informal harbors usually small and left unattended. Through these informal harbors

as entrance, either used electronic appliances or, if the goods did not work, e-waste from overseas come into the national market. At least there are two locations identified as sources of illegal used electronic goods to Indonesia. There is no record available about the volume of this entry. In other hand, the used electronics and e-waste may enter into Indonesia by falsifying documents. This Illegal import has occurred in some places in Indonesia.

To resume, in order to have accurate inventory data of e-waste generating in Indonesia, a fundamental data such as production capacity of selected electronic appliances, export-import of selected electronic appliances, estimation of “real” average life time of every kinds of electronic products, and entry of “illegal” obsolete or used electronic appliances should be considered. While a configuration to calculate or model generation of e-waste in Indonesia need to be established, regarding to identification of informal system of absorbing e-waste.

1.2 Objectives

The Objective of this Project is to conduct preliminary inventory on electronic and electrical waste in Indonesia as the initial step for developing national inventory system of e-waste which is likely to be a part of national inventory of hazardous waste. The Result of this project is, to implement environmentally sound management of electrical and electronic waste in Indonesia.

1.3 Scope of Activity

As implementing agency MOE will undertake two main activities of this project which are conducting preliminary inventory of e-waste and workshop for raising national awareness on e-waste. Scopes of activity agreed on the Memorandum of Understanding as follow:

<u>Preliminary Inventory of E-waste</u>

- Prepare Terms of Reference and appoint a project leader/consultant
- Initiation of desk study by consultant
- Prepare and carry out survey of used electrical and electronic wastes
- Prepare and carry out survey on facilities that perform collection, storage, recovery, recycling and disposal of e-waste and provide brief descriptions of their operations inter alia in terms of economic, environment, health and safety
- Analyse collected data and prepare report for selected items of electronic appliances namely Air Conditioner, TVs, Computers (PC and Laptop), washing machine, and refrigerators

National Awareness Raising Workshop

- Ensure to organize of the participation of all the delegates, including the administrative and logistic arrangement
- Prepare and send invitation letters to the government agencies and other participants
- Maintain the list of participants which shall be one representative per agency that are engaged in the implementation of the Basel Convention at the national level, in particular, involved in the work concerning hazardous waste inventories
- Prepare, in consultation with UNEP/SBC, the necessary documents for the workshop. In the case of documents prepared by UNEP/SBC, prepare copies for distribution to participant as required
- Organize the distribution of all working documents in advance and/or during workshop as appropriate; and
- Make arrangements for sufficient administrative staff to provide adequate support, including secretarial support during the workshop

1.4 Methodology of Study

In this project, survey method is carried out to identify e-waste distribution coverage in Indonesia. It involves respondents from trader, user, distributor, inter-islands trader, and

government agencies. This method is useful to get profound knowledge about e-waste distribution.

Case study is a process of a deeply and detailed analyzing and data collecting about a special occurrence as the chosen “case” (Nisbet and Watt, 1994). Case study is applied to the involved community of e-waste distribution based on involvement and problems level of e-waste incoming, trade and distribution also usage, to determine generally potential and e-waste distribution map in Indonesia.

The choice of case study strategy applied to doer community (individual or industry) is to analyze doer community characteristics, way of distribution, economics relation, and change of social-economy, then analyze them as a whole doer community (Arensberg and Kimball, 1972).

As it is qualitative study, it was designed to be conducted through orientation study i.e. field identification study and secondary data such as literature survey, data from related agencies, continued with exploration study to understand the phenomenon and field indication for collecting data which is relevant with the objectives of study. Validation of the data will be checked by confirmation study names direct interview with community (Sitorus, 1998, Soehartono, 1999).

Primary data was collected based on survey to the facilities site including electronic service centers, electronic shops selling refurbished or reconditioned goods, scrap collector companies and sites where illegal imports of e-waste were collected and or dumped. Secondary data was collected from various related sources such as government agencies, association of electronic manufacturers and other sources.

A series of consultative meetings and discussions with relevant agencies and organizations also NGOs were scheduled and conducted, followed by discussion on national workshop.

1.4.1 Survey Location and Time of Study

Survey on refurbishment and recondition facilities

Survey was focused in Bogor, Depok, Tangerang, and Bekasi on December 2006. Places of interest for collecting information include shopping centers, hyperstores, electronic centers and individual electronic stores or service facilities.

Shopping malls/centers which has grown significantly during the last decade, generally perform a "one stop shopping's" concept where everything are avaliable in one place. Electronics block, consisted of electronic shops, are always being a part of this facility. They do not only offer variety of electronic products but also electronic services. In addition, a big mall usually have a big tenant, namely hyperstores which mostly only sell branded new electronic products. Due to a case that a hyperstore found selling refurbished TV sets and then sued by its consumers, observation on hyperstores become a necessity

Electronic center is an independent complex that consist of electronic shops and services which are very possible to provide electronic reconditioned or refurbished services. The most interesting subject was individual electronic services due to their refurbishment activities and their potential extend the end up for obsolete electronics. This survey basically focuses on identifiying market of used electronics, the role of retailers and service center, and intensity of their activities. In addition, a similar survey also conducted in Batam Island and East Java Province at December 12-13, 2006. While survey in Batam emphasized on observation of refurbished and reconditioned shops and potential of e-waste recycling industries, in East Java survey mainly focused on e-waste recycling facility.

Survey on illegal import of used electronic goods or e-waste

Locate in Batam Island and Wakatobi Island, survey on illegal import is a case study. There are some related reasons in choosing the two places:

1. Those places are coastal areas which rely on inter-islands trading
2. The two islands have economical relationship with Singapore and Malaysia, as main sources of potential e-waste importation.
3. Both islands could represent Indonesia condition. Batam is a transit area for e-waste distribution in western Indonesia, while Wakatobi is a transit area in eastern Indonesia.

4. Some researchers are so experienced in researching in the two places that enable them to closely communicate with respondents. Therefore, it is possible to get depth, valid and reliable data in high accuration (Sitorus, 1998).

1.4.2. Technique of Collecting Data

To collect information related, there are several technique to carry out. Primary data is conducted through interview and observation which is an individual experiences researched (Denzin, 1989), while documents trace are conducted to collect secondary data received from related agencies, electronic producers, and internet. Then all data collected were clarified on National Workshop.

1.4.3. Data Analyzing

Data analyzing technique applied is qualitative data analyze method. The collected primary and secondary data were analyzed with descriptive analysis to explain activities of communities that have roles in distributing e-waste and to establish model to estimate generating of e-waste in Indonesia.

1.5 Limitation of the Study

This Preliminary Inventory is not aimed to provide the certain number of e-waste in Indonesia, but it is limited only to the related aspects with description of e-waste distribution map in Indonesia.

The observed variables in this study consist of : (1) description of location, (2) e-waste origin, (3) trading and moving process, (4) estimation of total production (if exists), (5) economic and social issues caused by e-waste distribution.

This study is emphasized on developing a reasonable approach in calculation and estimation of e-waste generation in Indonesia through inventory. It focuses on identification the sources and types of data, examination of the data conformity to objective of the Project,

verification of data and identification or approaches to create necessity but not available data. In addition, although the study is e-waste in general but the subjects are limited to electronic appliances including TV sets, Air conditionings, refrigerator, washing machines and computers.

1.6 Role of Preliminary E-waste National Inventory in the Context of a National Policy on Hazardous Wastes

This Project is expected to encourage further development of Indonesian legislature on wastes in general. Indonesia has regulations on industrial waste management but not for domestic waste. This study is considered as part of implementation to the existing regulation concerning hazardous waste and the Law of Environment Management that specify the need of legislature for hazardous waste management from non industrial sources. The success of this study might be useful for inventory of other specific wastes in Indonesia.

II. DEFINITIONS AND CLASSIFICATIONS

2.1 Definition and Classification of Electronic Wastes

There is no definition for “e-waste” in Indonesia regulation. In order to have a preliminary definition of e-waste and a common understanding among stakeholders, the Ministry of Environment (MOE) has raised this issue, including its relevance to used electronic goods. To define the difference between e-waste and used electronic goods will be problem for Indonesian stakeholders. However, there was a progress achieved with this issue after conducting this Project through the series of discussions, meetings and presentations.

Stakeholders have a common understanding that, e-waste might be interpreted as any obsolete electronic and electrical goods or components or parts. It should be differentiated between non-hazardous and hazardous e-waste. Hazardous e-waste should be any e-waste that its components or parts made from or containing hazardous substances. Hence, the whole obsolete electronic appliances might be considered as a hazardous waste as long as it contains parts or components that considered as hazardous waste. On the contrary, when it was dismantled, only components which contain or being contaminated by harmful materials would be considered as hazardous waste.

To illustrate, an obsolete TV sets or computer monitor in whole shape is a hazardous waste. If it dismantled, the status of components may different. CRTs due to contain lead is classified as hazardous e-waste and so it’s PCBs. However, when CRTs is treated to form cleaned cullet, its e-waste status would be changed into non-hazardous e-waste or even non e-waste. Hence, it encourages the authority to keep well informed with knowledge of materials for electronic components. It would need a large data base considering a large numbers of electronic components and its fast growing technology development.

Between e-waste and used electronics there is still a different understanding. The pro-economic development argues e-waste should be totally distinguished from second-hand

electronic that still has economic value. They are also reluctant to manage e-waste as hazardous waste, as there is no criteria or definition of e-waste and second-hand electronic. However, an example from overseas such as Nigeria where imported used computers turned into unmanaged electronic dumps. It is not easy to distinguish used goods from obsolete goods. The case also indicates that global export of hazardous waste to developing countries would keep continue in diverse ways. A serious concern should be raised because the similar problem is likely happen in Indonesia.

As a result, there is a need to build a criterion to differentiate second hand or used electronic products which are still workable, from obsolete electronic stuffs categorized e-waste. There is no dissimilarity in shape between second hand and obsolete electronic goods. Only workability test may differentiate them. Some countries set a policy to ensure that used electronic stuffs are really secondhand products. In Thailand, for example, it is allowed to import used electronic products which are still workable for some periods of time. The dates of production of the used products become significant consideration. In EU, there is a policy that used electronic equipment should pass individual workability test before being exported, as informed by Germany authority to the MOE of Indonesia.

Considering to the national regulation that restricts used goods from abroad, this issue should not be a problem. Therefore, the fact that there are legally used imported electronic stuffs is unexpected. However, elaboration of this aspect might be useful at least for developing quality standards for domestic used or secondhand electronic products in Indonesia.

Annex VIII and Annex IX to the Basel Convention determine some qualifications whether electronic waste categorized as hazardous waste or not. Though Indonesia ratified the Convention, the country is not in favor in implementing this stipulation especially since import of hazardous waste is prohibited. In fact, in global level Indonesia supports the amendment to ban export any hazardous waste from developed to developing countries under the Convention. In most cases, approach of Indonesia concerning hazardous waste is very conservative. This slant is based on the fact that national ability in managing

hazardous waste is insufficient and still need to improve. Therefore, importing hazardous waste especially for final disposal is irrational to implement. In a positive way those Annexes show an important illustration in developing national classification to determine whether an e-waste is hazardous or not.

Using interpretation based on the terminology of “waste” in the Indonesian existing regulation, e-waste, which mostly in solid form, is more applicable to be defined as hazardous waste.

According to the Law of Environmental Management and Government Regulations (GR) on hazardous waste, Hazardous Waste Management is defined as the residue from activities which contains hazardous materials and/or harmful to the environment and/or imperil the environment and the health as well as the survival of human beings and other living creatures”. Though e-waste might improperly be classified as “residue”, but the risks associated to e-waste is relevant to the risks of hazardous waste. E-waste as hazardous waste has consequences that in its management should comply with the provisions of hazardous waste management which is based on from cradle to grave principle. It means that, e-waste should be controlled through an established chain of custody system from its generation to its final disposal. The only problem with the regulation occurs if offices and household are exempted as liable entities to manage their hazardous waste.

There is a question whether e-waste should be categorized as hazardous or non hazardous waste. Article 7 to the GR 85/1999 indicates that wastes containing or contaminated hazardous substances or materials are considered as hazardous waste. It is very likely that hazardous or non hazardous should be determined based on the content of the material , not upon individual item of e-waste. Therefore, only parts or components made of hazardous material are recommended as hazardous waste.

Current production of electronic appliances tends to reduce or avoid the usage of hazardous material. For example, most tin solder industry in Indonesia starts to manufacture lead-free solder which demanding by export-oriented electronic manufacturers. Guidelines to identify

parts or components that categorized as hazardous might be obtained from BCRC SEA. These kinds of data might be obtained from R&D and purchasing division of electronic producers.

2.2 Selection of Economic Sectors Related to E- wastes

Electronic waste basically refers to obsolete electronic goods resulted from households and offices. Data concerning this waste is unavailable since there is no regulation in managing this waste in Indonesia. To figure out quantity of e-waste generated in Indonesia, it is necessary to examine the electronic manufacturers. Group of manufacturers usually have a specific code for identification.

There is an international coding system to specialize group of industry, namely ISIC. The ISIC consists of a specific numeric codes to identify group of industry based on their processes or activities. The more digits they have, the more specified the groups are. Every country may apply it or create their unique coding system.

In Indonesia, Ministry of Industry has an authority to develop and implement the industrial coding system based on the national needs. The electronic industry two digit's system is coded by "38", while more specified electronic industrial group activities is indicated by 5 digits Arabic number. Some industrial codes related to this study as shown in the following table.

Table 2.1. Industrial Code for Selected Electronic Manufactures

Industrial Codes	Remarks
38293	Air Conditioner, Under Fluid Machines Industry
38253	Micro Computer
38330	Refrigerators
38321	Color Televisions And Black And White Television
38330	Washing Machines

Source: Ministry of Industry

2.3 Selection of Commodities Related to E- wastes

An international trade in electronic equipments, parts and components is commonly happened. Indonesia sends abroad some electronic commodities, while in the same times brings in not only parts and components but also fully assembled products. As consequences, Indonesia domestic markets of electronics are fulfilled by domestic and imported products.

Data of export and import is generally managed by Ministry of Trade and Ministry of Industry. To identify the commodities of export and import, Indonesia also applies international Harmonized System (HS) of commodities. to the system help to simplify surveillance or monitoring the trans-frontier' flows of commodities by custom offices, especially in relation to taxes and tariffs, and its volume.

HS for commodities also uses a specific coding system likes such as coding system for industry. However, for these commodities, number of digits used could longer than industrial coding system due to the numerous of commodities for trading. The two digits for codification of electronic products are "84'. However, the two digits for electronics such televisions and parts likes Cathode Ray Tubes (CRTs) are classified in code "85". In order to have illustration of selected electronic products, using 6 digits of commodities might be appropriate. The list of electronic products and parts is shown in the table below.

Table 2.2. Harmony System Code for Selected Electronic Commodities

No	HS CODE	Remarks
Computers		
1	847160	Input or Output Units, For Personal And Micro Computer
Washing Machines		
2	845011	Fully Automatic, With A Dry Linen Capacity Not Exceeding 10 Kg
3	845012	Not Fully Automatic, With a Built-In Centrifugal Dryer, With A Dry Linen Capacity Not Exceeding 10 Kg
4	845019	With a Dry Linen Capacity Not Exceeding 10 Kg, NESOI
5	845020	With a Dry Linen Capacity Exceeding 10 Kg

6	845090	Parts
Refrigerators		
7	841810	Combined Refrigerator-Freezers Fitted With Separate External Doors
8	841821	Refrigerators, Household, Compression Type
9	841822	Refrigerators, Household, Absorption Type, Electrical
10	841829	Refrigerators, Household Type, NESOI
11	841430	Compressors Used In Refrigerating Equipment (Including Air Conditioning)
Air Conditionings		
12	841510	Window Or Wall Types, Self-Contained, Comprising A Motor-Driven Fan and Elements For Changing The Temperature And Humidity
13	841520	Used For Persons, In Motor Vehicles.
14	841581	NESOI, Incorporating a Refrigerating Unit And Valve For Reversal Of the Cooling/Heat Cycle
15	841582	Air Conditioning Machines NESOI, Incorporating A Refrigerating Unit, NESOI
16	841583	Air Conditioning Machines NESOI, Not Incorporating A Refrigerating Unit
17	841590	Parts, NESOI, Of Air Conditioning Machines
Televisions and Parts		
18	854011	Cathode-Ray Television Picture Tubes, Color
19	854012	Cathode-Ray Television Picture Tubes, Black And White Or Other monochrome
20	852813	Television Receivers, Black And White or Other Monochrome
21	852990	Parts (Except Antennas And Reflectors)

Source: Indonesian Book of Tariff (*Buku Tarif Bea Masuk Indonesia)*, Directorate General of Customs

III. OVERVIEW OF RELEVANT EXISTING REGULATION

3.1 Regulation on Waste

Since 1994 Indonesia has stipulated specific national regulation on hazardous waste management, while to control domestic waste, government has been dependent on general Law No. 23 Year 1997 regarding Environmental Management and local government legislation. To date, Draft of Law for Domestic Waste Management is still under discussion with stakeholders.

Although e-waste comprised hazardous waste and non hazardous waste material and generally generated from household and office activities, Indonesia treats e-waste under hazardous waste regulation by considering that e-waste initially comes from manufactured products and contains material of hazardous waste. Under the existing regulation, this basic regulation is the most appropriate one in order to prevent abandonment of this waste to domestic solid waste disposal site or anywhere else.

3.2 Regulation on Hazardous Waste

3.2.1 General

The Law of the Republic of Indonesia No. 23 year 1997 on Environmental Management stipulates that every liable person or any business and or activity must be responsible to manage the waste resulted from their activity. Generators of hazardous waste, in addition, should comply with regulation concerning hazardous waste management. Article 7 of the Governmental Regulation number 85 Year 1999 on Hazardous Waste Management provides list of categorized hazardous waste. Based on its sources, hazardous waste is divided into three groups namely hazardous waste from non specific sources, specific sources and unused material contain or is contaminated by hazardous material or substances such as expired harmful chemical, spills, packaging waste and off-specification material or products. Alternatively, other wastes that exhibit hazard characteristics

(explosive, flammable, reactive, toxicity, infectious and corrosive) and or cause chronic or toxic effects by appropriate testing should also be classified as hazardous waste. Regulation on hazardous waste in Indonesia, in fact, has taken into effect since 1994 under Government Regulation No. 19 year 1994 on Hazardous Waste Management.

To steer implementation of the regulations, some backbones' guidelines have been introduced in 1995. These guidelines are:

1. Guideline and Technical Requirements for the collection and storage of Hazardous and Toxic Waste, Decision of Head of BAPEDAL No. 01/BAPEDAL/09/1995;
2. Guideline and Technical Requirements for the documentation (manifest system) of Hazardous and Toxic Waste, Decision of Head of BAPEDAL No. 02/BAPEDAL/09/1995;
3. Guideline and Technical Requirements for Treatment of Hazardous and Toxic Waste, Decision of Head of BAPEDAL No. 03/BAPEDAL/09/1995;
4. Guideline and Technical Requirements for landfilling treatment and site of Hazardous and Toxic Waste, Decision of Head of BAPEDAL No. 04/BAPEDAL/09/1995;
5. Guideline for Hazardous and Toxic Waste labeling and symbol, Decision of Head of BAPEDAL No. 05/BAPEDAL/09/1995;

The regulation should be applied and abided by any industrial activitiy while hazardous waste from households, for example, is exempted. The Law 23/1997 requires government to have regulation concerning management of hazardous waste from non industrial premises to minimize difficulties in collecting data on e-waste from households, which is considered as the largest consumers of electronic products. Because manufacturer has no obligation to "take back" their obsolete products, it indicates that there is no liable party responsible for e-waste.

3.2.2 Regulation on Export-Import of Waste

By the President Decree Number 61 Year 1993, Indonesia ratified the Basel Convention, which has been treated and implemented equals to other Indonesian domestic regulations.

As Annex VIII to the Convention classifies e-waste as hazardous waste, Indonesia must handle transboundary movement of this waste based on guidelines provided by the Convention. Nevertheless Indonesia also has the Act Number 23 year 1997 on Environmental Management and Governmental Regulation No. 18 Year 1999 amended by Governmental Regulation No. 85 year 1999 on Hazardous Waste Management. According to these legislations, bringing any hazardous waste to Indonesia for any purposes, even for recycling is prohibited. Therefore, in hazardous waste transboundary movement regimes, Indonesia only allows to export and prohibits to import.

Article 21 of the Law No. 23/1997 on Environmental Management specifies prohibition to import of hazardous waste into Indonesia. The qualifications of prohibited wastes to import are:

- Wastes listed in Appendix I Governmental Regulation Number 85 Year 1999 on Hazardous Waste Management;
- Wastes with characteristics as specified by Article 7 Sub Article 3 Governmental Regulation Number 85 Year 1999 on Hazardous Wastes Management;
- Wastes that have been discovered to have acute and chronic characteristics after toxicological test specified by Article Sub Article 4 Governmental Regulation Number 85 Year 1999 on Hazardous Wastes Management;
- Wastes listed in Annex I, II, and VIII and exhibiting characteristics listed in Annex III of the Basel Convention;
- Wastes in the form of dust and mud/paste/sludge as written in Article 4 to Minister of Industry and Trade Letter of Decree No. 231/MPP/KP/07/1997 on Waste Importing Procedures; and
- Plastic Wastes as specified in the Appendix of Minister of Industry and Trade Letter of Decree No. 230/MPP/KP/07/1997 on Regulated Imported Goods.

3.2.3 Transboundary Movement of Hazardous Waste

These are some policies and legislations concerning import of particular hazardous waste to Indonesia which have been executed :

- All hazardous waste are prohibited to be imported. For lead-car battery wastes, the provision has been taken into effect since September 2002;
- Since September 1997, there has been prohibition on issuing permits for any types of business or activities that uses imported hazardous wastes as raw material.
- Since January 1998, import of hazardous wastes including used car-batteries, from listed countries in Annex VII to the Basel Convention (OECD, EC, Liechtenstein) was prohibited;
- Importing used car-lead batteries is allowed only from developing countries which are parties to the Basel Convention, and other developing countries through bilateral, multilateral and regional agreements

In relation with transboundary movement of used electronic appliances and e-waste, there is no official data available. However, from field inspections, the importation of e-waste usually exists in documents using other common terms such as mix metals scrap, plastic for recycle, etc., . To control this transboundary movement of waste is difficult tasks and requires strong coordination among supervisors.

Figure 3.1. Piles of imported e-waste in a recycling facility, stated as metal scrap in its import document.

Figure 3.2. Employees in a facility carry out dismantling of waste components manually without safety apparatus.

An exception of the transboundary movement is fiscal incentives and other facilities granted to industries located in bounded area. Any goods including waste or hazardous waste, sent to this area, are not classified as imported goods as long as they are immediately sent abroad. Some leakage, however, may occur if strict control not in place.

3.2.4 Legislation related to Trans frontier of Non Hazardous Waste

Importing wastes categorized hazardous is prohibited according to the Governmental Regulation number 18/1999 Jo 85/1999. In relation with the implementation of the Basel Convention, Annex VIII to the Convention classifies e-waste as hazardous waste. However, for e-waste without hazard characteristic as specified in Annex III, the Convention exempted them. Although it is not classified as hazardous waste, regulation in Indonesia is not automatically allowed importation of the kind of waste.

Based on Indonesia's legislation, only selected non hazardous wastes allowed to be imported, as long as not in the form of sludge, paste, or dust. The importers must have approval from the Ministry of Industry, and have a license from the Ministry of Trade. Restriction of waste importations is subject under several industrial and trade legislations, includes:

- Decree Letter of Minister of Industry and Trade No. 229/MPP/KP/07/1997 on Import Regulations;
- Decree Letter of Minister of Industry and Trade No. 230/MPP/KP/07/1997 on Regulated Import Goods;
- Decree Letter of Minister of Industry and Trade No. 231/MPP/KP/07/1997 on Waste Importing Procedures;
- Decree Letter of Minister of Industry and Trade No. 520/MPP/KP/08/2003 on the Prohibition of Import of Hazardous Wastes;
- Article 20 (2) & Article 21 in Act of the Republic of Indonesia Number 23/1997 on Environmental Management;
- Law of the Republic of Indonesia No. 10/1995 on Custom Regulation;

- Article 53 in Governmental Regulation No. 18/1999 Jo. 85/1999 on Hazardous Waste Management;
- Ministerial Decree of Ministry of Industry and Trade No. 39/M-DAG/PER/12/2005 regarding Imported of Used Machinery and Equipment

In 2005, a shipment of 50 forty-feet containers entered Indonesia. Import document stated the content was new office equipment and mixed metal scrap with HS Number 3926.10.20.00'. The purpose of import was to recover the scrap and then re-export. However, government inspectors found among wastes there were components that contaminated or containing PCBs that according to the regulation they were categorized as hazardous waste. Figure 3 shows this finding. It clearly indicates violating regulations could be occurred by chance.

Figure 3.3. Example of illegal waste, bulk of imported metal scrap containing or contaminated with Polychlorobiphenyils.

3.3 Import of Second-hand Machinery and Equipment

Under Ministerial Decree of Ministry of Industry and Trade No. 756/MPP/Kep/11/ 2002 regarding Imported of Used Machinery and Equipment, used machinery and equipment are defined as *machinery and equipment that can be reused or refurbished and not in the form of scrap.* These machinery and equipment can only be imported by licensed end-users, for production process or direct use in its business activities, and licensed refurbishment facilities. In relation with electronic waste, the Decree prohibits import of used electronic as follow: air conditioner, refrigerator, fan, house-hold washing machine, television and video projector, telephone (including wireless telephone), PCB and CRTs.

The amended Decree by Ministerial Decree of Ministry of Industry and Trade No. 39/M-DAG/PER/12/2005 regarding Imported of Used Machinery and Equipment covers HS number 84, 85, 86, 88, 89, 9002, 9006, 9007, 9008, 9010, 9011, 9012, 9013 and 9014. It allows the import of the following used electronic equipments but only for utilization by importers specified in Table 3.1.

Based on this table, therefore, used AC, television, computer and electronic component are not allowed to enter Indonesia's territory

Table 3.1. Importable Used Electronic Equipment

(Based on Ministerial Decree of Ministry of Trade No. 39/M-DAG/PER/12/2005)

No.	HS Number	Description
1	8418	Refrigerator, freezer and its component, electrical and others, compressor exclude for AC in HS Number 84.15
2	8419	Machinery, plant or laboratory equipment, heated electrically or not (exclude burner, oven, and others in 85.14) to process material with temperature difference such as heating, cooking, grilling, destilation, rectification, sterilisation, pasteurisation, condensation, cooling, exclude machinery or installation for household appliances; instant water heater and with storage, non electric
3	8419.11	Instant water heater with gas
4	8422	Dish washer
5	8465	Machinery for processing of PCB
6	8471	Automatic data processing machine and its units, magnetic and optical reader, machinery for data writer on coded data media and its processor, not described or not include in other HS Number
7	8475	Machinery for assembling of electrical lamp, tube or valve or flash lamp, in glass envelope, machine for making glass or glass product by heating
8	8501	Electric motor and generator (exclude electric power plant)
9	8514	Burner and electric oven for industry or laboratory for heating material process by induction or dielectric loss
10	8517	Electric apparatus for telephone or telegraph
11	8525	Transmission, receiver, recorder and reproduction apparatus, television camera, recorder camera and video, camera digital
12	8525.20	Wireless LAN, internet mobile phone, internet video conference, other mobile phone
13	8539	Light bulb or tubular lamp, include sealed beam and ultra violet and infra red lamp

As previous Decree, these machinery and equipment can only be imported by licensed end-users for production process or direct use in its business activities, and licensed refurbishment facilities. Procedure for this importation is as follow:

1. any proposal for importing of used machinery and equipment must be approved by Director of Import, Ministry of Trade by submitting all requested document;
2. approved proposal must be checked by Surveyor for its usage feasibility and specification and verified in written on Certificate of Inspection (COI), it declares that the machinery and equipment is working, possible for refurbishment, not in form of scrap and attached with technical specification;

3. technical inspection is conducted by Surveyor prior to grant the Certificate of Inspection in the exporting country;

Although this Decree defines used machinery and equipment as *machinery and equipment that can be reused or refurbished and not in the form of scrap*, it does not specifically regulate any appropriate life time feasibility and technical specification. The government relies on the COI prepared by Surveyor which follows international standard and code of conduct.

In addition, any broken, defected or polluted machinery and equipment which could not meet the criteria set by surveyors are not subject to be regulated by this Decree. They must follow other regulation on waste as described in Chapter 3.2.

3.4 Regulation on Consumer Protection

The Law No. 8 year 1999 regarding Consumer Protection is aimed to achieve six objectives which enable consumers to get self-protection mechanism, to protect from negative impact of the products and or services, to empower themselves in choosing and asking for their rights, to provide law protection and information access, to encourage producers to be more responsible for the importance of consumers protection and to increase the quality of products and or services in terms of business sustainability in producing products/services, health, convenience, security and consumers safety.

In this Law, there are 2 articles regarding rights and responsibilities of consumers, 2 articles for business sectors', while 20 articles are committed for limitation and or prohibition for business sector.

In the case of purchasing second-hand products, consumers have rights to have appropriate products quality and clear information on it (quality, guarantee). In Article 6, consumers have to read and follow the instruction manual for security and safety. Business

sector, therefore, has to enclose such a right, clear and valid information about the quality of products or services and its guarantee. They also have to provide information about how to use their products and its reparation and maintenance. In addition, Article 8 clearly states *that business sector is not allowed to trade broken, defected or used and polluted products without any complete and valid information to their consumers.* Negligence of this Article will ban their product to enter the market.

For products with life time at least 1 (one) year, the manufacturers are responsible for providing spare parts, after sales services and fulfilling the guarantee stated in the guarantee card.

Under this Law, business sector is liable for any consumer's loss due to misinformation on purveying the quality of the product. This compensation could be a refund or a replacement with other similar product. This liability does not exempt the business sector from its criminal or civil law negligence. Besides, any refusal to pay for compensation will result law suit in civil court.

This Law, however, does not state financial or legal penalty specified for incompliance. Business sector which does not comply with compensation only has to withdraw or discontinue its product sales in the market.

Enforcement of this Law is conducted by government along with civil society and NGOs on consumers' protection foundation. Recently, there were some immediate inspections to the market included hypermarket, which found out second-hand products sold as new products by falsifying document with incorrect quality information.

In order to implement this Law and other relevant legislation to protect the consumers, National Consumer Protection Agency is established and chaired by Minister for Trade. Its main duty is to protect consumers by conducting legal researches and reviews, researching on product quality, disseminating of information and receiving complaint on consumers protection and surveying on consumers demand . The information gained passes to the

government as an input, recommendation and consideration.,. Members of this Agency are representative of government, business sector, NGOs on consumers' protection foundation, universities and experts.

IV. RESULTS OF DATA COLLECTIONS

4.1 Secondary Data Collection

According to Ministry of Industry, to date, Indonesia has 80 large and 150 small- medium enterprises of electronic manufacturers. Most of them are located in Java Island, North Sumatera Province and Batam Island of the Kepulauan Riau Province.

Electronic industry in Indonesia covers very wide range of products, from household appliances to industrial electronic products. Based on data from Ministry of Industry, the main product of this sector industry are air conditioning (AC), electronic component, fan, other electronic product, radio, radio cassette, refrigerator and its component, and television. Based on production capacity, electronic component is the biggest, followed by computer components and equipments, television and air conditioning respectively.

In this Preliminary Study for e-waste inventory, the information about annual production capacity and real production capacity would become important to be reviewed. This data would give illustration on how much availability of electronic products in Indonesia. In turns, it will affect the size of international trade involving Indonesia which is shown by the value of import and or export for electronic items. However, the purpose of this Study emphasizes on what kind of available data its importance to predict the generation of e-waste in Indonesia.

4.1.1 Data of Production of electronic products

Official website of the Ministry of Industry at www.dprin.go.id., shows all information about industry in Indonesia. The source provides industrial production capacity data including selected electronic products namely air conditioning, refrigerator, washing machines, television and computer. A series annual data from 1993 to 1999 for those selected items were gathered from this website.

a. Air Conditioning

Table 4.1 shows that production capacity of air conditioning in Indonesia during these periods was remain stable. However, real production of this item was much lower than installed capacity. Although during 1993 to 1997 the real production had gradually increased, the following years were dropped drastically due to economic crises 1997.

Table 4.1 Production Capacity and Real Production of Air Conditioner (sets)

Year	Production Capacity	Real Production
1993 – 1994	379,000	42,000
1994 – 1995	379,000	43,000
1995 – 1996	379,000	59,000
1996 – 1997	379,000	65,600
1997 – 1998	379,000	23,200
1999 – 1999	379,000	23,200

b. Refrigerator

Unlike air conditioning, during the same period production capacity of refrigerator had increased almost three times from 577,000 sets in 1993 into 1,733,050 sets in 1997. The peak period was in 1996-1997, with more than half of million sets. Again, the real production decreased about 20% due to economic crises in 1997. This production, however, doubled up comparing to production in 1993-1994. Production capacity and real production for refrigerator is shown in Table 4.2.

Table 4.2. Production Capacity and Real production of Refrigerator (sets)

Year	Production Capacity	Real production
1993 – 1994	577,000	249,000
1994 – 1995	577,000	249,000
1995 – 1996	688,000	261,000
1996 – 1997	688,000	530,800
1997 – 1998	1,733,050	424,600
1999 – 1999	1,733,050	424,600

Table 4.2 shows production capacity and real production of refrigerator from 1993 to 1999. Both of production data had continuously increased up to 1997. After that the real production surprisingly decreased while the production capacity enormously multiplied.

c. Television

While production capacity of color television had closed to 5 million units and black and white television about 1.7 million units during the period, the real production of these items shows contradictive. Despite the fact that production color television had increased by three times during the period, the production of B/W television had surprisingly decreased from 331,000 units to 62,900 units. In fact, economic crises in 1997 did not really affect the real production of color television. On the other side, after reached the peak of production in 1996-1997 by 457,000 units, production of B/W television had continuously decreased by almost 80% from the beginning of the period. Production capacity and real production for television is shown in Table 4.3.

Table 4.3. Production Capacity and Real Production of Television (units)

Year	Color Television		B/W Television	
	Prod. Capacity	Real Production	Prod. Capacity	Real Production
1993 – 1994	4,661,000	956,000	1,689,000	331,000
1994 – 1995	4,661,000	1,725,000	1,689,000	331,000
1995 – 1996	4,661,000	2,125,000	1,689,000	457,000
1996 – 1997	4,661,000	2,638,500	1,689,000	125,700
1997 – 1998	4,715,000	2,638,500	1,689,000	62,900
1999 – 1999	4,751,000	2,638,500	1,689,000	62,900

d. Micro Computer

Micro computer is a general terms which include personal computer. Similar with production capacity of air conditioning, the production capacity of micro computer was also remain unchanged during the period with 313,000 units. However, the real production of micro computers had been steady growth, from 31,000 in the beginning period to 88,300 in 1999. Production capacity and real production for micro computer is shown in Table 4.4.

Table 4.4 Production Capacity and Real production of Micro Computer (units)

Year	Prod. Capacity	Real Production
1993 – 1994	313,000	31,000
1994 – 1995	313,000	31,000
1995 – 1996	313,000	43,000
1996 – 1997	313,000	87,000
1997 – 1998	313,800	88,300
1999 – 1999	313,800	88,300

e. Washing Machine

Production capacity and real production of washing machines during the period, in general, had increased. The economic crises in 1997 did not significantly affect the real production of this appliance. In fact, real production as well as production capacity was enlarged by 60% and 70% respectively. However, in terms of utilization capacity, comparing real capacity to production capacity in the same year the value was only about 20%. Production capacity and real production for washing machine is shown in Table 4.5.

Table 4.5. Production Capacity and Real production of Washing Machine (units)

Year	Prod. Capacity	Real Production
1993 – 1994	286,300	56,400
1994 – 1995	349,000	56,000
1995 – 1996	349,000	59,000
1996 – 1997	349,000	78,000
1997 – 1998	590,800	125,000
1999 – 1999	590,800	125,800

More recent data on utilization capacity of several industrial sub sectors is shown in Table 4.6 below. It depicts that after 1999, utilization capacity of IT and electronic sub sector had increased from 51% to 65% for several following years. It means that the real production of IT and electronic sub sector had grown during this period., though their production capacity is still unknown. To find out the real data, it is necessary to examine whether the sources of data being manipulated or not.

Table 4.6. Percentage Utilization Capacity of several Industrial sub sectors

in Year 1999-2004

No	Industrial Sub Sector	1999	2000	2001	2002	2003	2004
1	Metal and maritime	42.60	46.30	50.50	51.00	52.80	55.70
2	Land and air transport	18.20	33.50	39.80	42.20	32.50	33.50
3	IT and Electronics	51.00	65.00	65.00	65.00	65.00	66.00
4	Textiles	84.00	81.00	81.00	65.10	66.60	70.60
5	Varieties	46.00	54.30	55.40	55.20	59.00	59.40
Averages		**48.36**	**56.02**	**58.34**	**55.70**	**55.18**	**57.04**

The most recent data on electronic industry compiled from Ministry of Industry website is as shown in Table 4.7. In comparison to the previous data on production capacity of selected electronic products, in particular to the year 1999, all production capacity of selected electronic products had increased. For example, capacity production of air conditioning in 2005 was 29,181,400 units from only 379,000 sets in 1999. However, the different measurement used (unit Vs sets) need to be clarified since current production of air conditioning is dominated by split type which actually consist of two different items. In the case of computer, the increase of production capacity is sensible. During the last three years, some local branded computer products, have been competed with renowned international brands. However, the compiled data is only collected from Association of Electronic Manufactures (GABEL), so that there is no information regarding to non-member manufacturers.

Table 4.7. Production Capacity of Electronic Commodities in 2005

No	Commodity	Production Capacity	Unit
1	Air Conditioning	29,181.400	Unit
2	Television	63,882,025	Unit

3	Refrigerator and component	8,585,400 1,300,000	Unit Pieces
4	Electronic component	191,330,426 4,128,117,920 10,514,709 2,561,420 29,200 4,000	Sets Pieces Units M2 Mh Ton
5	Computer component and equipment	639,361,850 6,876,500 18,734,197	Pieces Sets Unit
6	Monitor computer	1,252,000	Unit
7	Printer	309,038	Unit

Source: Ministry of Industry

4.1.2 Data Export-Import of electronic products

Electronic appliances produced in Indonesia are solely marketed for domestic although some of products are intended for export. Economic crises in 1997-1998 severely affected electronic market. During the early of the crises electronic market size dropped to around 30%. Fortunately, in line with economic recovery, performance of this industry has improved gradually.

GABEL claimed that export of electronic commodities from 1998 to 2000 increased around 20% in average. This data, however, only fits for big manufacturers such as Samsung, Matsushita, LG, Toshiba and Sanyo.

According to Electronic Marketer Club (EMC), the market size in 2002 increased to 2.7 million for televisions, 1.5 million for refrigerator and 390,000 for AC and washing machine. The market would grow 15% annually. To fulfill local market demand, importing electronic products also occurred.

Data on export and import of electronic goods can be gathered from both Ministry of Trade and Ministry of Industry. However, since the data was intended to show economic performances of this sector, it was figured in currency value.

a. Air Conditioning

Export-import data of air conditioning and its related products is shown in Table 4.8. For household air conditioning, relevant data of product is expressed by Harmonized System Code 841510, covers the value of both window and split types. From 2001 to 2002, the value export of air conditioning exceeded the value of import. However, since 2003 to date, import values of this item has grown exceeding its export values. In fact, while export value continues to decrease, from US$24,450,191 in 2001 to only US$698,875 in 2005, import value significantly increases from only US$1,839,561 in 2001 to US$ 71,841,879 in 2005. It indicated that domestic market for air conditioning has been continuously growing while domestic products were unable to fill the market.

Table 4.8. Export-Import of Air Conditioning and related Products (in US$)

HS CODE	2001		2002		2003		2004		2005	
	EXPORT	IMPORT	EXPORT	IMPORT	EXPORT	IMPORT	EXPORT	IMPORT	EXPORT	IMPORT
841510	24.450.919	1.839.561	20.032.821	7.130.820	6.795.646	13.345.440	2.272.211	43.217.276	698.875	71.841.879
841520	5.312.808	294.061	7.287.935	227.876	7.675.915	844.223	8.141.410	481.646	4.313.531	313.804
841581	3.226.312	1.068.988	3.563.331	1.702.141	588.883	1.725.474	2.291.784	5.232.486	304.082	4.465.583
841582	1.386.099	11.848.465	13.139.953	11.517.541	19.362.372	19.401.435	12.015.846	20.556.130	2.082.791	21.130.532
841583	125.653	3.794.085	846	11.059.448	39.403	10.583.411	138.572	24.954.010	3.273	14.104.957
841590	18.274.201	19.749.497	20.980.373	30.289.265	23.147.732	34.169.339	15.421.215	55.598.859	16.689.866	53.494.951

841510 WINDOW OR WALL TYPES, SELF-CONTAINED, COMPRISING A MOTOR-DRIVEN FAN AND ELEMENTS FOR CHANGING THE TEMPERATURE AND HUMIDITY
841520 USED FOR PERSONS, IN MOTOR VEHICLES.
841581 NESOI, INCORPORATING A REFRIGERATING UNIT AND VALVE FOR REVERSAL OF THE COOLING/HEAT CYCLE
841582 AIR CONDITIONING MACHINES NESOI, INCORPORATING A REFRIGERATING UNIT, NESOI
841583 AIR CONDITIONING MACHINES NESOI, NOT INCORPORATING A REFRIGERATING UNIT
841590 PARTS, NESOI, OF AIR CONDITIONING MACHINES

b. Refrigerator

Data export-import of refrigerator is shown in Table 4.9 below. As the focus of study is on household appliances, HS codes relevant therefore are 841810, 841821, 841822, and 841829. For year 2006, export value of household refrigerators has been exceeding its import values. The largest share of Indonesia export is household refrigerator with compression. In addition, export values of compressor for the last three years have also been exceeding its import values. For other types of refrigerators such as combined

refrigerator-freezer with separate external doors, import values have always outnumbered its export.

Table 4.9. Export-Import of Refrigerators and related Products (in US$)

HS CODE	2001		2002		2003		2004		2005	
	EXPORT	IMPORT	EXPORT	IMPORT	EXPORT	IMPORT	EXPORT	IMPORT	EXPORT	IMPORT
841810	1.251.718	3.854.038	590.970	6.166.044	145.439	3.425.292	472.902	14.603.337	431.558	15.171.396
841821	18.439.083	11.710.343	20.728.671	10.815.946	33.125.208	15.281.859	25.121.692	18.249.956	21.729.904	15.764.631
841822	213.131	198.690	535.864	268.445	348.082	671.551	378.975	624.768	223.665	1.839.340
841829	651.579	1.343.952	481.758	3.593.633	380.687	4.931.486	29.517.733	1.768.540	48.047.179	286.381
841430	20.840.734	29.705.919	18.660.773	29.687.605	27.926.146	33.608.405	71.474.926	52.676.321	62.772.501	53.193.719
SUM**)	20.555.511	17.107.023	22.337.263	20.844.068	33.999.416	14.310.188	55.491.302	35.246.601	70.432.306	33.061.748

841810 COMBINED REFRIGERATOR-FREEZERS FITTED WITH SEPARATE EXTERNAL DOORS
841821 REFRIGERATORS, HOUSEHOLD, COMPRESSION TYPE
841822 REFRIGERATORS, HOUSEHOLD, ABSORPTION TYPE, ELECTRICAL
841829 REFRIGERATORS, HOUSEHOLD TYPE, NESOI
841430 COMPRESSORS USED IN REFRIGERATING EQUIPMENT (INCLUDING AIR CONDITIONING)
**) except HS Code 841430

c. Televisions

Since households only consume television, not in the form of Cathode Ray Tubes, relevant export-import data of television is described by HS Code 852813, namely television receivers including B/W and other monochrome. Table 4.10 shows the values of export-import for television and its related products. The Table also puts other HS Codes related to production television. According to the Table 4.10, domestic demand for televisions is growing and but it is unable to be fully supplied by domestic production. As a result, while export getting less time to time, values of imported television is relatively stable. Data also shows that values of export color CRTs from Indonesia were remain high during the period.

Table 4.10. Export-Import of Television, CRTs and related Products (in US$)

HS CODE	2001		2002		2003		2004		2005	
	EXPORT	IMPORT	EXPORT	IMPORT	EXPORT	IMPORT	EXPORT	IMPORT	EXPORT	IMPORT

854011	143.502.286	30.709.089	121.491.868	56.844.102	133.856.770	57.928.101	191.604.352	60.339.946	175.390.209	52.667.248
854012	25.689	422.886	339.372	251.946	3.436	132.218	0	25.457	0	77.658
852813	449.758	1.157.866	416.021	1.761.077	2.240.335	407.434	273.452	369.720	15.411	522.028
852990	325.041.988	47.879.544	361.750.775	39.337.254	414.690.991	54.990.726	303.540.427	61.762.316	288.149.187	53.478.151

Notes:
854011 CATHODE-RAY TELEVISION PICTURE TUBES, COLOR
854012 CATHODE-RAY TELEVISION PICTURE TUBES, BLACK AND WHITE OR OTHER MONOCHROME,
852813 TELEVISION RECEIVERS, BLACK AND WHITE OR OTHER MONOCHROME
852990 PARTS (EXCEPT ANTENNAS AND REFLECTORS)

d. Computer

Domestic market for built-up personal computers and laptops has been dominated by foreign brands. However, some domestic brands are also being recognized and gaining its popularity. Data on export-import of personal and micro computer is shown in Table 4.11. It shows that export value from Indonesia has outnumbered its import for the consecutive years within the periods. However the data does not only represent for build-up computer items but also for other related products.

Table 4.11. Export-Import of Computers (in US$)

PERSONAL AND MICROCOMPUTER (HS CODE 847160)	2001	2002	2003	2004	2005	January-August	
						2005	2006
EXPORT	548.208.837	565.987.507	404.636.196	914.357.358	1.161.548.816	717.275.323	578.666.990
IMPORT	108.146.396	93.206.129	89.319.390	74.747.961	89.027.700	56.233.217	79.328.974

Notes:: 847160 INPUT OR OUTPUT UNITS, FOR PERSONAL AND MICRO COMPUTER

e. Washing Machine

In Indonesia, washing machine used in households usually has about 5-7 kg in capacity with two different sections for washing and drying (the two tubes system). However, single tube automatic washing machine, though more expensive than previous model mentioned, currently gains its popularity. Data export-import of washing machines is shown in Table 4.12. For washing machine, It is clear that Indonesia market has dependency on imported product.

Table 4.12. Export-Import of Washing Machines (in US$)

HS CODE	2001		2002		2003		2004		2005	
	EXPORT	IMPORT	EXPORT	IMPORT	EXPORT	IMPORT	EXPORT	IMPORT	EXPORT	IMPORT
845011	30.215	13.808.401	50.075	15.308.700	92.975	19.829.585	143.807	29.728.372	104.519	29.990.685
845012	1.254.103	5.898.818	748.385	7.879.899	27.600	13.016.815	6.451	23.018.176	156	16.835.798
845019	11.962	1.798.725	5.375	1.089.021	450.556	1.391.963	87.169	2.405.398	74.797	4.322.076
845020	0	1.368.925	0	719.177	0	591.831	0	1.432.338	5.923	2.002.013
845090	13.236	2.953.623	19.693	3.566.739	60.482	3.322.965	202.381	4.189.122	3.668	8.154.514

Notes:
845011: FULLY AUTOMATIC, WITH A DRY LINEN CAPACITY NOT EXCEEDING 10 KG
845012: NOT FULLY AUTOMATIC, WITH A BUILT-IN CENTRIFUGAL DRYER, WITH A DRY LINEN CAPACITY NOT EXCEEDING 10 KG
845019: WITH A DRY LINEN CAPACITY NOT EXCEEDING 10 KG, NESOI
845020: WITH A DRY LINEN CAPACITY EXCEEDING 10 KG
845090: PARTS

4.2 Primary Data Collections

Primary data collection are focused to identify refurbishment and recondition facilities, potential e-waste recycle facilities and influx of illegal used electronics goods that potentially increase production of e-waste in Indonesia.

Refurbishment and recondition facilities are interpreted as shops or workshops that conduct electronics services and trade the used ones. Sites to be surveyed include shopping malls which might be occupied by electronic section or scattered individual shops and repair shops, as well as electronic blocks and individual electronic shops and repair shops. The purposes of survey are basically to identify the presence of used electronic market and refurbishment premises in particular area. Moreover, how to manage the obsolete products or electronic spare parts and components is also as part of observation. Survey was conducted in vicinities of Jakarta and Batam city.

Although there was no official e-waste recycling facilities in Indonesia, indication of some facilities which conduct recycling of waste categorized as e-waste emerged. To find out

whether this activity exists, some facilities in Batam City and East Java province have been surveyed. Focus of survey was to identify kinds of waste collected and managed.

In identifying potential illegal import of used electronic goods into Indonesia, two locations have been examined which are Batam Island and Wakatobi islands. This examination was emphasized to find out the pattern of the incoming of used electronic goods, the factors affecting the situations, and the volume of importation and its management of obsolete electronic goods. Direct observation was conducted only in Batam while for Wakatobi Islands was a case study.

4.2.1. Survey on Recondition or refurbishment electronic products

A. BODETABEK (Bogor-Depok-Tangerang-Bekasi) Area

A.1 Surveyed on Shopping Centers

Total number of shopping center or mall surveyed at the regions was 20 malls. It consists of 3 malls in Bogor, 2 in Depok, 10 in Tangerang, and 5 in Bekasi. The presence of a hyperstore in a mall is used as a simple indicator to measure the size of the mall. Mall occupied by a hypermarket is considered as a large mall.. There are 7 large malls in Tangerang and 1 in Bekasi, while all visited malls in Bogor and Depok are considered as small's categorized. The reason why so many shopping malls in Tangerang because Tangerang region consists of two areas, namely Tangerang Regency and Tangerang Municipality.

There were 7 electronic sections identified in surveyed malls, accounted for 2 in Bogor, 1 in Depok, 2 in Tangerang, and 2 in Bekasi. Electronic section is referred as specific floor in a shopping center allocated for electronic shops that sells home electronic appliances, computers, mobile phones, etc. All observed malls were carried one-stop-shopping's concept, meaning that the malls provide as much as possible things in order to satisfy consumer including shops that offer electronic products. However, the survey found that

only 7 out of 20 of observed shopping malls still had this section. This might indicate that the popularity of electronic section had diminished. In fact, according to shopkeepers in the visited electronic sections, the number of shops in electronic section was reduced. To illustrate, in the opening of Serpong Plaza, a four-storey mall in Tangerang in the end of year 2003, the third floor was allocated for electronic section. Nevertheless, number of electronic shops had reduced rapidly. In fact, during observation, this section had not existed and replaced by other kinds of shop. The situation might be affected by applied marketing strategy on selling electronic products in very large supermarkets, called hypermarkets.

The ultimate objective of this survey was to identify the presence of shops that sell used electronics as well as workshops that refurbish electronic stuffs including the way they manage obsolete parts or whole electronic goods. Based on identification on existing electronic shops in the observed malls, there were positive results concerning these matters. Shops selling used electronic goods were found in several malls in all regions. However, number of shops selling used or refurbished electronic stuffs was limited. Detailed data on this survey can be seen in Table 4.13

Survey in Bogor

In Bogor, the largest electronic section is in Plaza Jambu Dua which consists of 30 shops specialized on computers. The Shops sell both new and used PCs and laptops and provide repairing service of those items including monitors. There was one shop selling refurbished computers according to what customers want. They used components by combining both new and used parts. The customized assembling computers were using new casing and keyboard, while harddisk, motherboard and monitor were typically used items. Harddisk, motherboard and monitor, according to the shopkeeper, were made in China but bought from trader in Jakarta. Motherboards and harddisks were packed in styrofoam boxes, and each box was filled with ten motherboards or harddisks. Since new products of electronic parts usually were sold in individual package, this indicated that products were probably not new ones

Figure 4.1. A typical small shopping center located in Bogor

Survey in Depok

There was no shop selling used electronics found in malls. One shop in Depok Town Square and 5 shops in ITC (International Trade Centre) Depok only sold brand new computers, accessories and peripherals. The shop in Depok Town Square and other 3 shops in ITC Depok also offered services. Calculated from estimation given by technicians, number of computers being serviced in those shops was 13-32 units per week. In addition, it was confirmed that obsolete small parts from serviced computers usually was discarded into domestic trash bins, then probably collected by scavengers.

Survey in Bekasi

In Bekasi, only 4 out of tens shops in malls to be found selling used electronic stuffs. One shop in Plaza Duta was selling used air conditioning and reconditioning them. Two shops in Plaza Pondok Gede offered services for electronic goods such as television and refrigerator, and one shop in Mall Metropolitan sold computer monitor labeled “refurbished”. According to the seller, refurbished monitors were supplied from merchant in Jakarta.

Survey in Tangerang

Both two electronic sections found in Lippo Supermal Karawaci and WTC-Matahari malls were in Tangerang Regency. Electronic section in Lippo Supermal Karawaci was called Cyber City. There were ten computer and accessories shops including printing services. But

only one shop in this electronic section sold used electronic goods, which was used laptops. Compared to number of visitors of the mall, it seemed that the Cyber City was not a main attraction for most consumers. In WTC-Matahari Mall, the electronic section was located in third floor. There were 11 electronic shops. Some shops offered computers in package's price; most of them were customized computers. Other shops only sold computer accessories and peripherals, or printing service. In general, used items were not intentionally sold in this electronic section.

Tabel 4.13. Presence of used electronic shops and electronic refurbishment facility

No	AREA	No. Of Shopping Malls	No. of Hyper-store(s)	No. of e-section	Used electronic shops	workshops refurbished
1	**BOGOR**	3	0	2	Yes	Yes
2	**DEPOK**	2	0	1	No	No
3	**TANGERANG**	10	7	2	Yes	No
4	**BEKASI**	5	1	2	Yes	Yes

A.2 Survey on Individual Electronic Shops

Investigation on the presence of used electronic products and refurbishment facilities also was conducted over conventional electronic shops. The observed shops consisted of electronic malls, individual electronic shops and electronic workshops as well. An electronic mall or electronic center means a building occupied only by electronic shops including individual large electronic superstores. Individual shop refers to electronic shops located not in specific area for electronic or shopping center. Ordinary electronic shops and electronic repair shops were included in this category. The presence of designated premises as is shown in Table 4.14 below.

Table 4.14. Identification of Individual shops providing used electronic goods and refurbishment

	BOGOR	DEPOK	TANGERANG	BEKASI

Electronic Malls	No	No	Yes	No
Electronic shops	No	Yes	Yes	Yes
Workshops	Yes	Yes	Yes	Yes
Others	Yes	No	No	No

In Bogor area, there was a permanent second-hand market called Pasar Anyar. There were a few traders of used electronic, parts and components and obsolete stuffs, but only had limited visitors. Second-hand electronics and electrics displayed in these markets were mostly small items of household appliances such as iron, fans, electric motors, water pumps, etc. There were also found used printer and computer parts, used monitors, parts of mobile phones, etc. Not all Items they sold were workable ones. Consumers came to this market mostly because of interested for something's old and not longer available in markets. It was also found an electronics shop with installment system for payment. All products offered were new, but mostly not renowned brands.

In the way to Bogor city, there were two electronic workshops offering refurbishment of washing machines and refrigerators. But no clients nor refurbish activities conducted by technicians.

Located at Pondok Cina, Depok, there was a shop specialized on air conditioning sales and services with four technicians. Not only sales and services, the shop also bought used air conditioning from households and offices to re-sale.. Large numbers of used air conditioning were received from renovated offices and buildings. According to the shop owner, ratios of used air conditionings ready to sale, needed to refurbish before sale, and obsolete items was 60%, 30%, and 10% respectively. Number of AC serviced per week was 30 units, mostly car's AC. Individual used AC was received per week about 5 units, and sale of used AC was about 3 units per week. Obsolete AC was sold to scavenger or scrap collectors.

It was also found a second-hand computer shop in Depok area. The shop provide computer services, up grade processor from lower to higher Pentium, and sell used as well as new computers. Some of used computers, mainly laptop, were imported from Singapore and

China. Number of computers being serviced per week was about 30-40 units. The shop procured used computer about 20 units per week and resold about 15 unit per week. Number of imported laptops was fluctuating. During observation, there were 5 units imported laptop on display.

Table 4.15. Presence of used electronic shops and Refurbishment workshops

E-items / Area	Television		Air conditioning		Refrigerator		Washing Machines		Computers	
	S	WS	S	WS	S	WS	S	WS	S	WS
BOGOR	N	N	N	N	Y	N	Y	N	N	N
DEPOK	N	N	Y	Y	N	N	N	N	Y	Y
TANGERANG	Y	Y	N	N	Y	Y	Y	Y	Y	Y
BEKASI	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Notes : S : electronic shops selling used items
WS: workshops conducted electronic refurbishment

During the trips on surveyed premises, it was found two electronic workshops in Tangerang. Both entities were close to residential areas. The main activities were mending electronic stuffs such as fan, water pump, washing machines and refrigerators. The workshops also bought and sold used electronic appliances especially washing machines and refrigerators. For these items, workshops were not only fixing electric or electronic problem of the items, but also, if necessary, reshaping the frame or casing of the appliances through physical treatment such applied putty, abrading, coating and polishing. The observed workshops operated by owner whose act as the technician, and at least employed one assistant. Used items or parts usually were displayed, served as sources of parts or component and also as identity of the premises.

Other electronic workshops found in this area were television's workshop. The workshops were also located near residential areas. Beside television, they also repaired and maintained audio-video items such as CD, VCD and DVD players, loud speakers, and monitors. The workshops also bought and sold used television. Few reconditioned televisions were displayed in the workshops for sale. Some parts such as CRTs and PWBs from dismantled television were also displayed as identity of the premises.

While components or parts no longer demanded, those items were usually sold to scrap collector. Including to those items was a large part such as plastic casing of washing machines. Rate of refurbishment, in fact, were so limited. For example, to finish refurbishment of one refrigerator would need at least three days work. The situation was acceptable since demand for electronic repair had reduced gradually due to easiness to have new products.

In addition, there was also found a small workshop for computer. Service provided was fixing CPUs and harddisk. The shop rarely sold used computers. Besides mending computers, the shops also provided computer rental particularly for typing.

In Bekasi area, along the road from Pondok Gede to Bekasi, there were 3 repair shops for TVs, VCD players, washing machines, air conditioning both split and window models and refrigerators. The workshops also sold refurbished electronic products. Used products were bought from consumers.. The workshops kept non repairable stuffs as stock of parts or components which might be needed by future clients.

There was one computer workshops selling both new and used goods. Among used goods sold there were monitors that supplied from Jakarta, imported built up personal computers equipped with PI and PII processors, used motherboards which support PI and PII, and small capacities harddisks (1.2 GB; 2,4 GB; 3,6 GB; 4,2 GB up to 6.4GB). According to the shopkeeper, those used goods was bought in bulk at least one container in every purchasing. While the shop had no guarantee for products they bought, to attract buyers the shop gave consumers one week warranty for sold products. Completely obsolete product sold by weight to scrap collectors.

Individual electronic workshops in respect to ability extending the end-of-life electronic products have important role in reducing generation of e-waste. In Indonesia, electronic workshops fill the gap that authorized electronic center or authorized workshops left. Authorized workshops are usually owned by manufacturers or distributors or establishments

assigned by manufacturers or distributors. They provide limited service for particular brands, type of products and models. In general, they are solely intended to perform after sales service during guarantee periods of products. Technicians employed in this facility usually are trained by manufacturers. Most technicians typically have highly specialized skill to carry out services on particular product's type which require specific and limited parts or components.

On the other hand, individual electronic workshops which are usually owned by individual provide services regardless brands, type of products and models. The facilities usually are operated by informal sector, either by individual or micro and small enterprises (MSEs), with low capital but not necessarily low skill for using most applicable technology. The owner of this facility is usually also the technician. Their skill might be gained from vocational schools or just due to their fully experience in darning electronic stuffs as a hobby.

Diverge from authorized facilities, in many cases, unauthorized facilities conduct recondition or refurbishment of electronics goods and resell them. They may also offer both new and second-hand products, and might practice trade-in system. In addition to repair or replace broken components, they also fix the frame or casing of electronic goods. For this reason, survey was carried out to this type of facilities because they also have influence on extending the life time of electronic products, and this is a place where the obsolete ones may end up.

From field observation it was found that unauthorized facilities work in specific manners. Facilities that work with TV sets normally provide services for audio and video stuffs. Facilities work with air conditioner, habitually only work to repair air conditioners, or if there is diversification, only in types of air conditioners repaired such as for household or cars. Facilities that repair washing machines, typically also offer services for refrigerators and other electric motor stuffs. Body refurbishment is a common practice in this facility. Process of rebuilding, welding, putting, sanding, painting and polishing is a sequence of steps to renew old body of refrigerator or washing machine as well as electronic patching up. Computer services usually have more specific services. Some are specialized in PC's

service and other only handling computer notebooks. It is uncommon to find facilities offer services for all stuffs mentioned above. An exception only if the facilities are concentrated in an electronic service center.

A.3 Survey on Hypermarkets

Total hyper stores or hypermarkets visited were 10 sites. Of these, 8 hypermarkets were located in malls while the rests, individually stand in its own building.. To date, hypermarket in Indonesia is dominated by three largest chain stores, namely Carrefour, Giant and Hypermart.

Hypermarkets also become a subject of this survey due to recent case involving one hypermarket which sold refurbished televisions without labeling as refurbished or recondition products. It was such an important case that indicates illegal used electronic products exist in Indonesia market. However, result of investigation shown that there were no refurbished electronics goods sold in the observed hypermarkets. All hypermarkets only display brand new electronic appliances as well as computers.

One interesting factor in respect to consumption of electronic appliances in Indonesia was marketing strategies practiced by hyper-stores. One of the most common strategies was trade-in program. This program occurs as a marketing collaboration between the hyper-stores with usually renowned electronic distributors. By giving values for used particular electronic items regardless the condition, and even higher value for similar brand to product being promoted, the new products eventually seem more affordable to consumers. For electronic producers, this program is one way to make the price closer to the price of low-end competitor products. Collected used or obsolete products were taken by distributor. According to the source from one large electronic manufacturer, collected items will be sent to R & D division in manufacturer for examining the technological development of competitors' products.

Another strategy applied by hypermarket in marketing electronic products was offering soft credit system. To make the program attractive, total sum of price for credited items was

slightly lower than if consumer paid in cash. Some hypermarkets also provided 1.5% deduction for whose membership card. In addition, they also offered free delivery with a minimum purchase of electronic product within particular distances. These approaches made hypermarkets as preferable choice for consumer than conventional electronic shops which might need hassling before get a new electronic product. Lowered price for new electronic stuffs in turn may affect the willingness of consumers to buy second hand items or repair broken stuff to electronic workshops.

B. Batam Area

Used electronic shops in Batam could easily be found in every corner of the city. There were some popular places to look for used electronic items such as Cipta Prima shopping complex in Batu Aji, or Sengkuang in Batu Ampar. In fact, to find used electronics or other used items, even hotel equipments and cutleries, was not a difficult job in Batam. As a special bonded area, Batam has privilege to import everything but prohibited goods. For this reason, brand new goods might be imported cheaply and even lower than used ones. Most goods supplied to Batam were imported particularly from Singapore or Malaysia.

Shops that sell used electronic such as television, refrigerators, fan, computers, etc., can be found in Sengkuang, Batu Ampar. There were more than hundred of simple shops that sell mostly household equipments including electronic appliances. During observation, there was no significant number of consumers.

The similar situation was also found in Cipta Prima-Batu Aji, a shopping complex with 15 electronic shops selling television, radio, refrigerators, air conditioning, etc. All stuffs were used ones. According to one shopkeeper, in average, shops receives four unit electronic goods every week. Normally it is only 50% of stuffs workable and ready to sale while the rest sold as scrap to waste collectors. This problem arose due to, for example, used televisions were imported as bulk in container without workability testing. Therefore, between used and obsolete goods is hardly to be differentiated. The fact that unworkable electronic appliances directly sell to scrap collectors indicates that refurbishment was not a common practice for used electronic shops in Batam.

While used electronic appliances might be found anywhere, used computers both PCs and laptop usually were marketed in shopping centers or malls. There was a shopping mall called Carnaval Mall where the activities in this place only deal with computers which covers computer service and sales of used computers.

The fact that used electronic products not really demanded by consumers can be seen from number of visitor as potential buyers. As previously stated, visitors to Cipta Prima shopping complex in Batu Aji and Sengkuang in Batu Ampar were very rare. One analysis for this situation was again as the consequences of accessibility to get new electronic products offering by hypermarkets. According to one source, the price of used electronic products was only slightly less than branded products in hypermarkets. In addition, credit system presented by hyper stores provides easiness and comfort to consumers.

4.2.2 Survey on recycling facilities for electronic waste

Recycling facility specific for electronic waste, actually, has not existed yet in Indonesia. Survey was conducted in Batam Island and an Industrial estate in East Java Province where both places has similarity, to some extent. Batam Island is developed, established an granted a special bonded zone for the whole island, while the industrial estate visited also has privilege as bonded industries.

Formally, bonded zone is characterized as a building, place or area with certain boundaries where industrial activities such manufacture of goods or materials, design, engineering, separation, preliminary and final inspections, packing of imported goods or materials from Other Indonesia Excise Area which the result particularly to be exported. It was predicted that leakages imported e-waste or used electronic appliances from bonded areas to Indonesia market is likely to occur.

Batam Area

There are three companies recommended by the local Government City of Batam to be surveyed, since they have licenses to collect waste from electronic industries in the area.

The three companies were PT. Sentral Agung Himalaya, PT. Interco Bisnis Langgeng, and PT. Indo Batam Ekatama.

Established in 2003, PT. Sentral Agung Himalaya, is a collector of metal scrap and others. All collected wastes come from local electronic industries, especially companies located in Batam Center, Tanjung Uncang, and Muka Kuning areas. The company has a license to transport hazardous waste; however the capacity only used as compliment since most client demanding total unloading of their wastes. The waste they collect including fragmented wire, obsolete TV/computer screens, plastics, stainless steel, coppers, irons, aluminums, etc. Monthly estimation of collected waste includes 600 tons of irons; 300-400 tons of plastics, 4 tons of coppers and stainless steel. They are sorted and separated manually and then pressed to become export materials. Sorted materials, particularly coppers and aluminums have been exported to China and Thailand.

PT. Sentral Agung Himalaya has other 10 similar companies in Batam, five of them are big waste collectors. Although it collects waste that probably is categorized as e-waste, the company do not have any estimation of total amount e-waste received.

Tabel 4.16 Activity of Recycle Facilities in Batam City

No	Company Name	Activity	Kinds of e-waste Collected
1	PT. Sentral Agung Himalaya	Collecting metal waste from domestic sources, segregation, packing, export or domestic sale, no physical treatment	Rejected small parts of electronic components
2	PT. Interco Bisnis Langgeng	Collecting metal waste from domestic sources, segregation, packing, export or domestic sale, no physical treatment, producer polybag and garbage bag made from used plastic and new plastic	Plastic, e-waste: used PCBs, rejected PCBs, computer monitor, electrical and electronic parts
3	PT. Indo Batam Ekatama	Collecting metal waste from domestic and imported, segregation, packing, export or domestic sale, no physical treatment	Scrap: Al, Cu, brass, tin solder, plastic. e-waste: Used

			PCBs

PT. Interco Bisnis Langgeng in Tanjung Uncang is another wastes collector. Waste collected includes aluminums scraps, plastics, irons, coppers, cardboard, and obsolete electronic goods. All metal wastes are segregated manually then pressed into cube form to export. Hard plastic waste is grinded to become secondary materials in producing garbage plastics and poly-bags for seedling plants. The facility has machines for making plastic sheets.

In the location some obsolete electronic goods and components were found. They include computer CPU and monitors, industrial small monitors and panel controls. They were unusable PCBs containing components, trimmed PCBs, and other electronic components. All e-waste seem to be stored for long time without any treatment. According to the management, e-waste collected was not intentionally acquired. It was to grant clients request that all waste must be out of their premises. Except for plastic waste, no treatment facility employs in this recycle site. Amount of PCBs managed in this facility is about 300kg per month.

The last recycling facility visited was PT. Indo Batam Ekatama. The company in general has a similar scheme of activities to PT. Sentral Agung Himalaya and PT. Interco Bisnis Langgeng, but its license is to import metal scrap. Industrial metal scrap collected or imported were aluminums, copper, brass, plastic and electronics. Electronic scrap collected were unusable contained (by components) PCBs, rejected PCBs, IC, diode, transformer and capacitors, used computers, and panels. Current main activity is to separate and select of waste before it is sent to imported countries, such as Singapore, China, and Japan. Total PCBs and metal scraps collected per month are about 2-3 tons and 400-500 tons, respectively.

In national level, Batam is projected as one of area where development of electronic industry becomes priority.. Several electronic industries in Batam are shown in Table 4.17 below. It indicates some electronic manufactures in Lobam area, namely PT. Add Plus, PT.

Sumiko, PT. Yoshikawa, and PT. Escatec have generated PCB waste as much as 100-200 kg per month. Except PT. Escatec that stored its waste in its premises, all PCBs wastes from other industries is sent out to Singapore. In Muka Kuning area, about ten electronic manufacturers also generate PCBs waste in amount 250-500 kg per month for each industry.

PCBs waste in Batam seems to have economic value for recovery purpose. In contrast, a disposal of PCBs was found in area called Sei Lekop Tanjung Uncang. Located near a river, the volume of disposal was estimated 4m x 15m and 1.5 m in depth. There was no information about the origin of waste.

Based on survey, collection of e-waste in Batam occurred unintentionally because the premises involved in e-waste collection activity were not specifically built by any classification of waste. Although the facilities have license to recycle wastes, their activities are limited mainly to waste separation. None of facilities have thermal process, for example, to refine collected wastes.

Table 4.17. List of Electronic Industries in Batam Island

No.	Companies	No.	Companies
1.	PT. Ace Technindo Mechatronic	21.	PT. Livatect Electronic Indonesia
2.	PT. Advance Interconect Technologies	22.	PT. Minamoto Indonesia
3.	PT. Asahi Electronics Indonesia	23.	PT. Nissin Kogyo Batam
4.	PT. Beyonics Technology	24.	PT. NOK Asia Batam
5.	PT. Philips Industries Batam	25.	PT. NOK Precision Componen Batam
6.	PT. Daiho Batam	26.	PT. Panasonic Electronic Devices Batam
7.	PT. Evox Rifa Indonesia	27.	PT. Panasonic Shikoku Electronic

			Batam
8.	PT. Epson Batam	28.	PT. PCl Elektronik
9.	PT. Epson Toyocom Indonesia	29.	PT. Perkin Elmer
10.	PT. Flairis Technology Indonesia	30.	PT. Plexus Manufacturing
11.	PT. Foster Electric Indonesia	31.	PT. Polestar Plastik Batam
12.	PT. Hi – Tech Agratektron Sempurna	32.	PT. Rubycon Indonesia
13.	PT. Hitech Displays	33.	PT. Sanyo Precision Batam
14.	PT. Honfoong Plastics Industries	34.	PT. Sanmina PCl
15.	PT. Infinion Technologies Batam	35.	PT. Six Electronics Indonesia
16.	PT. Sat Nusa Persada	36.	PT. Solectron Technology Indonesia
17.	PT. Shinetshu Magnetics Indonesia	37.	PT. Sumitomo Wiring System
18.	PT. Thomson Batam	38.	PT. Teac Electronic Indonesia
19.	PT. Winindo Electronic Batam	39.	PT. Tec Indonesia
20.	PT. Japan Servo Batam	40.	PT. Volex Indonesia

Source : Batam Environmental Impact Agency, 2006

(2) Survey in East Java

Survey on recycling facilities in East Java Province conducted in an industrial estate called Ngoro Industri Persada. Located in Mojokerto Regency, total number of industries in the estate was 70. Most of industries are foreign investment from Taiwan. Some industries have bonded facilities, which means they have an exemption of importation taxes as long as their products are for export. Six recycling facilities were visited and observed. Result of survey as shown in Table 4.18 below.

Tabel 4. 18 Activity of Recycle Facility in East Java

No	Company Name	Activity	Kinds of e-waste Collected
1*	PT. Wajar Logam Jaya	importer mix scrap metal, TV and monitor, dismantling CPU and printer; recondition monitor, produce scrap metal or aluminum, brass ingots, grinded casings, export	e-waste: CPU, printer, TVs, monitor,
2*	PT. Sun Doly	Importer mix scrap metal, TV and monitor, dismantling CPU and printer;	e-waste: CPU, printer, TVs,

		recondition monitor, produce scrap metal or aluminum, brass ingots, grinded casing, export	monitor,
3	PT. Kingson Metal Industry	Metal smelter using imported material in form scrap of vehicles	e-waste: not found
4	PT. Metalindo Jaya Abadi	Recondition of CPU, fax machine, and printer from domestic originated for local market	e-waste: computer's CPUs, printer
5	PT. Fremont Nusa Metal	Non ferrous smelter using local mix scrap metal, metal apparatus reconditioned	e-waste: not found
6	PT. Hanjaya Perkasa Metal Indonesia	Non ferrous smelter using imported mix scrap metal, recondition metal apparatus, imported PCBs powder	e-waste: used PCBs, PCBs sacrap, PCBs powder

Two of the six premises observed,which are PT. Wajar Logam Jaya and PT. Sun Doly. Both facilities, have imported used electronic goods for recondition such as television, monitor, CPUs and printer. In these facilities, television and monitor were dismantled. CRTs were checked for workability and then polished. The final products were packed for export to China, Taiwan or Hong Kong. TV and monitor casings were crushed and packed also for export. Other part such as computer CPUs also were dismantled into empty casing, PCBs, and harddisk. Casings were crushed or pressed then packed for export. PCBs and harddisks were directly packed for export. Other metal parts were segregated then packed for export or melted prior to export. While regulation requires product to export, the potential of leakages into domestic markets may occur.

There was also a company that conducted recondition of computer and accessories for domestic market, by collecting used or obsolete computer from domestic markets. This company has no bonded facility.

In comparison to similar industries in Batam, facilities in this estate were more suitable to be categorized as recycling facilities as indicated by availability of installation of thermal process for producing metal ingots. However, these facilities were not yet appropriate to be classified as e-waste recycling due to its unspecific resources.

4.2.3. Influx of E-waste or Used Electronic Goods

a. Batam Island

Batam is an important area in the West of Indonesia designed to develop becoming a sister city of Singapore in industrial, trade and services. Batam Islands consists of 329 big and small islands and has 1,570.35 km^2 in size. The big islands are Batam, Rempang, Galang, and Bulan. As seen at Figure 4.2, Batam is bounded by:

1. Singapore and Johor on North borders
2. Bintan Regency on East borders
3. Lingga Regency on South borders
4. Karimun Regency on West borders

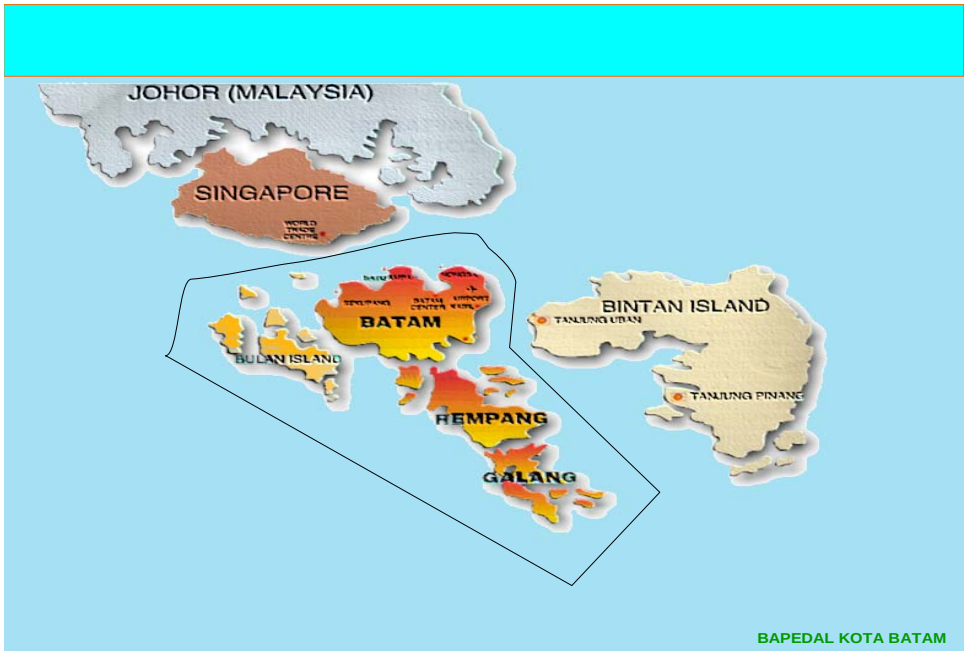

Figure 4.2. Map of Batam Island

Batam has strategic location in trade and services traffic with Singapore-Malaysia beside with other islands in Indonesia. It is also a bonded zone and there are easily to find low price of many electronic products.

Almost around area of Batam conduct trade relationship with Batam such as Pasir Panjang Port, WTC, Brani (Singapore), Johor, Malaka (Malaysia), and also coastal area and small

islands in Riau such as Bintan, Tanjung Pinang, Kuala Tungkal, Tembilahan, Pekanbaru, Rengat, Bangkinang, and even Natuna Island.

Batam has direct transportation access by air or sea routes with other cities such as Banda Aceh, Medan, Padang, Jambi, Palembang, Pontianak, Jakarta, Bandung, Yogyakarta, Surabaya, and Denpasar. But there are several areas in East Indonesia which have direct relationship with Batam using mouse route.

Because of its strategic position, Batam has attracted many investors from Singapore, Malaysia, other Asia countries, Europe, and America. The flow of goods and services has highly increased in both legal or illegal ways. This condition is a threat to the environment in Batam. Some activities which threaten the ecosystems in Batam are coast reclamation on mangrove, hill cutting, pollution of waste water, imported hazardous waste, imported used goods and e-waste, disposing of used goods, illegal used goods processing

Primary data was gathered through interview and direct observation to some locations of industries and used goods collectors in Batam on December 12 and 13 year 2006. Results of interview show that e-waste source in Batam were used electronics goods from Singapore that are not only in the form of electronics, but also many other consumable used goods that still have economics value. These goods sually carrie separately from non-electronics goods using wood ships and placed in container. The entrances of used electronic goods to Batam spread in 65 ports along the coastal line such as Batu Ampar, Nongsa, Sekupang, Marina, Kabil and Punggur.

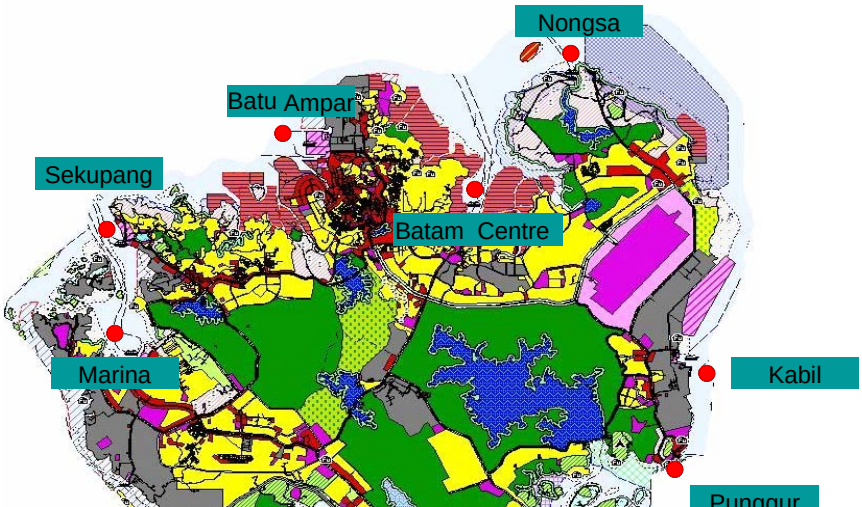

Figure 4.3. Map of Inflow-Outflow of Used Electronic Goods in Batam

One port observed is Sengkuang Port in Batu Ampar. PT. Octavia Mandiri uses the port for loading and unloading their belonging of used goods. The used goods arrived in Sengkuang, part of them is collected in port and carried straight by trucks to other place. Processing of used goods in Sengkuang is only to sort. So far the quantity of incoming used electronic goods from Singapore to Sengkuang Port is unknown because there is no recorded data for unloaded goods in Sengkuang. Used electronic goods not only sold in many kiosks along the road to Sengkuang Port, but they can also be found in used electronic markets that spread in some places such as:

1. Computer reparation and sale centers in Batam Centre
2. Sale centre of used goods in Aviari Market Batu Aji
3. Used goods kiosks in Batu Aji road
4. Sale centre of used laptop in malls

b. Wakatobi Island

Figure 4.4. Wakatobi Islands

Wakatobi islands, located in Province of Southeast Sulawesi between Banda Sea and Flores Sea, are also known as Tukang Besi islands. The name of Wakatobi is an abbreviation of 4 islands; **Wa**ngi-Wangi – **Ka**ledupa – **To**mia – **Bi**nongko. In year 2003 Wakatobi blossomed out from Buton Regency.

Safaa (2005) stated that Wakatobi Regency located in Wakatobi National Park area as a conservation area for about 1,390,000 hectares. The wide of Wakatobi area is 14,722.15 km^2, consists of 13,900 km^2 sea area (94 %) and 822.15 km^2 of land wide. Sea administration is as wide as national park.
As seen on Figure 4.4, this Island is bordered by Banda Sea in the North; Flores Sea in the South, Flores Sea and Buton Isle in the West; and Banda Sea in the East..

The population of Wakatobi is 93,355 inhabitants with growth rate 2.07 % per year. Wakatobi consists of 48 villages and 90 % located in coastal area (Safaa, 2005). Their main livelihood are inter-islands trading, dry land farming, and fishing. In 17th century Wakatobi even had been visited by VOC ships (Samlia, 1995). The domination of trading resulted grew wider of inter-islands trade to abroad such as to Singapore, Malaysia, Australia, and Timor Leste. Therefore it is not surprising that Wakatobi become a wholesaler area of used goods in east Indonesia.

The distribution area of used goods from Singapore and Malaysia in East Indonesia consists of Pare-Pare (South Sulawesi) and Wakatobi Islands (Southeast Sulawesi). Distribution in Wakatobi is divided into 4 big periods, before year 1980, 1980-1990, 1990-2000, and 2000 until now. Frequency of shipping, trade, and inflow-outflow of commodities before 1980 was generally conducted with East Malaysia (Tawau and Nunukan), while with Singapore had begun since 1980.

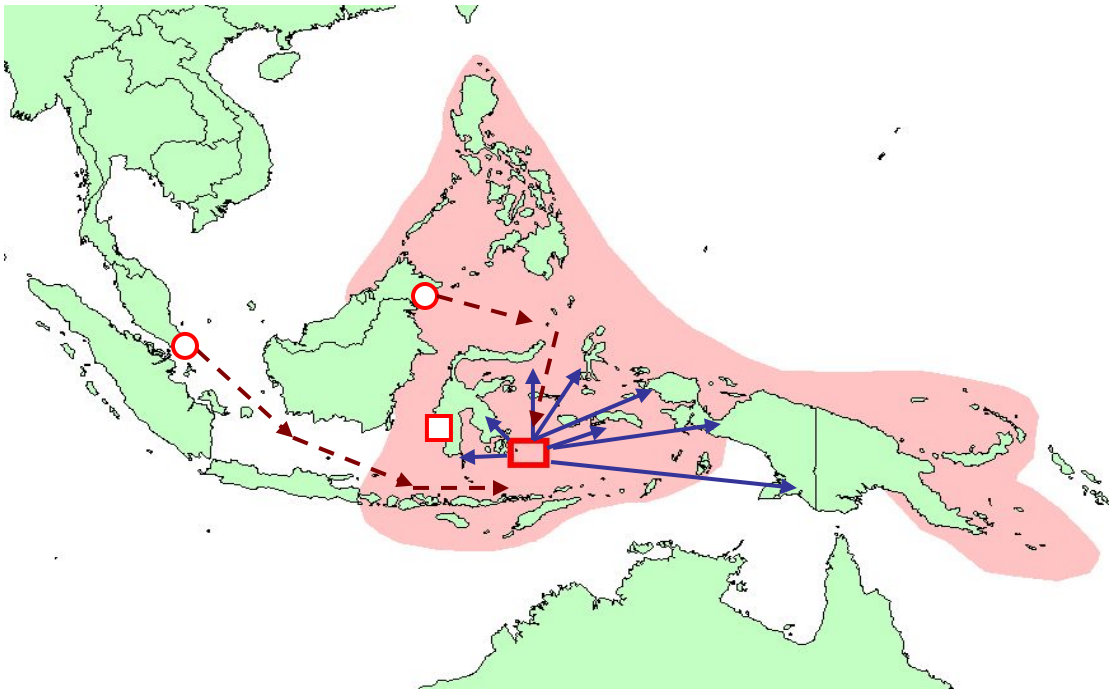

Figure 4.5. Distribution of Used Goods in Eastern Indonesia

Relationship with other countries has been conducted through trade and services (labors) with Singapore and Malaysia (Tawau, Nunukan) and by looking for the sea products to Pacific region, Palau, Australia, and East Timor (Samlia, 1995).

Used goods from Singapore and Malaysia consist of used clothes and used electronic goods. Changed dominant route of trade from Malaysia to Singapore was motivated by changing of consumers preference in East Indonesia. They started to get accustomed of electronic goods, cheap used clothes and motorcycle which all available in Singapore.

Although there is not certain number of goods volume, but according to interview, the distribution of wastes can be shown on Table 4.18.

Table 4.18. Relationship of Abroad Trade

Periode of Shipping	Kind of Ship	Load		Market Distribution	Trade Relationship (%)*)	
		Come Out East Indonesia	Come into East Indonesia		SGP	MLY
< 1980	Sail Ship (25-30 tons)	copra, cloves, pepper, eaglewood	Jewellery, plates, used clothes	Wakatobi, Maluku, NTT	25	75
1980-1990	Sail-Engine (30-50 tons)	Birds, crocodiles	Used clothes, electronics, used motorbike, Ceramics, garlics	Wakatobi, North Sulawesi, Southeast Sulawesi, Maluku, Irian Jaya	75	25
1990-2000	Engine (50-100)	Rattan, wood	Used clothes, electronics, fertilizer, garlics	Wakatobi, North Sulawesi, South Sulawesi Southeast Sulawesi, Maluku, Irian Jaya	75	25
> 2000	Engine Ship (75-200 ton)*)	Rattan, wood	Used clothes, big bike, spring beds, household equipments, fertilizer, electronics	Wakatobi, Southeast Sulawesi, North Maluku, Maluku, West Papua, Papua, South Sulawesi	75	25

*) Interview result, (2006)

Based on types of used goods, the composition of electronic goods is about 10 % of total goods loaded from Singapore, as the main source of used electronic goods, while 5% from Malaysia. But started from year 2000, volume of used electronic goods has decreased because of the reduced price and increasing amount of these goods in Indonesia.

Schoorl (2003) noted that in 1983 sail ships in Wakatobi Islands are 220 and still sail 150 ships. It is now predicted there are 250 ships and 50 ships of them still actively sail to abroad. If the average of sailing is 3 times in a year, it means there are 150 frequencies of ships loading in East Indonesia. With average tonage 75 tons/ship x 150 = 11,250 tons/year

and 10 % of total loads are electronic goods so there are 1,125 tons/year of used electronic goods come into East Indonesia.

Those e-wastes consist of TVs, refrigerators, radios, tapes, videos, and cameras. Nowaday those were dominated by used clothes, spring beds, and fertilizer (amonium nitrate). The increasing volume of fertilizer occured because of conflicts in Maluku and the demand for fish catching by bombs

V. DESIGN FOR NATIONAL E-WASTE INVENTORY

A Preliminary Study for National Inventory of E-waste basically served as preparation in developing strategy and framework for the comprehensive inventory. Activities in preliminary study, therefore conducted in accordance to common understanding on observed situation to all possible aspects or activities related to potential generation of e-waste as prescribed in the methodology of study. Basic approach of this study is not intended to have any specific number for any element related to generation of e-waste but more emphasized on (1) grabbing a comprehensive understanding on actual situation affecting e-waste creation (2) examining availability of data and its usefulness in managing the issue, (3) analyzing the result of observations and interviews to national e-waste generation, and (4) recommending any feasible aspect to consider in developing inventory of e-waste at national level.

5.1 Redefined Sources of E-waste in Indonesia

Since there is no specific definition on e-waste, this study has taken into account two mainstreams of e-waste sources, namely e-waste from production of electronic goods and its components, and e-waste as obsolete or post consumer electronic products. While e-waste (and other wastes) resulted from specific sources such as, electronic industry, has already been legislated under the national waste management regulation, e-waste as obsolete electronic products has no specific regulation applied so far. For this reason, identification of aspects related to this e-waste stream is more challenging.

The flow of e-waste generation and its possible management in Indonesia is as illustrated in Figure 5.1. The flow is actually identical to what was expected and planned in the methodology of study. However, after conducted verification through observations and interviews, there were some revealed and unrevealed information regarding to the roles of who was getting involved in generating e-waste. This information would be useful in

developing methods particularly in measuring each other roles in generating and managing the waste.

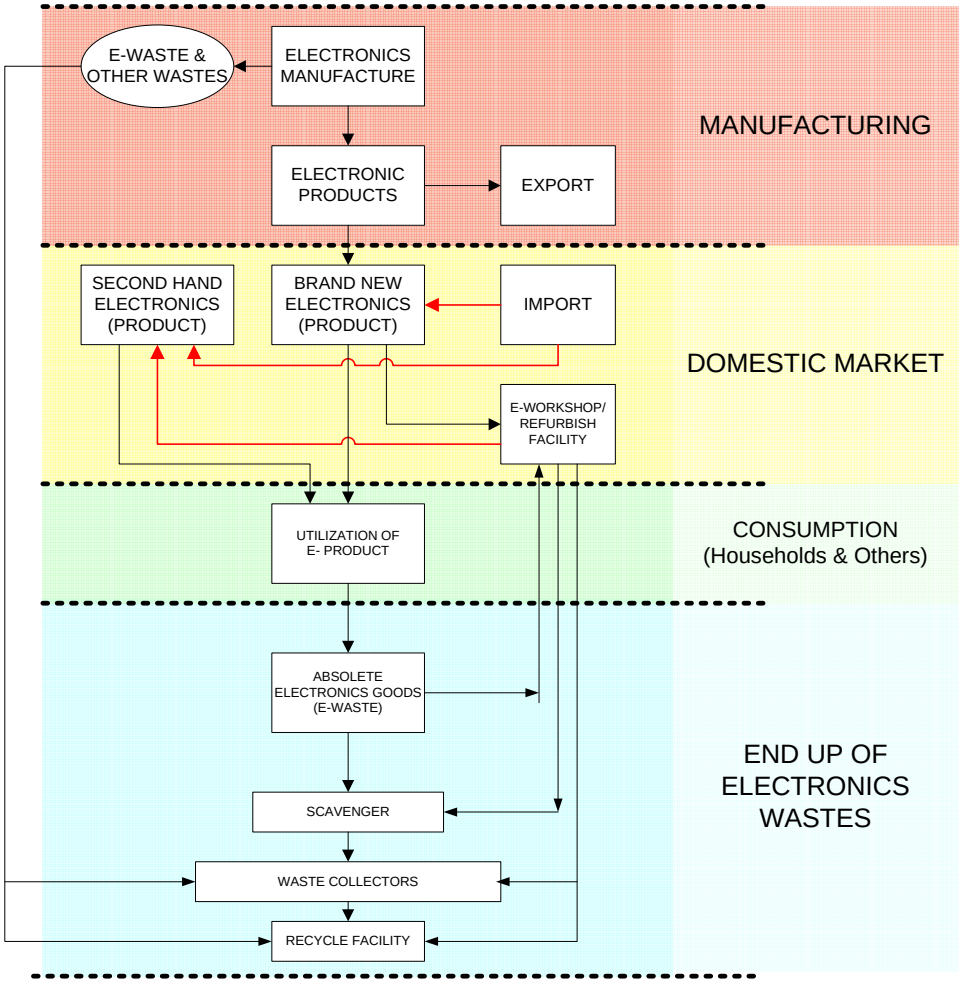

Figure 5.1 Potential generation of E-waste in Indonesia and its management

Electronic industries generate wastes from their production process. Waste such as PCBs scrap or rejected components from production process might be categorized as e-waste or even hazardous e-waste. Some electronic products were intended solely for export. Electronic industries whose products for export usually located in bonded zone such as Batam Island or in specific industrial estate such as in East Java Province. If it was located as an individual industry, the industry usually has bonded facilities provided by Ministry of

Finance. Other electronic industries distribute their products to fill domestic markets. Usually only small proportion of total products is sent abroad for export.

Domestic market for electronic products is not mainly dominated by local brand products. Volume of export-import, as presented in the previous chapter, indicates the dynamic of international trade of Indonesia. For particular goods, export from Indonesia has outnumbered its import. However, by time this situation may reverse.

It is also identified that some electronic products sold in Indonesia are illegally imported. In addition, Indonesia electronic market also is occupied by used or second hand products. This products are not only generated domestically but also from import.

Though regulation prohibits influx of most used goods including electronic goods, import of used electronic goods so far still exists. To illustrate, some electronic shops surveyed in BODETABEK regions sell used imported computer and accessories, which are supplied from traders or importers in Jakarta. In Batam, there are also found some markets of imported used electronic appliances such as refrigerators, television, automatic washing machines, etc. This similar situation also is occurred in Wakatobi Island.

In a rapid assessment on individual electronic shops conducted by Ministry of Industry in Semarang, Central Java Province, it was reported that some refurbished television product being sold in several electronic shops. To prevent suing by consumers or others, the product was packed using a box marked with a small symbol indicated that the product was not a new one. Domestic used electronic products could be second hand or refurbished or reconditioned products. Refurbished or reconditioned product typically is an old product made up by electronic workshops or unauthorized electronic service centers. This product might not have a complete set of original parts.

Based on observation, obsolete goods would be stored or displayed at electronic workshops both in whole shape and in parts or components. It purposes to be ready with component or parts stocks for next repair and to show its identity as electronic workshops.

Small parts or components are habitually discarded into trash bin, which are eventually collected by scavengers. Figure 5.1 does not show obsolete or used goods collected from trade-in program in hypermarkets. Those are sent to research and development department of the manufactures. Obsolete electronic products are likely sent to recycling facility either directly or through scrap and waste collectors. However, there is no data or report concerning this arrangement. Finding obsolete electronic products being dumped in domestic landfill facilities indicates that management on e-waste, to some extent, is existed.

In domestic waste management system, especially in urban areas, scavengers play important role reducing volume of waste by picking valuable wastes. Scavenger may work individually or in small groups. Valuable wastes collected are sold to a small collector which consecutively sending the waste to large collector or straight to recycle facility. Some scavengers might work collecting valuable wastes from house to house, business areas, domestic waste transfer stations or final disposal of domestic waste sites. Since electronic part might contain valuable metal, this waste would be picked up by scavengers. Obsolete electronic stuffs might also be over handed to mobile waste collectors that buy the e-waste or trade in with other things.

5.2 Analysis of Collected Secondary Data

Some data on production capacity and real capacity of selected electronic items (1993-1999), utilization capacity of electronic industry (2001-2004), production capacity of electronic industry for year 2005, and export-import of selected electronic products (2001-2006) could have been accessed from official websites of Ministry of Industry and Ministry of Trade as presented in the previous chapter.

Not all data seem to be up -dated continuously. Data on production capacity and real capacity of selected electronic items, for example, are likely no longer maintained, indicated by no additional data for next consecutive years. In fact, it is unable to access. Other data,

however, keep available and accessible but still need to up date, especially for utilization industrial capacity data.

Data on production and export-import of electronic appliances would expectedly give illustration about the volume of electronic products in Indonesia market. However, the fact that the two data using different measurement, making it rather impossible for data adjustment. To resolve this problem, tracking back to the original data will be required. Both Ministry of Industry and Ministry of Trade actually are not really the owners of the primary data but it should be taken from National Board of Statistic (NBS). Consequently, this situation makes a request for the data will face difficulty. From industrial statistic book released by NBS, this kind of data is not available.

Since the enacted Law on Decentralization in 2000, the authority of Ministry of Industry to issue industrial permits has handed over to local governments. This is a reason why data on production and capacity no longer published. This institution is not being the first hand to have information on industrial new investments. Hence, it is impractical to gather information from many local governments.

To estimate e-waste generation, data on national demand-supply of electronic products are more preferable than an adjusted data of production and export-import electronic products. Size of domestic market indicates availability or demand on electronic products. But the statistic does not express the number of electronic goods being consumed. Individual expense or purchase would have a close relation to volume of e-waste generation. This kind of data is not available in government site, but might be acquired from electronic manufacturers association (GABEL) or their marketing club (EMC) in form of domestic sales data. For example, EMC reported that total volume of national demand to 21 categories of electronic products in Indonesia was 12.029 million units while local products only supply for 7.981 million units. This statement implies that EMC has specific data for any particular electronic goods. This data on electronic goods consumption would be resourceful data in prediction the number of obsolete products in years to come.

However, in reality the end-of-life electronic products are affected by many factors. In fact, among different new electronic products there are various manufacturers guarantees that imply optimum life-time of their products. To illustrate, manufacture's or distributor's guarantee for refrigerator could be 3 years including spare parts, while for television could only be one year guarantee. Of course, the end-of-life for used electronic goods would be shorter and they are frequently sold without a guarantee, or if available only for very limited times.

To be accurate in estimating the potential generation of e-waste, data on durability or end-of-life any electronics goods should also be available. In addition, due to the availability of used electronic goods in market, its market proportion and its end-of-life should also be provided.

5.3 Analysis of Primary Data

5.3.1 Used electronic and Electronic Workshops

Based on the survey, refurbishment or reconditioned facilities and used electronic shops were found over regions observed. In general, current status on presence of these premises might be interpreted that second hand or refurbished market for computers are more available in shops located in shopping malls or electronic centers than in individual computer workshops. In contrast, more individual electronic workshops deal with electronic appliances instead of computers.

There is a tendency that workshops dealing with refrigerator also dealing with non automatic washing machine and fan, while workshops providing services on television usually handling audio and video equipments. However, workshops coping with air conditioning habitually only manage air conditioning in various kind, not limited to household air conditioning but also car's air conditioning. Workshops dealing with television, refrigerator and washing machines are usually located near residential areas, while air conditioning

workshops usually along a main road, especially if they also provide cars' air conditioning services.

Figure 5.2. Computer shop and workshops in an electronic center

Observation on these premises indicated that used electronic shops, except computers, parts and accessories shop and workshop in particular, were rarely visited by significant number of visitors. Although demand on used electronic products and to repair electronics seem decreasing,, some electronic shops and workshop have informed rough data on their average sales, but only for computer and its parts and air conditionings. The decreasing of refurbished or electronic workshops activities somehow related to electronic goods marketing strategies applied by chain of hypermarkets. Advances technology, decreasing product prices, product designs, and also easiness to get new product by trade in or soft credit (installment) system offering by hypermarkets have discouraged consumers to up grade or repair their old electronic stuffs. In turns, disposal of old ones would increase in years to come and it should be anticipated. Therefore, development a strategy to collect data related to activities of electronic refurbishment facilities as well as electronic workshops

should be considered as part in national inventory of e-waste. This data at least would be useful to map potential generation of e-waste.

According to electronic manufacturers association or GABEL, there is actually an association of electronic workshops called ABE. However, the information regarding ABE's activities, memberships and management of the organization is still unknown. For e-waste national inventory and possible development of e-waste environmentally sound management, revival of this organization would be crucial to national system for managing e-waste.

Most used electronic goods found in electronic shops and workshops in BODETABEK regions, computer and its peripherals in particular, are actually "imported products". The shops in the regions do not directly import but they get from trader in Jakarta.

Used goods, which very likely mixed with obsolete products or e-waste, are shipped in containers either 20 or 40 feet in size through international seaports. By shipping, imported products could be in large volume so that it is more effective and efficient.
Though this importation might be illegal, it is probably not occurred through Tanjung Priok harbor of Jakarta, but also in other 4 international seaports in Indonesia i.e. Makassar, Medan, Surabaya, and Semarang.

5.3.2 Recycling Facilities of E-waste

Regarding to recycling facilities, there was no any specific facility dedicated to recycle e-waste in visited sites. However, in some facilities, e-waste was found in various form like parts, component and in a whole obsolete products as well. Though it was found e-waste in their premises, most of them did not realize what they actually dealing with. Principally, their interest is only on the main composition of the waste, not its classification. Recycling facilities in Batam that found e-waste in their premises has made a statement that e-waste

in their place were not by intentional due to the “pick-all-wastes’” contract agreement with their clients.

Figure 5.3. Electronic parts and components found in a recycle facility in Batam

None of facilities performed any special treatment in order to isolate precious content from their e-wastes. In addition, only limited facilities in East Java has conducted thermal or melting process. However, the process was not specific to refine the precious content of e-waste such as gold, silver, which available in small amount of parts or components. Thermal processes employed in these facilities were only in order to form ingot or metal bars from scrap due to buyers’ request. In fact, recycling facilities visited generally conduct metal separation and packing, and no chemical or thermal process to be employed.

Two recyclers in Ngoro industrial estate in East Java Province were found to conduct import of used electronic for reconditions. Both activities with bonded facilities brought used television and computer monitor and other peripherals in from abroad. Reconditioning was

only conducted over CRTs of televisions and monitors. Though reconditioned products should be exported, a potential leakage to domestic market still may occur. By paying taxes, the facility might sell this used product to local market. This data might not available in Ministry of Industry or Trade since activities in bonded facility is in the authority of custom office which is under the Ministry of Finance.

Figure 5.4. An open storage of imported monitors in a reconditioning facility in East Java

The two facilities in East Java are not the only bonded facilities in Indonesia. Another facility that performs similar activities is found in Semarang, Central Java Province. In bonded area or bonded facilities, anything out from the facilities should get approval from custom office.. Except for export purposes, anything go out should be obliterated to prevent from further utilization.

However, standard for waste obliteration by custom offices does not comply with the existing environmental standard. In the recycling facility in Semarang, thousands of worn-out CRTs have just buried in land without any special treatment. In Ngoro Industri Persada, East Java, almost any waste from this industrial estate is dumped to a hill. E-waste such obsolete CRTs might also be abandoned in that site. Then a recycling facilities that conduct reconditioning could be consider as another stream of specific source of e-waste generators to electronic manufactures. Though the number of this generator is probably limited, but on those activities, amount of e-waste generated would be significant. For this reason, it is

recommended that this kind of facilities should also become a subject for the national e-waste inventory planned.

As mentioned previously, the only institution completed data from bonded facilities should be the custom offices. However, since they mainly interest on related administrative matters, there is no data being published related to waste. The Ministry of Environment, as a national authority on environment including waste management may ask for the data from the custom office. Alternatively, Ministry of Environment might conduct directs surveillance against bonded facilities on their waste management practice.

5.3.3 Influx of Used Electronic Goods

Two significant locations of used electronic influx into Indonesia have been identified in Batam Island and WAKATOBI Islands. Since activities in two locations were illegal then no official data would be found related to the volume of imported used electronic appliances. As a consequence, the only way to measure the volume of illegal imported electronic products is by conducting direct observation and interview.

In WAKATOBI, the annual estimation of imported used electronic goods into the island might be derived from the frequency of local ships sailing to and from Singapore or Malaysia. The ships departed from WAKATOBI brought natural products and other resources for trade. When it returns, they brought anything that expected or demanded by local people, including used electronic appliances. The research concluded that electronic goods were not the most valuable used items that imported although the amount was significant. To verify result of estimation, interviewing with management of storage houses, where imported used electronic placed, might be required.

In Batam, there were more than sixty informal harbors. For this reason, conducting the same estimation methodology as used in WAKATOBI's case was likely irrelevant. The best way for estimating volume of used electronic product in Batam is by performing direct survey. Shops selling used electronic products in Batam were located in specific areas.

However, there is a possibility that the import of used products also through formal harbor considering Batam is a special bonded island.

Figure 5.5. A small informal seaport in Batam Island was used for shipment of used goods

While conducting more intensive survey, it needs to keep in mind that market size of used product was relatively stagnant if not reducing. The reason is due to easiness to have new branded products provided by large electronic stores in the area.

5.4 Factors to be Considered in Preparing National Inventory of E-Waste

Preliminary Study on Inventory of E-waste in Indonesia indicated that there were three main sources of e-waste potential generation i.e. from electronic industry, from recycle facilities conducted reconditioning, and from consumer of electronic products. Data gathered from the first two main sources would likely have direct association to the generation of e-waste. However, for data from post consumer products would need specific approach since the data collected not directly indicated number of obsolete electronic products for the year of the data collected.

5.4.2 Collecting Data from Specific Sources

Specific source means electronic industry resulting e-waste from its production process. Current system in producing one electronic item would involve tens to hundreds component

before its assembling. Implying tight quality control and insurance, it is very unlikely that e-waste resulted from this category would in form of obsolete electronic appliances or goods. Therefore, e-waste from specific sources would likely be obsolete or rejected electronic parts or components.

Indonesian regulation on hazardous waste actually controls this kind waste, though it was not yet called as e-waste. Since the waste is subject to be controlled, there was actually responsibility of generators this waste to report total amount of its generated waste generated and its management. To have specific data on this e-waste, it is necessary to give classification or description on what kind of waste should categorize as e-waste.

Data collection could be conducted through direct monitoring by visiting the site or indirect monitoring by sending questionnaires. However, both direct and indirect approaches should bring the data owner to provide e-waste data in a preferable unit. In the context of e-waste management system, the preferable unit data is measured in weight. Therefore, standard operating for direct surveillances or prepared questionnaires should also emphasize the important of unit being used.

Based on distribution of electronic industry in Indonesia, subject for e-waste data collection from specific sources would be in six industrial electronic clusters. Current clusters of electronic industry in Indonesia are (1) Banten-DKI Jaya-West Java, (2) Batam of Kepulauan Riau Province, (3) East Java Province, (4) Kudus of Central Java Provinces, (5) Special Territory of Yogyakarta Province, and (6) North Sumatera Province. To these clusters, analysis of electronic industry types should be performed, to ensure correct target for surveillance or sending questionnaires.

Figure 5.6 Distribution of electronic industries in Indonesia

In analysis of electronic industry types, however, some obstacles would appear especially if there is a concern for particular electronic component or part. Basically electronic industry is only divided into two groups, assembling of electronic appliances or goods and electronic component or parts. Industrial codes applied in national system and HS code for products do not always indicate identity or activities of particular industry. It is not surprising if most industries are not familiar with these coding systems related to their activities. Therefore, for the initial survey for this category, all suspected industries generating e-waste should be included.

5.4.3 Collecting Data from Recycle Facilities

Recycling facilities might also be categorized as another specific source of e-waste. To collect data in these facilities could also be performed through direct monitoring by site visit or indirect monitoring by sending questionnaires. From this source, e-waste generated is probably measured in unit number of worn-out of parts or sub-assembly. It is recommended

the data also come with a conversion value for converting a unit number to a unit weight and vice versa.

Recycling facilities that carry out reconditioning over used electronic goods were actually limited. Since this practices not allowed in common industry, this kind of facility usually located in bonded zone. Though not in all cases, bonded facilities usually are provided to industrial estate or particular industry that meets the qualification. In general, most recycling industries awarded bonded facilities were foreign investments. Therefore, data on this kind of facility might be available in institutions that have authority to make the presence of this kind facility possible. Besides the custom offices, regional office of the National Board for Investment and the local industrial authority were the stakeholders of these industries. The involvement of local industrial authorities in issuing permit for such investment has been started since 1999, after the enacted of the law on Decentralization.

To identify recycling facility that performed electronic recondition, it might be started from identification of bonded industrial estates whose metal recycling industries resided. Data on industrial estate in Indonesia might be available in Ministry of Industry or from association of industrial estate. Some industrial estates also have their own websites. By checking facilities or services provided such as zone of allocation and assistance to get bonded facilities for potential tenants, it indicates that the industrial estate under their management is a bonded zone. Sometimes industrial estate management also puts their tenants in its websites or brochures. This approach needs such confirmation from the authority.

A short cut to this, of course by approaching the authority that issuing permit to conduct reconditioning and importing used electronic for the facility. Complete data probably is not available in a single authority. In fact, it is not really a short cut approach since distribution of this kind of facility in Indonesia spread over in some provinces. In general, to reach the expected recycling facilities that might generate e-waste could be possible if copy of industrial permits were gained. In industrial permit, scope of the facility activities was determined.

5.4.4 Collecting Data of Post Consumer Electronic Products

Estimating e-waste from post consumer products is a complicated task. This problem arises due to no specific data can easily convert into estimation of e-waste. While annual data on sale of electronic items still needs to pursue, the interpretation in how electronic goods become e-waste is also another obstacle to be overridden. In Indonesia, where extended responsibility for electronic producer was not in place, data of post consumer electronic were, therefore, not available. The presence of imported used electronic products has been distorted Indonesia electronic market. The presence of electronic workshops which has consequence to longevity of electronic products is another factor to take into account.

The closest data for interpretation the generation of e-waste from the post consumer product category was data of demand-supply and sales of electronic. These kinds of data might be provided by Electronic Marketer Club (EMC). However, the numbers issued by EMC do not always give sufficient explanation whether these include the import of used goods and or illegal products. In addition to this, national statistic data related to this issue need to be explored and derived. Data of product sales personal consumption expenditures, data from the family income and if available, data of national survey of expenditures might give better estimation on electronic appliances consumption.

Variability of end-of-life for each electronic item leads to the importance of data separation. It means, to have national inventory of e-waste from post consumer product should be based on calculation of e-waste potential generation for each electronic item. This individual approach might open possibility to include used products or refurbished items, whose behavior is likely differ from one item to another, into estimation of sub total of e-waste generation. So far, there was no reliable data concerning end-of-life of every electronic item including claims made by producers. Perhaps this matter can be consulted to electronic producers, including a potential replacement of parts in order to make electronic goods keep working. Repairing and parts replacement probably are the most frequent activities

conducted by workshops. Therefore, consultation is relevant aspect in estimating end-of-life of electronic product.

In addition, current situation concerning obsolescence of electronic appliances do not only rely on single reason. While conventional reason due to technical obsolescence-the product itself is worn out and no longer function properly-, other reasons of obsolescence could be economic, feature, ecological, aesthetical and psychological ones. Other reasons than the conventional one would increase rate of production of e-waste from this category.

Another factor need to be considered in estimating e-waste generation is demographic data. As the fourth most populated country in the world, Indonesia actually has uneven distribution of population caused by urbanizations. To illustrate, based on the 2000 population census, Indonesia has population of 205,843,000 inhabitants. With refer to population density, while national density was 111, in Java Island density reached a number of 997 people, and in Jakarta even greater, about 12,985 people in sq km. In comparison to the total national land area, Java Island and Jakarta were only 6.75% and 0.4% respectively of total land. In cities outside of Java Island, the patterns of urbanization to some extent were identical. As electronic appliances usually require electricity which is not distributed evenly in Indonesia, consumption of electronic goods would be likely concentrated in urban area. Having this situation, focus of potential generation of post consumer electronic products should be on urban areas.

Since electronic goods that consumed this year would be obsolete in some following years, there is a need to define a baseline year in estimating e-waste generation. This year data of obsolete electronic items, for example, would have relevance to data of sales or consumption in five or six year ago, depending on end-of-life the item itself. Therefore, a life cycle data analysis (LCDA) if available would be a great help in determining technical obsolescence of particular electronic goods. To make estimation simpler, therefore, some assumptions were recommended to be made.

Manalac, in order to estimate presence of electronic in the Philippines, uses this simple mathematical equation:

$$N_j = \sum_i (S)_i p(_{j-i+1}) + B(p_j)$$
$$B = \sum (He_i * f_i),\ i\ (\text{income decile}) = 1,2,3,4,5,\ldots..10$$

Nj	=	total e-waste at a certain time t
B	=	total e-waste at tome t=0 or the baseline data which represents the appliances which are presently owned regardless of their date of purchase
S	=	Number of sales
P	=	Probability of disposal rate
He	=	Household in decile with access to electricity
F	=	Fraction of the household owning a particular appliance

VI. NEED ASSESSMENT AND SETTING UP OF PERMANENT NATIONAL E-WASTE INVENTORY

6.1 Need Assessment

6.1.1 Regulation Aspect

The most important thing to be assessed is legislation on the definition and criteria of e-waste, so that all existing legislation can be enforced respectively. Further assessment should focus on interpretation of existing regulations that are sufficiently available but poorly enforced. First, the assessment on the different interpretation of restriction of import of second-hand equipment regulation and prohibition of import of e-waste. Second, the assessment on the implementation of bonded zone legislation and third, on the use of ISIC and HS Code in controlling of export and import of used electronic or e-waste.

It is also necessary to assess the establishments of specific regulation on e-waste management with the interest of national industry development, environmental and health concern and economic activities. With regards to consumers protection, it is important to include environmental consideration on the products which has direct impact to human health and safety

6.1.2 Institutional Aspect

Need assessment of regulation aspect is possible to be conducted, and the regulation could effectively be enforced, only if coordination and communication among involved institutions and organizations are in place. In this decentralization era, it is very important for the central government institutions to work closely with local government as many cases of illegal import occurred in their administrative boundaries. Besides, awareness and capacity of local government officers on managing hazardous waste including e-waste have to be built to deal with tricky and false promises of local revenue.

Communication with business sector (manufacturers, distributors, authorized service centers, associations etc) will benefit the effort of preventing illegal traffic of e-waste and managing e-waste generated in the country.

6.1.3 Technical Aspect

Assessment of technical aspect is firstly to develop technical criteria to support the main regulation aspect on definition of e-waste. Indonesian National Standard (SNI) on electronic products can be used as a reference, while involvement of experts will boost the assessment process. This criterion should be in line with the testing criteria for electronic products established by Ministry of Industry. Manual guarantee card provided by manufacturers, therefore, has to be checked with this criterion.

Based on this technical criterion, along with other assumptions and approaches as described previously in this Report, assessment on calculation of predicted e-waste amount is important to evaluate the magnitude of the problem and to provide its solution.

Further assessment is on implementation of environmental friendly electronic products by reducing or eliminating, if appropriate, any hazardous material contents. Manufacturers need to be encouraged to implement cleaner production and other approaches such as eco-design, extended producers' responsibility and take-back mechanism.

6.1.4 Law Enforcement and Inspection

With refer to specific regulation, technical criteria on e-waste and calculation of potential amount of e-waste, assessment on existing capacity of enforcement implementation can be conducted. These would depend on capacity of enforcement officers, coordination mechanism, supporting infrastructure, inspection mechanism, need of training and budget availability.

This assessment should consider the vast number of big and international ports, small and conventional ports, refurbishment facilities and second-hand products shop. Bonded zones are also part of this assessment with refer to dismantling and refurbishment activities and

disposing of the waste into this area and the possibility of leakage of “export” of refurbished product to Indonesia land.

6.1.5 Consumers Protection

Weak control causes various illegal goods spread easily to public. Nowadays consumers focus to low price and products function. They do not consider quality and products lifetime. In the other side people knowledge about regulation, standard, and quality are limited. The quality of products can generally be known after buying and using, however, consumers do not have bargaining position to put in a claim for the products they paid for.

Therefore, explicitness of consumer rights which are guaranteed in section 4 Regulation No. 8/1999 about Consumers Protection, have to be struggled such as:

1. Rights of pleasure, security, and safety
2. Right to choose
3. Rights of true, clear, and honest information
4. Right to be heard
5. Right to get protection advocacy
6. Right to get establishment and education
7. Right to be treated fairly, not discriminatory
8. Right to get loss replacement

On the other hand, the producers have to comply with Consumers Protection Regulation (Section 7 No. 8/1999), which are:

1. Give the truly and honestly information
2. Guarantee the products quality that produced and traded in which appropriate with the regulations
3. Give compensation and loss replacement

Generation of e-waste is unavoidable as a consequence of rapid electronic technology development and increasing demand of electronic products. In the case of illegal import of

e-waste, it occurs because of cross-cutting point of demand side of public on low prices of electronic products and supply side of private sectors in breaking through highly competitive business environment. When purchasing power of consumers is very low due to reduction of income, basic need consumption is still on the highest priority. These low prices electronic product are the most appropriate options, regardless the low quality, even the safety concern affected from the products.

Assessing on consumer protection will face the difficulties of consumers' purchasing power parity. It is the responsibility of government and consumer protection foundation to increase awareness of the people on product quality, technical specification and safety of refurbished electronic products as they deserve to have good quality and safe products. They also have to be informed of their roles in encouraging environmental friendly electronic production behavior among the manufacturers, and their right to have compensation in the case of damage or physical and financial losses.

It is also necessary to encourage manufacturers to enclose all relevant information regarding their products quality and technical specification specified on the guarantee manual. As the price get lower so does the quality, consumers have to be informed on all the consequences. Any environmental friendly approach, for example by eco-design or cleaner production, applied by the manufacturer will lead to the benefit of consumers. In addition, assessment of the development of Extended Producers' Responsibility which now is conducted by PT Astra Graphia Tbk. and take-back mechanism will protect the consumers from the exposure of hazardous waste resulted from uncontrolled management of e-waste.

It is very important, therefore, to assess the impact of refurbished or reconditioned electronic products and dismantling and refurbishment activities on human health, safety and environment to consumers, workers and community in dismantling and refurbishment facilities. National Consumer Protection Agency has a significant role to speak up the consumers' interest. .

6.1.6 Economic Aspect

This assessment, particularly in the form of cost and benefit analysis, on using e-waste as raw material for refurbished electronic products, is very important to be conducted to ensure all pro economic development on net revenue the community could gain. Cost of environmental recovery, safety and health impact due to exposure of hazardous waste contained in the e-waste or low safety of refurbished electronic products compares against economic benefit from job creation, income generation, revenue raising and economic recovery. We need also to consider the reduction of market share of domestic electronic products competes with this “legal “ or illegal import of e-waste.

This assessment should consider that refurbishment of electronic product activities conducted by mostly small and unauthorized enterprises or informal sector is not prohibited as long as they use domestic second-hand electronic or e-waste. The government even has to increase their technology capacity to operate in environmentally sound manner.

6.2 Setting Up of Permanent National e-waste Inventory

This Preliminary Inventory Project is very important as a reference to set up permanent national e-waste inventory. Based on analyzed data,, National Permanent Inventory will have sufficient basic working mechanism and support system.

Some fundamental elements that need to take into account in developing a permanent national e-waste inventory i.e.:

1. An agreement on what kind of data should be used in estimating generation of e-waste in national level. This study suggested three of e-waste sources in Indonesia namely from specific source, from recycling facility that conduct recondition, and from post consumer electronic products.

2. Method to estimate total generation of e-waste should be defined and designed. This estimation method should include consideration on what kind of data were required for further calculation, whether secondary or primary, or both. This approach is also need to consider relationships among data collected whether as complementary or for verification other data. In addition, particular statistical method might be needed to be developed.
3. Determine subjects related to the issue for data collection and its most feasible approaches. In addition, geographical distribution of subjects especially in respect to collecting primary data should be considered and determined.

4. Developing sufficient forms for collecting data such as questionnaires and list of interviews especially for primary data collection. For secondary data, this project also indicates the necessity to encourage the data owner for providing information in desirable format. This approach also suggests possibilities of inspection and data validation.

5. Once technical aspects in collecting data has been established, updating system should also in place. This issue at least might be relevant especially in estimating e-waste from post consumer products since data required for interpretation this source of e-waste should be taken from some consecutive years. In general, up dating system should ensure sustainability of e-waste data management.

6. To be fruitful, inventory data or its manipulated data should be available and accessible to either stakeholders or interested parties. Therefore, e-waste data should be readily available both in electronic information and in hard copies. In managing e-waste data availability, skillful human resource in sufficient number and sufficient finance should be available. In addition, structure and infrastructure for managing data and also maintaining inventory data should also be provided.

7. In order to manage information system related to the national e-waste inventory, both vertical and horizontal coordination among central government and local government

and other stakeholders should be established and maintained. This should include Institutional and technical responsibilities. Involvement of stakeholders would be expected when there is an incentive for them to be part of this system.

8. One of the most important aspects is to encourage the government to implement policies regarding on e-waste. It includes actively communication and disseminated information on e-waste which requires a political will regarding this issue. In addition, dealing with e-waste should also be supported by research and developments, development of policies, including implementation, evaluation and monitoring

VII. NATIONAL WORKSHOP ON E-WASTE

7.2 Introduction

Workshop on Electronic and Electrical Equipment (e-waste) Management in Indonesia has been conducted by Ministry of Environment on 20 – 21 December 2006 to increase awareness of stakeholders, to disseminate the concern and importance of e-waste problems in Indonesia and to clarify initial findings and data where illegal and legal import of e-waste occurred and where refurbishment facilities are in place, to all relevant organizations whose particular mandate and authority.

E-waste is relatively new issues in Indonesia, so that the stakeholders from various organizations were enthusiastic in learning the facts of the e-waste problems in our own land. In addition, journalists from several mass media were excited to attend the presentation to get main point of the problem.

During this two-day workshop, all participants has found out the complexity of the problem, from the lacking of legislation and enforcement mechanism, bureaucratic system, to technical capacity of refurbishment players and awareness among consumers. There were 35 representatives from institutions and organizations and 14 reporters from various media participated in the Workshop together with 10 staff of Assistant Deputy Minister for Toxic and Hazardous Substances and Wastes Manufacture and Agro Industry of Ministry of Environment and consultant as Organizing Committee.

7.2 Workshop Agenda

Panel Discussion I

National policy on trading of second-hand electronic and e-waste (Ministry of Trade), Consumers' protection regarding Second-hand electronic product and electronic product that uses second-hand electronic components (YLKI, Indonesian Consumers Foundation), Issues on E-waste in Batam City (Environmental Office of Batam City)

Panel Discussion II

Inspection and Problems in Facing Import of Second-hand Electronic and E-waste (Customs), E-waste Management (MOE), Issues on E-waste in Eastern Indonesia (Consultant).

Panel Discussion III

Policy on Development of Electronic Industry in Facing Trade of Second-hand Product and E-waste (Ministry of Industry), Existing Condition and Prospect of National Information and Communication Technology Industry (Ministry of Industry), Preliminary Identification of E-Waste Management in Indonesia (Ministry of Environment).

7.3 Findings

Legislation Aspect

- Regulation on prohibition of importing second-hand and e-waste has already been in place. However, trade of imported second-hand electronic product and product made of e-waste could be found easily in many places. It shows inconsistency in enforcing the regulation.
- Indonesia has not yet had specific criteria on e-waste, nor established specific regulation on e-waste management
- Legislation on bounded zone has direct linkages with amount of e-waste entering the country, as it allows to be used as raw material for recycling industry or for producing different type of products e.g. household appliances
- Legislation of e-waste disposal in bounded zone does not consider relevant regulation on Hazardous Waste Management
- There are different definitions on export-import of PCB scrap in Batam City that might be resulted from different reference of HS code

Institutional Aspect

- Different interpretation among institutions and organization regarding the legislation on e-waste reflects poor coordination and communication
- Some confusions among local government institutions in dealing with e-waste need to clarify by relevant institutions in central level
- E-waste discussion among institutions was started in January 2006, while the Workshop, that just has been convened in end of year 2006, is the real vehicle to involve other relevant organizations

Technical Aspect

- There is no technical definition on e-waste and second-hand equipment
- There is limited accurate and reliable data available, even in many cases authorities depend on data from trader association. Even worst, data in association is difficult to be accessed.
- there is no exact lifetime data of each type of electronic product to calculate assumption of the volume of e-waste

Economic Aspect

- Some institutions claim that second-hand electronic, refurbished electronic or electronic equipment made of e-waste component could benefit low-income society who could not afford the new ones
- They also concern the advantage of using this kind of electronic to create income generating of low skill and low capital livelihood, particularly under this unsolved economic crises situation
- Therefore they worry of unclear definition on e-waste would lead to unnecessary high cost waste management and opportunity cost to use that waste and second-hand product as those above-mentioned two economic activities.

- Ministry of Industry admit that illegal import of second-hand electronic and or e-waste has reduced domestic market for 40%. These products along with refurbished products has been many times captured by enforcement officers.

Inspection and Enforcement Aspect

- As an archipelago country, Indonesia has hundreds of seaports need to monitor for any illegal import of e-waste.
- Existing HS code, to some extent, has loop holes in order to falsify documents and to use inappropriate HS Code
- Survey in Batam and Wakatobi Island has found out that there are not inspection and enforcement taken in e-waste dumping sites
- There are indication the leakage or illegal entry of recycled and refurbished electronic equipment from bounded zone to Indonesian territory

Consumers Protection Aspect

- Consumers prefer to purchase cheap product instead of product quality and lifetime
- Limitation of information received by consumers and ability to assess the quality of the product
- There is no legal procedure to protect the consumers from defected product of second-hand or refurbished product

7.5 RECOMMENDATION

7.4.1 Legislation Aspect

- Ministry of Trade, Ministry of Industry, Ministry of Environment and Customs have to discuss regulation on prohibition of importing second-hand and e-waste in order to have similar legal interpretation to implement and enforce it accordingly
- Ministry of Trade, Ministry of Industry, Ministry of Environment and Customs have to discuss legislation on bounded zone facilities in order to have better understanding of

export – import procedures, and environmental and health consideration in disposing of the waste

- Ministry of Trade, Ministry of Industry, Ministry of Environment and Customs have to discuss the difference definitions on export-import of e-waste, for example PCB scrap, with refer to relevant HS Code. This is to prevent and to control falsifying of export-import document
- Indonesia has to establish specific regulation on e-waste management with the interest of national industry development, environmental and health concern and economic activities. It is also necessary to calculate immediately the amount of the e-waste to evaluate problem and provide its solution.

7.4.2 Institutional Aspect

- It is necessary to enhance coordination and communication among all involved institutions and organizations
- Central government institutions have to work closely together with local government as many cases of illegal import has occurred in their administrative boundaries
- Awareness and capacity of local government officers on managing hazardous waste including e-waste, have to be developed to deal with tricky and false promise of local revenue

7.4.3 Technical Aspect

- Technical criteria is needed to be agreed by all parties include universities and researchers to prepare definition and specific legislation on e-waste and second-hand electronic
- Manufacturers need to be encouraged to implement cleaner production and other approaches such as eco-design, extended producers' responsibility and take-back mechanism. It is necessary to arrange follow-up focused group discussion with them and their associations so that they can participate to share.
- Technical discussion should be convened among authorities and manufacturers to set up comprehensive management of e-waste including data collection and exchange.

7.4.4 Economic Aspect

- Cost of environmental recovery and health impact due to exposure of hazardous waste contained in the e-waste or low safety of refurbished electronic product should be taken into account in having net revenue the community could gain
- Refurbishment of electronic product conducted by mostly small and unauthorized enterprises or informal sector is not prohibited as long as they use domestic second-hand electronic or e-waste. The government even has to increase their technology capacity to operate in environmentally sound manner
- Calculation of economic benefit compared to environmental and health cost and reduction of domestic market share should be conducted to give stakeholders clear pictures of the problems of e-waste

7.4.5 Inspection and Enforcement Aspect

- Inspection and enforcement on illegal import of e-waste, refurbishment production process and export-import of e-waste, need to be increased particularly in the area surveyed where some illegal dumping sites were found
- Customs is encouraged to increase the effort in inspection and enforcement of illegal import of e-waste by building capacity of its fleet to monitor Indonesia's coast line, by increasing capability of its officers in identifying technical specification of illegal imported products, such as falsifying document and putting on inappropriate HS Code
- Although bounded zones are facilitated by specific export-import procedures, Customs has to inspect the leakage of the export-import flows to Indonesia territory, to decrease any potential damage to electronic industry development, environment and human health

7.4.6 Consumers Protection Aspect

- It is important to increase awareness of the people on product quality, technical specification and safety of refurbished electronic product. It is their right to have good quality and safe product

- Manufacturers need to be encouraged to enclose all relevant information regarding their products quality
- The government has to provide mechanism to protect consumers from sub-standardized products

REFERENCES

Aldin, M., 2003. Hubungan VOC dan Kesultanan Buton Pada Tahun 1613-1667. Kendari: Skripsi Sarjana Pendidikan Sejarah-FKIP-Unhalu.

Anonymous, 2006. Badan Pusat Statistik Wakatobi.

Anonymous, 2006. Rencana Pembangunan Jangka Menengah Daerah (RPJMD) Wakatobi. Bappeda Wakatobi.

Arafah, Nur, 1988. Pengaruh Lingkungan Terhadap Penyelundupan di Wakatobi. Jakarta: Finalis LPIR-XII Depdikbud.

Arensberg, CM. & Solon T. K., 1972. Culture and Community. Peter Smith, Massachusets.

Bahtiar A., 1992. Pengaruh Lingkungan Terhadap Aktifitas Perdagangan Illegal Luar Negeri (Studi Kasus Kecamatan Wangi-Wangi Kab Buton). Kendari: Skripsi Sarjana PMP-FKIP-Unhalu.

Denzin, NK., 1989. Interpretive Biography: Qualitative Research Method Series 17. SAGE Publication.

Governmental Regulation, 1999. Government Regulation Number 18/1999 on Hazardous Waste amended by Government Regulation Number 85/1999, Jakarta

Law of the Republic of Indonesia, 1995. Law Number 10/1995 on Custom Regulation, Jakarta

----------, 1997. Law Number 23/1997 on Environmental Management, Jakarta

----------, 1999. Law Number 8/1999 on Consumers Protection, Jakarta

Manalac, M.S., 200-, "*Electronic Waste: Threat in the Future*", University of the Philippines, Diliman, viewed 18/12/2006, <http://inter-disciplinary.net/ptb/ejgc/ejgc3/manalac%20paper.pdf>

Ministry of Industry and Trade, 1997. Decree Letter of Minister of Industry and Trade No. 229/MPP/KP/07/1997 on Import Regulations, Jakarta

----------, 1997. Decree Letter of Minister of Industry and Trade No. 230/MPP/KP/07/1997 on Regulated Import Goods, Jakarta

----------, 1997. Decree Letter of Minister of Industry and Trade No. 231/MPP/KP/07/1997 on Waste Importing Procedures, Jakarta

----------, 2003. Decree Letter of Minister of Industry and Trade No. 520/MPP/KP/08/2003 on the Prohibition of Import of Hazardous Wastes, Jakarta

----------, 2005. Ministerial Decree of Ministry of Industry and Trade No. 39/M-DAG/PER/12/2005 regarding Imported of Used Machinery and Equipment, Jakarta

----------, 2006. Data Kapasitas Produksi, viewed 18/12/2006 <http://www.dprin.go.id/data/Indonesia/Kapnas/fr01c01.htm>

Ministry of Industry and Trade. ILMEA database on Electronic Industry, viewed 14/12/2006 <http://ilmea.dprin.go.id/eksi/klp_detail.php?id=5&level=1>

National Statistic Agency. Monthly Export and Import

Nisbet, J. dan Watt, J. 1994. Studi Kasus: Sebuah Panduan Praktis (disadur oleh L. Wilardjo). Jakarta: PT. Gramedia.

Rabani, 1994. Migrasi dan Perkembangan Sosial Ekonomi Masyarakat Kepulauan Tukang Besi. Yogyakarta: Skripsi Sarjana Ilmu Sejarah Fakultas Sastra-UGM.

Safaa, Sarifuddin, 2005. Penyelenggaraan Pemerintahah Dalam Kawasan Taman Nasional Wakatobi. Makalah Seminar Kabupaten Konservasi. Bogor: Fakultas Kehutanan IPB.

Samlia, 1995. Peristiwa Penebangan Cengkeh di Wangi-Wangi Kesultanan Buton Abad XVII. Kendari: Skripsi Sarjana Pendidikan Sejarah-FKIP-Unhalu

Sitorus, MT. Felix. 1998. Penelitian Kualitatif: Suatu Perkenalan. Diterbitkan oleh Kelompok Dokumentasi Ilmu Sosial Jurusan Sosial Ekonomi Fakultas Pertanian IPB.