

Evaluation of Opportunities in E-waste Processing Facility  
Investment in Pune, India

LAHTI UNIVERSITY OF APPLIED  
SCIENCES  
Master Programme in International Business  
Management  
Master's Thesis  
Autumn 2011  
Sara Sakipour

Lahti University of Applied Sciences  
Master Programme in International Business Management

Sara Sakipour                      Evaluation of opportunities in e-waste processing  
   Facility investment in Pune, India  
Master's Thesis, 75 Pages, 12 Appendixes

Autumn 2011

## ABSTRACT

---

ELECTRONIC WASTE or E-WASTE or Waste Electrical and Electronic Equipment (WEEE) is the term used to describe old, end-of-life or discarded appliances using electricity such as computers, laptops, TV's, radios and refrigerators.

In India, rapid growth of the country along with urbanization and growing demand of electrical appliances has contributed to the digital revolution. However, this rapid development in hyper-technology has made e-waste one of the fastest waste streams. Pune is the second largest city in Maharashtra and 8th in country. More than 2,584 metric tonnes of e-waste is generated per year in Pune.

India has become an attractive destination for e-waste processing business. This thesis aims at evaluating this opportunity in the city of Pune to help the European investors find out how to do this business in the city of Pune.

The author aims at proposing the best applicable business model to European investors to help them achieve a successful business with regard to market situation.

The theoretical part contains e-waste concepts and all the necessary theories to develop a business model.

The research method applied in the whole study is qualitative method.

The empirical part contains the result of market research which includes stakeholders, competitors and customers.

In the conclusion part, an applicable business model is proposed which includes entry mode, supplying and distribution channel and products or services.

Key words: E-waste, e-waste processing business, ERP, recycling, re-use, collection mode, business model, India, Pune

## CONTENT

LIST OF FIGURES	IV
LIST OF TABLES	IV
1 INTRODUCTION	1
1.1 Background	1
1.2 Research questions, objectives and scope	4
1.2.1 Objectives	4
1.2.2 Research questions	4
1.2.3 Scope	5
1.3 Research approach	5
1.4 Structure of the research report	6
2 E-WASTE MANAGEMENT AND BUSINESS	7
2.1 E-waste definition and characteristics	7
2.2 E-waste generation and recycling rate	9
2.3 3-R principle and EPR model	10
2.4 E-waste treatment process and state of art technology	14
2.5 E-waste management model in Germany	16
2.6 E-waste business	18
3 INTERNATIONAL BUSINESS STRATEGY	19
3.1 International Marketing Process	19
3.2 Market Analysis	20
3.2.1 International Market Macro-Environment	21
3.2.2 Micro Environment Analysis	23
3.2.3 Competition analysis	25
3.2.4 Stakeholders Analysis	28
3.2.5 Cost and Payback Period	29
3.3 Business model development	30
3.4 Entry mode-Direct investment	32
3.5 Products/service	35
3.6 Customer segment	35
3.7 Supplying and distribution channel	36
3.8 Revenue model	36
4 RESEARCH METHODS	37

4.1	Steps of research	38
4.2	Data collection	39
4.3	Data analysis and interpretation	40
4.4	Research context	41
5	E-WASTE PROCESSING BUSINESS IN PUNE	42
5.1	E-waste generation	43
5.2	Driving forces to manage e-waste	44
5.3	Legislations concerning E-waste	45
5.4	Flow of e-waste	47
5.5	Big players and collection centers	49
5.6	Porter's 5 forces analysis	53
5.7	Stakeholders' analysis	55
5.7.1	Key stakeholders	55
5.7.2	Stakeholders priority	58
5.8	Summary	60
6	CONCLUSION	60
6.1	Market potentials and risks	60
6.2	Business model	63
6.2.1	Business scope definition	64
6.2.2	Customer segment	65
6.2.3	Product/service	65
6.2.4	Supplying and distribution	66
6.2.5	Revenue model	69
6.2.6	Mode of direct investment	72
6.3	Discussion	73
	REFERENCES	74
	APPENDICES	79

## LIST OF FIGURES

Figure 1: Waste hierarchy (source: Wastenet, 2011).....	12
Figure 2: Simplified flow diagram for the recycling of WEEE/E-waste.....	15
Figure 3: International marketing process .....	20
Figure 4: The five forces shape industry competition (porter, 2008).....	26
Figure 5: The business model mediates between the technical and economic domains (chesbrough. H, Rosenbloom R.S, 2002).....	32
Figure 6: E-waste generation (source: Tata strategic analysis) .....	44
Figure 7: Revenue mix (Source: annual report, 2010) .....	51
Figure 8: Scope for expansion .....	52
Figure 9: Porter’s 5 forces analysis for e-waste processing industry in India .....	53
Figure 10: Stakeholders identification (onprojects, 2007) .....	55
Figure 11: power/interest grid of stakeholders .....	59
Figure 12: E-waste recycling chain (source: StEP, 2009) .....	61
Figure 13: Issues and challenges .....	62
Figure 14: Hub and spoke model.....	67
Figure 15: Hub and spoke model for collection .....	67
Figure 16: proposed supply chain.....	68
Figure 17: Revenue model.....	70
Figure 18:Financial flow.....	72

## LIST OF TABLES

Table 1: the factors that influence entry mode choice (Driscoll, 1995) .....	33
Table 2: Comparison between Joint venture and Wholly foreign own enterprise (legalserviceindia, 2011).....	34
Table 3: Interview chart.....	40
Table 4:Waste from 183 computers( source: Toxic links) .....	70

# 1 INTRODUCTION

## 1.1 Background

ELECTRONIC WASTE or E-WASTE or Waste Electrical and Electronic Equipment (WEEE), is the term used to describe old, end-of-life or discarded appliances using electricity. It includes computers, consumer electronics, fridges which have been disposed of by their original users. E-waste contains toxic components which are hazardous in nature. The toxic components in the E-waste includes lead, mercury cadmium, printed circuit boards, arsenic, silicon, chromium, barium, bromine, poly vinyl chloride and other heavy metals. Hence, improper handling of E-waste leads to environment and health hazards. The range of these products is given below:

- *Computers*
- *Printers*
- *Fax machines*
- *CD players*
- *Televisions*
- *Radios*
- *VCRs*
- *Telephones*
- *Microwave ovens*
- *DVDs*

The United States is the largest producer of e-waste in the world. China stands in second place. Current population of India in 2011 is around 1,190,000,000 (1.19 billion) people (India online pages, 2011). India is one of the fastest growing economies of the world. In the recent years the consumption of electrical and electronic equipment (EEE) both from the institutional users and households has been increased. For two reasons e-waste is the fastest growing waste stream in

India. One is the high rate of consumption and the second one is short product lives due to the advance in technology.

Mumbai is India's largest port city. Pune is located 175 kms from Mumbai. Pune is the second largest city in Maharashtra and 8th in country. Pune city is Information Technology (IT) destination in the country. Therefore many IT companies have established their offices and they are expanding. Also the large number of educational and commercial institutions use IT and communication equipments. As per the 2007 report by Maharashtra Pollution Control Board (MPCB) on e-waste in Mumbai and pune region, Mumbai and Pune are among the top ten cities that generate e-waste. Mumbai generate the maximum e-waste in the country. Out of total e-waste generation in Maharashtra Pune contributes 2584.21 tonnes. The Mumbai-Pune industrial belt has become a hot spot for the investors. Mumbai is the port of import for new and used electronics. India has the task to address issue of illegal import. Industrial Hazardous Waste for the city of Pune is being managed by the MPCB regional office.

In 2010 the Indian Government moved to control the e-waste situation in India by drafting the E-waste (Management and Handling) Rules 2010. Under these rules the producer of electronic equipment is responsible for the collection and appropriate disposal of e-waste generated at the end of life of its products. The producers include manufacturers of products under their own brand, as well as those who sell under their brand products that are manufactured by contractors as well as importers of products for sale in India. The drafted rules will also ban the import of used electrical and electronic equipment in India.

Before that, rules addressed mainly the handling and disposal of industrial waste generated in manufacturing, and did not take into account the e-waste generated by products like computers at the end of their lifecycle. But MAIT (Manufacturers Association of Information Technology), Greenpeace, and other organizations have been pushing the government for the adoption of better e-waste rules (Ribeiro, 2010.)

For further knowledge about the new 2011 rules please refer to appendix 1.

There is no authorized recycling plant in Pune; therefore there is no proper management method to handle this huge amount of e-waste. Due to the inadequate infrastructure to manage e-wastes safely, these wastes are buried or burnt in the open air or dumped into the water.

In Pune and the surrounding areas, E-Waste is collected and then physically dismantled to recover plastic, metal, rubber, and glass and then forwarded to Mumbai where further dismantling and extraction of material takes place. The remainder is in turn sent to Delhi where precious metals such as Gold, Palladium, Silver and Copper are extracted from Printed Circuit Boards.

There are only about 10-12 organised e-waste management companies in India. Foreindia is one of the e-waste recycling companies in pune. ForeIndia has come up with a unique way to manage e-waste. Hi-Tech recycling (P) Ltd is another collection center in Pune. The company works in the fields of logistic e-waste management, data erasure and refurbishing, remarketing and recycling services. This company conducts a responsible in-house demanufacturing service for non-reusable and/or non-resalable products.

Attero Recycling is the only e-waste recycling company in India which does the processing of e-waste with zero landfill. Attero is based in Noida. Eco Recycling Limited, (Ecoreco) a subsidiary of Infotrek Syscom Limited, incorporated in the year 1994.

There are some venture capital firms that are investing in e-waste recycling plants in India. For example NEA-IndoUS Ventures, Draper Fisher Jurvetson, Granite Hill India opportunity ventures. Also International Finance Corporation (IFC) helps sustainable economic growth in developing countries by financing private sector investment, mobilizing capital in the international financial markets, and providing advisory services to businesses and governments.

Unlike Europe, e-waste is a valuable resource in India, and European investors need to recognize the characters of Indian e-waste processing market first. European investors have more experience in e-waste management. Due to the advance in technologies, European processors can recycle nearly 100% materials of e-waste and discharge 0%, for example Kuusakoski Company of Finland. Other key companies in Finland that are engaged in e-waste management are

- 1) Ecomation Oy: Maker of fully integrated e-waste processing machine



- 2) Otokumpu Oy : Metals refining company
- 3) Outotec Oy : Equipment maker for metals refining company
- 4) Azusser Oy : Equipment maker for battery recycling

Although India has become a welcoming destination of foreign investment but, investors find it difficult to enter the Indian markets due to political, bureaucratic, socio-cultural and demographic complexities of the country.

It is important for an investor to develop a good understanding of the Indian market and the economic situation of the country before entering into the economic system.

The author aims to do research about India e-waste processing market, and provide valuable suggestions on how to do e-waste business in the city of Pune in India for foreign investors.

## 1.2 Research questions, objectives and scope

### 1.2.1 Objectives

This study is to evaluate business opportunities in E-waste processing facility investment in Pune, India. The evaluation aims at finding out the characters of Indian market and business potentials and risks as well as the investment return. Based on the results, an innovative business model will be proposed for foreign investors. The components of business model for e-waste recycling unit in India consist of value chain analysis for e-waste in India, entry mode, risk management based on the entry mode, marketing plan process, success factors for doing business in India and business scope and target customers.

### 1.2.2 Research questions

The main question in this research is:

- What are the characteristics of Indian e-waste processing market? How to do a successful e-waste processing business in Pune, India?

But to find out the answer to the main question the following sub-questions are produced:

- How to understand an international market?
- How to develop a business model for e-waste processing in Pune, India?
- What are the e-waste and the characteristics of e-waste?
- What is the current situation of e-waste in India especially in the city of Pune?
- What is the current situation of e-waste in developed countries?

### 1.2.3 Scope

This research focuses only on the city of Pune and not the entire country. In order to execute this assignment, it is necessary to study the e-waste business chain linking different stakeholders to understand the trade economics and associated environmental impacts. So in order to conduct a field research in Pune, the author has the privilege of visiting some of the key players within the market. The author's discussion on entry mode, focuses only on direct investment and does not propose other entry modes as the preferred entry mode for example licencing because, these can't reveal a strategy that seeks little bureaucratic influence as well as to ensure an attractive return on investment.

### 1.3 Research approach

In this thesis, the author has employed qualitative method. This method helps to analyze the market which is important to find and recommend appropriate market entry mode for the prospective foreign companies.

The qualitative method also helps to analyze market's external environment, and market phases and finally drawing a conclusion on market evaluation.

In the theoretical part, the information is collected from secondary resources mainly authorized websites, articles and also books, and studies carried by other people.

In the field study primary data is captured through observation and interviews. In this part it is important to draw respondent's attention before starting the questions.

The author conducted face-to-face interviews with some of the companies dealing with e-waste processing facilities in Pune.

After interviewing some of the main players in the area a comparative method is applied to find out their success or failure factors in order to come up with the best business model for foreign companies.

#### 1.4 Structure of the research report

The thesis is in 6 chapters. Chapter one is the opening part which presents the background of the study, followed by research objective, research questions, research limitations, theoretical framework, research method and approach.

Chapter two and chapter three describe the theoretical framework. Chapter two introduces conceptual issues of e-waste, such as definition, characteristics, technology, generation and recycling, managerial principles and model. Chapter three helps to analyze the market with the help of theoretical knowledge, considering different forces such as stakeholders, industry actors; competition analysis as well as investment return analysis.

In chapter four, the research methodology and research context is presented. The contents of this part are including research approach and empirical material, data analysis and interpretation, also presents how the data was collected in order to find the answers for main research question and supporting research questions, comparative study method, strategy to develop a business model. This chapter guides the author to do the subsequent empirical research.

Author's field study and market analysis are described in Chapter five. Chapter six contains evaluation result of e-waste processing in Pune. The evaluation is subject to market potentials and risks. A business model is submitted based on previous analysis and findings.

## 2 E-WASTE MANAGEMENT AND BUSINESS

In order to start an e-waste business it is necessary to understand the basic concepts. This chapter describes basic concepts of e-waste management, including: e-waste definition and characteristics, e-waste generation and recycling rate, the current situation of e-waste management worldwide, 3-R principle and ERP model.

### 2.1 E-waste definition and characteristics

#### **Electronic waste, e-waste, e-scrap, or Waste Electrical and Electronic**

**Equipment (WEEE)** refers to any old, obsolete, end-of-life appliances using electricity which has been disposed of by their owners. E-waste includes discarded old computers, television sets, refrigerators, radios, telecommunication equipment, and laboratory equipment, basically any electrical or electronic appliance that has reached its end-of-life. E-waste has been one of the fastest growing waste streams in the world. E-waste contains valuable materials such as aluminium, copper, gold, palladium and silver, it also contains harmful substances such as lead, arsenic, mercury, hexavalent chromium, cadmium, barium and phosphorous. These substances are not only affect environment, but also the health of people if these substances are not properly treated at the end of life (Eol) of the equipment. The harmful effects of these elements are:

#### **LEAD**

- Extremely harmful to the human body;
- Damage both the central and peripheral nervous systems;
- Can cause seizures, retardation, high blood pressure, damage to the kidneys and liver;
- Adversely affects child development

#### **BERYLLIUM**

- Long term exposure can be carcinogenic, especially for the lungs;
- Extreme exposure can lead to a potentially fatal condition known as Acute Beryllium Disease

#### **ARSENIC**

- Arsenic is a notoriously potent poison;
- Causes severe damage to the digestive tract

### **MERCURY**

- Attacks the central nervous and endocrine systems;
- Harmful to mouth,teeth and gums;
- Poses risk in the neurological development of unborn foetuses

### **ANTIMONY**

- Toxic to humans in ways similar to arsenic;
- Fatal in large doses

### **CADMIUM**

- Potentially carcinogenic;
- Repeated exposure can damage the lungs, kidneys and liver;

Many electronic products have batteries that often contain nickel, cadmium, and other heavy metals. Relays and switches in electronics, especially older ones, may contain mercury. Also, capacitors in some types of older and larger equipment that is now entering the waste stream may contain polychlorinated biphenyls (PCBs).

Recycling e-waste needs suitable techniques and protective measures otherwise it can result in toxic emissions to the air, water and soil and cause severe land, water and air pollution.

Categories of Electronic waste:

1. Large household appliances
2. Small household appliances
3. IT and telecommunications equipment
4. Consumer equipment
5. Lighting equipment
6. Electrical and electronic tools (with the exception of large-scale stationary industrial tools)
7. Toys, leisure and sports equipment
8. Medical devices (with the exception of all implanted and infected products)
9. Monitoring and control instruments
10. Automatic dispensers

(econoweee, 2011)

E-waste has two primary characteristics:

- **E-waste is hazardous** - E-waste contains over 1,000 different substances, many of which are toxic, and creates serious pollution upon disposal.
- **E-waste is generated at alarming rates due to obsolescence** - Due to the extreme rates of obsolescence; E-waste produces much higher volumes of waste in comparison to other consumer goods. The increasingly rapid evolution of technology combined with rapid product obsolescence has effectively rendered everything disposable. (Mpcb, 2007)

## 2.2 E-waste generation and recycling rate

Due to the advance in technology people are upgrading their mobile phones, computers, televisions, audio equipment and printers more frequently than ever before. Therefore the amount of E-waste generation is growing rapidly in both developed countries as well as developing countries.

Global e-waste generation is growing by about 40 million tonnes a year (Sciencedaily, 2010). The United States is the largest producer of e-waste in the world. Most recent data from the Environmental Protection Agency estimates that 2 million tons of e-waste is created each year in the United States (VeganVerve, 2011).

Due to new electronic sales, as well as the import of e-waste from other countries China produces the second largest amount of e-waste at 2.3 million tons (Sustainable life media, 2010).

In European Union (EU), e-waste is growing three times faster than average annual municipal solid waste generation. Total amount of e-waste generation in EU ranges from 5 to 7 million tonnes per annum and is expected to grow at a rate of 3% to 5% per year. By 2011, it is estimated that e-waste generated in India would touch 470,000 MT. This is contributed by both house holds and corporate houses. In India, among the 10 states, Maharashtra ranks first in the e-waste generation. The total e-waste generation in Maharashtra accounts for 20,270.6 tons per year. Due to the presence of a large number of Information Technology Parks & electronic products manufacturing companies Mumbai and Pune generates the most of e-waste. (Envis, 2010)

By 2020, e-waste from televisions will be 1.5 to 2 times higher in China and India while in India e-waste from discarded refrigerators will double or triple (UNEP, 2010).

Maharashtra Central Pollution Control Board (CPCB) has identified Pune as one of the top ten cities generating e-waste. According to MPCB, more than 19,000 tonnes of e-waste is generated in Pune and Pimpri-Chinchwad area and the projected growth in the e-waste is estimated at 3500 tonnes a year. (Envis, 2010)

### 2.3 3-R principle and EPR model

In recent years the management of end-of-life electronics has become world's environmental and development issues to tackle. E-waste is growing exponentially simply because the market for electronic products is also growing rapidly. Rapid product innovations and upgrades combined with the migration from analogue to digital technologies and to flat-screen TVs and monitors are fuelling the increase. Due to increases in the generation of e-waste and its danger to the environment many countries legislate and implement policies that tackle the environmental problems along with e-waste. In 2010, the Indian Government moved to control the e-waste situation by drafting the E-waste (Management and Handling) Rules 2010. Under these rules the producer of electronic equipment is responsible for the collection and appropriate disposal of e-waste generated at the end of life of its products. The draft is now called as "E-waste (management and handling) rules, 2011" and shall come into effect from 1st May, 2012.

The principle of reducing waste, reusing and recycling resources and products is often called the "3Rs." 3-R is the most effective solution to the growing e-waste problem.

**Reduce** presents two propositions for producers and consumers. For producers, they design more environmental friendly. This means decreasing the composition of hazardous elements, considering easy disposal. For consumers, they make purchasing environmental products a priority. (Step, 2008)

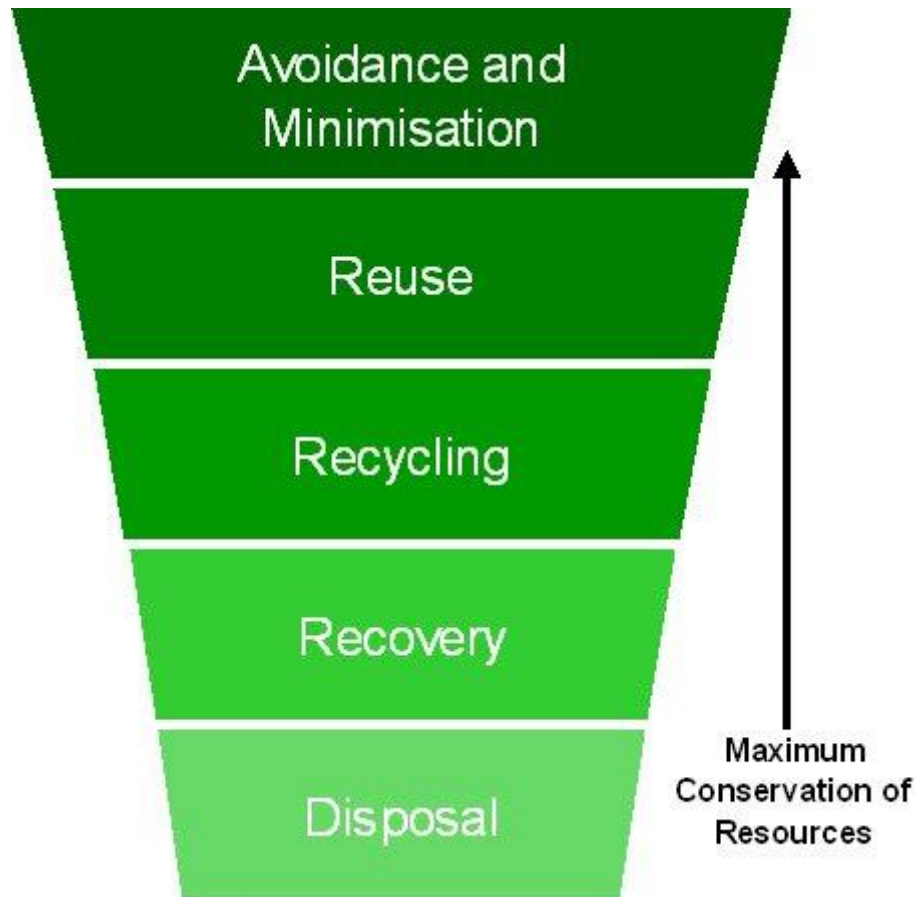
**Reuse** means if the used EE products and their accessories are in good condition to work, they could be re-sold to serve after refurbishing and cleaning up pro-

cess. In other cases, although the whole equipment doesn't work, the components can be disassembled and reused. Reuse is subject to save materials and power. (StEP, 2008) Reuse is the environmentally preferable option by extending the life of old equipments that defers the pollution and resource consumption associated with in making new products. Reuse provides opportunity, to the underprivileged who cannot afford or have no access to electronic equipment, at reduced or no cost.

**Recycle** refers to the proper end-of-life disposition of obsolete equipment. It's a conventional process. E-waste's valuable elements are reverted to a raw material form. The other parts, which can not be recycled, will be disposed without harmful impaction to environment. Recycling is the crucial process for sustainability, which contributes to utilize resource efficiently, decrease consumption of natural resources and save energy for mining materials. For example, if 100 million cell phones were recycled, the energy we save is enough for 19,500 households with electricity power for one year. (StEP, 2009) Some of the benefits from recycling are:

- 100% landfill diversion
- Recovery of raw materials from e-waste
- Arrangements for collection and removal of equipment from your premises
- Competitive pricing for recycling services





**Figure 1: Waste hierarchy (source: Wastenet, 2011)**

Most electronic devices contain a variety of materials, including metals that can be recovered for future uses. By dismantling and providing reuse possibilities, intact natural resources are conserved and air and water pollution caused by hazardous disposal is avoided. Additionally, recycling reduces the amount of greenhouse gas emissions caused by the manufacturing of new products. It simply makes good sense and is efficient to recycle and to do our part to keep the environment green. (EWC, 2011)

**"Extended producer responsibility" (EPR)** means that the responsibility of producers for their products is extended to the post-consumer stage. Under EPR, a company must be concerned not only with making the product and how it functions, but also with what will become of the product at the end of its useful life. In the case of consumer goods, this principle shifts responsibility for recycling and waste disposal from local government to private industry, thereby internalizing the costs of waste management into product prices. Under such a scheme, citizens pay for waste management as consumers, when purchasing products, rather than as taxpayers, through local taxes. EPR programs typically are aimed

at increasing recycling and often contain mandated recycling targets. (Bette Fishbein, 1996) EPR is an environment protection strategy.

### **Goals of EPR:**

The four principal goals of EPR, as stated by the OECD (Organisation for Economic Co-operation and Development) (2001) are:

1. Source reduction (natural resource conservation/ materials conservation)
2. Waste prevention
3. Design of more environmentally compatible products
4. Closure of material loops to promote sustainable development (Swiss ewaste competence,2011)

**Take-Back System Structure** According to StEP report, a model of e-waste management consists of four components, they are: systems of collection, processing, system management, which are the three main functions and financing scheme that enable the system to be executed.

If the collection, processing, financing of e-waste treatment were responsibilities assigned to producers, it would be regarded as EPR model. The result is easy recycling, prevent e-waste into inappropriate treatment stream, incentive environmental friendly e-waste industry.

**Collection system** The primary modes for accomplishing collection are: permanent drop-off facility, special drop-off events and door-to-door pick-up. The mechanism for accomplishing a mode depends on the stakeholder responsible for collection, which could be a government, retail, OEM (original equipment manufacturer) or commercial entity. A government entity could include a municipal or state department responsible for collecting waste. Retailers sell electronics in brick-and-mortar stores. Commercial entities involved in collecting e-waste are generally electronics recyclers, but could also be generic waste collectors. OEMs are the manufacturers of electronic products. (StEP, White Paper, 2009.)

**Processing system** is to firstly evaluate the collected scraps; some in good conditions will be refurbished and sold for reusing; the others will be recovered for valuable components, plastic, glass and metals; the rest, which are non-recycled and reminding post-recycled will be disposed properly. The mechanism of processing includes: storage, facilities in refurbishing, repairing, product lines in recycling and final disposal as well as the distribution channels of products reusing, recovering materials. (StEP, 2009; EPA US, 2009)

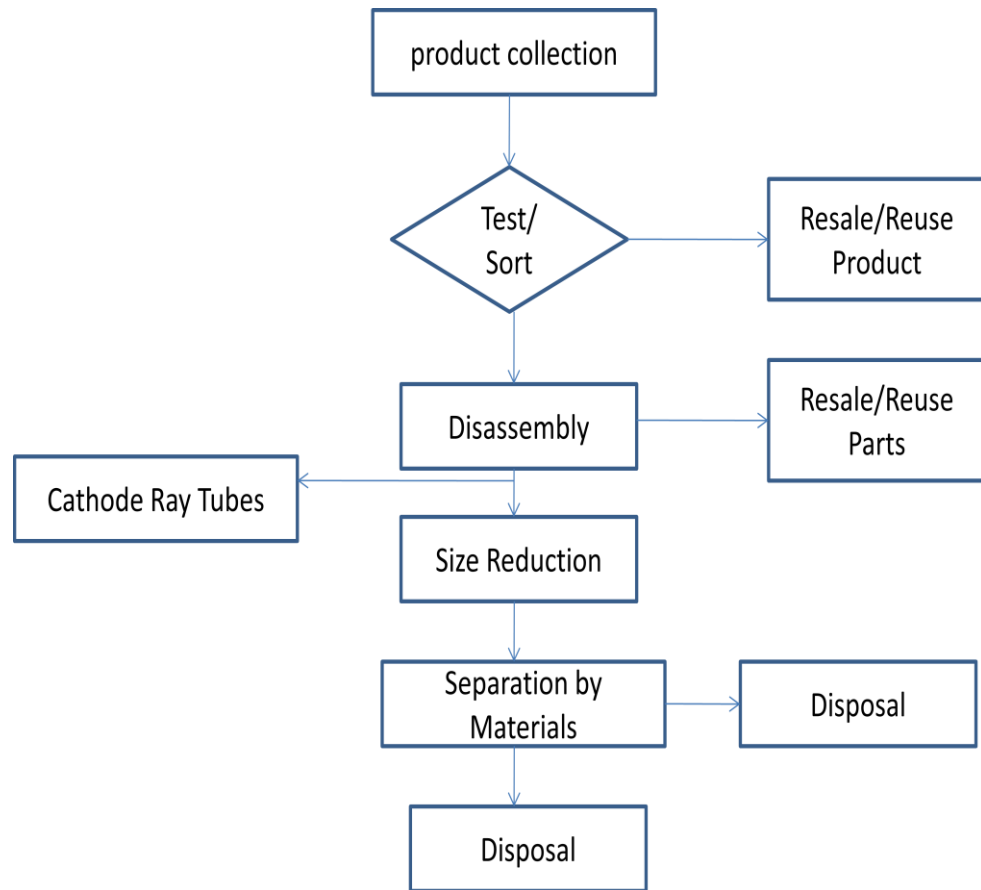
**System Management;** a take-back system does not run itself: an entity must be responsible for coordinating the actions of various stakeholders and enforcing the system rules and regulations. The system manager may be one of several different types of public or private entities that are outlined in this section. (StEP, White Paper, 2009.)

**Financing Schemes;** Financing of downstream e-waste activities and allocation of economic responsibilities along the downstream chain has proven to be challenging in countries with existing take-back schemes and in countries discussing potential take-back system architectures.

The way stakeholders financially contribute to different activities varies and many models exist. From a general perspective, there are three main stakeholders who could bear responsibility for end-of-life electronics products: The entire society, the consumers, the producers. (StEP, White Paper, 2009.)

## 2.4 E-waste treatment process and state of art technology

With the help of these official agencies' websites in e-waste management: United Nations Environmental Program, EPA US; Swiss E-waste Guide; The National Center for Electronics Recycling (NCER) US, the following is the process chart of e-waste treatment, and instruction of technology. It starts from product collection. At this stage, products are divided based on type and size. Then we have product testing in order to sort reusable and non-reusable WEEE/E-waste separately. Non-reusable WEEE/E-waste is disassembled into various parts. It is also very important to avoid pollution during downstream process. It is a manual work and can be done with the help of use of machine and hand tools.



**Figure 2: Simplified flow diagram for the recycling of WEEE/E-waste**

Source: Hai-Yong Kang, Julie M. Schoenung, Electronic waste recycling: A review of U.S. infrastructure and technology options, *Resources Conservation & Recycling* 45 (2005) 368-400, Elsevier

WEEE/E-waste fractions are sorted into reusable and non reusable parts. There are two technologies involved; refurbishing and shredding. Some parts will be repaired to resell. Non-reusable WEEE/E-waste parts undergo size reduction, separation and recovery of different materials for example ferrous metals, non-ferrous metals, plastics. They should be refined in order to be sold. The remaining WEEE/E-waste fractions are disposed. We have 4 different ways for disposing of e-waste which are: landfilling, incineration, recycling or exportation.

The most common practice is disposal in landfills. A large number of adverse impacts may occur from landfill operations. It results in leaching of toxic metals in soil, fatal accidents; infrastructure damage; pollution of the local environment; offgassing of methane generated by decaying organic wastes; harbouring of disease vectors such as rats and flies, particularly from improperly operated

landfills, which are common in developing countries; injuries to wildlife.(Ioma, 2008.)

Incineration technology converts the waste into ash, flue gas, and heat. The incineration process release heavy metals and other toxicants contained in electronic components as air emission. Incineration has strong benefits for the treatment of certain waste types in niche areas such as clinical wastes and certain hazardous wastes where pathogens and toxins can be destroyed by high temperatures. But the best way for disposing of electronic components is recycling process only if it employs environmentally sound recycling.

The approaches of e-waste processing changes rapidly as innovative technologies are employed. The final goal of processing technology innovation is to achieve Zero-emission or Zero-landfills (StEP, 2009; Renovodata Service, 2009).

## 2.5 E-waste management model in Germany

EPR model has been implemented in developed countries. In Germany under The new Electrical and Electronic Equipment Act [ElektroG] producers, importers and resellers have to take back and dispose the e-waste at their own charge, not only from business users but (via the municipal collection points) also from consumers. The "Elektrogesetz" limits and reduces the use of certain hazardous substances (RoHS), e.g. lead or quicksilver, in newly designed and produced equipment.

On July 6, 2005 the Federal Environmental Agency designed the "Stiftung Elektro-Altgeraete Register [EAR]" in Fuerth, Germany. EAR is accepting registrations of producers and their equipment.

In this model the users return electronic waste to the local collection sites. On the hand-over by the consumer the waste is divided into 5 separate types [collection groups]:

1. Large household appliances, automatic dispensers
2. Refrigerators and freezers
3. IT and telecommunications equipment, consumer equipment

4. Gas discharge lamps
5. Small household appliances, lighting equipment, electric and electronic tools, toys, sports and leisure equipment, medical products, monitoring and control instruments.

These collection sites are administrated by EAR.

**Recovery Procedure:** The local collection sites report a full container to EAR. Using a specific mathematical algorithm the clearing then determines the appropriate producer who will be responsible for its collection. The producer has to ensure that the container is immediately picked up by a logistics company and recovered and treated by a certified treatment facility afterwards.

What are the impacts of "Elektrogesetz"?

The consumer may return WEEE covered by the "Elektrogesetz" free of charge at the nearest public collection point. The registration of the producers, importers and resellers and their responsibility for the recovery of their WEEE additional indirect costs (e.g. through increased equipment prices or municipal waste collection fees) should be avoided.

Producers, as identified by the "Elektrogesetz", have to consider a number of obligations and deadlines. These companies have to register themselves and their equipment at EAR. As soon as the system starts they will have to care for the recovery, labeling, treatment, product design, giving information to the customers about possible recovery, reuse or disposal of the WEEE and continuously report the results to EAR.

The public waste management authorities have to prove suitable collection points for the return of WEEE. (The Elektrogesetz, 2011.)

India has a large recycling industry and has emerged as a major market for old and junked computers (Agarwal et al., 2003). It has been estimated by GTZ-MAIT study in 2007 that of the total e-waste recycled in India, 95 percent is recycled by informal recyclers, only 5 percent by formal recyclers.

A future model of an Indian e-waste handling system must make sure that informal recyclers play an active role, because it provides a significant number of jobs for many unskilled workers and it is their main source of income.

Historically, in 2001 in cooperation with MoEF (Ministry of Environment and Forests), the German Technology Cooperation (GTZ) began work on hazardous

waste management in India through the advisory services in environmental management.

## 2.6 E-waste business

ENVIRONMENT PROTECTION is today the major concern all over the world. Electronic waste should be looked at as a commodity because electronic products have a value even when they reach end of useful life. E-waste that we are throwing away contains more aluminium, gold and copper than we find in the ores. These metals are used in the circuit boards of computers and electronic gadgets. According to the study, 5 tonnes of e-waste, which would come from about 183 computers, gives a huge profit of Rs 1,78,308 (one lakh seventy eight thousand and three hundred and eight Rupees) (kukday kavita,times of india,2007). According to a report by UNEP titled, "Recycling - from E-Waste to Resources," the amount of e-waste being produced - including mobile phones and computers - could rise by as much as 500 percent over the next decade in some countries, such as India. Greenpeace, 2008 Report predicts the global WEEE arising from PCs, mobile phones and televisions will be around 5,504,737 MT in the year 2010 and 9,762,935 MT by the year 2016. India is now confronted with the huge problem of e-waste - both locally generated and internationally imported. Because it is often cheaper to buy a new device than to repair it, the rate of disposal has been on the rise. These hazardous wastes are still typically dismantled and recycled by hand in India in unorganized scrapyards that lack safeguards and government guidelines. Recently in India, electronic waste put under the hazardous waste management rules and any producer should recycle it with authorised e-waste recyclers, this new rule direct more and more of e-waste to the organised sector.

Multinationals such as HP and Sony Electronics are also showing keen interest in setting up plants in India.

In Pune, the city fast becoming the Silicon Valley of Maharashtra, e-waste is increasing at an alarming rate. An assessment carried out in India by MAIT and GTZ quantified e-waste generation to approximately 330000 MT, expected to

touch 470000 MT by 2011. Of the generated waste, only 19000 MT is recycled primarily by the informal sector. There is an urgent need to bridge the existing gap between e-waste generation and recycling.

### 3 INTERNATIONAL BUSINESS STRATEGY

In this chapter the author introduces international marketing, analyzes the target market and evaluates the situation of electronic waste recycling in India.

International marketing (IM) is also known as global marketing. It simply refers to the marketing carried out by organizations, across the national borderlines.

According to the American Marketing Association (AMA) "**international marketing** is the multinational process of planning and executing the conception, pricing, promotion and distribution of ideas, goods, and services to create exchanges that satisfy individual and organizational objectives.

Higher demands, population growth, movement of information at the speed of light have increased the importance of international marketing in the world.

Without international trade, nations would be limited to the goods and services produced within their own borders.

#### 3.1 International Marketing Process

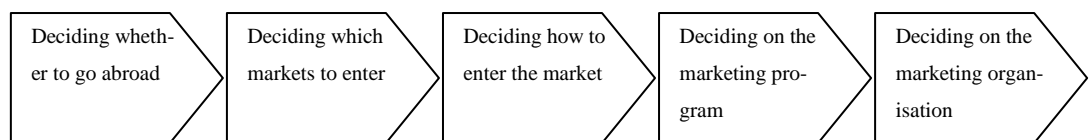
According to Kotler's theory (2007 & 2009), the international marketing process is comprised of 5 steps.

1. Analyzing international marketing opportunities to identify needs that a marketer may satisfy through its products or services. It can be done through secondary or primary data collection and analysis (market research).
2. After identifying the potential opportunities, select the groups of potential international customers (target markets) to whom to sell the products or services. It involves identifying the potential buyers, demand measurement & forecasting, market segmentation, market targeting & market positioning.



3. Adopting appropriate business and marketing strategies to offer best value to the potential customers, the firm needs to optimize all the activities, efforts undertaken and resource utilization. This requires the firm to adopt a coherent and appropriate logic or strategy to direct and control the alignment, coordination and optimization of its business and marketing effort.
4. Developing the international marketing mix, product, place, price & promotion
5. Manage the international marketing effort properly. Firms also need proper analysis, planning, implementation and control of their marketing programs.

The international marketing process is shown in figure 3.



**Figure 3: International marketing process**

### 3.2 Market Analysis

The goal of a market analysis is to determine the attractiveness of a market and to understand its evolving opportunities and threats as they relate to the strengths and weaknesses of a firm.

According to David A. Aaker (2001) the following are the dimensions of a market analysis.

- Market size (current and Future)
- Market growth rate
- Market profitability
- Industry cost structure
- Distribution channels
- Market trends
- Key success factors

Here we learn more about some of the concepts and tools associated with market analysis including macro environment, micro environment, stakeholders' analysis, competition analysis.

### 3.2.1 International Market Macro-Environment

Philip Kotler divided the marketplace into macro-environment and micro-environment. Macro-Environment also called general environment. Macro forces are external and uncontrollable and affect organisation's performance and strategies. These factors include the economic factors, demographics, legal, political, and social conditions, technological changes, and natural forces. Some examples of macro environment influences include competitors, changes in interest rates, and changes in cultural tastes, disastrous weather, or government regulations. Philip kotler defined macro environment factor is the driving force of market, while micro environment factor means the actors of industry (Kotler et. al, 2008). According to Kotler, macro-environment contains forces that can have a major impact on the factors in the micro-environment, which is why smart marketers track environmental trends and changes closely. Macro-environment include forces that creat opportunities and pose threat to the business units.

According to Hill and Jones,"*The macro environment consists of the broader economic, social, political, legal, demographic and technological setting within which the industry and the business units are placed.*"

#### **Political**

Political factors refer to intervention of government in the economy. The government may influence or limit various companies by its laws, regulations and policy to make sure that we have a fair market. A stable and dynamic political environment is necessary for business growth. An industry may have specific laws and regulations for example the political framework in India effects on the electronic waste recycling system. The Policy Statement on the Abatement of Pollution issued by the government of India in 1992, Hazardous Waste Manage-

ment and Handling Rules 2000. The Indian Government moves to control the e-waste situation in India by drafting the E-waste (Management and Handling) Rules 2010.

### **Economic**

These include interest rates, taxation changes, economic growth, inflation and exchange rates. If economy is in a depression, it will have negative effect on the business. Boom conditions have a positive effect on the economy for example higher national income growth increase demand for a firm's products. In general economic environment includes money market, capital market, infrastructure facilities, and purchasing power. In boom condition the purchasing power is high. Consumers afford to buy electronic products according to the latest fashion and innovation and throwaway the old ones. For example, the introduction of LED Screens, wireless keyboards and mice have replaced old hardware. In boom conditions we have

- Growth in software industry
- Computerization of banking and financial institutions, insurance, retail and other sectors

Therefore the generation of e-waste is higher.

### **Social**

Society and business influence each other and social-cultural factors are beyond the control of the business. Changes in social trends can impact on the demand for a firm's products. It will also affect availability and willingness of individuals to work. For example, considering the aging population demand for sheltered, accommodation and medicines increases whereas demand for toys falls. The social-cultural factors that influence e-waste business in India are e-waste generation, e waste collection, users' attitude for discarded EE products, knowledge of society, stakeholders and informal sector towards electronic waste recycling, its rules and regulations formed by the government. Also raising awareness among

the SMEs for business partnerships with larger industries, knowledge sharing, training and networking is an important activity.

### **Technological**

New technology creates new markets and new opportunities for businesses. New technologies create new products and new processes. Technological changes bring about changes in products, services, lifestyles and living conditions. Technology can reduce costs, improve quality and lead to innovation which can benefit consumers as well as the organisations. It is one of the major drivers, which is pulling the growth of e-waste. The corporate as well as individuals, do not want to be working on outdated technologies. Thus, they update themselves with new technologies to remain competent in market, leaving huge amount of ewaste behind. Fast changes in technology also create problems for enterprises. The establishment of collection centres in Pune improve the technology in the informal recycling sector.

### **Environmental**

Environmental factors include the weather and climate change. For example changes in temperature can impact on many industries including farming, tourism and insurance. Environmental factor is becoming a significant issue for firms to consider. The growing desire to protect the environment is having an impact on many industries and the general move towards more environmentally friendly products and processes is affecting demand patterns and creating business opportunities. Establishing clean e-waste collection channels in Pune can lead to a significant reduction in environmental impact due to improper e-waste recycling.

#### 3.2.2 Micro Environment Analysis

According to Kotler et al (2006) *“the micro environment consists of factors in the company’s immediate environment which affects the performane of the business unit. These include suppliers, marketing intermediaries, competitors, customers and the public.”*

According to Hill and Jones, "The micro environment of a company consists of elements that directly affect the company such as competitors, customers and suppliers."

Micro environment affects the performance of the company. It consists of stakeholder groups that a firm has regular dealings with.

Micro environment includes the following:

### **Suppliers**

Suppliers provide raw materials and components to the business. If the supplier is reliable, the business will run smoothly. Otherwise we may have to maintain high inventories which will increase our cost. In the business we should not depend on one supplier. In electronic waste recycling business the suppliers are electronic waste collectors (informal and formal sector), company collectors, households, retailers.

### **Customers**

Success of a business organisation depends upon identifying customers, their needs, taste, liking etc. Due to increase in competition attracting and satisfying the customer has become more challenging. There are different types of customers: foreign customers, industrial customers, government and other institutions. The business firm should make products according to the demands of customers. Customer segmentation should be considered on the basis of: income level, age, educational level, personality and lifestyle, taste and preferences. (Jain.T.R, Trehan.M, Trehan.R, 2010, P 10)

### **Market Intermediaries**

Market intermediaries include agents and brokers who help the company to promote, sell and distribute its goods to final buyers. Intermediaries help finding customers, and create satisfying customer relationship. Market intermediaries include the following:

- Financial intermediaries: banks, insurance companies, capital market,
- Physical intermediaries: transport agencies, warehouses
- Marketing agencies: advertising agencies, media firms, consultancy firms, etc.
- Middlemen: wholesalers, retailers, departmental stores.

There are markets for second hand electronic products in pune that has been observed.

### **Competitors**

Competitors' analysis plays key role in marketing analysis. Competitors mean other business units which are marketing or producing similar products or a very close substitute of our product. Each firm should evaluate its own size and industry position compared with competitors (Kotler, Armstrong 2008, p. 92). In today business world competition has increased to a great extent. Understanding the strategies framed by competitors and weaknesses of its competitors help to overcome the competitors. Globalisation promotes competition. Competitors' analysis has a very important place in empirical part. It also answers to the question of " *What are the success and failure in products 'value delivery to customers? "* ". (Jain.T.R, Trehan.M, Trehan.R, 2010, P 10)

### **Public**

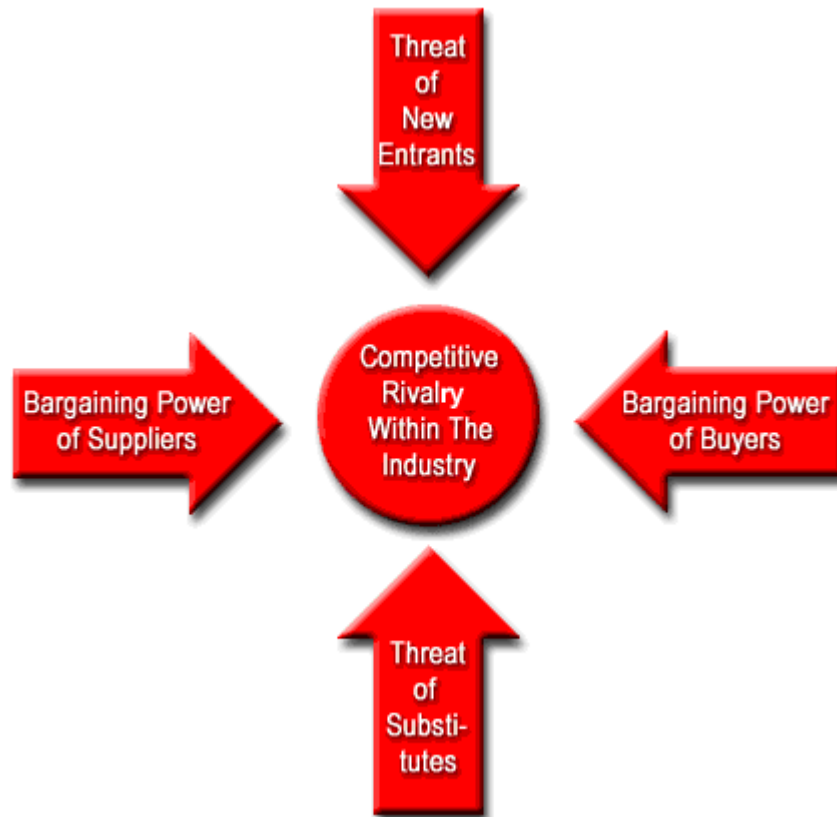
A public is any group that has an actual or potential interest in or impact on an organization. Publics can be identified as being:

- 1) Financial publics: influence the company's ability to obtain funds.
- 2) Media publics: carry news, features, and editorial opinion.
- 3) Government publics: take developments into account.
- 4) Citizen-action publics: a company's decisions are often questioned by consumer organizations.
- 5) Local publics: includes neighborhood residents and community organizations.
- 6) General publics: a company must be concerned about the general public's attitude toward its products and services.
- 7) Internal publics: workers, managers, volunteers, and the board of directors. (Jain.T.R, Trehan.M, Trehan.R, 2010, P 10.)

### 3.2.3 Competition analysis

The analysis of competitiveness is an important part of the strategic planning process. Five forces can help a company understand the structure of its industry. It helps company understand and cope with competition. Michael E. Porter built competitive analysis framework and model via his series classic works. Accord-

ing to Michael E. Porter there are five forces that shape industry competition in figure 4.



**Figure 4: The five forces shape industry competition (porter, 2008)**

**New entrants** -New entrants to an industry bring new capacity and a desire to gain market share that puts pressure on prices, costs, and the rate of investment necessary to compete (Porter, 2008). New entrants' threat depends on the entry barriers and incumbents reaction. When entry barriers are low, reaction from incumbents are expected little, the threat of entry is high, and the profitability of industry is moderate. When the threat of new comers is high, in-cumbents must decrease price or increase investment against new competitors (Porter, 2008: 5-13).

Industry structure drives competition and profitability, not whether an industry is emerging or matures, high tech or low tech, regulated or unregulated.

**The power of suppliers** -Powerful suppliers capture more of the value for themselves by charging higher prices, limiting quality or services, or shifting costs to industry participants (Porter, 2008:5-13).

Companies depend on a wide range of supplier groups for better service to customers. The power of supplier is strong if:

- The industry is high in concentration.
- None of buyer accounts for quite heavier than the others. The suppliers do not rely on few buyers for its revenues.
- The cost in switching other supplies is high.
- Suppliers have core competitiveness in products differentiated.
- There is no substitute for what the supplier provides.

Suppliers attempt to move forward into industry. If suppliers' profit is much less than companies, it evokes them to be new entrants (Porter, 2008: 13-14).

The power of buyers –According to porter powerful customers can capture more value by forcing down prices, demanding better quality or more service and generally playing industry participants off against one another, all at the expense of industry profitability. Buyers are powerful if they have negotiating leverage relative to industry participants, especially if they are price sensitive, using their clout primarily to pressure price reductions. Buyers are powerful if:

- Few large volume buyers are particularly powerful because of their significant importance to industry.
- Buyers can find an equivalent product because products are standardized or undifferentiated.
- The switching costs of changing vendors are low.
- Buyers threaten to integrate forward to the industry if vendors earn too much money. (Porter, 2008: 14-17)

The threats of substitutes -When the threat of substitutes is high, industry profitability suffers. Substitute products or services limit an industry's profit potential by placing a ceiling on prices.

The threat of a substitute is high if:

- It offers an attractive price-performance trade-off to the industry's product. The better the relative value of the substitute, the tighter is the lid on an industry's profit potential.
- The buyer's cost of switching to the substitute is low. (Porter, 2008)

Rivalry among existing competitors -High rivalry limits the profitability of an industry. The intensity of rivalry is greatest if:

- Competitors are numerous or are roughly equal in size and power.
- Industry growth is slow. Slow growth precipitates fights for market share.



- Exit barriers are high.
- Rivals are highly committed to the business and have aspirations for leadership, especially if they have goals beyond economic performance. (Porter, 2008: 18-21)

### 3.2.4 Stakeholders Analysis

To define the word “stakeholder” we must consider the stakeholder-organisation relationship. The best definition of stakeholder is by Freeman, who in 1984 defined a stakeholder as: ‘Any group or individual who can affect or [be] affected by the achievement of an organisation’s objectives’ (Freeman, 1984).

To identify the stakeholders relevant to an organization we must consider the organization’s size and activities.

Stakeholder analysis helps the author to define the proper interviewees to acquire more information relative to e-waste business in Pune. Generally there are two kinds of stakeholders; primary and secondary. Primary stakeholders are those who are directly affected. Secondary stakeholders play some intermediary role for example, NGO’s, consumer group, Government.

According to the report published by UNEP/GPA in 2004 stakeholder Analysis consists of four steps:

#### 1. Identification of key stakeholders

Key stakeholders are the potential beneficiaries that could affect or be affected by the business; who might be adversely impacted. To identify the key stakeholders we need to consider the relationship among the stakeholders.

#### 2. Assess stakeholders’ interest and the potential impact of the business on these interests.

This step helps us to identify the stakeholders’ interest in the business. Finding out the expectations of the stakeholders from the project, outcome benefits from the project for the stakeholders; and conflict of their interests with project goals.

#### 3. Assessing stakeholder influence and importance

Influence and importance here refer to the power of stakeholders over the project and importance of active involvement of stakeholders for achievement of project (business) objectives. Some important stakeholders have very little influence and

vice versa. In order to assess the importance and influence of stakeholders we should be able to assess:

- The power and status of stakeholder (in terms of economic, political and social)
- The degree of organization of the stakeholder
- The control the stakeholder has over strategic resources
- The informal influence of the stakeholder
- The importance of stakeholders to the success of business.

(UNEP/GPA, 2004)

#### 4. Outline a participation strategy

This step involves the different stakeholders. This step should be planned according to:

- Interests, importance, and influence of each stakeholder.
- Particular efforts needed to involve important stakeholders who lack influence.
- Appropriate forms of participation throughout the project cycle.

(UNEP/GPA, 2004)

#### 3.2.5 Cost and Payback Period

Capital Investment refers to money used by a business to purchase fixed assets such as land, machinery, or buildings. Capital investment is defined as the acquisition of a fixed asset that is anticipated to have a long life of use before it has to be replaced or repaired. Capital investment is the money invested in a business venture with an expectation of income, and recovered through earnings generated by the business over several years. It is the capital expenditure than for day-to-day operations or the working capital or other expenses. (Business dictionary, 2011)

Paypack period means the length of time required to recover the cost of an investment. Calculation formulation as:

$$= \frac{\text{Cost of Project}}{\text{Annual Cash Inflows}}$$

### **Investopedia explains *Payback Period***

All other things being equal, the better investment is the one with the shorter payback period.

Payback period is a useful method of determining the feasibility of a project though not without disadvantages. The project with a lower pay back period will be preferred.

In accounting Total Cost is the sum of fixed costs, variable costs, and semi-variable costs. Total Cost (TC) describes the total economic cost of production and is made up of variable costs, which vary according to the quantity of a good produced and include inputs such as labor and raw materials, plus fixed costs, which are independent of the quantity of a good produced and include inputs (capital) that cannot be varied in the short term, such as buildings and machinery. (Investorwords, 2011)

### 3.3 Business model development

A business model describes how a business makes money. Business model is to integrate all factors needed to make sure a successful business. Business model include the components of the business, the functions of the business, and the revenues and expenses that the business generates.

Rappa (2003) defines a business model as “the method of doing business by which a company can sustain itself” and notes that the business model is clear about how a company generates revenues and where it is positioned in the value chain.”

The business model consist of four basic parts. The first part is the products and services offered by the company for sale. The products or services aims at solving customers’ needs. The second part is target customers. The business model must have quality customers. They are expected to purchase product or services. The target customers can be divided into groups with different needs. The third part is infrastructure that requires for production and sale products/services.

This part describes how the products/services are created and delivered by supplying channel, production facilities, transportation mechanism and distribution

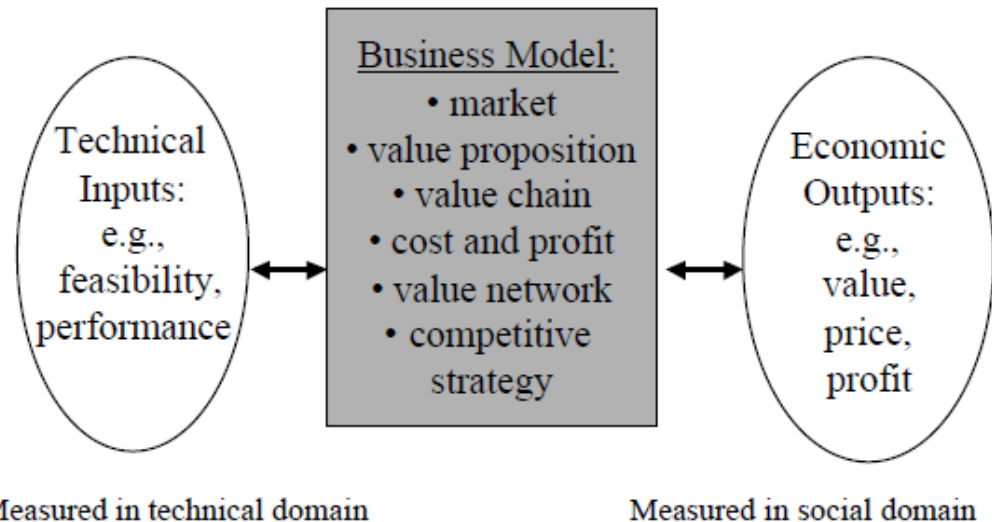
channels. Besides, which place to start the business is very important for foreign investors. The criteria for business potential place selection are which places have most probability to make a successful business. (Rochford College, 2010) Part four is financial results and profit the business expects to achieve. This part includes operation cost to start the business and the revenue model. The business model must be easy to sell. It must be able to maintain ongoing competitive advantage.

The business model then for a technology firm, needs to consider the many facets of the firm's operations required to utilise the technology opportunity profitably.

Chesbrough and Rosenbloom (2002) suggest that:

The functions of a business model are to:

- Articulate the value proposition, that is, the value created for users by the offering based on the technology;
- Identify a market segment, that is, the users to whom the technology is useful and for what purpose; and specify the revenue generation mechanisms for the firm
- Define the structure of the value chain within the firm required to create and distribute the offering, and determining the complementary assets needed to support the firms position in this value chain;
- Estimate the cost structure and profit potential of producing the offering, given the value proposition and value chain structure chosen;
- Describe the position of the firm within the value network linking suppliers and customers, including identification of potential complementors and competitors;
- Formulate the competitive strategy by which the innovating firm will gain and hold advantage over rivals.



**Figure 5: The business model mediates between the technical and economic domains**  
 (chesbrough. H, Rosenbloom R.S, 2002)

### 3.4 Entry mode-Direct investment

An entry mode into an international market is the channel which the organization employs to gain entry to a new international market.

There are two major types of entry modes: equity and non-equity modes. The non-equity modes category includes export and contractual agreements. The equity modes category includes: joint venture and wholly owned subsidiaries.

The mode of entry is a fundamental decision a firm makes when it enters a new market because the choice of entry automatically constrains the marketing and production strategy of the firm. The mode of entry also affects how a firm faces the challenges of entering a new country and deploying new skills to successfully market its product. (Gillespie, Jeannet and Hennessy, 2007) The key attribute that distinguishes the different modes of entry is the degree of control it gives a firm over its key marketing resources (Anderson and Gatignon 1986).

Table 1 indicates the factors that influence entry mode choice.

**Table 1: the factors that influence entry mode choice (Driscoll, 1995)**

Situational influences	Firm factor	Firm-specific advantages
		Experience
		Strategic considerations
	Environmental factors	Demand and competitive conditions
		Political and economic conditions
		Socio-cultural conditions
Moderating variables	Government policies and regulations	
	Corporate policies	
	Firm size	

India is one of the fastest growing major markets in the world and most popular markets for foreign entrants. Business activity with FDI is usually conducted through a company incorporated in India. The company can be a wholly-owned subsidiary of the foreign investor in sectors where 100% FDI is permitted or, where limits apply or for strategic reasons, a joint venture with an Indian counterparty. Incorporating a company in India is a straightforward, but time-consuming process. The investment in the company can be through the holding of shares and/or equity linked instruments.

The comparison of joint venture (JV) and wholly foreign own enterprise (WFOE) is shown in table 2

**Table 2: Comparison between Joint venture and Wholly foreign own enterprise (legalserviceindia, 2011)**

Mode	Advantage	Disadvantage
Joint venture	<ol style="list-style-type: none"> <li>1. Established distribution/ marketing set up of the Indian partner</li> <li>2. Available financial resource of the Indian partners</li> <li>3. Established contacts of the Indian partners which help in smoothening the process of setting up of operations</li> <li>4. A good strategy for first entering a foreign market especially when the commercial risks and country risks are high.</li> <li>5. It creates more flexibility for adapting the operation to meet the requirements under different competitive conditions.</li> <li>6. It incurs lower cost and lower resource commitment for entering foreign markets</li> </ol>	<ol style="list-style-type: none"> <li>1. An uneasy atmosphere is created by trying to combine the resources and the management approaches of two separate companies with different nationalities, backgrounds, experiences, abilities in one enterprise to pursue a common goal, to agree on common means and to work under the same authority, which creates problems in the day-to-day operation and the future planning for the JV.</li> <li>2. There is fear of the leakage of technical secrets since a strong foreign partner could use this technology for its own competitive advantage and perhaps create a future detriment to the parent company.</li> <li>3. JVs have to share the profit with local partners as well as reinvest the revenues for future expansion purposes.</li> </ol>
Wholly foreign owned enterprises	<ol style="list-style-type: none"> <li>1. Maintenance of effective control over its subsidiaries</li> <li>2. Transaction costs including the cost of negotiating and transferring information and capability to another firm, cost of personnel training, cost of losing the opportunity to having direct sales or getting the full amount of profit and the threat of creating a competitor in markets beyond the purview of the agreement might be avoided.</li> <li>3. It minimizes the dissemination risk</li> </ol>	<p>Involves highest level of risk and commitment by the foreign investing companies</p>

The first step in joint venture incorporation is the hardest and most important step which is to find a partner. A well established and strong Indian partner can help foreign investors to overcome difficult bureaucratic hurdles, to know the Indian market well and to be able to avoid attacks from jealous competitors.

### 3.5 Products/service

The end result of the manufacturing process, to be offered to the marketplace to satisfy a need or want is called product (Investorwords, 2011).

A good product is that which satisfies a customer fully in terms of quality, quantity and price.

In today's keen business competition product differentiation is a strategy that helps firms to increase the perceived value of their products and services compare to other firms' products and services. Product differentiation can be achieved in many ways. It may be as simple as packaging the goods in a creative way, or as elaborate as incorporating new functional features. Sometimes differentiation does not involve changing the product at all, but creating a new advertising campaign or other sales promotions instead.

### 3.6 Customer segment

Customer segmentation is the practice of dividing a customer base into groups that share similarities in specific ways relevant to marketing, such as interests, purchasing patterns, and so on. Using segmentation allows companies to target groups effectively, and allocate marketing resources to best effect (SearchCSR, 2010). Common objectives for segmentation include the development of new products, the creation of differentiated marketing communications, the development of differential customer servicing & retention efforts, channel strategy, and the maximization of profit/ROI for existing products (Doug Goldstein, 2009).

To do customer Segmentation managers must:

- Divide the market into meaningful and measurable segments according to customers' needs, their past behaviors or their demographic profiles;



- Determine the profit potential of each segment by analyzing the revenue and cost impacts of serving each segment;
- Target segments according to their profit potential and the company's ability to serve them in a proprietary way;
- Invest resources to tailor product, service, marketing and distribution programs to match the needs of each target segment;
- Measure performance of each segment and adjust the segmentation approach over time as market conditions change decision making throughout the organization.

### 3.7 Supplying and distribution channel

The supplying and distribution of E-waste is reverse logistics of EE products. Reverse logistics has been defined as “... the term most often used to refer to the role of logistics in product returns, source reduction, recycling, materials substitution, reuse of materials, waste disposal, and refurbishing, repair and re-manufacturing.” (James R Stock, 1998)

Reverse logistics encompasses the logistics activities all the way from used products no longer required by the user to products again usable in a market (Fleischmann, 1997).

Reverse distribution is the collection and transportation of used products and packages. Possible functions in the reverse distribution channel are: collection, testing, sorting, transportation, and processing (Pohlen and Farris, 1992).

Supply chain of electronic waste is the process of collecting e-waste for reuse and recycling. The supply chain and distribution channel explains the flow of electronic waste which is introduced in chapter 5.

### 3.8 Revenue model

Being a part of a business model, a revenue model is the business plan for an enterprise to make money.

A Revenue Model is the method or a business strategy which clearly shows how the business is planning to make money, in other terms how the business plans to generate income from its products or services (Eukhost, 2011).

The revenue-related criteria comprise the payment method and the revenue origin. The origin of the revenues can be direct or indirect and is addressing either the end-consumer (direct) or third parties like other companies (indirect). (Weber, Gruhn, 2005.)

The revenue model is explained in chapter 6.

Chapter 3 discusses the theories and concepts related to market analysis, business model development, macro environment, micro environment. Understanding these concepts and theories is important and helps the researcher to implement them in the empirical part.

In chapter 5 two powerful analysis tools – Porter's 5 forces and stakeholder approached are introduced. Also the flow of e-waste in pune as well as big players in the market will be explained. Finally a business model will be generated.

#### 4 RESEARCH METHODS

In this chapter, the methodological approach to the thesis is presented. It includes the steps of the research, data collection strategies, data analysis and interpretation and research context.

Market research is any organized effort to gather information about markets or customers. It is a very important component of business strategy. (McQuarrie, 2005) Market research is the collection and analysis of information about consumers, market niches, and the effectiveness of marketing programs.

Market research is the act of collecting data about a specific market through surveys, observations and other techniques. Market research is essential as it will help the company to determine the profitability of the market, the profit potential in the market, what customers want and need in the market, or if there are already popular products available. The primary objective of market research is data collection for analysis. The next step is to analyze the data and determine the causes of the failure or success of the product or services. Market research has to be done before entering into the market.

Generally speaking, market research can be conducted by two methods: primary research or secondary research. In primary research the information has been collected directly from the source for example getting feedback from the customers. Primary research is qualitative or quantitative.

Qualitative primary research involves gathering information from interviews or focus groups. For example open ended interviews. Quantitative primary research involves the collection of numerical information from surveys. This information is then analyzed. Survey is a good example of quantitative research.

For this thesis research, the qualitative method is chosen. The reason is that the qualitative method explores the topic in more depth and detail than quantitative research and offers more flexible relationship with the respondent and the data gathered has more depth. Qualitative research must be undertaken to gain a qualitative understanding of the problem and its underlying factors.

In qualitative method, data is collected in three different ways: in-depth, open-ended interviews; direct observation; and data interpretation.

Secondary research also called as desk research. These secondary sources could include previous research reports, newspaper, magazine and journal content, and government and NGO statistics.

#### 4.1 Steps of research

We can say that this research has three steps. The first step which is an important step is data collection. Data are raw material and basis for analysis and study.

There are two types of data; Primary data and secondary data. The primary data is gathered by the researcher in the target market. The secondary data is collected before the actual research is done in the target market. It is collected before the collection of primary data. The reason is that some of the questions can possibly have been already answered by other authors. Secondary data is gathered via reading journals, books and internet websites. It is collected rapidly, effortlessly and inexpensively.

The second step is data analysis and interpretation. The theories applied in market analysis, including macro-environment analysis, micro-environment analysis, porter's five forces and stakeholders analysis.

The process of evaluating data using analytical and logical reasoning to examine each component of the data provided. This form of analysis is just one of the many steps that must be completed when conducting a research experiment. There are a variety of specific data analysis method, some of which include data mining, text analytics, business intelligence, and data visualizations. The final step is conclusion which is based on the previous work. The conclusion introduces market potentials and risks, market growth and propose business model for foreign companies.

#### 4.2 Data collection

The data could be collected in two different ways. One way is collection of data by desk research method and the other is data collected by field research method. Desk research is a method for collecting secondary data. Desk research sources could be internet, books, journals, articles, and different websites for example websites of different agencies related to electronic waste in India.

Field research is research, by direct contact, with an identified (or targeted) group of potential clients. Field research aims at collecting primary (original or otherwise unavailable) data, using methods such as face to face interviewing, telephone and postal surveys and direct observation.

There are different types of interviews, which include:

- Structured interviews,
- Semi-structured interviews,
- Unstructured interviews,
- Non-directive interviews

Corbetta (2003, p.269) states structured interviews are "... interviews in which all respondents are asked the same questions with the same wording and in the same sequence." Semi-structured interviews are frequently used in qualitative research. The semi-structured interview is the most common form of interviewing. In it, the interviewer has worked out a set of questions beforehand, but intends the interview to be conversational. To do so, the interviewer can change the order of the questions or the way they are worded. He or she can give explanations or leave out questions that may appear redundant. So, the main job is to

get the interviewee to talk freely and openly while making sure you get the in-depth information on what you are researching. (Cohen D, 2006)

The nondirective interviews are those where the respondents are given maximum freedom to respond within the boundary set by the interviewer while as in semi-structured interviews, the interviewer attempts to cover a specific list of topics.

The timing, exact wording and time allocated to each question area are left to the interviewer's discretion. (Aaker et.al.2001, 187)

In this study the researcher has conducted a semi-structured interview. In few cases that she did not have access to the interviewees face to face, telephone interview has been conducted. Telephone interview enabled the researcher to gather information rapidly. The selected groups to interview are as following:

**Table 3: Interview chart**

<b>Governmental agencies</b>	<b>E-waste collectors, E-waste sellers</b>	<b>Ngo</b>	<b>E-waste recycling companies in Pune</b>
Maharashtra pollution control board (MPCB) & (PMC) <b>Pune &amp; Mumbai</b>	Swachh pune seva saha-kari sanstha, Ltd	Greenpeace (pune)	Hi-Tech Recycling India Pvt Ltd.
Mahratta Chamber Of Commerce (MCCIA)	Kagad Kach Kashtakari Panchayat	Deutsche Gesellschaft fuer Technische Zusammenarbeit (GTZ)	

#### 4.3 Data analysis and interpretation

The process of evaluating data using analytical and logical reasoning to examine each component of the data provided. This form of analysis is just one of the many steps that must be completed when conducting a research experiment. Data from various sources is gathered, reviewed, and then analyzed to form some sort of finding or conclusion. There are a variety of specific data analysis method, some of which include data mining, text analytics, business intelligence, and data visualizations.

Data analysis is a process, within which several phases can be distinguished. The data should be traceable, reliable and complete. (Mayor & Blackmon 2005: 345)

The criteria for data assessment are validity and reliability. The objectives of data analysis are to measure the strength of association, to evaluate the impact or importance of data, to assess the degree of uncertainty from random noise (“chance”) and to control and examine effects of other relevant factors.

The data interpretation is to find out the relevant information existed in data and methods to analyze them

#### 4.4 Research context

The following information about Maharashtra state and Pune city has been collected from the official website of pune, the Times of India and the Indian express.

The research has been conducted in the city of Pune, which is located in Maharashtra state, India. Maharashtra is a state located in India. It is the second most populous after Uttar Pradesh and third largest state by area in India. It is the richest state in India, contributing to 15% of the country's industrial output and 13.2% of its GDP in 2005-06. Maharashtra encompasses an area of 308,000 km<sup>2</sup> (119,000 mi<sup>2</sup>), and is the third largest state in India. It is bordered by the states of Madhya Pradesh to the north, Chhattisgarh to the east, Andhra Pradesh to the southeast, Karnataka to the south, and Goa to the southwest. The state of Gujarat lies to the northwest, with the Union territory of Dadra and Nagar Haveli sandwiched in between. The Arabian Sea makes up Maharashtra's west coast. Favourable economic policies in the 1970s led to Maharashtra becoming India's leading industrial state in the last quarter of 20th century. Maharashtra's gross

state domestic product for 2010 is at \$190.310 billion. Maharashtra is India's leading industrial state contributing 15% of national industrial output and over 40% of India's national revenue. The majority of Marathi people are Hindus form 83.2% of total population and Hinduism plays important role in Maharashtraian people in there day-to-day life.

Pune is known for its educational facilities and relative prosperity. Pune is the cultural capital of Maharashtra. Pune has well-established manufacturing, glass, sugar, and forging industries since the 1950-60s. Pune has a tropical wet and dry climate with average temperatures ranging between 20 to 28 °C (68 to 82 °F). As per the 2010 Census of India estimate, the population of the Pune urban agglomeration is around 5,518,688. Growth in the software and education sectors has led to an influx of skilled labour from across India. Pune has the sixth largest metropolitan economy and the second highest per capita income in the country. It is home to the Automotive Research Association of India. Pune and around also houses foreign direct investments like Alfa Laval, Sandvik, Atlas Copco, Keihin FIE, Panasonic, Sharp, Enkei, Tata Tokyo, Tata Yazaki, Tata Yutaka, Lumax and many more. Pune has more than a hundred educational institutes and nine universities. There are many real estate developers who are building properties in Pune like Tata Housing Development Company and many others. Pune is well-connected to other cities by Indian highways and state highways.

## 5 E-WASTE PROCESSING BUSINESS IN PUNE

In this chapter the author focuses on the e-waste processing business in Pune, India. It consists of electronic waste generation in the target area, driving forces to manage e-waste and the flow of e-waste. The author explains the proposed e-waste generation for the better understanding of the e-waste situation in Pune. This project is co-financed by European Commission under its SWITCH ASIA programme and the German Ministry for Economic cooperation and development (BMZ). The Deutsche Gesellschaft fuer Technische Zusammenarbeit (GTZ), the lead implementing agency, works on behalf of the BMZ. The Indian partners are MAIT and Toxics Link.

## 5.1 E-waste generation

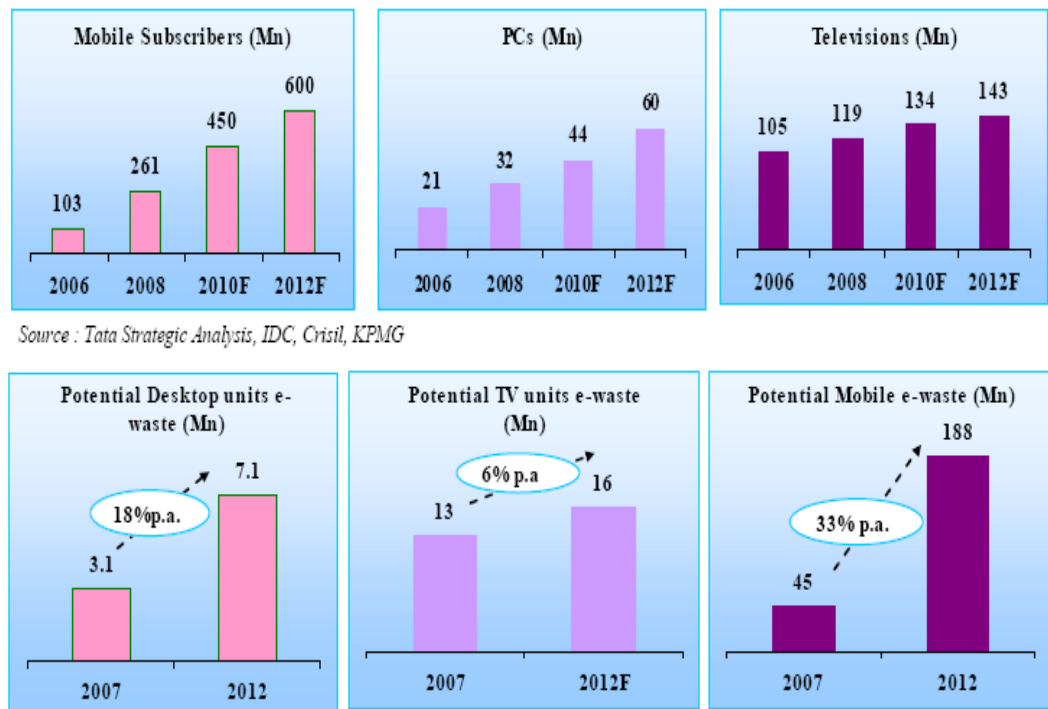
The electronics industry is the world's largest and fastest growing industry. According to a recent study carried out by MAIT and GTZ in 2007 about 380000 tons of e-waste are generated annually in India and expected to touch 470000 tons by 2011. India generated close to half a million tonne of e-waste in 2010 and it is growing at a rate of 20-25%. Sixty-five cities in India generate more than 60% of the total e-waste generated in India. Ten states generate 70% of the total e-waste generated in India. Maharashtra ranks first followed by Tamil Nadu, Andhra Pradesh, Uttar Pradesh, West Bengal, Delhi, Karnataka, Gujarat, Madhya Pradesh and Punjab in the list of e-waste generating states in India. Among top ten cities generating e-waste, Mumbai ranks first followed by Delhi, Bangalore, Chennai, Kolkata, Ahmedabad, Hyderabad, Pune, Surat and Nagpur. 50,000 tonnes per year are illegally imported. According to the estimates made by MAIT, the Indian PC industry is growing at 25 percent annually. Over 2 million old PC are ready for disposal. In India, it is estimated that the e-waste is 0.1-0.2% of the total municipal waste. In case of PCs, 22% of the e-waste is generated by households and it is the business sector which accounts for the 78% the e-waste, because 83% of household customers are first time buyers. (Mundada, M. N.; Kumar, S. and Shekdar, A. V, 2004) As far as sales of computers and mobile phones are concerned, sale of computers and laptops has been grown at 18% in 2009-10 as compare to 2008-09 (MAIT annual report, 2010)

Innovative products and attractive market offers contribute to more e-waste generation. In India the new computer is purchased sometimes not due to improper functioning but for upgrading system or software (Williams, E., Kahhat, R., Allenby, B., Kavazanjian, E., Kim, J. and Xu, M, 2008) Cost of mobile and computer components is high. For example, the cost of battery in case of mobiles and laptops, and cost of cartridge in case of printers, so the customers prefer to replace the product with new one.

Pune ranks among top ten cities generating e-waste in India. The growth of IT industry, high rate of electronic consumption, short product lives due to the advance in technology and illegal import of electronic wastes lead to the generation of a huge amount of e-waste in Pune. There is also a large quantity of E-waste



from manufacturing in the form of defective printed wiring boards, IC chips and other components discarded in the production process.



**Figure 6: E-waste generation (source: Tata strategic analysis)**

The charts show the sales by volume for mobiles, PC and Television. Now ideally it would be any manager's delight to see sales figures increasing exponentially but it is nightmare for increasing e-waste which needs to be addressed.

## 5.2 Driving forces to manage e-waste

In India, the IT industry has performed so well against the global competition. Government institutions, public and private sectors and EE manufacturers are the main sources of electronic waste in India. Illegal import of electronic waste is another major source. E-waste has become a reality in India. Pune is one of the four major cities (Bangalore, Delhi, Kolkata and Pune) to be considered as hubs. In India there is a huge gap between generation and recycling of e-waste. Recycling and disposal is not properly done due to lack of appropriate technology. There is no authorised recycling plant in Pune, no proper management method to handle this huge amount of e-waste. As a result the e-waste buried or burnt in the

open air or dumped into the water. A need has been felt for an efficient and environmentally sound management of e-waste.

If the e-waste recycling process is managed professionally it can turn into a profitable business. The presence of valuable resources such as copper, silver, gold and platinum make it attractive to recycle e-waste.

95 percent of the e-waste in India is recycled through the informal sector (GTZ-MAIT study, 2007). E-waste collection and recycling provides job to the informal sector and thousands of people which should be considered. Currently, e-waste recycling system is purely market driven. It means that it is determined by market forces and as an investor in this business you need to keep eyes on competitors. Approximately 3% of e-waste reaches authorized recyclers. So occupying the present vacuum in terms of presence of authorized players is important.

### 5.3 Legislations concerning E-waste

In India electronic waste is being covered under the broad regulatory framework related to hazardous waste. The Ministry of Environment and Forests is responsible for planning and coordinating the environmental programs.

According to Maharashtra Pollution Control Board (MPCB) report on electronic waste in 2007, The Ministry of Environment and Forests (MoEF) has issued the following notifications related to hazardous wastes:

1. Hazardous Wastes (Management and Handling) Rules, 1989/2000/2002
2. MoEF Guidelines for Management and Handling of Hazardous Wastes, 1991
3. Guidelines for Safe Road Transport of Hazardous Chemicals, 1995
4. The Public Liability Act, 1991
5. Batteries (Management and Handling) Rules, 2001
6. The National Environmental Tribunal Act, 1995
7. Bio-Medical Wastes (Management and Handling) Rules, 1998
8. Municipal Solid Wastes (Management and Handling) Rules, 2000 and 2002

In 1992 India acceded and ratified the Basel convention to address the problem of disposal of hazardous wastes. As per the convention, India can not export the hazardous wastes.

There is a lot of environmental legislation but not specifically for e-waste.

Around 14 laws in regard to the environment have been enacted, however several provisions of these laws apply to various aspects of electronic wastes. (MPCB, 2007) The 'Guidelines for environmentally sound management of E-waste' published by Government of India in April 2008 was the first step in response to the e-waste challenge in India.

Pressures from environmental groups such as Greenpeace, Toxics Link as well as the Centre for Science and Environment and agencies such as GTZ and MAIT led the government to wake up to the threats posed by E-waste and to frame the E-waste (Management and Handling) Rules 2010. The draft was reviewed and now it is called as 'E-waste (management and handling) rules, 2011'. These rules shall come into effect from 1st May 2012. The e-waste (management and handling) Rules, 2011 would recognise the producers' liability for recycling and reducing e-waste in the country. Also the consumers would be aware about the hazardous components present in the product along with the instructions for handling the equipment after its use along with the Do and Don't. Enterprises and government will be responsible for recycling of the e-wastes generated by them. The State Pollution Control Board will be required to prepare and submit to the Central Pollution Control Board (CPCB) an annual report (based on the data received by consumers) with regard to implementation of these rules, by September 30 of every year.

With the rules in place, there have been some changes in the e-waste management and handling practices across the country. The rules have most directly impacted upon the functioning of the formal sector enterprises. However, the rules have also given rise to a number of formal enterprises offering various solutions for e-waste. These rules while giving solutions for the environmental risks of e-waste don't address the financial impact of suddenly formalizing a sector which has been informal for so long. Waste collection and handling is a source of livelihood for a large number of informal sector workers. Many of them constitute some of the poorest sections of society.

The Rules very clearly defined the roles and responsibility of all stakeholders and that is one of the reasons for increasing involvement of formal recyclers into managing e-waste. Increasing awareness amongst organizations, their responsibility towards society and the new e-waste (management and handling) rules 2011, all beg towards a change in e-waste management practices which are not only safer but also appreciative of the contributions of the informal sector.

#### 5.4 Flow of e-waste

In India, most of the activities, like collection, transportation, segregation, dismantling, recycling, disposal, are carried out by informal sector. The rag pickers (also known as kabadiwala) collect all kind of waste like papers, books, newspapers, plastic, cardboard, polythene, metals, etc. including e-waste, and earn their livelihood by selling it to middlemen or scrap dealers. This is a very good source of income not only for rag pickers but also for middlemen and scrap dealers.

The e-waste/ WEEE from Pune, is transported to Mumbai Municipal Region (MMR) for dismantling and further supply to Delhi market. Some of the major hubs for e-waste collection and transportation in Pune are Chikhali, Kuddalwadi, Pawarwasti, Jadhavwadi and Moshi. Chikhali in pimpri-chinchwad area acts as a major hub for collection, transportation and trading of e-waste. Kuddalwadi, Pawarwasti, Jadhavwadi and Moshi act as sub hub for e-waste. E-waste from these sub-hubs is collected at Chikhali and transported to MMR for dismantling. The main e-waste operations undertaken here are Collection, dismantling of refrigerator, plastic shredding and transportation of TV, PC, Refrigerator, PCB/PWB and wires to Mumbai. No mechanism exists in the state to monitor and track its inventory, collection, transportation and disposal. (WEEE recycle, 2011) The main key players in the electronic waste processing are informal recyclers. At the moment the recycling activities are carried by the informal sector using highly hazardous and polluting techniques for processing the e-waste. There is no collaboration between the informal sector and formal recyclers. The current situation is unacceptable. There is a need for improving the channelization of the E-waste in pune. The recent proposed project by **Deutsche Gesellschaft fuer Technische Zusammenarbeit (GTZ)**, aims at involving producers

and recyclers. This model is implemented by end of year 2013. This model brings the informal sector into the main stream of e-waste recycling activities. Finally they are able to establish their identity and know their roles better. This model suggested establishing clean e-waste collection channels which lead to a significant reduction in environmental impact due to improper e-waste recycling. This project also improves working conditions in the informal e-waste sector and mainly focuses on collectors and dismantlers. The target Groups in this project are:

- MAIT
- Manufacturers of IT equipments in Pune
- WEEE recycling SMEs; that is Informal sector workers, collectors, traders, dismantlers and segregators
- Formal sector recycling units in Pune
- Large generators of WEEE in Pune

It consist of following activities:

- Establishment of collection points

Setting up collection points in identified locations that are in strategic positions for e-waste generators. These collection points could be boxes for just dropping the e-waste. They also serve bulk customers, individual and others involved.

- Establishment of collection centres

The e-waste then shall be transported from these collection points to the collection centers where they shall be sorted for refurbishment and recycling.

The collection centers are operated and maintained by the association of informal sector who become the collection agencies on behalf of the large brands. These associations will have contracts with formal sector recyclers to deliver the e-waste generated to them for environmentally sound management (ESM) of e-waste.

At the end we have an organized collection system.

- Revival of take-back systems

There are a number of on-going efforts by manufacturing units to organize the take-back system and make the system stronger so that e-waste doesn't find its way to the unorganized recyclers.

- Capacity building

Capacity building shall be achieved through training programmes and technology transfer for both informal and formal e-waste recyclers. The training modules aim to include environmental and health standards while recycling e-waste. The awareness programmes will enable members of the informal sector to understand the risks involved in the operations.

- Monitoring and evaluation

Setting target for take-back system and establishment of a system for monitoring of target achieved.

- Research and Development(R&D)

One of the proposed activities is research and development. R&D is very important because it helps to have access and become familiar with the best available technology. R&D activities develop environmentally sound recycling technologies for specific waste streams.

- Policy dialogues and dissemination activities

The results would be used to prepare policy briefs for the government and industry bodies highlighting the role of SMEs in e-waste recycling. (GTZ-ASEM, 2011)

This model covers the major quantum of e-waste. Using environmentally sound technologies involving producers and recyclers (informal and formal), encompassing Small and Medium Scale Enterprises (SMEs) and other stakeholders in the value chain. Establishment of clean e-waste collection channels reduce the material drifting to the informal sector. This would lead to reduction in environmental impact due to improper e-waste recycling activities by the informal sector. (GTZ-ASEM, 2009) The new system provides a convenient collection and disposal system for large and small consumers. They can return the e-waste safely.

## 5.5 Big players and collection centers

In Maharashtra there are only three authorized recycling company. Less than 5% of market is captured by formal recyclers. These authorized recycling facilities that have been approved by the Maharashtra Pollution Control Board are located

to take care of e-waste. So far none of them operate in Pune. These are as follows:

- Hi-Tech Recycling India (P) LTD

The company works in the fields of logistic e-waste management, data erasure and refurbishing, remarketing and recycling services. This company conducts a responsible in-house demanufacturing service for non-reusable and/or non-resalable products. They also keep records of how and where all the recovered base materials and hazardous materials are treated. They comply with the requirements of environmental laws. After collecting e-waste products with company's own vehicle and driver, data from customer's system is destroyed electronically or physically or else, HDD is removed for a physical destruction. The process of e-scrap consists of removal of cover, removal of cable assemblies and wiring, dismantling of rear panel, removal of pc boards and dismantling of chassis.

The collection channels are: Industries, commercial institutions, households.

The company pays for computers, mobiles, some of the materials from commercial institutions. The company does not pay for CRT, glass or CFL. The company has a maximum capacity of 500 metric tones per annum for e-waste recycling and has a great potential for expansion.

- Earth sense recycling PVT.LTD

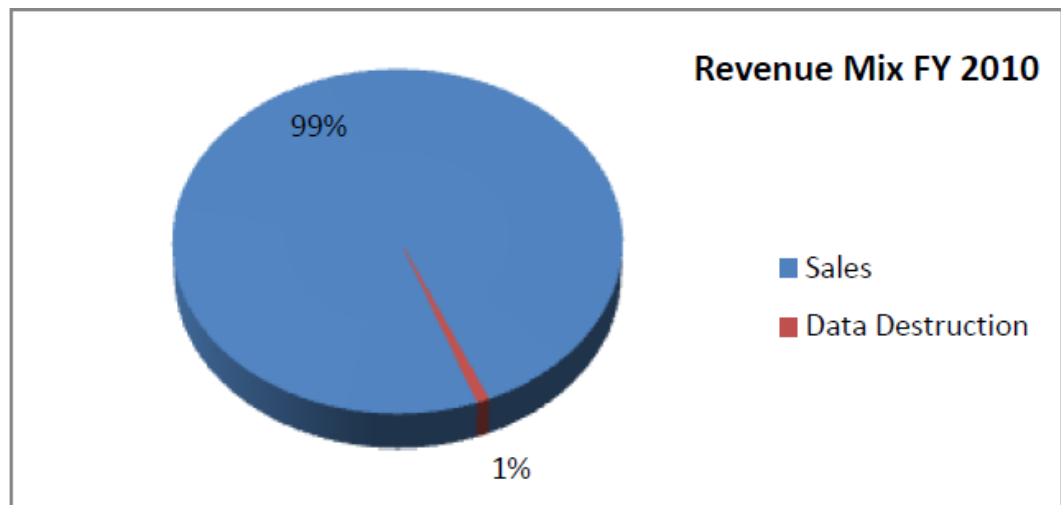
The company was established in 2000. G.J.Multiclave (India) pvt.ltd and E-parisaraa pvt Ltd are joint venture with this company. G.J.Multiclave (India) Pvt. Ltd is India's First Bio Medical Waste Management Company established in 2000. E-Parisaraa is one of the first companies in India to apply scientific processes to the recycling of electronics in India. This company concentrates on reduce, reuse and recycle. At the time of recycle they take extreme measures to ensure that customers' discarded asset will be destroyed or recycled. They break down e-waste equipment into recyclable metal, plastic, and glass that, after processing, can be used as raw materials for new products. (Earthsenserecycle, 2008) The company has a maximum capacity of 360 metric tones per annum for e-waste recycling.

- Eco recycling limited

The company was incorporated in September 2007. Ecoeco was jointly promoted by Infotrek Syscom Limited, a company listed on the Bombay Stock Ex-

change since 1995 and Mr. B K Soni, the first generation entrepreneur & main promoter of Infotrek Syscom Ltd. As on April 15, 2011, Bennett, Coleman & Company limited holds 600000 equity shares in Eco Recycling Limited. The company stands on 5th position in India on basis of maximum installed capacity and has a turnover of 10 crores.

Remarketing and leasing contribute to the majority of company's income. In Maharashtra there are few companies go for such activities therefore the revenue mix for FY2011 is expected to show similar pattern.



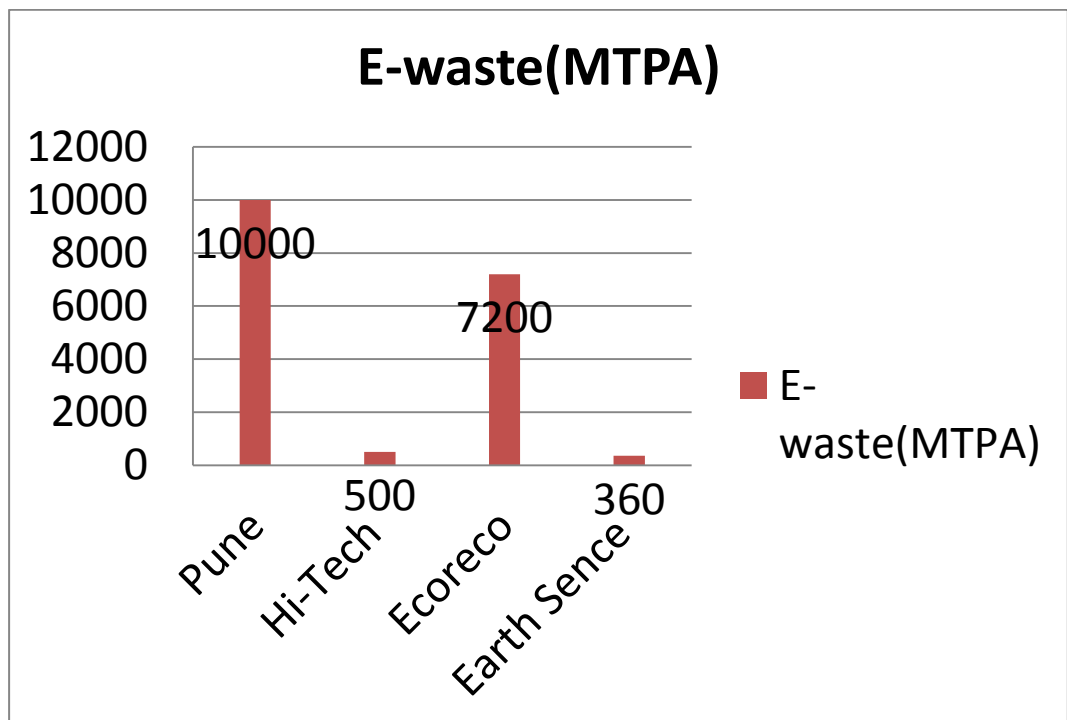
**Figure 7: Revenue mix (Source: annual report, 2010)**

From FY2009 to FY2010 the financial performance of the company was not good. The effective e-waste recycling activities commenced from September 2010. The company is expected for expand its machinery and recycling facilities and has a maximum capacity of 7200 metric tones per annum for e-waste recycling. The company is the only major player in Maharashtra and has monopolistic advantages in the Maharashtra e-waste recycling market. It has over 600 collection points across India and 350 companies as their clients. The company has an established network all over India and has strong presence in Mumbai, Delhi and Hyderabad. It focuses only on the B2B (Business to Business) segment as it is their primary interest and does not consider B2C (Business to Customer) segment. The company does not sell anything instead it buys electronic waste from corporate organizations. It has concentrated only on the recycling aspect of the business. The company receives clients due to its sister concern Infotrek Systems



and have relied heavily on it. Eco recycling does not advertise much. It aims to increase business but has no clear target sector in mind. Their mistake is that the company has no growth strategy and is simply reaping the benefits of the growing industry. The company does not have a business development team or a customer relationship department.

The scope for expansion and comparison among three companies has been shown in figure 8. As you can see the e-waste generated in Pune and Pimpri Chinchwad region is 10000 tonnes per annum.



**Figure 8: Scope for expansion**

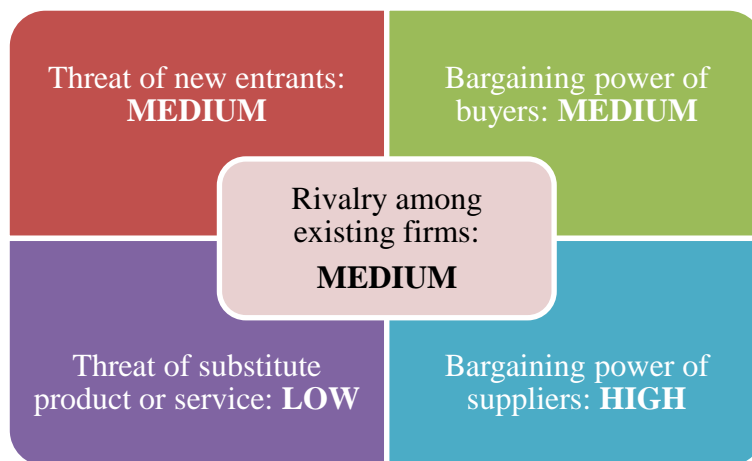
The profit of e-waste recycling companies depends on few factors. For example the quantity of e-waste generated. The company must have a strong collection system and comprehensive transportation. Research and development, material recovery, reuse and reproduce are other factors. So far no e-waste facility is in operation in Pune but lot of IT industries situated in Pune to get e-waste.

After analysing the market the proposed marketing strategy for e-waste recycling business is that:

- The company needs to work on building its brand value
- It needs to establish itself as a beneficial partner to the corporate sector
- It needs to position itself better to both the B2B (business to business) and C2B (customer segment)

- It needs to develop strategic partnerships across the industry
- The company needs to set an ambitious but realistic targets like achieving 3% market share in the next 2 years
- The company needs business development managers to increase its reach
- Assess and develop ways to increase benefits of its relation with NGOs and government organisations
- Start involving the customers themselves
- Act as a facilitator between organisations desiring to donate electronics and those in need of it

#### 5.6 Porter's 5 forces analysis



**Figure 9: Porter's 5 forces analysis for e-waste processing industry in India**

#### **Bargaining power of suppliers:**

E-waste collectors have a key role in e-waste generation in India. Collection happens through small licensed or informal scrap collectors and sent to Delhi and Mumbai. 95 percent of the e-waste in India is recycled through the informal sector (GTZ-MAIT study, 2007). The informal recyclers have a strong supplying power. Other important suppliers are processing facilities manufacturers. E-waste is a real problem in India. There are few collection centers in India that have been registered with the central pollution control board. In Maharashtra there are only 3.

Attero recycling is the only e-waste recycling company which does the complete e-waste management process. With the current e-waste generation in Pune, there is a need for e-waste recycling companies with the zero landfill and higher recycling rate. So the bargaining power of suppliers is high.

**Bargaining power of buyers:**

Poverty is widespread in India. The 2011 global hunger index (GHI) report ranked India 15<sup>th</sup> among leading countries with hunger situation. So for the poor people in India market demand for secondary material is high. On the other hand first hand electronic products have a huge market demand for average income level, society and rich people. Advance in technology and consumer choice led to the huge e-waste generation. So the bargaining power of buyers is medium.

**Threat of new entrants:**

In India the e-waste recycling industry is dominated by the informal sector. Due to the keen competition between formal recycling sector and informal sector, the formal recycling sector faces challenges for collection and transportation.

India does not have any legislation dealing with e-waste. If foreign investors are interested in technology transfer and entering the e-waste recycling industry the application procedure is unclear. Due to the new E-waste (Management and Handling) Rules 2011, the e-waste has to be recycled by authorized recyclers. also the project implemented by GTZ aim to establish a proper collection system so the threat of new entrants is medium to high.

**Threat of substitute products or services:**

There are three methods to deal with electronic waste in India: Landfill, incineration and recycling. The existing dumping grounds in India are full and it is difficult to get new dumping sites due to scarcity of land. Incineration produces dioxin and it causes air pollution. Also in incineration method the waste should have high calorific value. Recycling e-waste in an environmentally friendly method is the best. So the threat of substitute is low.

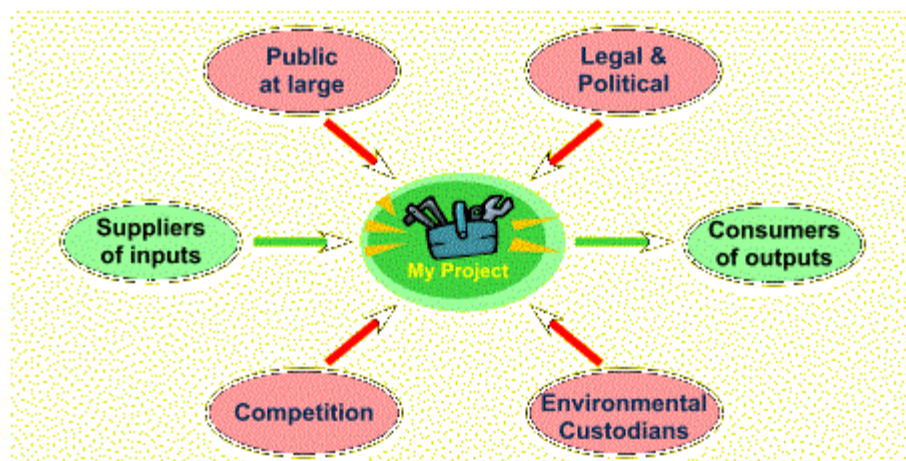
**Rivalry among existing firms:**

The electronic waste recycling industry is huge in India. At the moment the informal recyclers occupy resources. The recycling industry is managed almost entirely (95%) by informal recycling businesses. Pune is no exception. Formal recycling industries have to compete with the informal businesses. There is no cooperation between them. The new project implemented by GTZ integrate in-

formal sector in the formal collection channels so that cooperation is established between formal and informal sector. So the rivalry among existing firms is medium.

### 5.7 Stakeholders' analysis

Stakeholder management is critical to the success of every business. Stakeholders could be strong supporters of your business or they could block it. The stakeholders' analysis helps to evaluate the influence and importance of stakeholders. Based on this analysis investors manage their relationship with them. In this study the author focuses on the non-internal stakeholders. The first step in stakeholder analysis is to identify them.



**Figure 10: Stakeholders identification (onprojects, 2007)**

The main stakeholders in e-waste generation and management are the manufacturers, distributors/importers, refurbishment centres, consumers, collectors, recyclers, policy makers and policy implementers.

#### 5.7.1 Key stakeholders

The following various stakeholders are involved in e-waste trade.

##### **Regulatory bodies (Government)**

They are constituted to protect the environment. They have control over various trades which affect the environment. In their opinion the HW (hazardous waste) rules are going to take care of e-waste. This means liability of the effects of recy-

cling has been seen as a responsibility of producers, government and recyclers. These are:

1. Ministry of Environment and Forest (MoEF)
2. Central Pollution Control Board and Maharashtra Pollution Control Board (CPCB and MPCB)

### **NASSCOM**

NASSCOM is The National Association of Software and Services Companies. Currently, NASSCOM is headquartered in New Delhi, India with regional offices in the cities of Mumbai, Chennai, Hyderabad, Bangalore, Pune and Kolkata. NASSCOM has been the strongest proponent of global free trade in India. NASSCOM was set up to facilitate business and trade in software and services and to encourage advancement of research in software technology. It is a not-for-profit organization. NASSCOM is committed to work proactively to encourage its members to adopt world class management practices, build and uphold highest quality standards and become globally competitive.

### **MAIT and other agencies**

MAIT was set up in 1982 for purposes of scientific, educational and IT Industry promotion, MAIT has emerged as an effective, influential and dynamic organisation. The organization's special focus is on domestic market development and attracting foreign investment in the Indian IT Industry. Their objectives are:

- Enabling a policy framework of IT manufacturing ecosystem
- Attracting investments in IT manufacturing
- Simplification of Procedures for Exports and Imports
- Increasing IT Penetration/Usage in India
- Reduction in local levies and taxes on IT products to make IT affordable
- Promoting Design, Innovation and New Product Development
- Local Language IT Applications/Products/Solutions
- Promoting usage of genuine IT products, components and consumables
- e-Waste Management (MAIT, 2008)

### **Mahratta Chamber of Commerce Industries & Agriculture (MCCIA)**

Mahratta Chamber of Commerce, Industries (MCCIA) was founded by Late Mr A. R. Bhat in 1934 to accelerate the industrial growth in and around Pune. MCCIA has an important role in accelerating the industrial and economic development of Pune. MCCIA has continuously driven to make Pune a global business destination and has been catalyst for economic development of the region. Their vision is to facilitate the transformation of Maharashtra as the premier destination globally for Industry, Trade, Commerce and Agriculture. Their missions are

- To make a beginning by developing Pune into a world class centre by improving its physical and social infrastructure.
- To promote Information Technology, Biotechnology as focal industries by leveraging the existing educational, industrial and agricultural resources in Maharashtra. (MCCIAPune, 2011)

MCCIA is branding for Pune to attract investments. The chamber has Partnership with the Government for different projects. The chamber also promotes international trade and business.

### **NGOs**

Green peace is an NGO located in Pune. Greenpeace in India has been campaigning on this issue since last 4 years and has achieved significant success. The current e-waste management and Handling law by the Government of India is a witness to this success.

GTZ support India in achieving its development goals and reducing the challenges it faces. The governments of India and Germany agreed that their development cooperation will concentrate on the following priority areas:

- Sustainable Economic Development
- Energy
- Environmental Policy, Conservation and Sustainable Use of Natural Resources

In India Many NGOs strongly believe that e-waste should be dealt with a separate policy and EPR framework should be the basis. Participation of NGOs in the e-waste debate in India is limited to a small number of NGOs due to the lack of

knowledge and expertise of e-waste issues. They are also agreed producers need to conduct take-back schemes.

### **Consumers**

Consumers contribute to the major share of E-waste in Mumbai, Pune and Pimpri Chinchwad region. Consumers include: individual households, business sector, commercial establishments, manufacturers and retailers.

In India producers don't believe that all the Indian industry is ready for EPR legislation right now. But they believe in developing the capacity for the future. They believe industry will implement EPR if there is legislation.

### **Suppliers**

The suppliers could be E-waste formal and informal collectors; ERA (e-waste recyclers association); E-waste individual collectors; E-waste processing equipment manufacturers.

Informal sector has been viewed as the most affected stakeholder if there is any new legislation on e-waste.

Recyclers think that EPR is very good for India. It can help them in terms of better collection so that their input will be guaranteed.

#### 5.7.2 Stakeholders priority

After identifying stakeholders now it is time to prioritize the stakeholders with the help of power/interest grid to work out their powers, influence and interests.

Power	High	<b>Box A Keep satisfied</b> Ministry of environment and forests Central pollution control board Maharashtra pollution control board Individual collectors	<b>Box B Manage closely</b> Retailers Business sector (E-waste processors) MAIT NASSCOM Formal and informal e-waste collectors EE manufacturers
	low	<b>Box C Monitor</b> Pune municipal corporation E-waste processing equipment manufacturers	<b>Box D Keep informed</b> NGOs Small size e-waste processors
		Low	High

**Figure 11: power/interest grid of stakeholders**

Box A- The group with high power but low interest to involve business

Box B- The group with high power and high interest to participant business

Box C- The group with low power and low interest in business

Box D- The group with low power but high interest to involve business

The stakeholders in box A are powerful but not much interested in e-waste processing business. They should be kept satisfied. The investors should establish a good relationship with them. They can provide usefull information to the new investors. They can support the investors and improve the profit rate of business. The stakeholders in box B are both powerful and highly interested to manage e-waste in an environmentally friendly manner. They are strong competitors. They can contribute to the success of project in productivity and better financial performance for example formal recyclers and informal collectors.

Stakeholders in box C are not much interested in e-waste business. They require minimum effort.

Stakeholders in box D should be kept informed. These stakeholders should manage their relationship and cooperate with stakeholders in box B in order to become successful in this business.



## 5.8 Summary

To summarize this chapter:

95% of E-waste recycling is carried out by SMEs in the informal sector. The informal sector is characterized by:

- ❖ Unskilled workers
- ❖ No occupational Health and Safety awareness.
- ❖ They work in polluting backyards which pose threat to workers.
- ❖ The informal sector have important role in the e-waste trade chain.
- ❖ They are illiterate and belong to rural immigrant families.
- ❖ They have problems such as lack of minimum wages, lack of access to credit, lack of recognition by the authorities and lack of access to social protection schemes.

Establishment of clean e-waste collection channels helps to establish an environmentally sound technology involving SMEs in the informal sector.

Porter's 5 forces analysis shows the market competition is not strong as the threat of new entrants and new products or services is low. But the bargaining power of suppliers is strong. The suppliers are e-waste collectors and technology providers. Cooperation with informal collectors plays an important role.

## 6 CONCLUSION

The conclusion includes e-waste recycling market (potentials and risks) and proposing business model for European investors to establish e-waste recycling unit in Pune.

### 6.1 Market potentials and risks

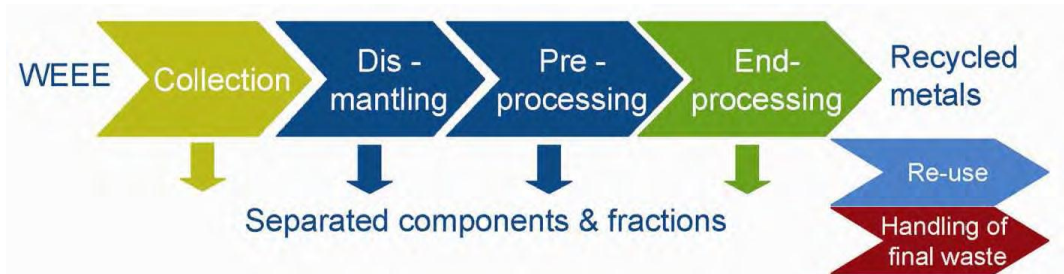
India's rapidly growing economy generates more than 500,000 tons of electronic waste every year, a number expected to reach 1 million tons by 2012. (Washingtonpost, 2010)

India will continue to allow FDI without any limits (100%) under the automatic route for Greenfield investments. Growth of international trade after foreign direct investment policy undertaken by the Indian government creates potential market for foreign investors. Pune is known for its educational facilities and relative prosperity. Pune is the cultural capital of Maharashtra. Pune has the sixth largest metropolitan economy and the second highest per capita income in the country. It is home to the Automotive Research Association of India. Many multinational companies have set up manufacturing facilities, R&D centres and off-shore software development facilities in Pune.

Computers, information and communication technologies equipments, TVs, refrigerators and washing machines drive the growth of e-waste recycling industry in India.

The recycling chain for e-waste consists of three main steps:

- I. Collection
- II. Sorting/dismantling and pre-processing (including sorting, dismantling and mechanical treatment)
- III. End-processing (including refining and disposal)



**Figure 12: E-waste recycling chain (source: StEP, 2009)**

In India the labour cost is low. Providing a better control of the informal sector, India has a great potential for the introduction of pre and end-processing technologies with a strong support in capacity building in the informal sector (StEP, 2009). What is pre-processing and end-processing?

The collection rates depends more on social factors than collection methods. The collected equipment is sorted and then enters pre-treatment step. The aim of dismantling and pre-processing is to liberate the materials. Pre-processing is mechanical dismantling. At this stage Hazardous substances are removed and stored or treated safely. Valuable components are reused or directed for recovery pro-

cesses. This includes removal of batteries, capacitors etc. prior to further (mechanical) pre-treatment.

Refrigerators and air conditioners contains ODC (Ozone depleting substances) so in pre-processing stage they should be treated carefully to avoid air emissions.

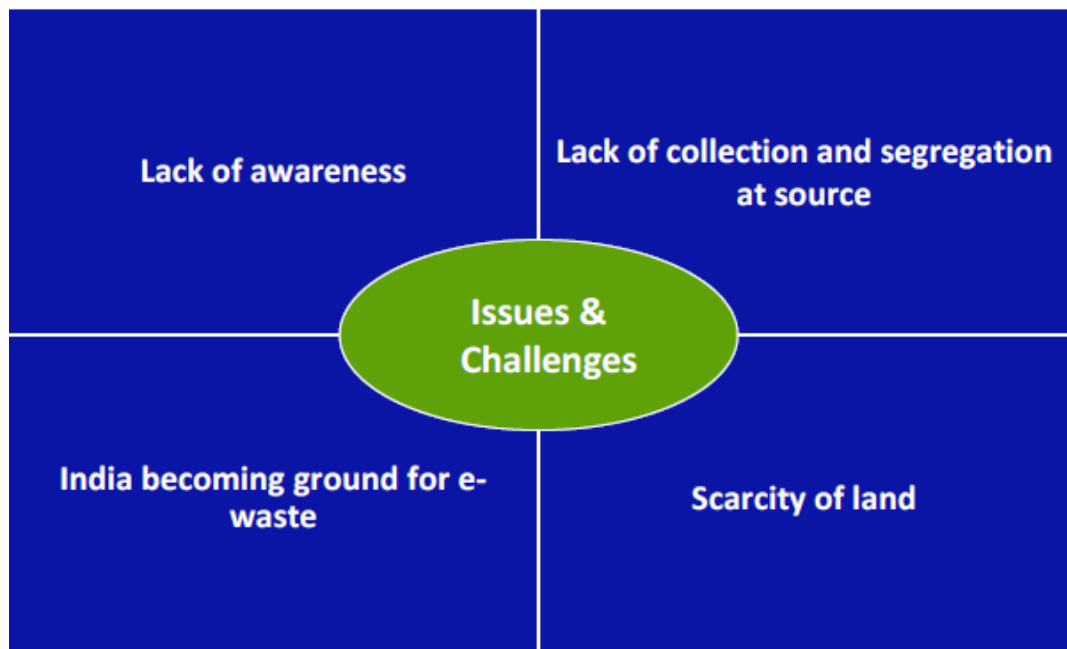
The de-gassing is done in pre-processing stage. The circuit boards contain lead.

They can be removed by manual dismantling, mechanical treatment or both.

In case of mobile phones and MP3 players which are complex electronic devices after removal of the battery they are sent for end-processing to recover metals.

The final stage is end-processing which is refining and disposal. From investment point of view collection, dismantling and mechanical pre-processing are less challenging than end-processing. End processing need investment in advance technologies. All the steps are linked. What is done in dismantling and pre-processing affects the subsequent steps of material recovery.

Success of take-back scheme creates potential in this field as well. Also I should mention that less than 5% of the market is captured by authorised players so the new company can occupy the space and benefits from future government subsidies.



**Figure 13: Issues and challenges**

Majority of e-waste recycling industry is managed by informal sector without any control. SMEs in the informal sector are unskilled workers. They are usually illiterate and belong to rural immigrant families. They form an important part of

the e-waste trade chain. They are spread in clusters. Informal sector includes material extractors, waste importers, scrap dealers, disassemblers and recyclers. The informal sector offers to collect and recycle the e-waste, while compensating the customers. Large manufacturers have not been successful with meeting their collection target because their mechanism competes with the informal sector. So there is a risk associated with competition. Also integration of informal sector in the formal collection channels is a challenge. There are three types of risk associated with e-waste recycling business in Pune. Regulatory risk, market risk and technology risk. The intensity of risk due to lack of definition of WEEE in existing regulations is high but the intensity of Risks due to lack of harmonization of WEEE in Export/ Import rules is medium. Market risks includes risk of availability of raw material, risks associated with collection and risks associated with transportation. The intensity of market risks in Pune is low. The technology risks include risks due to scale of operation, environmental issues and type of raw material in the recycling system. The intensity of technology risks in Pune is medium. The foreign investors should pay attention to the type of raw materials and scale of operation. Risk of expected output, price risk, risk due to the time taken to design take back system including collection, transportation, roles and responsibilities and monitoring are other market risks. Leakage prevention and channelization of material is a challenge. Lack of specific legal frameworks and a low national priority for e-waste, lack of a collection infrastructure, and high costs of logistics are other problems.

E-waste market in Pune is developing, the market potential is huge and recently market growth is accelerating. The existence of illegal recyclers impacts the efficiency of collection systems and business operations. A designed dismantling facility with proven technology is needed in Pune.

## 6.2 Business model

The business model is a working description that includes the general details about the operations of a business. The submitted business model in this study is to help investors run their business successfully. It includes business scope, customer segment, product/services, supplying and distribution channels, revenue

model and proposed entry mode. The business model is applicable for setting up recycle e-waste plant in Pune. In this business model the e-waste collection and recycling leverage on Business to Business (B2B) and Customer to Business (C2B) networks.

In Business to Business (B2B), the transaction occurs between companies. In Customer to Business (C2B), consumers (individuals) offer products and services to companies and the companies pay them.

### 6.2.1 Business scope definition

The company is into recycling of e-waste generated by individuals and corporate bodies. The company collects e-waste from households, informal retailers, corporate clients like Infosys, Vodafone and any established company having substantial IT infrastructure and recycle the waste i.e. recover materials such as precious metals like steel, aluminum, copper, mercury, and plastic. The company identifies equipments which are in working condition or which can be made reusable after small repairs. The company sells the metals and remarkets and lease the equipments recovered from recycling.

The company also does data destruction by destroying hard-disks, compact disks and other memory devices. The company can charges fee on data destruction from the clients who fears leakage of sensitive information.

**Re-use or Refurbishing:** Secondary consumer markets for repair and reuse of electronic equipment are growing. Reuse avoids the need to extract more valuable resources or expend energy in the manufacture of new equipment. Reuse reduces demand for the production of new equipment. The various reuse options can be: Second hand product, modified product after repair, and reuse of old parts in new product. This technique could eliminate waste disposal costs, reduce raw material costs, save energy and provide income from a reusable waste. In India resale and reuse of computers is high.

**Recycle and disposal:** If reuse and refurbishment is not applicable, recycling and disposal is important for e-waste recycling processors. Gold, silver, platinum, palladium, copper, tin, and zinc are recovered in the recycling process. Recycle reduces the amount of greenhouse gas emission.

**Re-production (Upcycle):** Upcycling is a process in which disposable or discarded items are repurposed to make them valuable, useful, or simply aesthetically pleasing (Wisegeek, 2011). Using innovative techniques reduces the e-waste generation to the large extent. Through upcycling, old electronics get saved from being thrown away. The business enterprises can even involve people for bringing new ideas for upcycling. Of course upcycling needs technology and human resources and more investment but it is beneficial for society and environment and it increases the profit made by the company and creat goodwill.

### 6.2.2 Customer segment

Based on the business scope the customers are IT Companies, government offices, electronic devices repair shops, EEE manufacturers like LG, Videocon, Godrej, secondary material dealers, dealers of EE reproduced products and dealers of reusable components and products. These products enter the second hand market. Recovered metals are sold to third party at market price. The Recycled gold is sold to corporate houses like Tanishq, Reliance jeweler. Non-hazardous wastes can be sold off to construction sites at scrap value.

In this business model to attract the customers and suppliers of e-waste the e-waste recycling company can incentivize Households and IT companies by

- Gift vouchers for giving away electronic appliances
- Discounts on new purchase
- Entering into long term contract with IT companies having substantial IT infrastructure
- Advertisement in local business magazine and registration with just dial services
- Awareness programme to be conducted to industries
- Sending introductory letters to all Industries
- Use of internet to promote the service

### 6.2.3 Product/service

Products and services offered by the e-waste recycling unit in Pune include proper arrangement of assets and transportation, sale of equipment and components, lease of equipment, resale products or components, secondary materials such as refined metal, gold, plastic, copper, glass that are produced from secondary materials and e-waste processing or disposal service.

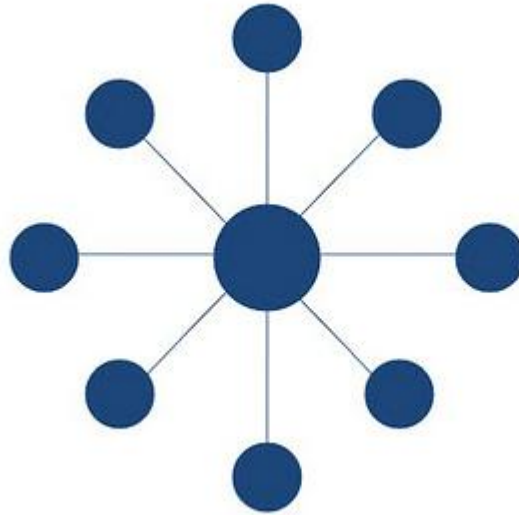
The company should highlight the advantages it can offer in terms of CSR practices and environmental help.

#### 6.2.4 Supplying and distribution

In this model to set up authorized e-waste recycling unit in Pune you need to

- Set up logistic chain for B2B e-waste collection from corporate IT companies by entering into long term contracts with them. These are manufacturers, importers and assemblers of EEE and have substantial IT infrastructure.
- Set up logistic chain for C2B e-waste collection. The collection to be carried out at point of purchase (POP) and informal retailers. After collection reaches a pre-specified limit, it is now sent to the warehouses located in different cities and from there to the central hub in Pune.

The collection is processed through hub and spoke model. Hub and Spoke model Provides Centralized Resources to Business Units. The hub and spoke model is a system which makes transportation much more efficient by greatly simplifying a network of routes.



**Figure 14: Hub and spoke model**

The proposed collection system based on hub and spoke model is shown in figure 15.



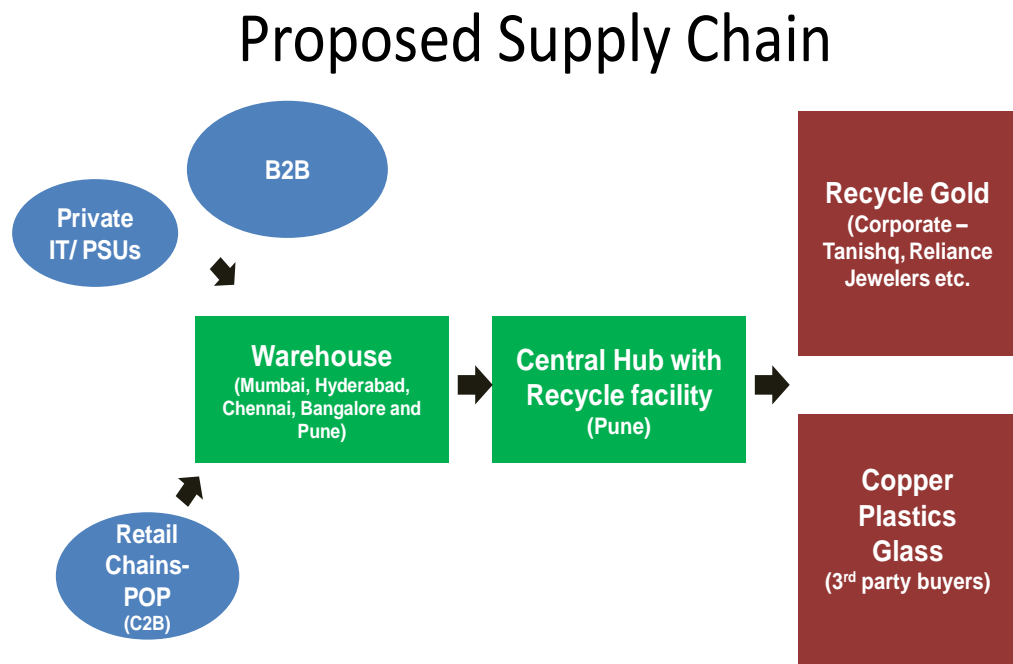
**Figure 15: Hub and spoke model for collection**

**Chennai, Bangalore and Hyderabad are among top cities generating e-waste but if the recycling unit in Pune is not willing to incur the transportation cost, they can concentrate only on Maharashtra. Mumbai alone generate**



**50000 tones of e-waste per year. Pune generate 10000 tones and it is expected to grow by 3500 tones every year.** The collection can be done weekly for C2B e-waste collection and every 2 weeks for B2B collection.

In this business major costs would be logistics and cost of acquiring e-waste. The proposed supply chain model is shown in figure 16.



**Figure 16: proposed supply chain**

In this business model the company needs to work with rag pickers or refurbisher's scattered across the city and the country as they would provide direct supply and demand sources. After collecting the e-waste the e-waste then from warehouses is transported to the authorized recycling facility in Pune. E-waste from households is collected at point-of-purchase of company's retail outlet and other informal retailers and it is sent to the recycling plant in Pune.

Processing of e-waste would generate valuable metals which would be sold off in two ways:

- Selling recycled gold to Corporate houses like Tanishq, Reliance Jewellery
- Selling metals to third party at market price

Other methods are

- Repair and resale of products to second hand dealers
- Reproduction by using innovative techniques
- Generation of non-hazardous wastes which can be sold off to construction sites at scrap value

**Major hubs of e-waste in unorganized sector in Pune are:**

- **Chikhali** => collection and transportation of TV, Pc, Refrigerators, and PCB/PWB and wired
- **Kuddalwadi** => collection and transportation of TV, PC and Refrigerators
- **Pawarwasti** => collection and transportation of PWB/PCB
- **Jadhavwadi** => collection and transportation of PC and Refrigerators
- **Moshi** => physical extraction of copper wire from cables, collection and transportation

Chikhali in Pimpri Chinchwad area acts as a major hub for collection, transportation and trading of ewaste in Pune and Pimpri Chinchwad region. In this business model the authorised recycling unit collect the e-waste in Chikhali through informal retailers. At the moment the major quantum of e-waste is collected by individual collectors and informal sector. Collaboration with these groups is important.

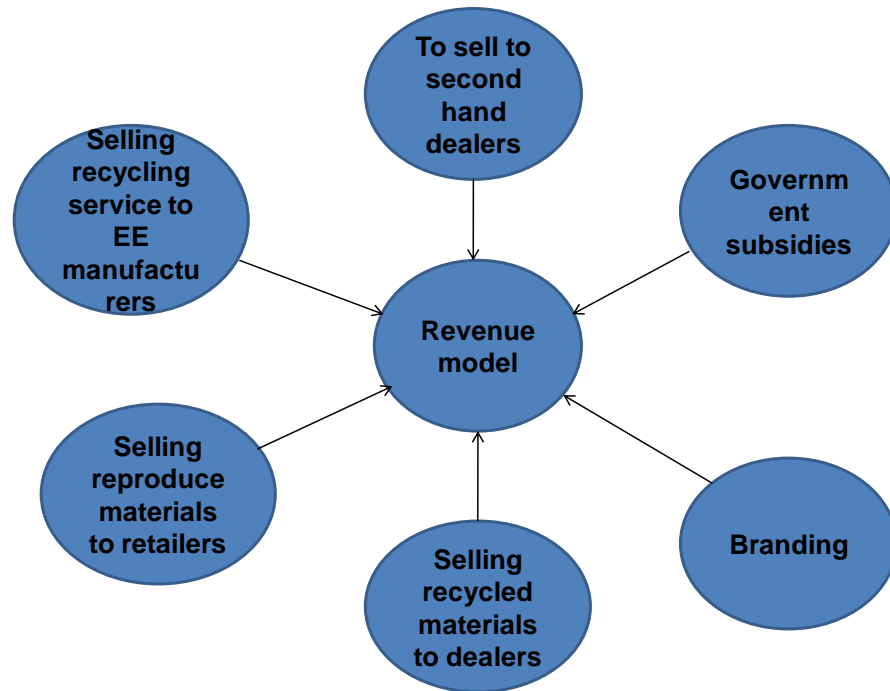
#### 6.2.5 Revenue model

A revenue model is a business plan for a company to make money. Revenue pays the expenses of running the business and if it is above the expenses it is the profit. There has to be multiple ways for a company to make profit so that the company does not depend only on one product or service. A good revenue model reduces the risk of failure and helps the business to survive even at the times of economic collapse.

Based on our business scope the revenue model for an e-waste recycling business in Pune can be explained as below:

- **Reuse and refurbish** => sell to second hand dealers

- **Recycle and disposal** => selling recycling service to EE manufacturers,  
To sell recycled materials to secondary materials dealers
- **Reproduced (Upcycle)** => selling reproduces materials to EE retailers
- **Availing government subsidies**
- **Branding of recycled products for example recycled gold**



**Figure 17: Revenue model**

In this model the recyclers are procuring waste at a cost. The following calculation shows that this model has capacity to support the cost paid to e-waste generators so that they can be an active participant in this model.

Estimated financials for recycling of 5 tonnes of e-waste:

5 tonnes of computer waste:  $5000\text{kgs}/27.2\text{kgs}$  (wt. of one component) = 183 nos.

Waste estimation from 183 computers:

**Table 4: Waste from 183 computers( source: Toxic links)**

Sl No.	MATERIALS	Material in 1 Computer (in kgs)	Material in 183 Computer (in kgs)	Recoverable material	Market Price	Total value
1	Copper	1.91	348.63	313.77	291.00	91306.01
2	Tin	0.27	49.80	34.86	605.00	21092.07
3	Lead	1.72	315.43	15.77	75.00	1182.85
4	Aluminium	3.86	705.56	564.45	143.00	80715.98
5	Nickel	0.23	42.33	33.87	1600.00	54186.95
6	Iron	5.58	1020.99	816.79	18.00	14702.19
7	Zinc	0.60	109.57	65.74	170.00	11176.06
8	Plastic	6.26	1145.50	229.10	60.00	13745.95
	Total					288108.06

Thus, taking a very conservative estimate of the materials recovered, total value of the recoverable materials from 183 computers will be Rs 2, 88,108

The input cost of 183 computers (from various market sources) is approx.

183 x 600 (inclusive of the logistics) = Rs. 109800

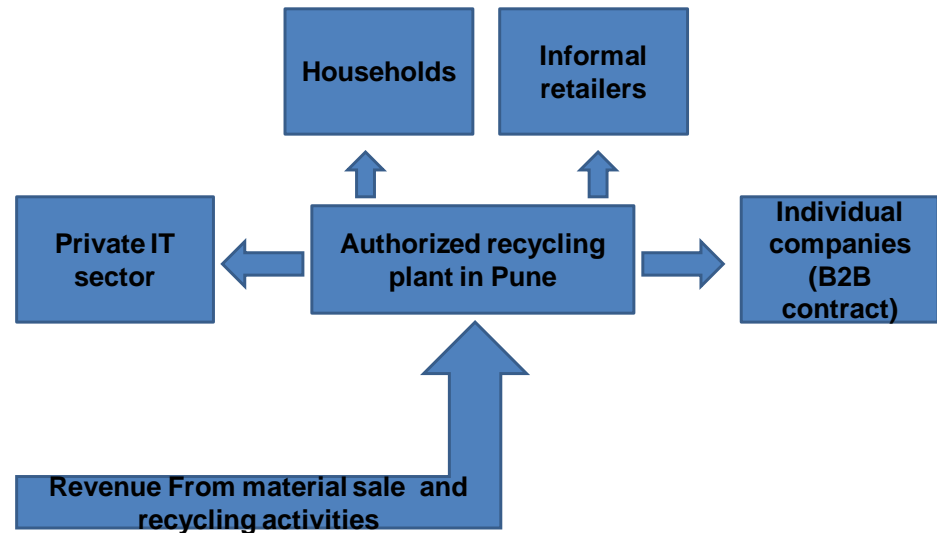
Therefore difference: output–input = Rs. 1, 78,308

Rs 1, 78,308 will include the processing cost and profit for the recycler.

Percentage cost distribution:

- ❖ 38 per cent on input materials
- ❖ 62 per cent on processing of materials and profit

Financial flow in the proposed model is shown in figure 18.



**Figure 18:Financial flow**

#### 6.2.6 Mode of direct investment

The entry mode should reveal a strategy that seeks little bureaucratic influence and attractive return on investment.

In this study the Joint Venture has been chosen as the best entry mode for european investors willing to invest in e-waste recycling business in Pune.

Benefits of choosing the entry mode (Joint Venture):

1. The foreign investor brings in new technology, systems and products and the Indian partner takes care of human resources, legal and tax issues and marketing. New technological knowledge helps the Indian companies to grow.
2. With high bureaucratic barriers the foreign investors need Indian partners' help in communication with other stakeholders in e-waste trade chain. Indian partner have experience and good relation with governmental bodies.

3. Joint Venture is a great way of reducing research costs.
4. Joint Venture parties share the liabilities and jointly manage the risks associated with new venture.
5. Joint Venture is the best way to cut the costs and saving money as it reduces the investment risk.

Speed, access, sharing of resources and high profit are other reasons for choosing the joint venture method. So the joint venture is the most suitable investment mode for European investors.

### 6.3 Discussion

The e-waste generation is growing fast and the market potential is huge. The size of the opportunity could well be imagined when one considers two factors; 3.3 lac tons of e-waste in India and three authorized recyclers present in Maharashtra. As it is, this figure only includes PCs, TVs and mobiles. Collection of e-waste is a challenge but by integrating informal recyclers in the formal collection channels resource utilization is increased due to better collection and channelization of e-waste. The city of Pune needs a designed dismantling facility with proven technology. There is definitely potential in this market

- The government subsidies would be benefit in this business
- The e-waste recycling system in pune is market driven and 95% of market is informal recyclers. The organised players presence less than 5% of the market.
- By having long term B2B contracts other companies enter the value chain.
- The company can tie up with unorganised sector for collection of e-waste.

This business model is for potential investors interested in the field of e-waste recycling.

## REFERENCES

**Online sources**

Business dictionary,2011, micro environment access on 4th september 2011, available at

<http://www.businessdictionary.com/definition/microenvironment.html>

Business dictionary, 2011, capital investment, access on 15th October, available at

<http://www.businessdictionary.com/definition/capital-investment.html>

Business model, investorwords, 2011, access on 15th October, available at

[http://www.investorwords.com/629/business\\_model.html#ixzz1asOCT6Up](http://www.investorwords.com/629/business_model.html#ixzz1asOCT6Up)

COHEN, D. (2006): Qualitative Research Guidelines Project. Semi-structured interviews. New Jersey: Robert Wood Johnson Foundation. available at

<http://www.qualres.org/HomeSemi-3629.html>

CPCB (Central Pollution Control Board) (2010), ‘List of Units Registered with MoEF/CPCB as Recyclers/ Reprocessors having Environmentally Sound Management Facilities (e-waste Reprocessors)’, Available at:

[www.cpcb.nic.in/divisionsofheadoffice/hwmd/e-Waste.pdf](http://www.cpcb.nic.in/divisionsofheadoffice/hwmd/e-Waste.pdf),

Doug Goldstein, what is customer segmentation, 2009, access on 20th October, at

<http://ezinearticles.com/?What-is-Customer-Segmentation?&id=2119470>

Environmental information centre of maharashtra,2009,e-waste generation scenario\_[referred to 25th april].available at:

[http://envis.maharashtra.gov.in/envis\\_data/files/Ewastgeneration\\_scenario.html](http://envis.maharashtra.gov.in/envis_data/files/Ewastgeneration_scenario.html)

EWC electronic recyclers, 2011, benefits of recycling\_[referred to 1st may 2011] at: [http://www.ewastecenter.com/ewaste\\_new/sub05\\_03.php#](http://www.ewastecenter.com/ewaste_new/sub05_03.php#)

Environmental Department of Maharashtra, 2010, E-waste generation scenario \_[referred to 26th April 2011].available at

[http://envis.maharashtra.gov.in/envis\\_data/files/Ewastgeneration\\_scenario.html](http://envis.maharashtra.gov.in/envis_data/files/Ewastgeneration_scenario.html)

E-waste.in, 2010, e-waste statics \_[referred to 26th April 2011].available at:

[http://www.e-waste.in/weee\\_basics/weee\\_statistics](http://www.e-waste.in/weee_basics/weee_statistics)

Econoweee, 2011, Categories of EEE \_ [referred to 23<sup>rd</sup> April 2011].available at:

[http://www.econo-weee.com/categories\\_of\\_eee.php](http://www.econo-weee.com/categories_of_eee.php)

Eukhost, what is a revenue model? , 2011, access on 22nd October, available at <http://blog.eukhost.com/webhosting/what-is-a-revenue-model/>

Environmental Information Center [online]. E-waste generation scenario ScienceDaily, 2010, Hazardous e-waste surging in developing countries\_[referred to 20th April 2011].available at:

<http://www.sciencedaily.com/releases/2010/02/100222081911.htm>

Foreindia .com, 2008, Pune perspective \_ [referred to 2<sup>nd</sup> April 2011].available at: <http://www.foreindia.com/introduction.html>

India online pages, 2010, India's population 2011 \_ [referred to 29<sup>th</sup> march 2011].available at: <http://www.indiaonlinepages.com/population/india-current-population.html>

International Roundtable for Environmentally Sound Management of End-of-Life Electronics, 2009, referred to 7<sup>th</sup> may 2011 at

[http://www.ieewaste.org/pdf/227background\\_paper\\_DecWorkshop\\_\(2\).pdf](http://www.ieewaste.org/pdf/227background_paper_DecWorkshop_(2).pdf)

Investorwords, market research, 2011, available at

[http://www.investorwords.com/2985/market\\_research.html](http://www.investorwords.com/2985/market_research.html)

Improving municipal wastewater management in coastal cities, Unep/GPA, 2004 ,access on 14th october 2001, available at

[http://esa.un.org/iys/docs/san\\_lib\\_docs/tsc\\_training\\_manual\\_wastewater\\_english.pdf](http://esa.un.org/iys/docs/san_lib_docs/tsc_training_manual_wastewater_english.pdf)

Landfill Operation Management Advisor,2008,referred to 3rd may 2011

<http://loma.civil.duth.gr/>

Mpcb, 2010, Report on assessment of electronic wastes in Mumbai-pune Area [referred to 23<sup>rd</sup> April 2011].available at:

<http://mpcb.gov.in/images/pdf/ewastereport1.pdf>

Management tools, 2011, customer segmentation, access 20th October at

<http://www.bain.com/publications/articles/management-tools-2011-customer-segmentation.aspx>

Moritz Fleischmann a, Jacqueline M. Bloemhof-Ruwaard, Rommert Dekker b, Erwin van der Laan, Jo A.E.E. van Nunen a, Luk N. Van Wassenhove, Quantitative models for reverse logistics: A review, available at

[http://www.elsevier.com/authoried\\_subject\\_sections/S03/Anniversary/EJOR\\_free\\_25.pdf](http://www.elsevier.com/authoried_subject_sections/S03/Anniversary/EJOR_free_25.pdf)



Payback period, sudhakar, november 2007, access on 15th october, available at <http://finance-and-cost-management.blogspot.com/2007/11/payback-period.html>

Product differentiation, investopedia,2011, access on 20th october 2011, available at

[http://www.investopedia.com/terms/p/product\\_differentiation.asp#axzz1bJjxd69d](http://www.investopedia.com/terms/p/product_differentiation.asp#axzz1bJjxd69d)

Ribeiro, John, 2010, India plans laws on e-waste management \_ [referred to 29<sup>th</sup> march 2011].available at:

[http://www.pcworld.com/article/195205/india\\_plans\\_laws\\_on\\_ewaste\\_management.html](http://www.pcworld.com/article/195205/india_plans_laws_on_ewaste_management.html)

Report 2010'; Available at: [www.mait.com/Mait-Annual-Report-20-9-10.pdf](http://www.mait.com/Mait-Annual-Report-20-9-10.pdf), (accessed: 2nd October, 2011)

Hi-techrecycling, 2010, access on 28<sup>th</sup> October, available at

<http://www.hitechrecycling.in/>

Report on assessment of electronic wastes in Mumbai-Pune area, Maharashtra pollution contro; board, March 2007 available at

<http://mpcb.gov.in/images/pdf/ewastereport1.pdf>

Sustainable life media, 2010, GREEN GADGETS \_ [referred to 25<sup>th</sup> April 2011].available at: <http://www.matternetwork.com/2010/2/indias-e-waste-grow-500.cfm>

Science daily, 2010, Hazardous E-Waste Surging in Developing Countries \_[referred to 26th April 2011].available at:

<http://www.sciencedaily.com/releases/2010/02/100222081911.htm>

Solving the E-waste Problem, 2008, Annual report, access on 1/05/11, available at <http://www.step-initiative.org/>

[http://www.step-initiative.org/pdf/white-papers/StEP\\_TF1\\_WPTakeBackSystems.pdf](http://www.step-initiative.org/pdf/white-papers/StEP_TF1_WPTakeBackSystems.pdf)

VEGANVERE,2011,e-waste on the rise,[referred to 19th april 2011].available at:

<http://www.aboutmyplanet.com/environment/e-waste-on-the-rise/>

What is business model, business model institute, 2011, access on 15th October, available at <http://businessmodelinstitute.com/what-is-a-business-model/>

Options available for a foreign entity to invest in India, legal service India, 2011, access on 19th october, available at

[http://legalserviceindia.com/articles/fr\\_st.htm](http://legalserviceindia.com/articles/fr_st.htm)

Zeinbook, 2011, international marketing process-[referred to 4<sup>th</sup> September]

available at [http://www.zainbooks.com/books/marketing/international-marketing\\_4\\_five-steps-of-the-international-marketing-process.html](http://www.zainbooks.com/books/marketing/international-marketing_4_five-steps-of-the-international-marketing-process.html)

### **Books**

David A. Aaker, 2001, strategic market management, 6th edition, john wiley&sons, New York.

Anderson, Erin and Hubert Gatignon (1986), “Modes of Foreign Entry: A Transaction Cost Analysis and Propositions,” *Journal of International Business Studies*, 17, (fall), 1-25

Chesbrough, H. and Rosenbloom, R.S. 2002, ‘The role of the business model in Capturing value from innovation: Evidence from Xerox Corporation’s technology

Driscoll, 1995, foreign market entry methods: a mode choice framework, in SJ Paliwoda & JK Ryans (eds), *International marketing reader*, Routledge, London; NewYork.

Gillespie Kate, Jean-Pierre Jeannet and H. David Hennessy (2007), “Global Marketing,” 2nd Edition, Houghton Mifflin Company, Boston, MA 02116-3764

Jain T. R, Trehan M., Trehan R., 2010, business environment, 13th edition, V.K (India) enterprises, New Delhi

Kotler P., Keller K., Brady M., Gooman M., Hansen T., 2009, *Market management*, Pearson Prentice Hall, 13th edition

Kotler P., Armstrong G., 2008, *the principles of marketing management*, Pearson Prentice Hall, 13th edition

Mundada, M. N.; Kumar, S. and Shekdar, A. V. (2004), 'E-waste: a new challenge for waste management in India', *International Journal of Environmental Studies*, Vol. 61, No.3, pp. 265 – 279

Porter M., 2008, *the five competitive forces that shape strategy*, Harvard Business School Publish Corp., p: 4-21

Spin-off companies’, *Industrial and Corporate Change*, vol. 11, no. 3, pp. 529-555.

James R Stock (1998), *Development and Implementation of Reverse Logistics Programs*, Oak Brook, Illinois, Council of Logistics Management.

Corbetta, P. (2003), *Social Research Theory, Methods and Techniques*. London: SAGE Publications.

Williams, E., Kahhat, R., Allenby, B., Kavazanjian, E., Kim, J. and Xu, M. (2008), 'Environmental, Social and Economic Implications of Reuse and Recycling of Personal Computers', *Environment Science and Technology*, Vol. 42, No. 17, pp. 6446-6454

## APPENDICES

## Appendix 1: E-waste new rules 2011

**GOVERNMENT OF INDIA**  
**MINISTRY OF ENVIRONMENT AND FORESTS**

**CHAPTER I****GENERAL****1. Short Title and Commencement.** –

(1) These rules called the e-waste (Management and Handling) Rules, 2011.

(2) They shall come into effect from 1<sup>st</sup> may, 2012.

**2. Application.** –

(1) These rules shall apply to every producer(s), dealer(s), collection centre(s), refurbisher(s), dismantler(s), recycler(s), auctioneer(s) consumer(s) or bulk consumer(s) involved in the manufacture, sale, purchase and processing of electrical and electronic equipment or components as specified in schedule-I and shall not apply to the following:-

(a) Waste water and exhaust gases as covered under the provisions of the Water (Prevention and Control of Pollution) Act, 1974 (6 of 1974) and the Air (Prevention and Control of Pollution) Act, 1981 (14 of 1981) respectively and rules made there under;

(b) waste arising out of the normal operations from ships beyond five kilometers of the relevant baseline as covered under the provisions of the Merchant Shipping Act, 1958 (44 of 1958) and the rules made there under;

(c) radio-active wastes as covered under the provisions of the Atomic Energy Act, 1962 (33 of 1962) and rules made there under,

(d) ozone depleting substances (ODS) as covered under the Ozone Depleting Substances (Regulation and Control) Rules 2000 made under the Act; and

(e) Batteries as covered under the Batteries (Management and Handling) Rules, 2001 made under the Act.

**3. Definitions.** - In these rules, unless the context otherwise requires, -

(a) 'Act' means the Environment (Protection) Act, 1986 (29 of 1986);

(b) 'Auction' means sale of used electrical electronic equipment or component(s) thereof by invitation of tenders or auction, contract or negotiation by individual(s), companies or Government Departments;

(c) 'Authorisation' means permission for handling, collection, reception, storage, transportation, dismantling, recycling, treatment and disposal of e-waste granted under sub-rule (2) of rule 11;

(d) 'bulk consumer' means bulk users of electrical and electronic equipment such as Central or State Government Departments, public sector undertakings, banks, private companies, educational institutions multinational organizations and others that are registered under the Factories Act 1948, Companies Act 1956 or the Societies Registration Act 1860, and the Micro, Small and Medium Enterprises Development Act, 2006 including the international agencies;

(e) 'Central Pollution Control Board' means the Central Pollution Control Board constituted under sub-section (1) of section 3 of the Water (Prevention and Control of Pollution) Act, 1974 (6 of 1974);

(f) 'Collection centre' means a centre established, individually or jointly to collect e-waste;

(g) 'Consumer' means any person(s) using electrical and electronic equipment excluding the bulk consumers;

(h) 'Dealer' means any person who sells and receives electrical or electronic equipment or components thereof to and from the consumers or bulk consumers or other dealers or retailers on behalf of the producers or otherwise;

(i) 'Dismantler' means any person engaged in dismantling of used electrical and electronic equipment into their components;

(j) 'Disposal' means any operation which does not lead to recycling, recovery or reuse and includes physic-chemical or biological treatment, incineration and deposition in secured landfill;

(k) 'environmentally sound management of e-waste' means taking all steps required to ensure that e-waste are managed in a manner which shall protect health and environment against any adverse effects, which may result from hazardous substance contained in such wastes;

(l) 'electrical and electronic equipment (EEE)' means equipment which is dependent on electric currents or electro-magnetic fields to be fully functional including those used for the generation, transfer and measurement of such currents and fields falling under the categories set out in Schedule-I.

(m) 'e-waste' means waste electrical and electronic equipment, whole or in part included in, but not confined to equipment listed in schedule-I and scraps or rejects from their manufacturing process, which is intended to be discarded.

(n) 'Extended producer responsibility' (EPR) means responsibility of any producer of electrical or electronic equipment, for their products beyond manufacturing until environmentally sound management of their end-of-life products.

(o) 'Facility' means any location wherein the process incidental to the collection, reception, storage, segregation, refurbishing, dismantling, recycling, treatment and disposal of e-waste are carried out;

(p) 'Form' means forms appended to these rules;

(q) 'Historical waste' means e-waste available in the market on the date from which these rules come into force.

(r) 'Orphaned products' means non branded or assembled products as well as those produced by a company, which has closed the operation or stopped the product support;

(s) 'Producer' means any person who, irrespective of the selling technique used; (i) Manufactures and offers to sale electrical and electronic equipment under his own brand; or

- (ii) Offers to sale under his own brand, the assembled electrical and electronic equipment produced by other manufacturers or suppliers; or
  - (iii) Offers to sale imported electrical and electronic equipment;
  - (t) 'Recycler' - means any person who is engaged in processing e-waste for recovery of useful materials or reuse;
  - (u) 'Refurbishment' means repairing of used electrical and electronic equipment to be put back to original use and selling the same in the market;
  - (v) 'Refurbisher' means any person who is engaged in refurbishment;
  - (w) 'Schedule' means the Schedules appended to these rules;
  - (x) 'State Government'- in relation to a Union territory means, the Administrator thereof appointed under article 239 of the Constitution;
  - (y) 'State Pollution Control Board'- means the concerned State Pollution Control Board or the Pollution Control Committee of the Union Territories constituted under sub-section (1) of section 4 of the Water (Prevention and Control of Pollution) Act, 1974;
  - (z) 'Transporter' means a person engaged in the off-site transportation of e-waste by air, rail, road or water
- Words and expressions used in these rules and not defined but defined in the Environment (Protection) Act 1986 shall have the meanings respectively assigned to them in that Act.*

## **CHAPTER II RESPONSIBILITIES**

- 4. Responsibilities of the producer.** – The producer shall be responsible for:-
- (1) Collecting of any e-waste generated during the manufacture of electrical and electronic equipment and channelizing the same for recycling or disposal.
  - (2) Ensuring that all electrical and electronic equipment are provided with a unique serial number or individual identification code for tracking their products in the e-waste management system.
  - (3) Collecting e-waste generated from the 'end of life' of their products in line with the principle of 'Extended Producer Responsibility' (EPR), and to ensure that such e-wastes are channelized to registered refurbisher or dismantler or recycler.
  - (4) Setting up collection centers or take back system either individually or collectively for all electrical and electronic equipment at the end of their life.
  - (5) Financing, and organizing a system to meet the costs involved in the environmentally sound management of e-waste generated from the 'end of life' of its own products and historical waste available on the date from which these rules come in to force. Such financing system shall be transparent. The producer may choose to establish such financial system either individually or by joining a collective scheme.

(6) Providing contact details such as address, telephone numbers/helpline number and e-mail of dealers and authorized collection centers to consumer(s) or bulk consumer(s) so as to facilitate return of used electrical and electronic equipment.

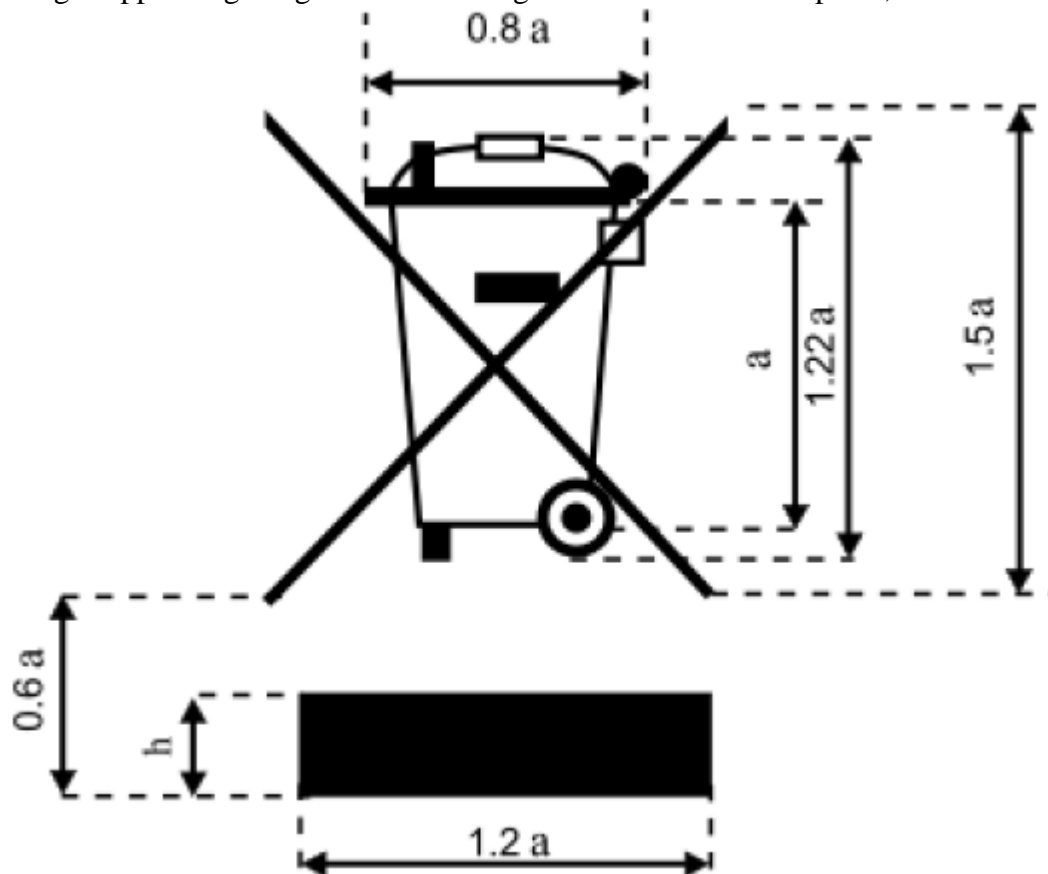
(7) Creating awareness through publications, advertisements, posters, or by any other means of communication and information booklets accompanying the equipment, with regard to the following:

(i) Information on hazardous constituents in e-waste electrical and electronic equipment;

(ii) Information on hazards of improper handling, accidental breakage, damage and/or improper recycling of e-waste;

(iii) Instructions for handling the equipment after its use, along with the Do's and Don'ts;

(iv) Affixing the symbol given below on the products to prevent e-waste from being dropped in garbage bins containing waste destined for disposal;



(8) Obtaining an authorization from the concerned State Pollution Control Board or Pollution Control Committee in accordance with the procedures prescribed under rule-11;

(9) Maintaining records in Form 2 of the e-waste handled. Such records should be available for scrutiny by the appropriate authority.

(10) Filing annual returns in Form 3, to the concerned State Pollution Control Board or Pollution Control Committee, on or before the 30th day of June following to the financial year to which that return relates.

**5. Responsibilities of dealers. –**

(1) Every dealer shall be responsible to collect the e-waste by providing the consumer(s) a box, bin or a demarcated area to deposit e-waste.

(2) Every dealer shall make an application in Form 4 to the concerned State Pollution Control Boards or Pollution Control Committees for grant of one time registration;

(a) The State Pollution Control Boards or Pollution Control Committees shall register the dealer on a one time basis and registration would be considered as deemed if not objected to within a period of 30 days.

(b) The registered dealer shall be required to submit details of e-waste collected to the concerned State Pollution Control Board or Pollution Control Committees on yearly basis and registration would be liable for cancellation on failure to furnish these details to the State Pollution Control Boards or Pollution Control Committees:

Provided that the registration granted to the dealer shall not be cancelled unless he has been given a reasonable opportunity of hearing.

(3) Every dealer shall ensure that the e-waste thus collected is safely transported back to the producer or to authorized collection centre as the case may be.

(4) Every dealer shall file annual returns in Form 3 to the concerned State Pollution Control Board or Pollution Control Committee, on or before the 30th day of June following to the financial year to which that return relates.

(5) Every dealer shall maintain records of the e-waste handled in Form 2 and such records should be available for scrutiny by the appropriate authority.

#### **6. Responsibilities of refurbisher. –**

(1) Every refurbisher shall collect e-waste generated during the process of refurbishing and channelized the waste to authorized collection center.

(2) Every refurbisher shall make an application in Form 4 to the concerned State Pollution Control Boards or Pollution Control Committees for grant of one time registration;

(a) The State Pollution Control Boards or Pollution Control Committees shall register the refurbisher on a one time basis and registration would be considered as deemed if not objected to within a period of 30 days.

(b) The registered refurbisher shall be required to submit details of e-waste generated to the concerned State Pollution Control Board or Pollution Control Committees on yearly basis and registration would be liable for cancellation on failure to furnish these details to the State Pollution Control Boards or Pollution Control Committees:

Provided that the registration granted to the refurbisher shall not be cancelled unless he has been given a reasonable opportunity of hearing.

(3) Every refurbisher shall ensure that the e-waste thus collected is safely transported back to authorized collection centre or registered recyclers as the case may be.

(4) Every refurbisher shall file annual returns in Form 3 to the concerned State Pollution Control Board or Pollution Control Committee, on or before the 30th day of June following to the financial year to which that return relates.

(5) Every refurbisher shall maintain records of the e-waste handled in Form 2 and such records should be available for scrutiny by the appropriate authority.



**7. Responsibilities of collection centers** – Any person(s) operating collection centre(s) individually or collectively shall,-

(1) Obtain an authorization in accordance with the procedures prescribed under Rule -11 from the concerned State Pollution Control Board or Pollution Control Committee as the case may be and provide details such as address, telephone numbers/helpline number, e-mail, etc. of such collection centre(s) to the general public.

(2) ensure that the e-waste collected by them are stored in a secured manner till these are sent to producer(s) or refurbisher or registered dismantler(s) or recycler(s) as the case may be;

(3) Ensure safe transportation of the e-waste; and

(4) Ensure that no damage is caused to the environment during storage and transportation of e-waste; and

(5) File annual returns in Form 3, to the concerned State Pollution Control Board or Pollution Control Committee on or before the 30th day of June following to the financial year to which that return relates.

(6) Maintain records of the e-waste handled in Form 2 and such records should be available for scrutiny by the appropriate authority.

**8. Responsibilities of consumer or bulk consumer.** –

(1) Consumers of electrical and electronic equipment shall ensure that e-waste are deposited with the dealer or authorized collection centers.

(2) Bulk consumers of electrical and electronic equipment shall ensure that e-waste are auctioned to or deposited with the dealer or authorized collection centers or refurbisher or registered dismantler or recyclers or avail the pick-up or take back services provided by the producers; and

(3) Bulk consumers shall file annual returns in Form 3, to the concerned State Pollution Control Board or Pollution Control Committee on or before the 30th day of June following to the financial year to which that return relates.

**9. Responsibilities of dismantler** – Every dismantler shall,-

(1) Obtain registration from the Central Pollution Control Board in accordance with the procedures prescribed under the rule -13.

(2) ensure that no damage is caused to the environment during storage and transportation of e-waste;

(3) ensure that the dismantling processes do not have any adverse effect on the health and the environment;

(4) ensure that the facility and dismantling processes are in accordance with the standards or guidelines published by the Central Pollution Control Board from time to time; and

(5) Ensure that dismantled e-waste are segregated and sent to the registered recycling facilities for recovery of materials;

(6) Ensure that non-recyclable/non-recoverable components are sent to authorized treatment storage and disposal facilities.

(7) File a return in Form 3, to the State Pollution Control Board/Committee of Union Territories as the case may be, on or before 30th June following to the financial year to which that return relates.

(8) Not process any e-waste for recovery or refining of materials, unless he is registered with Central Pollution Control Board as the recycler for refining and recovery of materials.

**10. Responsibilities of recycler/ reprocessor** – Every recycler shall

(1) Obtain registration from Central Pollution Control Board in accordance with the procedures prescribed under Rule -13.

(2) Ensure that the facility and recycling processes are in accordance with the standards laid down in the guidelines published by the Central Pollution Control Board from time to time;

(3) make available all records to the Central or State Pollution Control Board/ Committee of Union Territories for inspection;

(4) Ensure that residue generated thereof is disposed of in a hazardous waste treatment storage disposal facility;

(5) File annual returns in Form 3, to the State Pollution Control Board or Committee of the UT as the case may be, on or before 30th June following to the financial year to which that returns relate.

### **CHAPTER III**

#### **PROCEDURE FOR SEEKING AUTHORIZATION FOR HANDLING e-WASTES**

**11. Procedure for grant of authorization.–**

(1) Every producer, collection centre, dismantler and recycler of e-waste shall require obtaining an authorization from the concerned State Pollution Control Board or Pollution Control Committee of Union Territories as the case may be.

(2) Every producer, collection centre, dismantler and recycler of e-waste shall make an application, within a period of three months starting from the date of commencement of these rules, in Form 1 to the State Pollution Control Board or the Pollution Control Committee for grant of authorization;

Provided that any person authorised under the provisions of the Hazardous Wastes (Management, Handling and Transboundary Movements) Rules, 2008, prior to the date of coming into force of these rules shall not require to make an application for authorization till the period of expiry of such authorization; Provided further that a recycler of e-waste who has not been authorised under the provisions of the Hazardous Waste (management, Handling and Transboundary Movements) Rules, 2008, shall require following the procedure mentioned in sub rule (1) above.

(3) On receipt of the application complete in all respects for the authorization, the State Pollution Control Board or Pollution Control Committee of Union Territories may, after such enquiry as it considers necessary and on being

Satisfied that the applicant possesses appropriate facilities, technical capabilities and equipment to handle e-waste safely, grant within a period of one hundred and twenty days an authorization in Form-1(a) to the applicant to carry out safe operations in the authorized place only, which shall be valid for a period of five years.

(4) The State Pollution Control Board or Pollution Control Committee of the Union Territories after giving reasonable opportunity of being heard to the applicant shall refuse to grant any authorization.

(5) Every person authorized under these rules shall maintain the record of e-waste handled by them in Form-2 and prepare and submit to the State Pollution Control Board or Pollution Control Committee, an annual return containing the details specified in Form 3 on or before 30th day of June following to the financial year to which that return relates.

(6) An application for the renewal of an authorization shall be made in Form-1 at least two months (sixty days) before its expiry and the State Pollution Control Board or Pollution Control Committee may renew the authorization after examining each case on merit and subject to the condition that there is no report of violation of the provisions of the Act or the rules made there under or the conditions specified in the authorization.

(7) Every producer, collection centre, dismantler and recycler shall take all steps, wherever required, to comply the conditions specified in the authorization.

(8) The State Pollution Control Board in case of a respective State or the Pollution Control Committee in case of Union Territories shall maintain a register containing particulars of the conditions imposed under these rules for environmentally sound management of e-waste, and it shall be open for inspection during office hours to any person interested or affected or a person authorized by him on his behalf.

#### **12. Power to suspend or cancel an authorization.-**

(1) The State Pollution Control Board or Pollution Control Committee of the Union Territories may, if in its opinion, the holders of the authorization has failed to comply with any of the conditions of the authorization or with any provisions of the Act or these rules and after giving a reasonable opportunity of being heard and after recording reasons thereof in writing cancel or suspend the authorization issued under these rules for such period as it considers necessary in the public interest.

(2) Upon suspension or cancellation of the authorization, the State Pollution Control Board or Pollution Control Committee of the Union Territories may give directions to the persons whose authorization has been suspended or cancelled for the safe storage of the e-waste and such person shall comply with such directions.

### **CHAPTER IV**

#### **PROCEDURE FOR REGISTRATION WITH CENTRAL POLLUTION CONTROL BOARD**

##### **13. Procedure for grant registration. –**

(1) Every dismantler or recycler of e-waste shall make an application, within a period of three months starting from the date of commencement of these rules, in Form-5 in triplicate to the Member Secretary of the Central Pollution Control Board enclosing accompanied with a copy of the following documents for the grant or renewal of registration:-

(i) consent to establish granted by the State Pollution Control Board under Water (Prevention and Control of Pollution) Act, 1974, (25 of 1974) and Air (Prevention and Control of Pollution) Act, 1981(21 of 1981);

(ii) Certificate of registration issued by the District Industries Centre or any other government agency authorized in this regard;

(iii) Proof of installed capacity of plant and machinery issued by the District Industries Centre or any other government agency authorized in this behalf

(iv) in case of renewal, a certificate of compliance of effluent and emission standards, treatment and disposal of hazardous wastes as applicable from the State Pollution Control Board or Committee of the UT or any other agency designated for this purpose; and

Provided that any person registered under the provisions of the Hazardous Wastes (Management, Handling and Transboundary Movements) Rules, 2008, prior to the date of coming into force of these rules shall not require to make an application for registration till the period of expiry of such registration; Provided further that a recycler of e-waste who has not been registered under the provisions of the Hazardous Waste (management, Handling and Transboundary Movements) Rules, 2008, shall require following the procedure mentioned in sub rule (1) above.

(2) The Central Pollution Control Board, on being satisfied that the application is complete in all respect and that the applicant is utilizing environmentally sound technologies and possess adequate technical capabilities, requisite facilities and equipment to recycle and process e-waste, may grant registration to such applicants stipulating therein necessary conditions as deemed necessary for carrying out safe operations in the authorized place only.

(3) The Central Pollution Control Board shall dispose of the application for registration within a period of ninety days from the date of the receipt of such application complete in all respects.

(4) The registration granted under these rules shall be valid initially for a period of two years and thereafter for a period of maximum five years on subsequent renewals from the date of its issue, unless the operation is discontinued by the unit or the registration suspended or cancelled by the Central Pollution Control Board.

(5) The Central Pollution Control Board may after giving reasonable opportunity of being heard to the applicant, by order, refuse to grant or renew.

(6) The Central Pollution Control Board shall monitor the compliance of conditions stipulated for granting registration.

(7) The Central Pollution Control Board may cancel or suspend a registration granted under these rules, if it has reasons to believe that the registered recycler has failed to comply with any of the conditions of registration, or with any provisions of the Act or rules made there under, after giving an opportunity to the recycler to be heard and after recording the reasons there for.

(8) An application for the renewal of registration shall be made in Form-5 at least two months (sixty days) before its expiry and the State Pollution Control Board or Pollution Control Committee may renew the registration after examining each case on merit and subject to the condition that there is no report of violation of the provisions of the Act or the rules made there under or the conditions specified in the registration.

(9) The dismantler or recycler shall maintain records of the e-waste purchased and processed and shall file annual returns of its activities of previous year in Form 3 to the State Pollution Control Board or Pollution Control Committee on or before 30th day of June of every year

(10) The Central Government and the Central Pollution Control Board may issue guidelines for standards of performance for recycling processes from time to time.

**14. Procedure for storage of e-waste.-**

(1) Every producer, dealer, collection centre, dismantler or recyclers may store the e-waste for a period not exceeding one hundred and twenty days and shall maintain a record of collection, sale, transfer, storage and segregation of wastes and make these records available for inspection:

Provided that the State Pollution Control Board may extend the said period in following cases, namely:

- (i). Dismantlers and Recyclers up to six months of their annual capacity; or
- (ii). Collection centers who do not have access to any registered dismantling or recycling facility in the concerned state; or
- (iii). the waste which needs to be specifically stored for development of a process for its recycling, reuse.

**CHAPTER V**

**REDUCTION IN THE USE OF HAZARDOUS SUBSTANCES (RoHS) IN THE MANUFACTURE OF ELECTRICAL AND ELECTRONIC EQUIPMENT**

**15. Reduction in the use of hazardous materials in the manufacture of electrical and electronic equipment.-**

(1) Every producer of electrical and electronic equipment shall comply with the threshold limits as prescribed in Schedule -III for the use of certain hazardous substances in electrical and electronic equipment. Such reduction in use of hazardous substances in electrical and electronic equipment shall be achieved within a period of three years from the date of commencement of these rules.

(2) In the event of such reduction in the hazardous materials used in the electrical and electronic equipment, the detailed information on the constituents of the equipment shall be provided in the product information booklet.

(3) Imports or placement in the market for electrical and electronic equipment shall only be permitted for those which are RoHS compliant as per the Schedule-III annexed to these rules.

(4) Every producer or importer of electrical and electronic equipment shall furnish in written a declaration with regard to compliance to the requirement of Schedule-III.

**CHAPTER VI**

**MISCELLANEOUS**

16. Every producer(s), dealer(s), collection centre(s), refurbisher(s), dismantler(s), recycler(s), auctioneer(s) consumer(s) or bulk consumer(s) shall not import used electrical and electronic equipment in India for use.

17. **Duties of Authorities.** - Subject to the other provisions of these rules, the authority shall perform duties as specified in Schedule-IV.

**18. Annual Report.-**

(1) The State Boards and the Committees shall prepare and submit to the Central Pollution Control Board an annual report with regard to the implementation of these rules by the 30th September every year in Form 6.

(2) The Central Pollution Control Board shall prepare the consolidated annual review report on management of municipal solid waste and forward it to the Central Government along with its recommendations before the 30th December every year.

**19. Transportation of e-waste. –**

(1) The transportation of e-waste, when these are intact, shall be like any other electrical and electronic equipment.

(2) In case of transportation of e-waste either for dismantling or for recycling or for final disposal to a facility existing in a State other than the State where the waste is generated/collected, the transporter shall obtain 'No Objection Certificate' from the State Pollution Control Board of the State of transit.

(3) In case of transportation of e-waste through a State other than the State of origin of destination, the transporter shall intimate the concerned State Pollution Control Board beforehand.

**20. Accident reporting and follow-up.-** where an accident occurs at the facility processing e-waste or during transportation of e-waste, the producer, transporter, dismantler, refurbisher or recycler, as the case may be, shall report immediately to the State Pollution Control Boards/Committees of Union Territories about the accident providing the details in Form 5.

**21. Liability of the producer, collection centre, transporter, dismantler and recycler of e-waste. –**

(1) The producer, collection centre, transporter, dismantler and recycler, as the case may be, based on their respective responsibilities defined earlier shall be liable for any damages caused to the environment or the human health including third parties due to improper handling and disposal of e-waste.

(2) The producer, collection centre, transporter, dismantler and recycler as identified to be liable in (1) above shall inform the Central/State Pollution Control Board/Committees of Union Territories of the damages caused and undertake to reinstate or restore damaged or destroyed elements of the environment at his cost, failing which they shall be liable to pay the entire cost of remediation or restoration of the environment.

(3) The consumer shall be liable to deposit the e-waste with the authorized dealers, or collection centre failing which they shall be liable to pay a fine as specified in the act for any violation of the provisions under these rules.

22. The collection, storage, transportation, segregation, refurbishment, dismantling recycling and disposal of e-waste shall be in accordance with the procedures prescribed in the guidelines published by the Central Pollution Control Board from time to time.

**23. Appeal. –**

(1) Any person aggrieved by an order of suspension or cancellation or refusal of authorization or its renewal passed by the State Pollution Control Board or Pollution Control Committee, may within a period of thirty days from the date on which the order is communicated to him, prefer an appeal in Form 7 to the Appellate Authority comprising of the Environment Secretary of the State.

(2) Any person aggrieved by an order of suspension or cancellation or refusal of registration or its renewal passed by the Central Pollution Control Board, may, within a period of thirty days from the date on which the order is

Communicated to him, prefer an appeal in Form 7 to the Appellate Authority comprising of the Secretary, to the Government of India in the Ministry of Environment and Forests.

(3) The appellate Authority may entertain the appeal after the expiry of the said period of thirty days if it is satisfied that the appellant was prevented by sufficient cause from filing the appeal in time.

(4) Every appeal filed under this rule shall be disposed of within a period of sixty days from the date of its filing.

## Appendix 2: Questionnaires for interview

### **Governmental agencies**

Respondents:

Pune municipal corporation (PMC)

Maharashtra pollution control board (MPCB)

Maharatta chamber of commerce industry and agriculture (MCCIA)

Interview questions:

- What is your opinion about the new e-waste (management and handling) rules 2010 issued by the Indian government?
- What are the long terms plans to manage e-waste recycling in pune?
- What is the current situation of e-waste recycling in pune? What are the steps to improve it?
- What are the other stakeholders' roles to improve the situation?
- What are the policies to deal with informal recyclers in pune?
- How about the situation of current licensed recycling companies in pune? What are the policies to develop these licensed companies' development?

### **E-Waste collectors, E-waste seller**

Respondents:

Swachh pune seva sahakari sanstha, Ltd

Kagad Kach Kashtakari Panchayat

Interview questions:

- How do they collect e-waste?
- (at swachh )What is the annual collective numbers? What are their problems in e-waste collection?
- How to deal with these E-waste products? Resell, recycling or others?
- How do they transport and store e-waste?
- What are the changes in their system after the new e-waste (management and handling) rules 2010 issued by the Indian government?
- Comparing between official and unofficial collectors, what are their advantages and disadvantages?

### **NGO**

Respondent: Greenpeace

- What's the opinion on e-waste recycling and disposal in pune? Including positive and negative factors in this industry.
- What's the opinion on how to improve those negative factors?
- What are the activities related to e-waste recycling which had been held recently? What are the purpose of these activities and how to evaluate them?
- What are activities to be held in future and their purpose?
- What's plan to develop e-waste recycling (e-waste collection) in pune?

### **E-waste recycling companies in pune**

Respondent:

Hi-Tech recycling Pvt.Ltd

Interview questions:

- Explain the company briefly.
- What are technologies to apply for in disposal? Process and product line information included.
- What are the collective channels for e-waste resource, and collective methods, price if pay for?
- Who are companies' main customers?
- How do they compete with illegal competitors? Any suggestion on how to deal with activities of illegal sector?
- Besides the government support, what efforts from community to develop e-waste recycling they hope?
- Are they interested in cooperation with foreign colleagues? If not, why? If yes, what they expect foreign companies make up weakness?