Evaluation of Opportunities in Large Scale E-waste Processing Facility Investement in China

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Yang Xun

Lahti University of Applied Sciences
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ABSTRACT

E-waste is the short term of waste electrical and electronic equipment. Driving by the forces of saving resources, management the danger of e-waste toxic components, e-waste business develops rapidly.

China is the country who meets the most severe situation to deal with e-waste problem as it produces a massive volume of scraps every year and holds most illegal imported e-waste. Many investors intend to enter into Chinese e-waste processing business market. This thesis aims at providing some suggestions on how to do such a business in China for European investors.

The thesis introduces the market situation of e-waste processing in China. Based on the market analysis, an innovative business model is proposed to European investors, to help them achieve a successful business in large scale e-waste processing in China.

The theoretical part contains two parts. One introduces knowledge about e-waste concepts and e-waste business. The other outlines the framework of market research and theories to develop a business model.

The research method applied in the whole study is qualitative method. Additionally, the comparative method is put to use in the competitors' analysis.

The empirical part is to describe the result of the market research. The result concerns the driving forces of market, competitors, stakeholders as well as industry competition.

In the final conclusion part, the proposal about market potential and risk is offered firstly. Subsequently, the business model with components: entry mode, products/service, supplying and distribution channel and revenue model are proposed.

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

CONTENT

1 INTRODUCTION

1.1 Background

The generation of electrical and electronic equipment waste (hereinafter referred as e-waste) is huge annually. They come from all kinds of discarded electrical and electronic devices, such as computers, televisions, air conditioners, washing machines and cell phones etc. From the statistics of US Environmental Protection Agency (EPA), 157 million computers, 20 million TVs, 126 million cell phones were discarded in 2007. Discarded electronics make up around 2% of the municipal waste stream, and is the fastest growing part. Without proper treatment e-wastes, the inside toxic substances e.g. lead, mercury, cadmium, beryllium, and other hazardous chemicals would be discharged, poison environment, and cause high risks of serious sickness.

China, as one of the biggest countries in electrical and electronics (hereinafter short as EE) goods production and consumption, where also holds most of dumped e-waste shipped from developed countries, faces more severe situation to reduce e-waste's impacts on environment and human health problems. *China has made great efforts for the challenges of e-waste and the illegal shipment from other countries*. (Liu 2006, pp.92). These efforts include, design and execute legislations to regulate e-waste recycling and disposal, forbid import e-waste, put funds to research and develops processing technologies, offer favorable polices for e-waste large-scale processing facilities, e.g. taxation reduction and subsidy. All these initiatives promoted rapid development of e-waste business in China recent years. Lots of large scale e-waste processing plants had been built, especially the places along coastlines. The investors include EE manufacturers, like Changhong Group, Fuji Co., Ltd (Japan); professional waste recycling technology companies, like Fortune Group (U.S.), TES Envirocorp (Holding) Pte Ltd (Singapore). In view of processing facilities' modes, some are domestic companies, like Huaxing; some are joint ventures, e.g. Hangzhou Dadi Company; some are wholly foreign owned

companies, like Fuji Aike, Fortune China Group. Besides, China National Development and Reform Commission appointed nine big processing plants of various provinces to hold e-waste management trial projects. Government agencies can observe the operation of these companies; learn from their lessons of successes and failures. The accumulated experiences are benefit to carry out more sound and preferable policies in whole managerial scheme, from e-waste collection, logistics, recycling to final disposal.

After several years' operation, these large scale processing plants' business results are quite different, profit, petty gains or loss. Managers blamed the unsatisfied performance on imperfect legislative framework, which affected to obtain enough e-waste to feed product lines, reach full production which require numerous materials. The shortage of e-wastes supplying restricted effectiveness of large-volume production, therefore led high cost in operation. Thus, managers claimed more subsidies. Although Chinese government tried to control the stream of e-scraps to formal section, e-wastes collected by individual collectors are much more than formal collectors. Waste continues to flow illegal section. They are transferred to small size family workshop, repair workshop, where e-wastes are recycled by unskilled persons utilizing lagging technology. After refined valuable metals, such as gold, copper and re-utilized components, they abandon the unsettled remaining parts which still consist of rudimental metals and chemicals. Accordingly, the informal recycling brings on poison to environment.

In response to industry's calling on and realizing the activities of informal sections threaten the development of formal ones, Chinese government have implemented practical initiatives to regulate e-waste business on the basis of several years' experiences. The resolute actions to forbid illegal import and small workshops were exerted at coastline provinces. Moreover, the Ordinance on the Management of Waste Electrical and Electronic Products (hereinafter short as **the Ordinance**) came out at the beginning of year 2009. The Ordinance contributes to well defined responsibilities of participants in e-waste flow, relevant government authorities, EE manufacturers, collectors and formal recycling enterprises etc. The term extended producers responsibility (EPR) are clearly stated as well as the fund to subsidize e-waste treatment fixes on EE producers, which sounds more reliable in compari-

son with sourcing from government budget. Furthermore, national Trade-in policies, sponsored by The Ministry of Commerce started from June 2009 in order to motive EE products sale, also bring along the high rate of users to return discarded products. These initiatives tackle to the current problems existed in e-waste processing industry. It is estimated that the subsidy for large scale processing enterprises will be increased quite soon, and some official sites for e-waste collection are about to be established.

All of these arrangements again drew investors' great interest to invest e-waste large scale processing business in China. For European investors, they have longer history to manage e-waste and accumulated more experience in practice. The strengths of European investors are to acquire state to art processing technologies and master know- how skills. Relied on the advantages in technologies, European processors can recycle nearly 100% materials of e-waste and discharge 0%, for example Kuusakoski Company of Finland. In spite of competence in technologies, there are quite difference in market situation. In Europe, e-waste are commonly considered worthless, and are thrown away with easily (Wang, 2008). In China, e-waste are regarded as valuable resource, normally need to purchase from users. Therefore, the European model can't be transplanted in Chinese market entirely. For European investors, they need to recognize the characters of Chinese e-waste processisng market first, then decide how to operate large scale e-waste processing plants. They need design a increative business model which is fitting to Chinese market.

For potential foreign investors, there are lots of problems to understand Chinese market situation thoroughly. The e-waste flow in China is much more complicated by contrast developed countries. Large amount of informal individual collectors, underground e-waste trade markets and backyard recyclers despoil resource and benefits from formal processors. They are moving operation, not easily traced and surely not willing to communicate with strangers. And, multifarious administrations in e-waste legislative management are a competitive task as well. Approval of legal license, application for subsidy, taxation reduction, supervision of disposal quality, etc. assign to minimum eight authorities who are differentiated in local, provincial and national grade. Furthermore, it is difficult to communicate with

other important e-waste involvers, such as EE manufacturers, waste collectors and retailers. Limited by language and different culture background, they are not open to exchange useful information with foreigners. So, as a native-born Chinese, the author aims to do research about Chinese e-waste processing market, and provide valuable suggestions on how to do e-waste business in China for European investors.

1.2 Research questions, objectives and scope

1.2.1 Objectives

The topic of this study is to evaluate the business opportunity to invest a large scale e-waste processing facility in China. The evaluation aims at making conclusion on business potentials and risks in China as well as investment return. Based on the evaluation result, an innovative business model will be proposed for foreign investors. The components of business model consist of entry mode, business scope, products, target customers, potential areas, supplying and distribution networks and revenue model.

1.2.2 Research questions

The main research question:
What are the characteristics of Chinese e-waste processing market? How to do such an e-waste management business in China?

The following sub-research questions are produced to help figure out the answers of main questions

- How to understand an international market?
- How to develop an innovative business model?
- What are e-waste and its characteristics?
- What is the current situation of e-waste business in developed countries?
- What is the current situation of e-waste business in China?

- Who are the main e-waste processors in Chinese market? What are their businesses? How do they operate budiness and what causes their difference in business performance?

1.2.3 Scope

One of the limitations of this thesis is that the author's discussion on entry mode focuses on direct investment, in spite of foreign companies can enter Chinese market using other entry modes, for examples: exporting equipments or technologies to recycling and disposal plants, or licensing intellectual property to Chinese licensees. These kinds of other entry modes are not discussed because they can't generate sustainable cash flow comparing with direct investment. The author's opinion was concluded from preparatory desk study to research e-waste business features.

The e-waste processing plant mentioned in the following is a large scale one, excluding small to medium ones, otherwise specified. Chinese market addresses a huge number of small to medium size processors. They make significant profit by very low cost in using manual workforce and unsafe disposal. Although their business is very profitable now, but it will burden heavier and heavier pressure from government enforcement. So, large scale business is desired for foreign investors.

The author intends to study the market situation all over country, actually in field study, it's impossible to travle the whole country. The selected research cities s are where e-waste processing industy is distributed centralizely, namely: Beijing, Guangzhou, Suzhou as well as Qingdao. E-waste business there are typical samples to present the characters of whole industry. But unbalanced economy development in regions and various local customs still shape regional difference in pattern of consumption, customers' awareness of e-waste danger and administrative capability of local governments. Therefore the potential invested places are especially pointd out in the conclusion. The other parts of conclusion are utilized in the same or similar geographycial regions as well.

1.3 Research approach

The research approaches used in this thesis are qualitative method and comparative study method. Qualitative method is employed in whole research, whatever preparing desk study period and final reporting period. Comparative study method is utilized to analyze main players' business model.

Using qualitative method is purposive mainly to obtain enough data, which is the base for next step market analysis and finally drawing a conclusion on market evaluation. The data is divided into primary data and secondary data. The data is gathered in two phases. First phase is desk study to learn industry and target market prior to fieldwork. It is a preparation period to read literatures through relevant journals, national and international agencies' websites, NGO's reports, big players' websites and their reports etc. Literature reviewing is the preliminary search tool that helps to generate and refine research ideas (Saunders, Lewis, Thornhill, 2009, pp. 58). Through reading relevant articles, authors shape impressions of e-waste business, then determine the research places and groups of participants as well as questionnaires settled for respondents. Second phase is field study. Data is captured through observation and interviews. Sometimes, the industry participants, such as the illegal e-waste recyclers are reluctant to answer questions. So far the researcher observes their activities, context, even body language to find out the hidden information. Interview is a practical way to gather data. Researchers' communication skill influences the quality of collective data, surely the willing of respondents also impact data collection. The top principle is to acquire interviewees' favor and draw their attention prior to start questions. The questions for interviewees are open-end questions. Response and follow-up questions according to respondent's answers are principal to lead the conversation in deeper discussion. In order to make use of limited interview time, a person assisted in data record is very helpful in data completeness. Almost of author's interviews were companied with a note-taker. Prior to visiting respondents, researcher explains to let note-taker understand which data are important and should pay attention to in the coming on interview.

Comparative method is applied to study the successes and failures of main players' business and analyze why caused their difference in business performance. The

purpose of comparative study players is to dig useful data as the reference when author develops a suitable business model for foreign companies.

1.4 Structure of the research report

The thesis is divided into four parts, totally six chapters. Part one is Chapter one, the opening part to describe briefly background of the study, research objectives, research questions, limitations, and research methods.

Part two is the description for theories framework, including Chapter two and three. Chapter two serves to introduce conceptual issues of e-waste, such as definition, technology, generation and recycling, managerial principles and model. All the issues are compulsory to understand the following Chinese market description and analysis. Chapter three is to outline theoretical knowledge for market analysis, highlight central issues of market influence forces, industry actors, stakeholder analysis approach, competition analysis as well as investment return analysis. Besides, Chapter three serves to introduce theories regarding development business model, highlight these components of business model: entry mode, marketing strategy and revenue model.

Part three presents research methodology in Chapter four. The contents of this part is including foreign market entry strategy, process of research, criteria for collective data, criteria for sample places and respondents selection, comparative study method, strategy to develop a business model. This chapter guides the author to do the subsequent empirical research.

Part four is served as empirical part, consists of Chapter five and six. Both the result of author's field study and market analysis are described in Chapter five. Chapter six contains evaluation result of Chinese e-waste processing. 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

This chapter describes basic concepts of e-waste management, including: e-waste definition, its benefits and danger, the current situation of e-waste management worldwide, top principles of e-waste management, ERP model. The e-waste business is briefly introduced.

2.1 E-waste definition and characteristics

E-waste, short term of Waste Electrical and Electronic Equipment (WEEE), defines to cover almost all types of electrical and electronic equipment that has entered or could enter the waste stream (StEP, 2009). According to Directive 2002/96/EU, the category of e-waste includes 10 classifications, shown in table 1. China applies the same category according to its regulation published in 2003 (Liu. et al., 2006).

Table 1: WEEE categories described in the Directive 2002/96/EU

No.	Category
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

E-waste is of concern largely due to containing hazardous substances. Although the substances' weight varies a lot in different kinds of electronic appliances, the material composition is quite similar (Swiss e-waste guide, 2009). Lead, mercury, cadmium and brominated frame retardants are usual toxic elements in e-waste (EPA US, 2009). Take personal computer as an example. Computer uses cadmium in rechargeable computer batteries and switches in CRT monitors. Cadmium can be

bio-accumulated in the environment and is extremely hazardous to humans' kidneys and bones. Plastics, including polyvinyl chloride (PVC), combined in printed circuit boards, connectors and cables, can discharge dioxins that damage the reproductive and immune system if they were disposed improperly, e.g. burnt or land-filled. Moreover, mercury, which is the material of lighting devices, damages the nervous system, kidney and brain, and in worse, can be passed on through breast milk (StEP, 2009).

Besides the toxic substances, e-waste also contains valuable materials, which can be extracted or recovered through recycling process. Let's take mobile phone to be example. A mobile phone has 40 elements, such as copper, tin, ferrous metals e.g. cobalt, indium, antimony as well as precious metals e.g. gold, silver, palladium. Nevertheless the valuable metals' weight is be tiny, one mobile phone has only 9 g copper, 250 mg silver, 24 mg gold and 9 mg palladium, but multiple the sum of mobile phones sold globally, 1.2 billion in 2007, the total weight of valuable metal is significant. To refine all containing recyclable materials from e-waste is a very profitable business (StEP, 2009 & Hagelüken, Meskers, 2008).

The presence of hazardous elements in E-waste classifies them into hazardous waste, while many valuable elements can be recovered. Both the hazardous and valuable characterizes e-waste. E-waste need to be handled scientifically, where fosters the development of e-waste recycling industry.

2.2 E-waste generation and recycling rate

The volume of e-waste generation is huge annually and being one of the fastest growing components of solid waste (EPA US, 2008). But, e-waste quantities are difficult to calculate precisely because the variables exist across countries' e-waste categories. Accordingly, the overview generation data and forecasts are mainly based on estimations (Swiss e-waste guide, 2009). The most cited fact about e-waste generation was published by Basel Convention during the Nairobi conference to address the growing challenge of electronic wastes on 27 November 2006 (Basel Convention, 2009):'Some of **20 to 50 million metric tonnes** of

e-waste are generated worldwide every year. In the US alone, some 14 to 20 million PCs are thrown out every year. In the EU the volume of e-waste is expected to increase by 3 to 5 percent a year. Developing countries are expected to triple their output of e-waste by 2010'. Besides, the US EPA has estimated a 5 to 10 per cent increase in the generation of e-waste each year globally (StEP, Annual Report, 2009).

Although the volume of e-waste is massive, the rate of recycling is very low. See below table 2. It's the facts of generation and recycling in the US 2007.

Table 2: E-waste generation and recycling in 2007, USA (Source: EPA US 2008)

	Generated (million of units)	Recycled (million of units)	Recycling rate (by weight)
Televisions	26.9	6.3	18%
Computer products	205.5	48.2	18%
Cell phones	140.3	14	10%
*Computer products include CPUs, monitors, notebooks, keyboards, mice, and hard copy peripherals.			

According to this table, even in one of the earliest and leading countries in dealing with e-waste problem, the recycling rate of the United States is less than 18%. In developing countries, there are lots of uncountable e-wastes, which are stockpiled or treated in informal sector. Therefore, the average global rate of proper recycling is much lower than 18%, around 15% (Pike research, 2009).

E-waste without safe treatment leaves behind serious environmental problems. The reserved toxic elements in obsolete EE products release dioxins, and seep into groundwater and never break down. Confronting such severe situation, many governments and international organizations put e-waste management into emergency file.

2.3 3-R principle and EPR model

Significant increases in the generation of e-waste and its danger to environment force many concerned countries to legislate and implement policies that tackle the environmental problems along with e-waste. In 2003, EU published its Waste Electrical and Electronic Equipment Directive (WEEE, 2002/96/EU) and Directive Restriction of Hazardous Substance (RoHS, 2002/95/EU) to stipulate e-waste management. WEEE aims to decrease generation of e-waste and promote their reuse and recycling. RoHs aims to reduce use of hazardous substances in electrical and electronic appliances. In US, till present, 39 states of America announced managerial laws respectively (EPA U.S., 2009). As an emerging issue, e-waste is under scrutiny by some special authorities, e.g. EAP US, EPA UK, international organizations, e.g. Greenpeace, Basel Convention, and Solving the E-waste Problem (StEP), which is the delegation of United Nations for e-waste problem. All these organizations' initiatives focus on promotion 3-R principle and model of Extended Producer Responsibility (EPR) in whole flow of EE products, manufacturing, consumption and waste processing.

The **3-R** is the hierarchy principle in e-waste management, which in terms of Reduces, Reuse and Recycle.

'**Reduce**' presents two conceptions both for producers and consumers. For producers, they design more environmental friendly: decrease the composition of hazardous elements, consider disposal easily and entirely. For consumers, they purchase environmental products in 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 process. 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).

'**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 (EPA US, 2009; StateMaster, 2009; StEP, 2009).

The benefits of 3-R initiatives is to divert e-waste's materials from improper disposal, landfilled or incineration; reduce pollution air, water and greenhouse gas emission in manufacturing new products or handling discarded product; save energy and conserve natural sources, which are valuable and limited (EPA, 2009; StEP, 2009).

Extended Producer Responsibility (EPR), defines as an environmental policy approach in which a producer's responsibility is extended to the entire life cycle of a product, including the take back, recycling and final disposal (Swiss E-waste Competence, 2009). EPR releases consumers' responsibilities in collection, proper treatment and payment of e-waste processing. The mentioned responsibilities are shifted to producers. Under EPR rule, the manufacturers could be liable to collect back and properly recycle the goods. The implementation of EPR requires the support from international and regional agencies due to cross-border issues. The other issue about management could be 'corporate social responsibility (CSR)', where manufacturers commitment these efforts as part of their image building in the society (RIM, 2009).

According to StEP report, a model of e-waste management consists of four components, as shown in below figure 1, they are: systems of collection and processing, system management, and financing scheme.

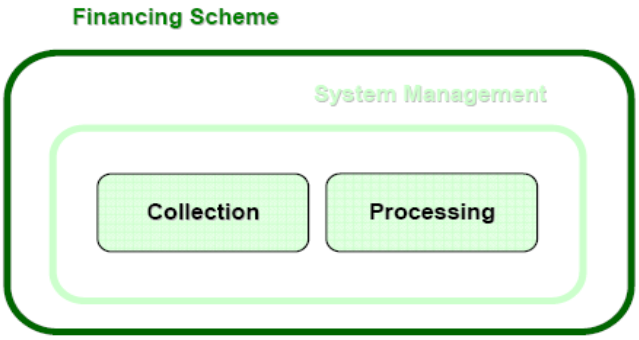

Figure 1: E-waste management model (Source: StEP, White Paper, 2009)

In this model, if the collection, processing, financing of e-waste treatment were responsibilities assigned to producers, it would be regarded as EPR model. The goal of EPR model is to: motivate producers to design and manufacturing in priority of easily recycling, less toxic materials; prevent e-waste into inappropriate treatment stream, landfills or being incinerated; recover scrap materials for conserving natural resources and energy; incentive environmental friendly e-waste industry, including: collection, transportation, recycling and disposal.

Collection system is to take back products and packaging when they are discarded to users. Primary modes for collection are: drop-off sites, drop-off campaigns, and door-to-door collection. The accomplishment of collection depends on concerns and awareness of stakeholders, who could be government, EE manufacturer, retailer, other commercial entity like logistic provider, and consumers. Government, manufacturer, retailer are mechanisms of locating permanent drop-off sites and launching drop-off campaigns. The awareness of consumers could maximize the rate of electrical scraps pick-up. In ten US states, to ensure obsolete collection, consumers pay the deposit when they purchase, and refund when they return used products. Retailer is the leverage in this Deposit-Refund system (Waste to Wealthy, 2009). In practice, a 'third-party organization' normally delegated by Original Equipment Manufacturers (OEMs) fulfils the collection from drop-off sites and door-to-door pick-up. The 'third-party organization' can be profit-motived or non-profit organization. If it is operated by OEMs themselves, it is non-profit. For example, Duales System Deutschland (DSD) is responsible for collection and recycling of packaging waste throughout Germany. Industry sponsors DSD by li-

cense fee. On the contrast, economic incentive is offered for the 'third-party collector', e.g. some logistic providers, UPS and Federal Express in US (StEP, 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 valuable components, plastic, glass and metals; the rest parts, which are non-recycled and reminding post-recycled will be disposed properly. The mechanism of processing includes: precise for storage, facilities in refurbishing, repairing, product lines in recycling and final disposal as well as the distribution channels of products reusing, recovering materials. The following subtitle 2.4 will discuss detailed processing technology (StEP, 2009; EPA US, 2009).

System management is to organize or appoint an entity for coordination among various stakeholders. The management activities include: collection fees from EE industry, reimbursing collectors and processors, monitoring and evaluation the system efficiency of e-waste management. The entity for management could be government authority, like Germany, the Federal Environmental Agency designed a organization AER to be management device; or third-party organization, like Sweden, where requires all logistics and processors be hired through El-Kretsen, which is owned by 20 business associations (El-Krestsen, 2009); or industry itself, like South Korea and Maine of U.S. (StEP, White paper, 2009; Chung et. 2008).

Financing Scheme varies in countries and states, in terms of taxes, fees, deposit etc. 'Eco-taxes' or 'eco-fees' is charged to either manufacturers or consumers or both of them, which are used to incentive collection and recovery programs. For example, in Belgium, eco-taxes are aimed to motivate reusable and recyclable products, ensure some particular products recycling rate to high level gradually, and prevent hazardous substances entering the waste stream (StEP, White paper, 2009; Waste to Wealthy, 2009).

2.4 E-waste treatment process and state of art technology

The processing of e-waste can be divided into three phases: first is sorting out and dismantling, then is recycling and reusing, the final is disposal process. The fol-

lowing is the process chart of e-waste treatment, and instruction of utilized technology. The information is integrated from texts of these official agencies' websites in e-waste management: EPA US; Swiss E-waste Guide; The National Center for Electronics Recycling (NCER), US; and RecycleWorks.

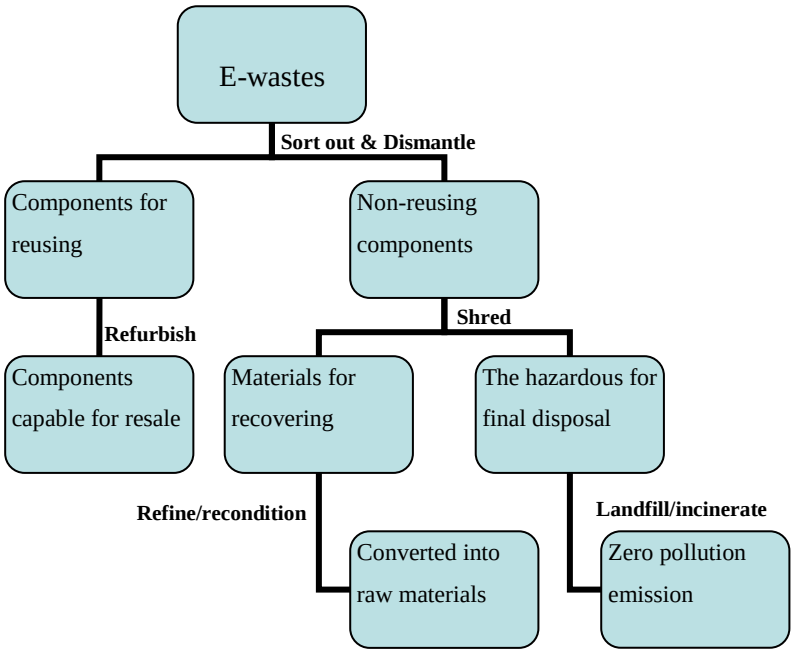

Figure 2: The process of e-waste treatment

After collected from users, e-wastes are classified according to varies in size and type. Subsequently dismantling involves disassemble the equipment into various parts, metal and plastic frames, power suppliers, circuit boards, etc. In this phase, the crucial task is to remove toxic substances e.g. lead glass from CRT screens, CFC gases from refrigerators, light bulbs and batteries, in order to avoid pollution during downstream process; and yield components that can be reused. Sorting out and dismantling e-waste are mostly manual work, done by trained technicians, who use kinds of machine and hand tools.

In the second phase there are two technologies involved, refurbishing and shredding. For components which are in workable condition will be repaired and clean up (refurbished) to resell for service. The others will be smashed and separated (shredded) into ferrous metals, non-ferrous metals, plastics, as well as hazardous materials. Shredding process employs large pieces of equipment, few

workers. During this phase, gas emissions are filtered and effluents are treated to discharge, minimize environmental impact.

The separated fractions need to be refined or conditioned in order to be sold as raw materials, or to be disposed in a final disposal site respectively. During the refining/reconditioning process, metals, including copper, gold, etc. precious metals, plastics and glass are three main types of materials. They are extracted through some techniques. Hazardous fractions usually are disposed by two methods, incineration and landfilling. Some recycling plants combine both methods. If with neither pre-treatment nor sophisticated flue gas purification, incineration would release poisonous air to cause second contamination. Although landfilling is widely used for waste final disposal, but it is high risk to leak after long term use, then toxin soil and water. Currently the state of art technology is pre-treatment of flue gas, then the components needed to be disposed are feed to incineration tower, the residue ash and components which cannot be handled are to be land filled.

The approach of e-waste processing changes rapidly as innovative technologies employ. 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

E-waste management model in Germany is taken as example to explain detailed EPR model implemented in developed countries. The author's purpose to write this is to let readers easily understand what are China lack of although both of them execute EPR model in WEEE management.

In associate with EU Directive of WEEE (2002/96/EC) and Directive of RoHS (2002/95/EC), Germany announced The Electrical and Electronic Equipment Act (ElektroG) in March 2005 to regulate producers, importers, and resellers take responsibility to take back and dispose e-waste at their own cost. The consumers also pay the treatment fee of e-wastes which are not listed in free charge items. Accordingly the state doesn't pay any handling fee. In July, 2005, a special organi-

zation, ‘Stiftung Elektro-Altgeraete Register (EAR)’ was designed by the Federal Environmental Agency to administrate implementation of ElektroG. EAR, represents producers, carries out all functions and duties, include: register producers, importers, resellers and their equipments; examine and certify the financial guarantees for equipments which can also be used by consumers; coordinate the provision of suitable containers and collection of e-waste; control and enforce the implementation of the law; raise fees and fines from industry (The ‘Elektrogesetz’, 2009). The management framework is drawn below as figure 3.

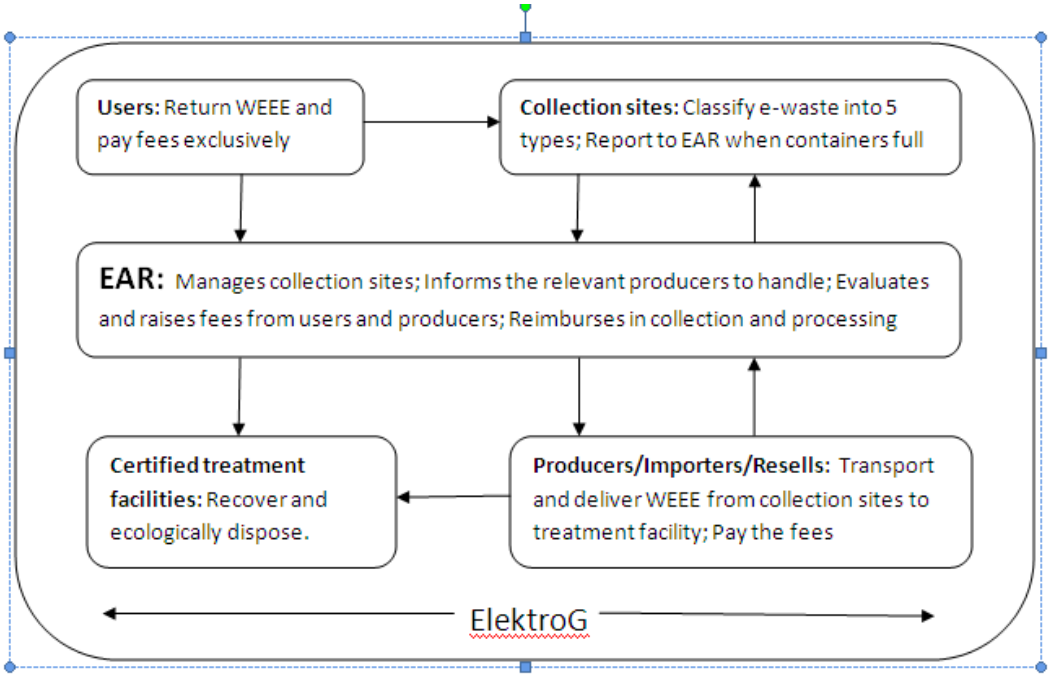

Figure 3: E-waste management model in Germany (The ‘Elektrogesetz’, 2009)

Users return waste of electrical electronic equipment to collection sites, which are administrated by EAR. The e-wastes are classified into 5 types, namely large household appliances, automatic dispensers; refrigerators and freezers; IT and telecommunications equipment, consumer equipment; gas discharge lamps; small household appliances, lighting equipment, electric and electronic tools, toys, sports and leisure equipment, medical products, monitoring and control instruments. The local collection sites send a full container report to EAR. Using a specific mathematical algorithm, the appropriate producer will be informed a full container message. 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 (The ‘Elektrogesetz’, 2009).

For the e-wastes included in The ‘Elektrogesetz’, cost during transportation and treatment are fully covered by producers, who pay for logistic companies and certified treatment facilities. For the e-wastes excluded, the users and producers jointly afford the cost (The ‘Elektrogesetz’, 2009; Fredholm et., 2009).

2.6 E-waste business

According to a new report from Pike Research, *The e-waste crisis will worsen over the next several years until 2015, when volume will peak at 73 million metric tons. However, the firm forecasts that global volumes will decline in 2016 and beyond, as a number of key e-waste initiatives begin to turn the tide*. The war againist e-waste calls on efforts from government, electronic manfuaturing and processing and users.

EU countries, US, Switzerland, Canada, as well as some Asia countries, e.g. Japan, South Korea established legislative system to stop e-waste problem become worse. They had banned e-waste to be directly land filled or incinerated, which created business opportunity in e-waste processing industry. Many leading electronics manufacturers and service providers involve this industry to committ corporate social responsibility, including Cisco, Dell, HP, Motorola, Nokia, Vodafone etc. Along with innovation of technologies, more and more processing company make money even though they pay for e-waste. Hewlett-Packard is the one of them (EPA US, 2009; Pike research, 2009).

Under HP’s new e-waste recycle program, consumers will receive money for returning their old PCs, servers, phones, printers, and other electronics, regardless of brand name. The amount of cash given to consumers depends on the resale value of the item being recycled. Both users and e-waste processors get income in e-waste treatment (HP, 2009).

According to greentechmedia.com, *the worldwide market for electronic recycling will come to $11 billio* (equivalent 8.25 billion euros in exchange rate 1:0.75) *this*

year and is growing at around 8.8 percent annually, the fastest segment in solid waste. In the U.S., electronic recycling services will be a $17 billion (equivalent 12.75 billion euros in exchange rate 1:0.75) *business.* (Weinkauf, 2009)

Barely in European countries, the revenue of recycled materials reached to 2 billion euros (European commission, 2008) annually. And that, more and more nations comprehended importance of managing e-waste environment friendly, they took actions to manage e-waste. Recycling is the most sciencfic method in management and incentived by governments (Reuters, 2009)

In summary, there are five forces to drive e-waste processing to be a fast growing and properous manufacturing industy in the world (StEP, 2008).

- A mass of e-waste generate annually. In order to reduce their impacts on environment, e-waste need to be treated safely. Actually, till present, the recycling rate of e-wast is quite low.

- Demands for scondary materials, which are manufactured during processing and cheapter than primary materials are increasing.

- Innovation of recycling and disposal technology motive e-waste industry to have more income.

- Some incentive policies and regulations to ban e-waste discarded, boost industry development.

- More jobs create in recyling process, contributes to decline unemployed. Recycling creates 5-7 times more jobs than incineration, 10 times more jobs than landfilling barely.

3 INTERNATIONAL BUSINESS STRATEGY

This chapter is served as the theoretical background of subsequent analysis and findings. The theories discussed in this chapter are focus on analysis of target market—E-waste in China and development an innovative business model which is suitable for the local market. The highlighted key issues outline the framework of research areas that are conduct the field study.

Today more than ever, no country can isolate itself from the rest of the world (Terpstra, Russow 2000). Foreign investors intend to access international markets for their objectives achievement.

International marketing is, by definition, the act of marketing across national boundaries (Terpstra, Russow 2000). According to Doole and Lowe's definition, *at its simplest level, involves the firm in making one or more marketing mix decisions across national boundaries. At its most complex level, it involves the firm in establishing manufacturing facilities overseas and coordinating marketing strategies across the globe* (Doole and Lowe, 2001). That is, international marketing is to apply marketing principles to more than one countries.

In Sak Onkvisit & John J. Shaw's book, 'International marketing: analysis and strategy' (2004, pp: 3, Routledge) says: *process of international marketing should 'begin with an understanding of what marketing is and how it operates in an international context*. The below firstly discuss the process of international marketing.

3.1 International marketing process

According to Kolter's theory (2007 & 2009), the process of a company's international marketing:

First, evaluate the necessary to internationalize, e.g. company needs a larger customer; company wants to reduce its dependence on any one market; company has enough funds, human resources to extend market.

Second, decide which markets to enter. The selection criteria of intended market are: Higher profit opportunities - more customers, current products can not meet market requirement entirely, incentive policies etc.; estimated growth rate is higher; competition is not intense; the entry barries are not very strict.

Third, analysis potential market. The market analysis include: Macro influence forces analysis; industry actors analysis, customer, competitor; supplying and distribution analysis; competition analysis; stakeholder analysis etc.

Fourth, entry code selection. After define the entry barriers, then evaluate internal and external factors of company, so the entry mode can be chosen.

Fifth, develop marketing strategies and plans. The contents of marketing strategies and plans are: Define corporate business scope; customer segment; marketing mix; the levels of supplying distribution channels, from raw material to final product distribution.

The process to enter international market is shown in figure 4.

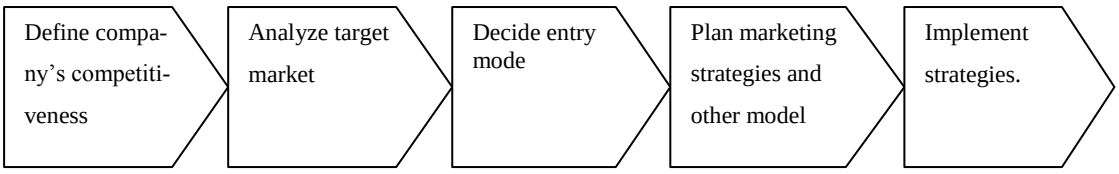

Figure 4: Process of international market entry

3.2 Market analysis

The point of industry analysis is not to declare the industry attractive or unattractive but to understand the underpinning of competition and the root causes of profitability (Porter, 2008, p:5).

The aim of this subtitle is to introduce some concepts associated with market analysis, including introduction of some analysis tools. It lays foundation for the following entry mode determination and marketing strategy planning. The contextual issues include: Macro environmental marketing analysis, industry actors analysis, stakeholders analysis, industry competition analysis as well as investment analysis.

3.2.1 International market macro- environment

Before doing business in foreign market, the first step is to understand the characters of market. International market has obstacles on the way of potential new entrant and competes with the incumbents (Levy, 2005). Foreign entrants must break through these borders. A business plan should be developed in purpose of business set-up. With detailed marketing plan, business will be well-prepared to face the very likely difficulties. In order to understand marketplace dimensions, to *carefully monitor the environment in which the business carries out* (Baker, 2007) is in the first instance in planning.

Kotler divided marketplace into as macro-environment and micro-environment. He defined macro environment factor is the driving force of market, while micro environment factor means the actors of industry (Kotler et. al, 2008). Macro environment is discussed this subtitle while next one is micro environment discussion.

Macro environment factors are the major forces impact on all companies. These forces affect and moderate the behavior of all the actors in the market, industry competitors, suppliers, distributors and customers (Kotler et. al, 2009, p. 153). These forces represent which company must monitor and respond although they are 'non-controllable'. They are organized into five forces - political/legal, economical, social/cultural, natural and technological forces (Kotler et. al, 2009, p. 154). Michael J. Baker provided a specified framework of macro environment analysis (2007, p.176). Kotler (Kotler et. al, 2008, p. 94-112) explained the elements in macro forces while Hollensen (2004, p. 193-201) emphasized on cultural force.

The political-legal environment

The political and legal environment consists of laws, government agencies and pressure groups that influence and limit various organizations and individuals. To study the political factors of target market is benefit to discover new business opportunities created by them (Kolter et. al, 2009) as well as recognize legislative restrictions. For instance, the stipulation on Extended Responsibility of Producers (ERP) has brought more potential powerful competitors of recycling industry -- electrical & electronic producers. They are urged to deal with corresponding e-waste products and some of them tend to integrate recycling business by themselves or jointly.

The common contents of political environment analysis (Baker 2007 & Keegan 2002) are shown as below:

- The administrative laws and regulations in correlated business
- Political areas in tax policy, labour law, environmental law, trade restrictions, tariffs, and political stability
- Specific laws concerning formation, taxation and control of organizations
- The administrative government agencies in levels of national, regional and municipal
- The programmes adopted by governmental organizations to promote/restrict business

The economical environment

The economical environment consists of factors that affect consumer purchasing power and consumption patterns. They factors are (Usunier, 2000 & Kotler et. al 2009):

- Purchasing power
- Average income distribution (income and wealthy)
- Unemployment rate
- Varies in consumption patterns

The social-cultural environment

To enter into international market, social-culture is a prominent variable from home market. It is complex and influences all business actors. *Culture is the collective programming of the mind which distinguishes the members of one human group from another… Culture, in this sense, includes systems of values; and values are among the building blocks of culture* (Hofstede, 1980, p. 21).

There are four layers of culture, in the terms of national culture, business/industry culture, company culture, individual behavior (Hollensen, 2004, p:196). All layers of culture present the relationships to people themselves, to others, to organizations, and to society… (Kotler, et. al 2009, p. 164).

Elements constitute socio-culture are: language, manners and customs, religion and population etc (Hollensen, 2004, p: 200-204).

The social-cultural factors that influence e-waste business in China are comprised in e-waste generation, collection and users' attitude for discarded EE products.

Technological environment

The technological environment is a dramatic force now shaping market (Kotler, Armstrong, 2008). The innovation of technologies creates new markets and opportunities (Baker, 2007). The main processors in Chinese market imported state of art technology from leading country. As such technology has detailed introduced in

Chapter 2, thus in the field study the technologies applied in processors are not the key issue, but the infrastructure and production process has been researched.

Natural environment

The natural environment involves natural resources' categories and quantity. There are several trends in the natural environment. First is shortage of raw materials. 3R principle (Reuse, reduce, recycling) is a popular initiative in many countries to solve this shortage. The second is increasing pollution results in consumption growth. Industries are required to disposal the damageable/toxic waste they produced. The third trend is increased government intervention in natural resource management. Governments' concerns on cleaning environment are different. Some designed and imply very strict regulations while the others ignore or do little on environment friendly (Kotler, Armstrong, 2008 & Baker, 2007).

3.2.2 Micro environment analysis

Micro environment include all participants carry out market. They are varied in effect (positive or negative), ability to create value and relationship (Kotler, Armstrong 2008, p. 90) with other actors. The purpose of micro environment analysis is to define the influence power of actors, what they need & want, as well as how the actors work together in form of systems to deliver customer value.

Suppliers

Suppliers provide resource needed by company to produce its goods and service. Resource supplying shortage, delays, or cost increasing can harm the company's sales volume (Kotler, Armstrong 2008, p. 91). In WEEE processing business, suppliers are various e-waste collectors, individual/company collectors, retailers etc.

Marketing intermediaries

Marketing intermediaries represent the actors help company to promote, sell and distribute its products to final buyers. Intermediaries help find customers, and create satisfying customer relationship. Companies must partner effectively with

intermediaries to optimize the performance of the entire system. Actors of intermediaries are listed in table 3.

Table 3: Marketing intermediaries (Source: Kotler, Armstrong 2008, p. 91-92)

Intermediaries	Functions
Resellers, include wholesalers, retailers	Distribution channel to find customers or make reselling.
Physical distribution firms	Distribution channel to stock, transport and delivery goods to destinations.
Marketing services agencies, include marketing research firms, advertising agencies, media firms, and marketing consulting firms	Help target and promote products to the right market.
Financial intermediaries, include banks, credit companies, insurance companies, and other financial institutions.	Help finance transactions or insure against the risks associated with buying and selling goods

During field study, the intermediaries in transportation and distribution are observed or interviewed. They are: EE retailers, second-hand market and logistic companies.

Competitors

New entrants only can achieve competitive advantages if their products provided more value to customers than competitors do. So, competitors' analysis plays key role in marketing analysis. The questions answered in competitors' analysis are: Who are main competitors? What customer needs and preferences are you competing to meet? What are the strengths and weaknesses of their products and services? What are the success and failure in products' value delivery to customers? (Management help, 2009) Each firm should evaluate its own size and industry position compared with competitors (Kotler, Armstrong 2008, p. 92), and then design the strategies to compete.

Besides the above motioned data about competitors, financial data will be collected as most as possible. Different companies in the target market have different levels

of profitability. Their profit and cost can be sued as a guideline for evaluating how much need initially and profit potentials. The financial data is used in investment and return of investment analysis. Therefore, competitors' analysis has a very important place in empirical part.

Publics

A public is any group that has an actual or potential interest in or impact on an organization. Seven types of publics are identified according to Kotler & Armstrong (2008, p. 93), namely financial publics (bank investment house, stockholders), media publics, government publics, citizen-action publics, local publics, general public and internal publics.

In the field study, public groups centralize government agencies and municipal governments.

Customers

To identify target customers might be the most important mission in the company business. Establishment of the value delivery system is to serve target group of customers and seek strong relationships with them. Customer markets are divided into five types, namely consumer markets, business markets, resell markets, government markets and international markets (Kotler, et al, 2009).

'Company cannot serve with all customers in large, broad or diverse markets. The market should be divided into groups of customers or segments associated with their needs and wants. Company needs to identify which market segment it can connect and communicate effectively. To make such a decision firstly requires the understanding the difference of customers' behaviour and demands in each segment. Then, one or more market segments are selected as target market. Finally, company can decide what products or unique value distinguished from competitors offered to target segments to satisfy them' (Kotler et al., 2009).

The actors of e-waste business in China can be also understood by stakeholder analysis theory, which are specified discussed in subsequent stakeholder analysis.

3.2.3 Competition analysis

To comprehend international market, it is required a keen understanding of competition situation. The analysis of competitiveness is not only to define competitive forces, but also study their underlying causes. Michael E. Porter built competitive analysis framework and model via his series classic works. He had identified fives forces that shaped industry competition in figure 5.

Figure 5: The five forces shaped industry competition (Porter, 2008)

New entrants -New entrants bring new production capacity and they desire to share market, that puts pressure on prices, costs (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, incumbents must decrease price or increase investment against new competitors (Porter. 2008, pp: 5-13).

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

Power of buyers- Powerful customers can capture priorities in lower price, better quality or more services, all at expense of industry profitability (Porter 2008). 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.

The below buyers are sensitive in price.

- The cost to purchase products occupies large proportion of cost structure of procurement budget. Thus buyers are likely to shop around and bargain hard.
- The profit of buyers is margin. They are under pressure to decline purchasing cost.
- The quality of buyers' products is little impacted by the industry products they purchased.
- The cost or profit of buyers is little affected by industry products.
  (Porter, 2008, p. 14-17)

The threat of substitute - Substitutes can take place the industry's products as their function is familiar. When the threat of substitutes is high, industry profit probability reduces. The threat of substitute is high when:

- Substitute offers attractive product with high-performance or lower price.
- The swift cost to substitute is not expensive.
  (Porter, 2008, p.17-18)

Rivalry among existing competitors - Rivalry among existing competitors is changing by marketing activities, eg. price discount, advertise campaign, new products launching and service improvement. The rivalry among existing competitors is strong if:

- A large number of competitors increase the intensity of rivalry.
- Slow market growth rate reverse the competition for market share.
- Exit barriers are high while entry barriers are few. The entry barriers don't limit new entrants while exit barriers keep companies. Both of them cause the number of competitors of industry increasing.
- Rivals are highly committed to the business and have aspirations for leadership, especially if they have goals beyond economic performance.

Firms can't read each other's signals well because lack of familiarity with one another, diverse approaches to compete or differing goals (Porter, 2008, p. 18-21).

3.2.4 Stakeholder analysis

The definition of a stakeholder comes in various forms and flavors, some of which prefer a narrow one; others deliberately maintain the broadest possible scope. Nevertheless, the most frequently citied definition is Freeman's:
A stakeholder in an organization is any group or individual who can affect or is affected by the achievement of the organization's mission. (Freeman, 1983, p 38).

The author seeks below benefits from stakeholder analysis:

1. Through identify the groups of stakeholder groups, the author can define the proper interviewees to acquire more information relative to e-waste business in China.
2. By analysis stakeholders' characteristics, the cooperation network can be outlined and prioritize key stakeholders.

In order to meet the purpose, the process of stakeholder is concluded. First step: Classification and identification of stakeholders. The primary aim of stakeholder classification is to name those who could and should have a stake in business.

Freeman (1984) contributed to categorize stakeholders into groups of economic, technological, social, political, and managerial. He delineates the 'stake' that stakeholders have in the firm as equity, economic or influencer, and the power that they wield as formal or voting power, economic power or political power. Freeman's theory laid groundwork of stakeholder identification and the latters added new groups or amended impetus based on Freeman's (see figure 6).

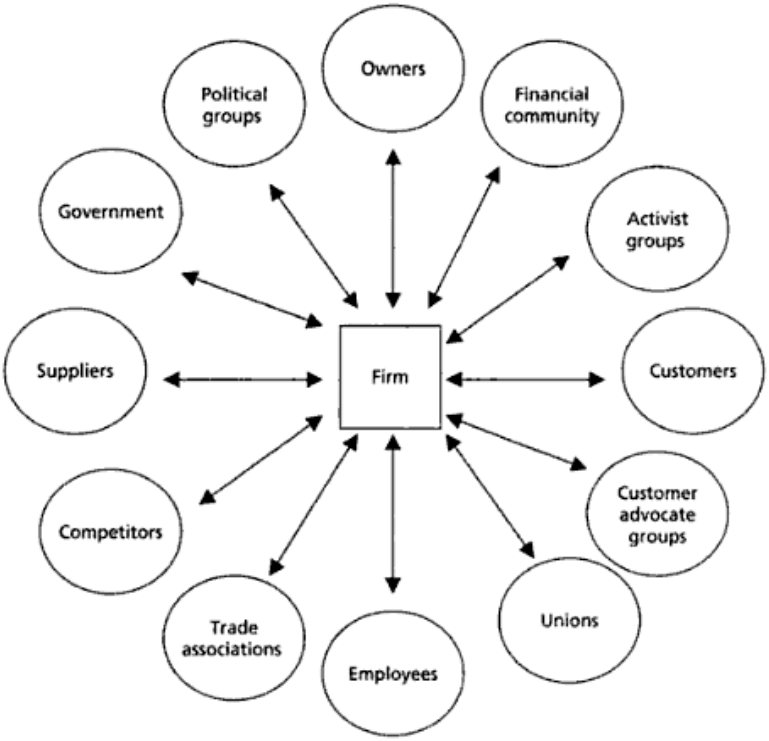

Figure 6: Stakeholder map of a very large organization (Freeman, 1984)

Besides the ‘Stakeholder map’, some simple questions can be used to help to list the stakeholders. The questions are who, what, where questions. For example, who supervise e-waste recycling industry, where collectors get e-waste and what they do collected scrap. When listing the stakeholder groups in empirical part, not all stakeholders should participate, those who have the marginal and the powerless stake for the e-waste recycling joint venture are out of consideration (Mindtool, 2009).

Second step: Analyzing the stakeholders’ nature/possession

After stakeholder identification, there is a long list of organizations that affect positively or negatively for e-waste business. The purpose of analyzing stakeholders’ possession is to acknowledge their impact power and weight their interest, and then prioritize them.

A simplified model for analysis stakeholders is a Power/Interest Grid shown in below figure 7.

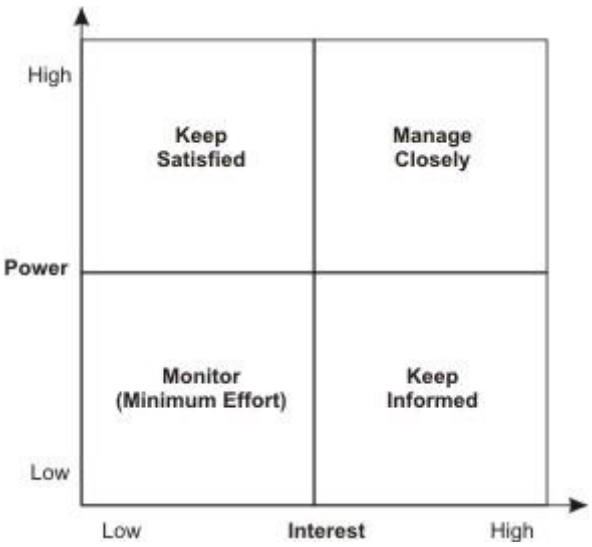

Figure 7: Power/Interest Grid for stakeholder analysis prioritization (Mindtool, 2009)

The longitude presents the degree of stakeholder’s interest while the latitude presents the degree of power stakeholder possesses to affect intended project. Each box contains the different groups of stakeholders, who will influence power and

should be treated with difference. The position of high power, high interest groups are those make the greatest efforts to satisfy and must keep close relationship with them. The position of high power, less interest group represents those who should keep satisfied, but less opportunity to involve. The box of low power, high interest group represents those who keep them adequately informed, exchange ideas. They might be very helpful with the details acquiring. The position of low power, low interest group shows people have insignificant influence, just watch and monitor their actions (Mindtools, 2009).

3.2.5 Cost and payback analysis

For investors, the capital investment decisions that involve the purchase of items such as land, machinery, buildings, or equipment are among the most important decisions undertaken business in target market. These decisions typically involve the commitment of large sums of money. The other issue of concern by investors is how long the money can be paid back (Boehlje, Ehmke, 2010).

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, 2010)

The cost of project contains fixed cost and variable cost. The fixed cost is that does not vary depending on production or sale levels. In the initial investment, that is investment in fixed properties, such as land, precise, product lines etc. The variable cost is cost of labor, material or overhead that changes according to the change in the volume of production units. Cash flow equals (Profit + depreciation). It is the money left over after all the bills (expenses) are paid and depreciation taken out. (Investor Words, 2010).

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 consists of four basic parts:

Part 1- The products/services offered for sale
This part defines what value the products/services have to attract customers to purchase. The value aims at solving customers' problems, or meet customers' needs that don't supply by other business.

Part 2- Target customers that the business expects to purchase
Target customers are the ones that the business expects them to purchase products/services. Because the products/service are varies, so the target customers can be divided into groups with different needs. This part defines who are the potential customers and their needs as well as their purchasing patterns.

Part 3- 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.

Part 4- Financial results and profit the business expects to achieve
This part includes how much needed to build the facilities to begin operations. Furthermore, the revenue model is compulsory. The revenue model is the ways of business receives income from products/service sale. (Rochford College, 2010)

From the theory of Kotler about process to enter international market, there is another factor that excluded above mentioned business model for foreign investors – entry mode. It plays the first place in foreign investors' plan to enter foreign market. The below will discuss it as starting part.

To sum up, this thesis will finally generate a business model for foreign investors. Integrate the issues about e-waste and business which is described in Chapter two and those knowledges about business model development, the following business model components are produced.

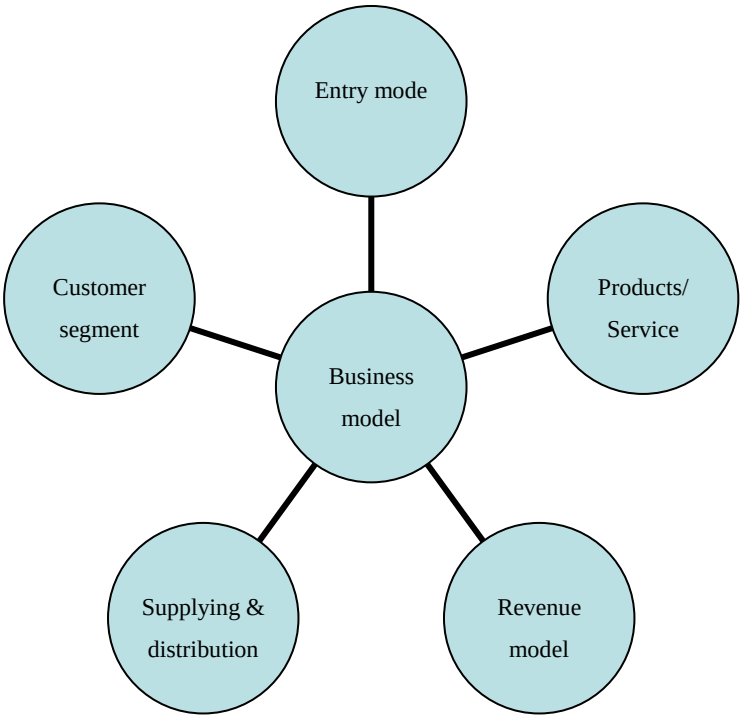

Figure 8: Components of proposed business model

3.4 Entry mode-Direct investment

On the basis of market comprehension, entry mode is the subsequent decision for international marketing. Each entry mode has advantages and a disadvantage. If company wanted to share risk and favors to access, it must share interest and controlling. On the opposite, company can hold 100% control and burden 100% risk. The approaches to the choice of entry mode are various, such as the Uppsala model, the transaction cost approach etc. However, Hollensen (2004, p. 279-280) integrated various ideas to conclude the factors to influence entry mode choice. One is internal factors, firm size, international experience, and product specification. The other is external factors, socio cultural, political, market size and growth, customer demand, entry barriers and competition etc.). Besides, desire mode characteristics

(such as value, risk, control and flexibility) and transaction-specific behavior (transaction cost, tacit nature of know-how) should be considered as well.

As the topic definition- large scale processing business in China, so the entry modes are limited within foreign direct investment. In China, there are two main types of foreign direct investment: to establish a joint venture with a domestic company (hereinafter short as JV) and to establish a wholly foreign own enterprises (WFOE).

The comparison of JV and WFOE is shown in below table 4.

Table 4: Comparison between Joint venture and Wholly foreign own enterprise. (Quickmba, 2009)

Mode	Advantage	Disadvantage
Joint venture	Less entry barriers: import and legislative restrictions Overcome culture distance; Combines resources of joint parties; Domestic party can provide resources, distribution channels, etc.; High potential profit and less investment required.	Difficult to manage; Lack of control; Lack of flexibility; Greater risk as high investment; Partner may become a competitor.
Wholly foreign owned enterprises	Overcome some entry barriers, e.g. legislative restrictions ; Reduce political risks; Less culture diversity; Greater in control Protect intellectual property.	Require higher investment and higher risk; Difficult to manage local resources; Difficult to communicate with key local stakeholders.

In selection JV or WFOE, the principle is to define what the foreign company needs mostly when they enter Chinese market. The identification of needs is based on result of market research.

If chosen JV, the partner selection costs longest time in all steps of JV formulation. First is to profile the characteristic of desired partner. What kinds of skills, resources or knowledge expect to be offered by partner. Then, identify the potential partners. Normally, one potential partner may not bring all the needed values. But the other values can be provided surpluses via its network. Next is to screen and evaluate joint-venture candidates. The evaluation of partner candidates is through stakeholder analysis approaches, described subsequently. The criteria to judge suitable joint venture partner is crucial. After possible partner was selected, initial contacts and discussions start till partner is chosen. *The chosen partner should bring the desired complementary strength to the partnership, and neither joint party has the desire to acquire the other partner's strength* (Hollensen, 2004, p. 322).

3.5 Products/service

Generally speaking, a good product will sell itself. In intense competitive market, there are no bad products anyone as customers easiy find substitutes. Hence the products must intend to satisfy customers needs. Business model contains products/service statement in order to define the features of produts/serive. The requirement for desired products/service is to:

- To have differeentiated features versus competitors;
- To meet some certain of customers needs
- Customers have good experience using them

(12 manage; Mindtools, 2009)

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 interets, purchasing patterns, and so on. Using segmentation allows companies to target groups effectively, and allocate marketing resources to best effect (SearchCSR, 2010).

Customer segmentation is a powerful means to identify customer needs. Then companies can determine development appropriate products, cusomized markting programs and reasonal pricing. Customer Segmentation is most effective when a company tailors offerings to segments that are the most profitable and serves them with distinct competitive advantages. This prioritization can help companies develop marketing campaigns and pricing strategies to extract maximum value from both high- and lowprofit customers (Managementtools, 2009)

3.7 Supplying and distribution channel

From Wei's article 'The Optimization model of e-waste reverse logistics and recycling network' (Wei, et al, 2008), the supplying and distribution of E-waste is reverse logistics of EE products. Defined in 'the Dictionary of Sustainable Management', reverse logistics is 'The process of collecting used products and materials from customers to be reused, recycled, or upcycled into other products. This process treats these materials as valuable industrial nutrients instead of disposed of as trash. This is the complement to the traditional supply chain and distribution system used to produce and deliver products to customers'.

The definition describes the flow of e-waste. The detailed process of e-waste flow will be introduced in Chapter 5. The issues include: Channels to collect e-waste, that explains the supplying of e-waste and the different distribution of reuse/recycle/upcycle products.

3.8 Revenue model

Zerdick et al. (1999) define the revenue model as the 'determination of the sources of revenue'. In other words, revenue model is the origins of company income. Hence they are an integral part of business model. From revenue-related criteria, revenue model is classified as direct and indirect revenue-origin. The revenue

model supposed in this thesis concentrates to direct originated revenue from manufacturing and sale of products (Weber, Gruhn, 2005).

In field study, the author explores the sources of main players' revenue. They are quite different. The author will offer a revenue model to extend the ways of revenue origin based on comparison main players' operations.

Summarized this chapter, it deals with the related concepts of market analysis and business model development. It contributes to framework the research work in fieldtrip and defines the contents the author wants to recommend for foreign investors. The important concepts like market driving forces, market actors, and international market entry strategy, two powerful analysis tools – Porter's 5 forces and stakeholder approached are introduced. On the basis on the analysis of Chinese e-waste processing market, a business model will be generated. Entry mode, product/service, customer segment, supplying and distribution as well as revenue model are components to combine the business model. Among of them, although entry mode has many alternatives, the mode discussed focus on foreign direct investment.

4 RESEARCH METHODS

‘Market Research is a systematic, objective collection and analysis of data about a particular target market, competition, and environment. It always incorporates some form of data collection whether it be secondary research (often referred to as desk research) or primary market research which is collected direct from respondent. With markets throughout the world becoming increasingly more competitive, market research is now on the agenda of many organizations, whether they are large or small. Market Research is either quantitative, qualitative, or a combination of both. (Maketresearch, 2009)

The qualitative method is chosen as mechanism for this thesis research, because ‘qualitative method is used to explore in-depth issues of one topic, unlike quantitative research deals with fixed set of question’. The employment of qualitative approach, drawing on combination methods outlines the complex net of Chinese e-waste process industry (Marketsearch, 2009).

There are various types of qualitative market research methodologies. Face to face interview, direct observation, data interpretation, etc.

Comparative method is embedded during industry research. The comparative method is often used in the early stages of business development. It can help the researcher to ascend from the initial level of selected case studies to a more advanced level of model through exploring variables and similarities of cases. In comparative study part, the author are examining two four cases. On the basis of the target of study, the comparative items are decided. The thesis is purposive for business model, so the relevant components of case companies will be examined to analyze success and failure. The business model will come out to take the essence, amend the unreasonable ones. (Uiah, 2010).

‘Various methods of market research are used to find out information about markets, target markets and their needs, competitors, market trends, customer satisfaction

with products and services, etc. Businesses can learn a great deal about competitors, customers, their wants and needs, how to meet those needs and how the business is doing to meet those needs (Managementhelp, 2009).

4.1 Steps of research

The steps of research procedure have three phrases. Data collection is the first step. The collective data is both primary and secondary data. Primary data is captured through field study, and secondary data is gathered via reading journals, books and internet websites. Data analysis and interpretion is the second step. The theories applied in market analysis, including macro-environment analysis, micro-environment analysis and the two approaches, Porter's 5 forces analysis and stakeholders analysis had been introduced in Chapter 4. The last step is to get conclusion based on the previous work. The conclusion is subject to propose for foreign companies. The research step chart is in below figure 9. The figure also presents the issues done in each purchase.

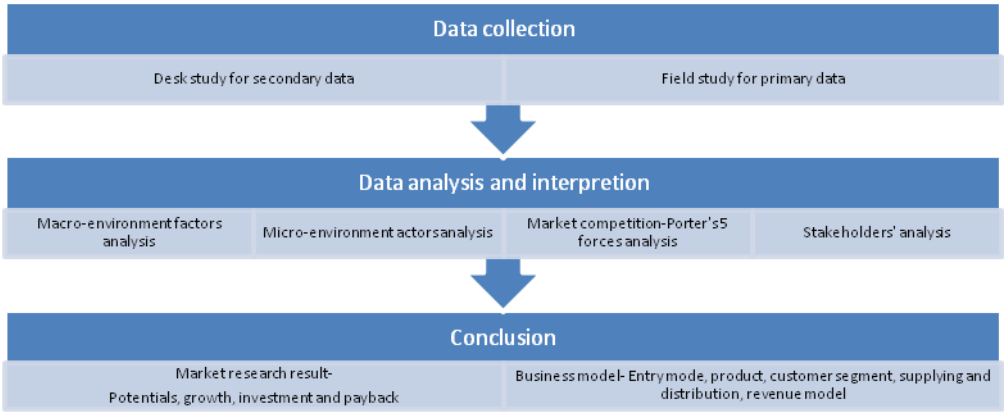

Figure 9: The steps of research

4.2 Data collection

Data collection is the first step, and also might be the most important step in research. It is the straw for bricks. The data collection sources either desk research or field research.

Desk research is to capture information through internet, articles or books. The internet is the essential tools for primary data. The useful websites of agencies, organizations, companies relating to this topic are attached in references.

Field research aims at getting data relies on empirical techniques, face to face interviews, telephone, post survey and direct observation. Between them, 'Interview with a single respondent based on pre-prepared topic and questions' is a powerful tool and applied frequently (BusinessDictionary, 2009).

The collected data required to be validity and reliability. In practice, respondents' experience, position and open mind towards interview. Surely the communication skills of interview conduct will motive respondent in deeper discussion, extract more valuable information.

4.3 Sample determination

As mentioned before, China is a large country with diversity in economy development, income level, customs, business atmosphere etc. For empirical study, the first thing is to decide where to conduct. The criteria to select areas to do field study are:

- As many of Chinese cities have not own e-waste processing facilities, so the area should have relevant long history to do e-waste business. If it has both formal and informal sections, that is better. The minimum length is 3 year.
- The e-waste management system is relatively comprehensive, such as government has detailed initiatives to regulate e-waste business, the formal section has a whole flow of e-waste treatment.
- The local commercial culture and governmental behavior are open, respondents tend to frankly speaking.

After research cities picked out, the following thing is to select respondents. The criteria are stated below:

- The respondent is familiar with e-waste business, market situation, or is one of participants in e-waste flow.
- The respondent has long time to study e-waste business in China, their experience is unique.
- The respondent is willing to meet the author, and would like to exchange his experience.

To meet the criteria of above, the below cities are determined to be the places to conduct the field study.

Two Municipalities directly under the Central Government plus three e-waste business advanced cities, namely respectively Beijing, Tianjin, Guangzhou, Suzhou, and Qingdao.

The selected groups to interview are as following:

Government agencies:
The Ministry of Environment Protection
The Trade and Foreign Investment Promotion Bureau, Qingyuan City
Beijing Municipal Development and Reform Commission
Chengdu Municipal Environment and Protection Bureau

NGOs emphasis on e-waste:
Greenpeace, China

EE retailers
Suning Appliance
Yongle Appliance

EE manufacturers:
Changhong Electronics Group
Haier Group

Collectors of e-waste:

Guangzhou Tianren Recover Co. Ltd.

Beijing Balizuang (Unofficial)

Processors of e-waste:

Huaxing Environment Protection Development Company

Guangdong Qingyuan Waste Recycling Center

Fuji Aike (Suzhou) Co., Ltd.

Qingdao New World Environment Technology Company

4.4 Data analysis and interpretion

The criteria for data assessment are validity and reliability. Data analysis objectives are (Epidemiolog, 2010):

1. Examine data quality and enhance data quality.
2. Describe the study population and its relationship to some presumed source.
3. Assess potential for bias, e.g., nonresponse, refusal, and attrition, comparison groups.
4. Estimate measure of frequency and extent (prevalence, incidience, means, medians)
5. Estimate measures of strength of association or effect
6. Assess the degree of uncertainty from random noise (‘chance’)
7. Control and examine effects of other relevant factors
8. Seek further insight into the relationship

Data intepretion means translating information. All types of data must be coded. The objective is to figure out variables from information, with an eye towards their analysis. The data intepretion is to find out the relevant information existed in data and methods to analyze them (Epidemiolog, 2010).

To sum up, this chapter is to introduce the research methods that applied in this thesis. The next chapter is the description of research result, both desk study and field study.

5 E-WASTE PROCESS BUSINESS IN CHINA

This chapter is regarding e-waste process industry in China, including influence forces in political, social, economical and technological, and main industry participants: governments agencies, recyclers, collectors, EE producers, EE retailers. As China just published one of the most important e-waste management legislations, under such a circumtance the reaction of involvers is to be evaluated in stakeholders analysis. The competiton sitution is explained by Porter's 5 forces model. The comparison between Chinese main processors is described as well. The comparitive study is focus on their strengthen and weakness in business model. The result of comparison brings benefit to design a suitable business model for foreign investors.

5.1 E-waste generation

China's scaling-up economy greatly increases consumption of EE products. As an EE manufacturing and consumption dominant developing country, a pile of e-waste is growing quickly in China. With the trends of shorter lifespan and assemble line kicking out cheaper products, the mass of obsolete e-waste is growing at a blistering pace. It is reported that most of refrigerator, wash machine, TV in late 80's and early 90's are out of use and needed to be disposal. Meanwhile, there are large volume of disqualified products and scraps during electrical and electronic appliances manufacturing. The generation of e-waste is expected to reach 105.28 million tons or 1,300,000,000 units in 2010. Despite of domestic generation of e-waste, illegal import of e-waste is still rampant in coastline areas neverthelss Chinese government legally banned waste import (Yang et al, 2007; Liang et al, 2007; Fortune group, 2009).

In the below table, shows the estimated volume of e-waste in near future years.

Year	Refrigerator	Air conditioner	Washing machine	Television	Computer	Total	Growth rate (%)
2001	6,708	630	10,942	14,358	246	32,884	
2002	4,631	1,580	9,484	16,892	836	33,422	16
2003	4,699	3,464	10,747	20,577	1,388	40,876	223
2004	4,858	3,934	12,545	25,376	2,066	48,778	193
2005	5,967	6,826	12,073	27,113	2,914	54,893	125
2006	7,681	7,862	13,422	34,970	4,050	67,985	239
2007	9,185	9,740	14,430	42,620	6,720	82,695	216
2008	9,797	11,569	13,416	39,360	8,777	82,918	3
2009	10,444	13,376	15,958	40,937	14,635	95,350	150
2010	10,600	18,267	19,645	51,550	32,167	132,228	387
2011	12,100	23,336	25,334	65,414	59,749	185,934	406
2012	12,790	31,351	30,355	74,318	80,849	229,664	235

Table 5: Forecasted scrapping volume of five major electronic equipment types (× 1000 units) (China's Plastics Statistics Yearbook, 2006).

China population is around 130, 000, 000 (2007) while in 2010, there is total amount of e-waste about 130,000,000. That means every Chinese generates one unit of e-waste annually. As rurual areas' average annual income is far lower than urban's, thus at cities, discarded EE products by per people is bigger than one person one e-waste per year. The average annual growth rate of e-waste between the year 2001 and 2012 is very high, over 100%. E-waste is one of the most growing rapid sectors in solid waste.

5.2 Driving forces to manage E-waste

China, as the fastest developing country, has a great demand for all kinds of resources. Electric and electronic manufacturing to meet rapid growing market requires normous mineral resources. But calculated by the forecast of mental consumption in 2010, the explored deposit can only supply 10-15 years stably. In the circumstance of huge demand for resources, but shortage of primary material, it is a win-win business to develop regenerated resources industry both for economy and social benefits. The secondary materials market enlarged recently, but a research of The Committee of Renewable Resources estimated that in China, the value of non-recycled materials which can be renewable amounts to around 35-45 billion US dollars per year. The data shows the renewable industry has great potential in China. Because of rich contents in renewable resources and its huge mass, e-waste

plays key role in resources renewable industry, it can add new blood into resources supplying. (Cai, Shi, 2009 & Xinhua net, 2009)

Driven by flourish e-waste generation, demand for low-cost materials to alleviate domestic shortage, and creating job opportunity to employ abundant low-salary people from suburban areas, e-waste business develops very fast and become an important industry in costal regions (Lin et al, 2002). Although huge mass of e-waste generation, and lack of resources drives to recycle e-waste efficiently, the treatment technology is in low efficiency and not safe to environment. Except for a few licensing processing companies, the majority of recyclers in market is informal sector, e.g. family workshop or small scale plants. To pursue a high profit, they dissolve and exact metals through strong acid and easily discard the remaining part, that contains valuable and poisonous components. The rate of utilization in informal processing workshop is quite low, while brings on great pollution to environment (Greenpeach, 2009).

Under the circumtances – stress to decrease damage by informal section, shortage of primary resource, creation employment opportunity for excessive labor force under formal factor, Chinese government urged to regulate e-waste business. Chinese market is an emergy market for e-waste processing facilities, especially large scale processing facilities.

5.3 Legislations concerning e-waste business

Chinese government published its first regulation concerning e-waste management in the end of 1990s. China is a signatory to both the Basel Convention and the Basel Ban Amendment, officially banned the import of e-waste. Till present, several relevant legislative documents relevant to e-waste management announced. After reading carefully the texts of these documents, the following laws and regulations are picked out as they are direct to e-waste management or greatly influenced e-waste business in China.

The Cleaner Production Promotion Law was approved by the Standing Committee of the National People's Congress (NPC) of the People's Republic of China on June 29, 2002. This new law is the most significant of a number of initiatives Chinese government has taken to establish cleaner production nationwide as one of China's key strategies for sustainable development. It lays out a solid lawful groundwork for the consequence regulations and policies.

Recycling Economic Promotion Law published in Aug. 2008. The term 'recycling economy' is defined as reduction, reuse, and recycling of resources in production, circulation, and consumption to promote environmental protection, as well as the efficient use of resources through 'resource – product – recycling' and 'producer – consumer – recycler' models. This law builds the 3-R model for waste management. Comparing the previous related laws, it has more stipulations regarding e-waste. In article 38, it stipulated that goods after the restoration, which meet the standards must mark in a prominent position as re-use products, and e-waste must be delivered to the dismantling enterprises with qualification. Article 46 proposes two incentives in e-waste collection, in terms of 'trade new good for old' and 'purchasing deposit'.

Measures for the Administration of Prevention and Treatment of Pollution by Electronic Information Products, regarded as "China Restrictions of Hazardous Substance (RoHS)" was issued in Mar. 2007. The Chinese RoHS applies to control and reduce pollution and other hazards to the environment by electronic information products in the process of manufacturing and selling. This regulation defines scope of electronic information products; identify toxic and hazardous substances inside electronic information products. The methods to control pollution include technical measures adapted in design and production, labeling measures, procurement channel measures as well as banning to import EE products which contain any listed toxic and hazardous substances. Seven departments, including the Ministry of Information Industry, the National Development and Reform Commission, the Ministry of Commerce, the General Administration of Customs, the State Administration for Industry and Commerce, the General Administration of Quality Supervision, Inspection and the Quarantine, and the State Environmental Protection Administration (replaced by the Ministry of Environmental Protection in 2008), are

appointed as supervising and regulatory authorities. The range of authority and responsibility for each department explain explicitly. In line with legal power, penal clauses stipulates as a very important part of the RoHS.

The Ordinance on the Management of Waste Electrical and Electronic Products (hereinafter short as **the Ordinance**), finally published in Feb. 2009 after years debate among industry participants, is regarded as Chinese WEEE directive which exerts a strong influence. The objective of this regulation is to stipulate e-waste recycling and disposal into a licensing scheme, meanwhile motive the legal business and against illegal participants.

The Ordiance plays an important role in e-waste business. The main contents of it are:
First, the Ordinance categorizes e-waste, which takes reference from Directive 2002/96/EC. China has the same category of e-waste with EU.

Second, it declares separation of duties for authorized departments. The Ministry of Environmental Protection, the ministry of Industry and Information Technology as well as the National Development and Reform Commission are responsible drafting of regulations, coordinating and monitoring enforcement. The Ministry of Commerce is in charge to manage e-waste collection. The municipal environmental protection department is the mechanism of e-waste treatment and has the approval right for e-waste treatment enterprises licensing.

Third, the collection of e-waste can be collected by multiple channels while their disposal should be dealt with centralized. Only licensing companies can conduct e-waste recycling.

Fourth, it is the first regulation to definitely state model of Procurers Responsibility (hereinafter short as **EPR**) is applicable in e-waste management. Accordingly it is usually regarded as counterpart of the directive of EU Waste Electrical Electronic Equipment (WEEE). Details of Chinese EPR include: A special fund for Waste Electrical and Electronic Appliance Treatment is to be constructed by the departments responsible for ‘resource comprehensive use’, under the scrutiny of the State

Council. The manufacturers and importers of electrical and electronic products fulfill the obligations to contribute the fund; Manufacturers must adopt product designs that use nonhazardous treatment of resources, select non- or minimally hazardous and toxic materials or materials that are easily recycled and reused, and meet recoverability ratio to be set; Manufacturers should also use designs that favor 'circular use', and furthermore provide information on the product composition, recycling and treatment instructions associated with the product and materials – this overlaps with provisions in China's RoHS regulation; Manufacturers are required to deliver waste electrical and electronic appliances generated in the manufacturing process to qualified treatment enterprises, while waste electrical and electronic appliances must be collected through sale and post-sale service outlets, and deliver the waste electrical and electronic appliances to licensed treatment enterprises.

Five, it tells the responsibilities of business consumers. Electrical and electronic products' business users, like official institutions, public organizations, enterprises and schools should send their e-waste to licensed recycling enterprises, then finalise the cancellation procedure after asset verification.

Six, it introduces the incentive polices in tax e-waste final disposal etc.

Seven, the Ordinance stipulates the criteria of licensed enterprises to do recycling and disposal as well as the procedure of certificate application.

Eight, it focus on penal clauses for breach this regulation and specific fine amount.

The legislative discussion is concentrated on the Ordinance, as it is the most important and correlative regulation of doing e-waste business in China. The analysis is in forms of its strengths and weakness. The Ordinance has great positive influence in e-waste business. Comparing the previous laws and regulations, it has strengths in: EPR is put forward as e-waste managerial model, and outlined its structure including three systems, namely collection, management, processing and financial scheme. The functions of authority departments are distinguished clearly. Municipal governments and their affiliated departments are mechanism to enforce e-waste management, promotion collective channels, approval licensing and su-

pervision licensed companies. Normally in China, operator of public service project, especially environment protection is determined by means of bidding. Municipals have power in selection tenderer. The Ministry of Commerce centrally manages e-waste collection and design policies to incentive collective rate. EE producers, sellers, post-service companies, special collectors construct multi-channel collection systems. The processing of collective e-waste only authorizes to deal with by licensed companies. Any recyclers unlisted without license are illegal. Meanwhile, the weakness of management model is not to define finance management. Producers offer funds in e-waste handling; however who is the responsible organization to collect and disburse money and the chargeable amount from producers don't introduce in Ordinance. Besides, lack terms of the details to restrict illegal actions and the liability of individual users to return discarded appliance result in the Ordinance is criticized by industry.

5.4 Flow of E-waste

In China, practical situation is a large part of e-waste flows into informal sector. The individual collectors, family workshop processors as well as some repair shops are doing e-waste recycling business. Thus the e-waste flow in China is more complicated than EU countries where only formal processors involve. At this point, an investigation of the e-waste collection, transferring, and processing system in China is urgently needed to know. After reading journals related to e-waste business in China and observing the real process, the below figure is drawn to present flow of e-waste.

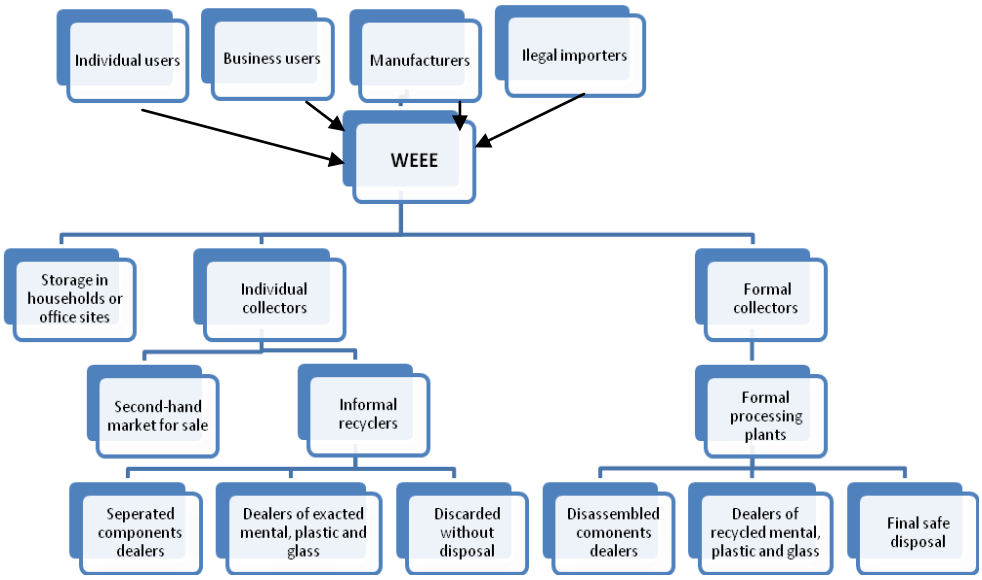

Figure 10: Flow of WEEE

There are four **main sources for e-waste**: individual users, business users, manufacturers and illegal importers. With China economy development and individual income level rising, Chinese people annual consumption for EE productions increase greatly. TV occupancies the biggest share in household appliances while mobile phone dominates in information products. The wastes from individual users are abundant and dispersed, so difficult to collect. The business users include governmental departments, institutions and enterprises. The character of business users is their number less than individual users but a single one generates much more. Waste electronic and electrical products collected from business users usually cost lower in transportation comparing with individual users. Industrial manufacturers produce defective products which belong to e-waste. EE manufacturers have multiple roles in e-waste management. They take extended responsibility in waste handling and provide financial support to waste processing handlers, moreover they are generators of e-scraps, also they are big customers for secondary materials that exacted from e-waste. Driven by profit to dissolve e-waste, coastline areas are infested by illegal import. As China had forbid to import e-waste and

cracked down smuggling, therefore for formal recyclers, waste from smugglers can't be considered as reliable source (Veenstra, 2009).

The generated e-wastes flow downstream to three braches: temporary storage in household/office sites, captured by informal, collectedf by formal collectors. Most of Chinese people hardly regard used electrical and electronic products as waste, they think them as 'valuable items'. Chinese people have habits to keep disused or replaced old products at home in case of possible reuse, e.g. send them to poor relatives; or they sell used products to door-in collectors. It's seldom to find EE products throw away with other solid waste. The percentage of stockpiled e-waste and collected waste stands even, each of them around 50 %. Informal collection accounts for 45.2 % while formal collectors only get far fewer 4.8 % (Yang, 2008).

The e-waste that flows into individual collection section are divided into: reuse directly 20 % and sell to informal recyclers 25.2 %. The informal recyclers refurbish e-waste and resell them at second-hand market, that part occupies 18 % of total amount. The of remaining e-waste 7.2 % are seperated manually, then exacted coverable materials. The refined materials are sold to all kinds of material dealers. However, the poisonous remnants are discarded (Yang, 2008).

Formal recyclers do e-waste processing environment friendly, but because of very low formal collection rate, the amount they process is tiny, only accounts for 4.8 % of total (Yang, 2008).

The below table is the comparison between formal and informal sections of e-waste business. The comparative issues concentrate on their variables in collection mode, cost and profit.

Table 6: Comparison of Formal and Informal section (Wang, 2008)

	Informal processors	Formal processors
Collection mode	Relied on large quantity individual collectors, who contact directly with staffs of residential communities or scriptoriums and easily to collect e-waste from households or offices. The collection is payable. Very efficient mode.	Have multiple modes, including collection companies, EE manufacturers and retailers or themselves. Normally pay lower price in collection. Low efficient modes.
Processing cost	They are small size, using manual power in disassembling, separation and dismantling, even extraction. They don't treat e-waste in safe disposal. Very low processing cost.	They cost high in fixed assets, e.g. land and mass treatment product lines. The processing cost depends on volume of production, larger volume lower the cost. Because of inefficient collection system, the processing cost is very high.
Profit	High	Low or loss

From the above, the efficency in informal system is very high, while the formal one is in low efficient. The basic reason that caused such differces is their collection modes differ greatly. Although formal collection channels are multiple, but without interest incentive, the collection systems works efficiently. The mode mode of individual collectors apply – door in and payment collection is adaptable for current customers' awareness of e-waste. More than 80 % of residents knows nothing about danger of e-waste, they are of concern largely the price to sell e-scaps.

5.5 Geographical distribution of e-waste processing facilities

The main centralized clusters for the waste electrical and electronic appliances are located at three areas, namely: the Pearl River Delta, the Yangtze River Delta and the Area Around Bohai Bay. See figure 11, these places are marked in red cycle.

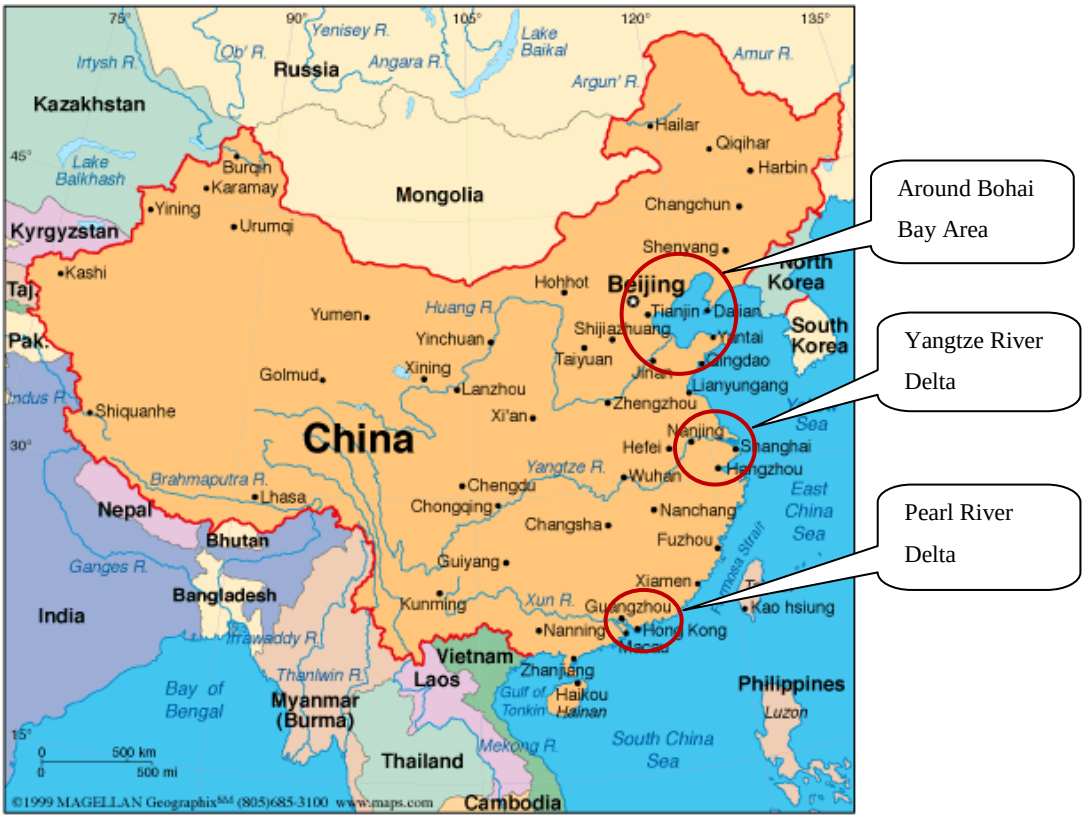

Figure 11: Geographical distribution of centralized cluster of e-waste processing industry

Main cities suited within these areas include: Guangzhou, Foshan, Shenzhen, Donguan of the Pearl River Delta; Shanghai, Nanjing, Suzhou, Hangzhou of the Yangtze River Delta; Beijing, Tianjin, Qingdao, Dalian of Around Bohai Bay Area.

The common features of the areas in economy are:

- Most of key electrical and electronic manufacturers of products and components address in these areas, including many big foreign invested companies. Such as Toshiba, Nokia, Intel, Siemens etc. and (Zhuang, 2006)

- They stand the leading position in Chinese economy development. 12 of Top 15 GDP cities stand at these areas, they are: Beijing, Tianjin, Shanghai, Guangzhou, Shenzhen, Qingdao etc. Advanced area economy and high level income cause these cities consume more EE products and generate more e-waste. The three cities which exclude are metropolis located in Middle Western of China, **Chongqing, Chengdu and Wuhan**. The ranking of municipal GDP 2009 please see the appendix 2.

- The municipals of some cities have detailed design of e-waste management. For example, Beijing Municipal government plan to collect 5,152,000 units e-waste in 2010, 40% of them will be handled centralized, which need processing capacity of 2,060,100 units yearly. In 2010, 1-2 large scale processing projects will be built which scale to annual 1,000,000 units. The long term goal of Beijing Municipal is to reach e-waste recycling rate to 80% (Beijing Municpal Development and Reform Commission, 2006) .

Since year of 2003, National Development and Reform Commission (NDRC) assigned four cities, Beijing, Tianjin, Qingdao and Hangzhou to address the trial projects of e-waste management. The objective of trial projects is to explore a suitable e-waste management model for whole country. From last year, the cities to host trial projects extended to nine cities. Now, the processors who hold these trial projects become important large-scale players in e-waste business. Two of them will be discussed in next part as examples of processors.

5.6 Big players in large-scale e-waste processing

There are four companies of e-waste processing to be analyze in this subtitle. Each of them can represent a group of companies who feature in some common points, e.g form of company, mode of business, etc.

Qingdao New World Ecological Technology Company (herein after short as 'New World') is located in Qingdao City. It is the only official licensed e-waste disposal company of Qingdao city. The total number of e-waste in Qingdao City is

around 5, 240,000 units per year. Home appliance takes major account, 81.9%. Most of e-wastes are purchased by drop-in individuals, who pay 5-30 euro per unit for collection. The rate of collection, both formal and individual, is 82.6%, the rest 17.4% is stored by residents.

The company was established jointly by Haier Group and Qingdao New World Investment Company. Haier Group is one of the largest EE producers of China. Haier products distributed in all over of the country. Haier has strong research and development capability. The initial invested fund is 8,130,000 Euros (1 Euros equivalent 10 Yuan) and total investment till the first half year of 2009 is 10,700,000 Euros. The processing plant occupied land of 66，000 square meters.

The product lines include: Manual dismantling line, maximum annual production capability 50,000 units; Shredding and separation line, annual production capability 200,000 units; Large mass dismantling, can produce 600,000 units per year. The goal of company is to process 1,800,000 units of e-waste per year. The processing plant locates at Laixi city, where is the transportation center. The process system comprises dismantling workshop occupied 5,500 square meters land, recycling plant and hazardous disposal plant. The recycling plant mainly treats discarded television, refrigerator, air conditioner, washing machine, computer, small appliance, office electrical product, circuit board, waste cables. The ingredient of hazardous materials and the hazardous produced in processing are treated safely by disposal plant of New World Solid- waste Comprehensive Disposition Co., Ltd. The technology and machines for shredding and separation product lines were imported. The intellectual property right of other 11 product lines is owned by company itself. The creative technology is mainly in processing equipments' optimization, integration and system construction. The recycling rate of main five types of e-waste is refrigerator 83%, washing machine 90%, air conditioner 90%, television81%, PC 86%.

Figure 12: E-waste classification and dismantling. (Source: Gootech, 2009)

After several years' experience, New World established its comprehensive collection system for used EE products. Cooperated with Haier post-service department, Xin Tiandi set 10 collection sites in Qingdao city. Besides, through signed alliance agreement with local collectors of Linyi city and southern Shandong province, New World established a network integrated resources with both company and individual collectors. The transportation system applies diverse logistic of new EE products distribution system that builds by Haier Group. Till present, the total number of collection stations is 104, covered 17 main cities of Shandong Province. The below Figure 11 marks the locations of every collection sites and disposal plants all over Shandong province. In this map, red cycles represent treatment plants, blue stars are information branches, pink squares mark collection stations and green triangles are alliance collectors.

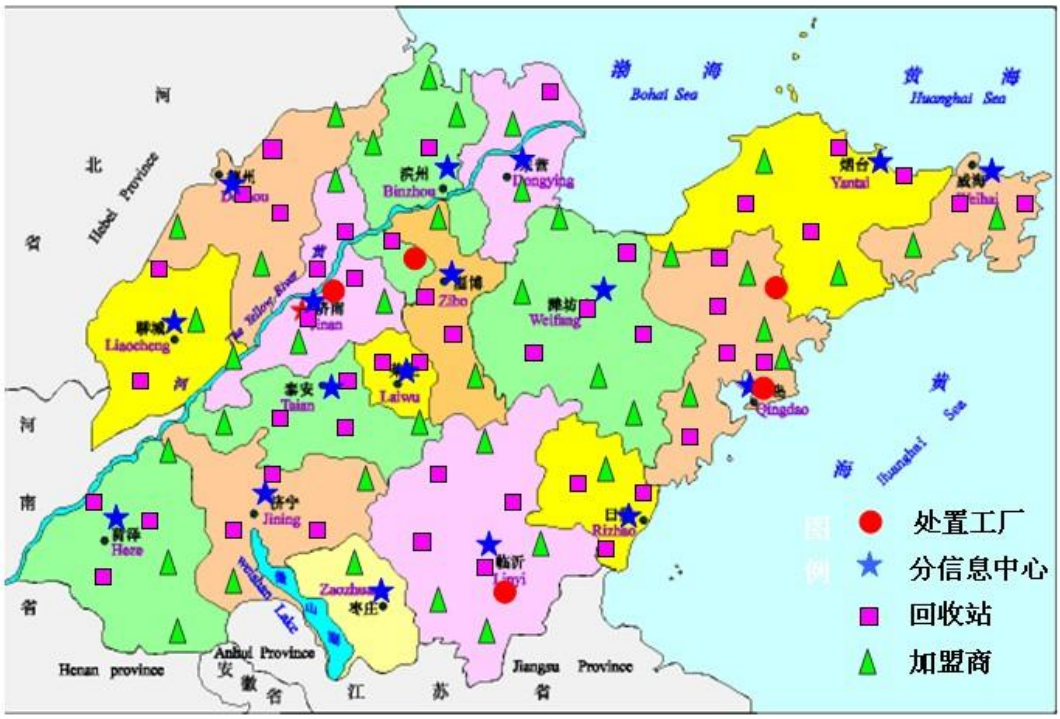

Figure 13: The map of New World collection sites and disposal plants. Red marks: processing plants; Pink marks: collection sites. (Source : New World, 2009)

The integrated collection system is organized by four channels: community collection, trade- in, EE producers' collection as well as collection from governmental departments, state-owned enterprises and institutions. The below will discuss each channel respectively.

Community collection is target to source from household and company users. New World announced two hotlines for users dialing. Information center pass details of collective address and e-waste description to collection stations, then stations drop in for collection. The collection is paid, and the price is almost the same as market price. The below table 7 is the price for collected five main types of e-waste and comparative price of individual payment.

Table 7: Collective price of New World

Type	New World Collective price (euros/unit)	First hand individual collector's price
Washing machine	12–22	10–20
Refrigerator	18–32	15–25
Television	8-21	5-30
Air conditioner	19–48	15–40
PC & laptop	PC 15–28, Laptop 35	PC 15–30, Laptop 30-40

Although price for e-waste collection is higher than first-individual collector payment, but it still doesn't work efficiently. The reason is Chinese users hardly know that the e-waste collected by individual collector are treated properly and cause environment pollution. The other reason is users are getting used to sell e-waste to door-in collectors.

'Trade-in' events incentive EE retailers in e-waste collection. As a promotion activity, New World carried out Trade-in in 33 big EE retailers, such as Suning, Wuxing, Sanlian etc. When consumers return the old EE products to designated collection sites, they can get a voucher whose amount is higher than selling to individual collectors, usually between 6-20 Euros. The voucher deducts the equivalent money in purchasing new products. In 2004, the number of collected e-waste is 2855 units. The number is so small because the collective price of Trade-in is lower than market price. Therefore most of e-wastes were sold to individual collectors and flow into illegal market. The situation did not changed till after June 2009, the Commerce Ministry issued a incentive policy-Trade-in. Consumers can get maximum 10 % subsidiary when buy new products if they return the old one to official collectors. Nevertheless paid much lower than market price, consumers rather sell their e-waste to official collectors. The number of collected e-waste via official collectors increased greatly. Launched in Sep. 9, till Nov. 18, the collected e-waste estimated to amount 70,000 just in 40 days (Municipal Information, 2009).

EE producers' collection is based on the industry character of Qingdao city. There are over 10 EE producers at Qingdao, including three large scale companies: Haier

group, Hisense group and Qingdao AUCMA Electrical Appliance Co., Ltd. EE producers generate e-waste during phases of research & development, tri-al-produce, producing, sales and after-sale. The source of e-waste from EE producers is mass and stable. New World signed contract with Haier Group to collect and disposal e-waste in manufacturing. The other enterprises is in contact to reach more agreement on collection and disposal (China Nonferrous Metal Association, 2007).

Collection from governmental departments, state-owned enterprises and institutions is another stable source of e-waste. New World made a research on amount of discarded EE products in Qingdao municipal departments, affiliated organizations, state-owned enterprises and institutions. 160,000 governmental departments, enterprises and institutions discard e-waste 94, 5000 units totally. Among of them, personal computer accounts 77.5 % of total amount, and air conditioner, television are in the next and the 3rd places. Qindao Municipal government and Shandong Province published official document to require their affiliated departments, enterprises and institutions to submit discarded EE products to licensed company, like New World. The rate of collection from this channel is lower. From 2006 to 2008, New World got 22,000 units of e-waste from this channel.

Through all four collection channels, New World collected over 110,000 units of e-waste in 2008, and the number of 2009 estimates more than 500,000.

The profit analysis is to take example of refrigerator. The sales of secondary material is 10 euros per unit, while the cost is much higher than sales. The cost of scrap refrigerator treatment includes hazardous material disposal (e.g. Freon disposal costs 10 euros), payment in collection, transportation, labor, electricity and depreciation etc. The situation of washing machine and television are similar. Accordingly, without any subsidy from municipals while paid for collection and transportation, New World operates at a loss definitely. Actually New World continue to operate by governmental subsidies.

Beijing Huaxing Environmental Protection Corporation (after shorten as ‘Huaxing’) is the only licensing company to do large scale e-waste handling. It

started to build e-waste processing plant in 2005 and completed at the end of 2009. The project lies at Environmental Protection Industry Park, Tongzhou District, Beijing. The 1st phase investment: 8,000,000 euros, land area around 40,000 square meters, the maximum production capability 1,200,000 units per year. The constructions include: E-scraps Testing Center, three processing product lines, warehouse and other accessory equipments. Based on imported new large scale product lines, Huaxing improved processing technology. Its manufacturing mode changed from 'manual disassembly, with supplementary mechanic dismantling' to 'principally mechanic dismantling, together with manual separation.

Huaxing has various collection methods, which are supported by Beiijng Municipal initiatives. Beijing Municipal Development and Reform Commission and Financing Bureau jointly issued a document in 2007, stated that government departments and institutions should submit discarded EE products to Huaxing by free. At the end of 2006, Huaxing signed an agreement with Suning Company, one of the biggest EE products dealers, to deal with the used products collected through 'Trade-in'. Besides, Huaxing set up collection sites at second hand markets and other EE products dealers. In order to provide convenient service in e-waste collection, Huaixng offered two free hotlines and online trade platform，to collect e-waste payment. Meanwhile, Huaixng cooperated with EE producers addressed at Beijing, to provide processing service for rejection and second products and discarded office appliances. Furthermore, started in August of 2009, all of 16 licensing companies win the tender of National Trade-in policy, have transported the collected e-waste to Huaxing for processing. From August to October, Huaxing had received 87,549 units from the tender collectors. With comparison its designed 1,200,000 units capacity, Huaxing is still widening its multiple collective channels to meet the production demand.

The wastes that Huaxing mainly processed are home appliances, from small to large size. The recyclable materials are mainly in circuit board, which exact copper, gold etc. The actual production in 2008 is 209,000 units, and 2009 estimated around 250,000 units. Huaxing expected that large scale processing industry will become profitable since National Trade-in policy implementation. This policy not only

incentive high collection rate, but also increasing the citizens' awareness of e-waste danger. But Huaxing is also worried once the incentive policy stopped, the collection will be difficult as before. Till present, Huaxing enjoys the subsidy from national government departments, which make up their loss in processing.

Nanjing Kaiyan Electronic Co. Ltd (after short as "Kaiyan") was established in November, 1995 in Nanjing, China, with investment of 1.3 million euros. The business scope of Kaiyan is to recycle and disposal displays of TVs and computers as well as their components, such as CDT guns. All of scraps processing productions lines depend on imported technology, processing production capacity 250,000 units per year.

The output of Kaiyan is renewable picture tubes, display tubes and energy-economic lightening products. Its main customers include LG, Philips and other major manufacturers. Kaiyan collected discarded products from these manufacturers and also sell renewable components to them. Besides, Kaiyan also collects waste from users based on National trade-in policy. The annual output is display tubes around 1 million units and lighting products around 5 million units.

The annual revenue of Kaiyan ranges between 2-2.7 million euros. Kaiyan is one of the most profitable companies in e-waste recycling in China (Kaiyan, 2009). Although Kaiyan didn't announce it profit performance, the other main plays agree that its profit rate over 100 %, payback period is very short, 1-2 years.

Fuji Xerox Aike (Suzhou) company (hereafter short as "Aike") is the subsidiary fully owned by Fjuji Xerox Co., Ltd. Aike was invested about 4 million euros to build a recycling and disposal facility at Suzhou Industry Park in May, 2007. It started to operate since Jan. 2008. The recycling rate of office equipments will reach to 96 % while printer cartridges 99.9 %. Its goal of disposal is Zero landfilling, zero pollution.

The business of Aike is to collect printers, photocopiers and printer cartridges to convert them into new raw materials, totally in 64 types, such as iron, copper, glass,

lens etc. Meanwhile, Aike produces new equipments and printer cartridges making use of recycled materials. The factory can produce 15,000 sets of equipments and 500,000 printer cartridges per year in maximum production. In 2008, it produced 4,000 sets of equipment and 120,000 printer cartridges.

The processing facility of Aike is built based on 3R principles. After testing collected scraps, they are dismantled entirely. The components which can be used directly will reuse, the remaining parts will pass to renewable partners. Some of them can be paid, but majority should pay to partners.

The collection modes of Aike are to collect directly by its salesman and through retailers. The collection rate from direct customers is high, reaches to over 70%. The challenge of collection is rate through retailers is very low, which caused low efficient of whole collection system (Liang, 2009).

According to statement from Mr. Chen, vice president of Fuji Xerox China Corporation, the estimated payback period of Aike was 8-10 years. The estimated payback period of Fuji is without any financial subsidy from producers and government did not provide financial support in waste collection.

Below the author will do comparative study of above described processors. The common point is all of above metioned plays are to put high investment doing large scale e-waste treatment. The issues to compare are company mode, investment, business scope, production capacity, collection systems, and profit. The contents of comparative study on big players are shown in below table 8.

Table 8: Comparison business model between four big players

	New World	Huaxing	Kaiyan	Aike
Company mode	Jointly company, one party is a large scale EE producer	Domestic company	Domestic company	Fully owned subsidiary of a foreign parent company
Investment (euros)	10.3 million	8 million	1.3 million	4 million
Business scope	To process all kinds of EE appliances, exact recycled materials.	To process all kinds of EE alliances, exact recycled materials.	To process displays of TVs and computers, reuse workable components; re-produce new components with recycled materials.	To process printers and cartridges; reuse and re-produce recycled components and materials into new components and equipments.
Production	Maximum 180 million units per year, actually 250,000 units. Medium recycling rate, about 85 %.	Maximum 120 million units per year, actually around 280,000 units. Similar recycling rate as Huaxing.	Actual 250,000 units per year; output includes tubes, 1 million sets per year and lighting products, 5 million sets per year. Very high recycling rate.	Maximum produce printers 15,000 sets and 500,000sets cartridges, actually 4,000 and 120,000. Very high recycling rate.
Collection channels & efficiency	EE manufacturers; Retailers; Community; Governments and institutions. Low efficiency.	EE manufacturers; Retailers; Hotlines and online trade-in; Governments and institutions. Low efficiency.	EE manufacturers; Retailers. High efficiency.	From its direct customers and retailers. The previous collection rate is high, while latter is low. Medium to high efficiency.
Profit	Loss, but subsidized by government	Loss, but subsidized by government	Average annual revenue 2.5 million euros, high profit rate: >50 %. Very short paypack period, 1-2 years.	Profitable in re-using and reproduction, but the outsourcing final disposal raises cost. Paypack period 8-10 years. Cash inflow around 400,000 euros per year. Profit rate is medium.

Based on comparison above, it is concluded that the key factors to influence profit of large-scale e-waste processing plant are:

- Efficiency of collection system. If the amount of waste collection can match the supplying to product lines, the profit is high. And vice versa. Multiple collective channels help raise rate, but how to motive each channel for collection is the key point. To increase rate will do: establish a comprehensive transportation system, which is easy and prompt for users returning waste; offer a grand market price for waste payment.

- Revenue model. Simplifying revenue model decreases profit. Only abstracting metals, recycling glass or other materials couldn't cover the cost in payment collection, transportation, and manufacturing. That's the reason caused loss of New World and Huaxing. To make profit need a diverse revenue model, such as Kaiyan and Aike to reuse workable components and re-produce components or equipments making using of recycled materials.

- Building facility to process all kinds of e-waste needs higher investment. It also affects business profit. Kaiyan's investment is least because it only treats displays, while New World's is highest for high fixed cost in equipments and precise.

5.7 Porter's 5 forces analysis

From the above analysis about Chinese e-waste market, the result of market competition using the tool of Porter's 5 forces analysis is shown in figure 14:

Bargaining power of suppliers is STRONG.
The most important suppliers for WEEE business are e-waste collectors. They plays key role in the success of e-waste large scale processing projects. The large scale equipment requires a massive volume of mateiral supplying. Through analysis main players in large-scale processing market, there is a finding that their profit relies on the volume of collected e-waste. As purchasing power is high, so the bargaining power of supliers is strong. The company collectors has stronger bargaining power than individual collectos.
The other important suppliers are processing facilities manufactuers. Processors seek the innovative technology in order to less cost of recycling and disposal. The technology that increases the recycling rate and decreases the discharge rate is welcome by processors. For producers of providing such state of art technology, they have strong power in bargaining. There are some other suppliers, like who provide accessories of production are omitted to discuss here as unsignificant influence.
Bargaining power of buyers is LOW.
China is lack of resources to meet the growing demands of EE production. The secondary material is the efficient alternative to solve the problem of resources shortage. Normally, the price of secondary materials is cheaper than primary ma-terials' while same in quality, so the market demand for secondary materials is high. The strong purchase power let the bargaining power of buyers is low.
Reusing old EE products is consumption habit of Chinese people, especially in poor areas, people would like to buy used products than new ones as lower price. The products for resale have large market and adequent purchasing power. So buyers bargaining power is low.
Threat of new entrants is MEDIUM.
The potential new entrants include: EE manufactuers and other processors. The EPR model requires manufacturers to offer subsidy in e-waste treatment. If the chargeable money is high, it will change the attitude of EE manufactuers to set foot in waste processing business by themselves. Till present, the charge standard doesn't clarify, so here estimate threat from EE manufactuers is medium. Chinese carried out incentive polies to motive the development of large scale

e-wast processing. The investment in this industry is welcomed by governments. So there is seldom political entry barry. However a lots of big size foreign processors had already entered into Chinese market. Although there are thousands of medium to small sized processors in market, restricted by high investment and legal barry, they are very difficult to become new entrants. In overall, the threat of new entrants is medium.
Threat of substitutes is LOW.
There are several methods to deal with e-waste: recycling, landfill and incineration. The recycling method is the priporized principle in e-waste management in China. Besides, cyclic utilization material meets the goal of sustainable economy. In many places, directly incineration or landfill e-waste is banned. So the threat of substitutes is low.
Rivalry among competitors is MEDIUM TO LOW.
China generates a massive volume e-waste every year. Plus the e-waste storage in household and offices, the e-waste processing market is huge.
The e-waste processing is not intense competition industry in China. Large scale processors distribute along coastline areas. The inland market is almost blank. Even in e-waste processing centralized areas, normally there is only one large processor one place.
The huge number of informal processors deepens the competition in coastline areas. They occupy resources. It is estimated that the number of informal processors would reduced rapidly once government raise execution power to regulate market.

Figure 14: Porter's 5 force analysis for e-waste processing industry in China

5.8 Stakeholders' analysis

The stakeholder analysis is subject to evaluate influce and position importance of stakeholders. Investors can design relationship management strategy based on this analysis.

5.8.1 Identification of stakeholders

Followed Freeman's model (Figure 6) on 'Stakeholder map of a very large organisation' to identify the stakeholder groups for building large scale processing facility, the stakeholders are divided into external and internal stakeholders. Like below figure 13.

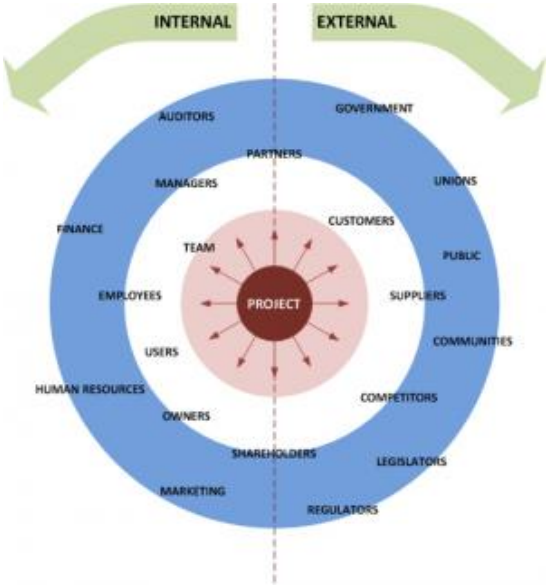

Figure 15: Stakeholders identification (Source: Wordpress, 2010)

In this thesis, the stakeholder analysis concentrates the non-internal stakeholders. The below table list the stakeholders in groups.

Table 9: Group of business stakeholders

Group	Stakeholder
Suppliers	E-waste formal collector; E-waste individual collector; E-waste processing equipment manufacturer;
Governments	The Ministry of Environment Protection and its municipal branches; National Development and Reform Commission and its municipal branches; Municipal governments; Other supervising and supporting government agencies;
Local community organization	Municipal community administrative committee
Consumer advocates	EE products retailers; Advertise companies; Logistic carriers; Market research companies; Public relationship consulting companies;
Customers	Municipal governments; EE products or components manufacturers; Secondary materials dealers; Retailers for resale products (Second hand market);
Competitors	EE manufacturers; E-waste licensing processors; Small e-waste recycling workshops;
Media	Local newspaper, television, websites;
Environmentalists	NGOs, like Greenpeace; Tzu Chi Foundation.

On the basis of previous subtitles about market description, some of stakeholders have little influence power to business, they won't be discussed below. The key stakeholders for building large-scale e-waste processing plants in China include: governmental agencies (The Ministry of Environment Protection, Development and Reform Commission and their direct branches), municipal governments, EE manufacturers, EE retailers, E-waste collection companies, individual collectors small recycling family workshop, licensing processors, logistic carriers, NGOs. Their stakes of business introduce here respectively.

The Ministry of Environment Protection and branches

The Ministry of Environment Protection and branch departments are main mechanism to supervise e-waste treatment. The ministry's mission is to design relevent regulations to manage e-waste, while its braches are to excute the functions of approval licensing application, supervising the environmental standard of waste disposal. They are stakeholders because they have strong legal impact power to e-waste business.

National Development and Reform Commission and branches

The central department - Natioianl Development and Reform Commission is responsible to coordianate and research e-waste management all over country. It is also the department to set the long term goal to increase recycling rate. Through interview with officials, NDRC has put focal point of work on waste management, they estalished several e-waste treatment bases by the end of 2010 in The 11th 5-year plan. In the next 12th 5-year plan, the investment in environmental protection will reach to 3 trillion RMB, the output value to 4.92 trill RMB. The goal of e-waste management tends to carry out centralized processing at central cities.

The municipal departments are to set local medium term goal of e-waste management based national's goal and local situation. Beijing Municipal Development and Reform Commission had a plan: during The 11th 5-year, establish community

collection sites covered the whole city and the recycling rate reaches from 20 % to 40 %.

Municipal governments

The main responsibility of municipal governments in e-waste is to decide the location of plants, offer incentive polies and crack down illegal recycling. Beijing city will build 1-2 large-scale processing plants in 2010. The goal of growing production capacity is one million units per year. They have strong power to influence business either in initial construction phase or later operation phase.

EE manfuactuers

They plays key role in e-waste flow and business. Their discarded products during manufacturing are one source of e-waste. According to ERP model stipulated in the Ordinance, producers pay for waste treatment. That makes them be the potential entrants of processing industry. Furthermore, the technology owned by them is what processors need. To improve the rate of reuse, need mature technologies in waste examine, refurbish and repair. The technology help processors sell qualified second-use products.

EE retailers

Large-scale processors that host national trial project cooperated with retailers for the sake of taking back e-waste easily. Large EE retailers, such as Suning and Yongle usually motive sale via trade-in. Users can return old appliances to compensate money when they buy new ones. They are also the carriers for National Trade-in Policy by The Mininstry of Commerce.

E-waste collectors

Through discussion above, e-waste collectors is the determinant factor of success. For processors, who are confident support from collectors, obtain enough e-waste with ground payment, they definitely achieve satisfied profit. The e-waste collec-

tors are divided into company collectors and individual collectors. Although individual collectors are in small siz, they are huge number and accumulated relationship with communities. Therefore their influence is power and should be considered when design business model.

E-waste processors

The existed e-waste processors are the competitors. Till present, e-waste processing in China is not a competitive market. These processors' production capacity can not reach the demand to treat generated e-waste. They have stakes in building more facilities. But the high investment and unsatisfied operation performance are the barriers for them to enlarge facilities.

Logistic carriers

The logsiters carry out storage and transportation of e-waste, as well transport outputs to customers. It is the reverse logistic system of EE products distribution. Logistic carriers are interested in e-waste business. If logistic carriers could do both EE products districution and take-back discarded products, it makes full use of their transportation ability. But logistic carriers' business depends largely upon EE producers and retailers. So their power is low.

NGOs

In China, there are several NGOs who watch e-waste keenly. Like Greenpeace, Basel China etc. The points they concern are to strengthen in reducing poinsonous materials, collect and treat e-waste in formal section, ban waste import etc. Their activities call in the attention of govenment and users' awareness on e-waste problems. As they don't do any e-waste management practically, their support in collection is small.

5.8.2 Stakeholders priporize

The priority of stakeholders is based on Power Interest Grid. The figure 16 shows the levels of power and interest of stakeholders.

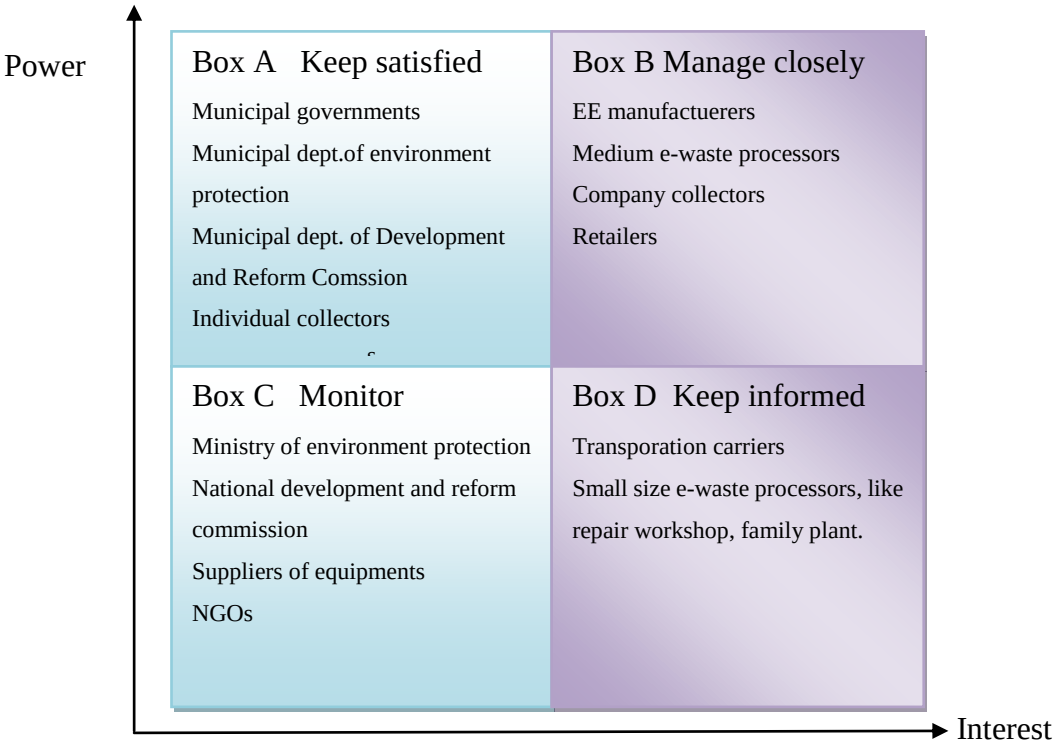

Figure 16: Power/interest grid of stakeholders

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 important and influence the business directly. Investors should establish good relationship with them. New entrants can capture useful information from them on requirement of business opening, quality standard, the municipal scheme etc. They also master incentives and can support to return departments' used product by free. Otaining support from these stakeholders can improve the profit rate of business.

Box B contains the stakeholders who are close partners. Their influence power is strong. They are potential competitors, important suppliers, and logistic providers.

Box B stakeholders help increase productivity, further in better financial performance.

The stakeholders in Box C represent those that should be concerned. They haven't direct force on business meanwhile they are not interested in business. Their macro forces can push the development of whole industry.

Stakeholders addressed in Box D are those to provide or possibly provide compensatory service. They are segment of e-waste flow, grasp knowledge concerning business, so they are interested in participating. But without enough technologies/funds or business experience limited, they are difficult to do large scale processing business. Only they are possible to do this business upon cooperation with stakeholders in Box B. Investors should deal with them to keep informed.

5.9 Summary

This chapter writes the details of e-waste processing market situation in China. This subtitile is to summarize the contents.

It is estimated that China will generate 1.3 billion units of e-waste in 2010, furthermore, a huge amount of non-processing scraps were accumulated in previoius years. Therefore the stockpiled e-waste is in a massive volume, they needed to be handled properly.

E-waste business in China grows quickly. The business is developing drived by not only the huge generation, but also some other forces. Lacking of primary resources, for example mineral deposit, and the danger of illegal e-waste treatment, obliges the Chinese government to make efforts of e-waste management. Several laws and regulations are published in order to regulate the market and motivate the development of formal large scale processors. EPR model is firstly defined legally to be the model of e-waste management. Licensing processors can get subdisy from EE producers in near future. The approval procedure of processing license is also

stipulated. The recycling business that breaches out the regulations will be published.

E-waste processors are distributed centralizedly in three areas, Around Bohai Bay area, Yangze River area and Pearl River area. They are also the central areas of EE manufacturing industry. Both legal and illegal sectors are situated in these areas. After comparison between legal and illegal sectors, it is found that illegal processors are more profitable than legal ones relied up higher efficient collection system.

The comparative study about four big players is the key part of this analysis chapter. The issues in comparison include company form, investment amount, business scope, production, collection system and profit. Through comprehensive comparison, the factors which influence e-waste business success will be clarified for readers. They are efficiency of collection, sources of revenue and high investment.

Porter's 5 forces analysis showns the market competition is not strong. But the barginning power of suppliers is very strong. The suppliers are e-waste collectors and technology providers. Foregin investors should be carefully deal with relationship with them.

Stakeholders analysis defines the key stakeholder for business, and how to manage the relationship with them. Governmental agencies, municipal governments and individual collectors have great power to influence. It's important to have a good relation with them. EE manfucturers, medium scale processors, EE retailers as well as company collectors not only have strong power to influence business, but also are interested in e-waste business. They are the candidates for close cooperation.

The analysis about Chinese e-waste business makes such a concludion. Having a successful e-waste processing business in China should find out the answers for these three questions: 1. How to improve the efficiency of collection system? 2. What kinds of ways are needed to generate more revenue? 3. How to deal with the relationship with key stakeholders. The next chapter aims at the solutions.

6 CONCLUSION

The conclusion is the proposals for European investors. The first one is the market potentials and risks. The second one is suggestions on business model.

6.1 Market potentials and risks

Chinese market in e-waste processing has great potentials. This result is based on the analysis of market demand and supply as well as policy leading direction.

Electronic equipment quickly becomes obsolete. Various EE products users generate a mass volume of e-waste annually, plus with the stockpiled used products, the total amount is normous. Although a huge amount of e-waste is generated annually, the recycling and disposal rate is low. Let's take Qingdao city as an example. The amount of annual e-waste is around 5 million units, while New World - the only licensing large scale company there has a treatment capacity of 1.8 million units maximum. There is 3.2 million units' gap between demand and supply capacity. So the rest of e-wastes enter into informal sector or is stored by users. The other eight trial cities have similar situations. In some inland but advanced economical cities, the demand is greater because they are without any large-scale processing facilities.

China has a large amount of people. The population of central city is at least 5 million, plus the medium cities suround them, the total population of a central city covered is around 10 million. According to the estimation of e-waste generation per person, central cities' annual WEEE amount reaches 10 million units. That means in a central city, it is required to establish 10 large scale processing plants with capacity of handling one million disaposal units annually. Actually, the average number of processing facility in central city is less than one. Considering there are over 35 cities in China which are regarded as central cities, the market potential is huge from the perspetive of supply and demand.

Urged by the shortage of primary resource, and solving the problems which are brought by improper treatment, The Chinese government regulates the informal sector and motivates e-waste processing industry through publishing regulations, setting up trial treatment centers, as well as other encouragement policies. Furthermore, in order to reduce dependency for imported resources, the renewable components and recycled materials are in demand and growing fast. All of these factors cause the enlarging e-waste processing market.

The Chinese government tends to treat e-waste centralizedly. It is foreseen that large scale processing plants will become a dominant part of industry in near future. Chinese government set several large scale processing plants as the models of e-waste management. The municipalities provide lots of incentives to motivate their development, such as rent exemption or low price land use property, tax reduction etc. Large scale processing plants have high cost ultilizing foreign advanced technology. They recycle e-waste entirely in an environmental-friendly way. The Chinese government executes financial preferrable policies, trade-in and subsidy to enhance the competence of formal processors. Along with announcement of the Ordinance - Chinese WEEE, the government has rasied the entry barries in e-waste treatment technology and started to restrict the operations of small workshops. With small size processors gradually exiting the market, the large processors enlarge their volume of output and achieve more profit.

Investment in a large scale facility in China has risks as well. The risks lie in high investment and official executive power in restriction of illegal recylers.

A large amount of funding is required in purchasing fixed property, the investment in building a large scale processing facility is high. The sum required ranges from 1 million to over 10 million euros. However, the return of investment varies upon difference in business model. According to the analysis of the four main players in the processing industry, we found that busines definition, collection system efficiency, revenue model are determinant factors to affect operation performance. A suitable business model generates more cashflow, gives investors abundant return. The best financial performance company has high return of investment. Its revenue

is double that of investment. The high revenue and high profit rate make satisfactory return of investment. Coversely, inappropriate model results in only breaking even or loss.

Currently, the operation of illegal recyclers is taking over the interest of legal ones. It is difficult to prohibit their illgal business totally. Therefore governments' experience and their executive abilities will influence the business of formal processors. Foreign companies must take good relationship with local government as one of crucial factors when they plan marketing strategy. A good strategy will help in raising business revenue.

In Chinese market, the demand for renewable components or recycled materials is large. The processing companies can sell their products easily. On the other hand, individual collectors, who control most of e-waste, cooperate more closely with illegal processors than formal ones. That causes the formal processors haven't a plentiful e-waste supply to meet the requirement of large scale production. Thus efficiency of manufacturing depends on the efficiency of collection system. Till present, both industry actors and government had not found practical methods to establish a perfect collective network to increase formal collection rate. The author will submit a collection system plan following based on her collective information both from field study and desk study. In China's e-waste processing market,. While

To sum up, the Chinese e-waste market for large scale processing facilities is developing, the maket potential is huge and recently market growth is accelerating. The potential problems are high investment while risk is in low investment return; the existence of illegal recyclers impacts the efficiency of collection systems and business operations. The next subtitle is targeted to managing risk and improving manufacturering efficiency.

6.2 Business model

The below submitted business model is to help in optimizing business for investors. It combines the definitions of these issues: business scope, target customers, products/service, supplying and distribution channels, revenue model as well as mode of direct investment. The final issue is direct investment mode as it can be decided only the other issues have been clarified.

6.2.1 Business scope definition

Based on learning about the successful cases of Kaiyan and Aike, and comparison between the formal and informal sectors (see chapter five), the author defines the business scope for large scale processing as consisting of :

Re-use: In China, the life span of EE products is shorter than before. The scraps of electrical electronic equipments still have many components or even some of appliances that can be reused directlymany after refurbishing. From the comparison between formal and informal sectors, it is clear that the informal makes the most of reusing e-waste as they can. What Kaiyan and Aike do is they reuse components from collected waste as much as they can. The reusing compoents are assembled in new products. Thus they improve the reusing rate, and this can increase their income.

Recycling and disposal: Recycling is an important income source for all processors. The recycled materials in e-waste include: metals, glass, plastics, papers etc. The Chinese market has great demand for these secondary materials as they are cheaper than primary materials. Disposal is to treat the rest in an environmental-friendly way.

Re-production (Upcycle): Most processors, including the informal and most domestic processors, don’t re-produce using the secondary materials they recycle. Actually, from the experience of Kaiyan and Aike, we can conclude that fully utilizing the value of the secondary materials will greatly improve the profit of

e-waste business. It is a common that to sell finished product generates more income than only selling components or materials. What kinds and types of products should be manufactuered in upcycle is a important issue for the processing company. The barriers for processors in re-production are funding technology. Re-production will need more investment in manufacturing lines as well as the requirements for technology and human resources. The intended foreign companies must evaluate their competence and then decide the mode of investment.

6.2.2 Customer segment

According to 3R business scope, the customers are divided into the following groups:

Dealers of resale products

The products to reuse include appliancess, equipment and disassembled components. The customers in this segment need operational used products. The reusing products need to pass through the procedure of testing , repairing and refurbishing before delivery to second-hand market. The dealers of resale products usually operate their business in second-hand markets.

Secondary material dealers

The customers in this group purchase the extracted metals, smashed glass and plastic etc. They are concerned with price of secondary materials, lower is better. But their bargaining power is weak.

Dealers of EE reproduced products

The clientele of this group is the same group as for original EE products, such as EE wholesalers, retailers and big direct users. Their needs are high quality products at a cheaper price. Relying on the cheaper cost in materials, the reproduced products can meet their needs.

Comprehensive processing service or only disposal service buyers

This group includes municipal governments, other processors and EE manufacturers. Stipulated by The Ordinance, EE manufacturers pay for e-waste handling. They are potential processors if the standard of payment is higher than their expectation. In the some other countries, like South Korea, some of EE manufacturers unite regionly to build their processing facitlities while the others outsource to specialized processors. In China, it is municipal government to take responsibility to manage local e-waste treatment safely. It tends to deal with e-waste in the centralized treatment plant. The mode of such a plant is BOT- Build, operate and transfer. The foreign investor is permitted to submit a tender of project.

The other processors might be the customers to buy final disposal service. Lack of advanced technology, some processors'quality can't reach national standard for e-waste discharge. So they have to outsource final disposal to others processors, who are advantage in treatment before emission. Normally these companies have not cooperated with foreign investors.

6.2.3 Products/service

Products/service offered to the target customers include: resale products or components; secondary materials, such as refined metal, cullet, plastic pieces, paper etc; products that are produced from secondary materials and e-waste processing or disposal service.

6.2.4 Supplying and distribution

The manufacturing of e-waste recycling is more important than selling products. The place to locate the facility is the priority determination in the initial phase. The author will recommend potential areas here for European investors.

Most Chinese big cities have great potential in the e-waste processing business. The big cities are defined as the municipalities directly under the Central Government, the capital cities of province, and others whose GDP is rank in the top 30. These cities share common features of big population and developed local economy. Therefore the volume of e-waste in such a big city is larger than other cities. Three cities are highly recommended, Chongqing, Chengdu and Wuhan where there are no of centralized processing plant. These cities' GDPs are among the top 15 (2009 ranking). Furthermore they have plans to increase investment in the next 5-year development. The locations of the three highly recommended cities are marked by red stars, shown in the figure 17.

Figure 17: The locations of the most potential places to address large scale processing plants

The supplying of e-waste determines the productivity. The collection system is one of the top issues for e-waste business. The collection system is built to connect with all sources, except illegal import.

The individual collectors capture over 90% of e-waste that flows to recycling. Each individual collector has his collective network, although it's small but very stable

and highly efficient. Except for a few individual collectors recycle e-waste by themselves, the other ones sell collected stuffs to the waste market or bigger individual collectors. After several transfers, e-waste is sold to informal recyclers. Each dealer has profit in every transfer, so the direct collectors sell collected e-waste at a low price. It leaves possibilities to arrange individual collectors into a company collection system. In addition, individual collectors can deliver scraps to designated collection sites directly by themselves, thus processors save the cost in transportation. It's a good stratedy to recruit individual collectors for building a comprehensive collection system for foreign companies.

The other recommended collection modes are similar to the methos using by big players, like Huaxing and New World. Their methods include: e-waste from EE retailers via signed contracts; free collection from government departments and institutions, which can be managed through record in purchasing and clearance when returning; waste from EE manufacturers, who generate imperfection; online platform for e-waste payment collection or donation. The collection system is also presented by below figure 18.

Figure 18: Supposed collection system for investors

6.2.5 Revenue model

The revenue model presents the way a business gets money. The more multiple forms of cash flow mean the companies' income sources are various. This is beneficial in reducing the dependency on one product, thus decrease operating adventure.

There are five ways to achieve cash flow:

1. To resell refurbished products to second-hand dealers
2. To sell recycled materials to secondary materials dealers
3. To sell comprehensive recycling and disposal service to municipalities, EE manufacturers; or only sell final disposal service to other processors
4. To sell the products produced using secondary materials to EE retailers
5. To get subsidy from governments, or from producers after The Ordinance takes effect – Jan., 2011

The sources of revenue is also presented by the below figure

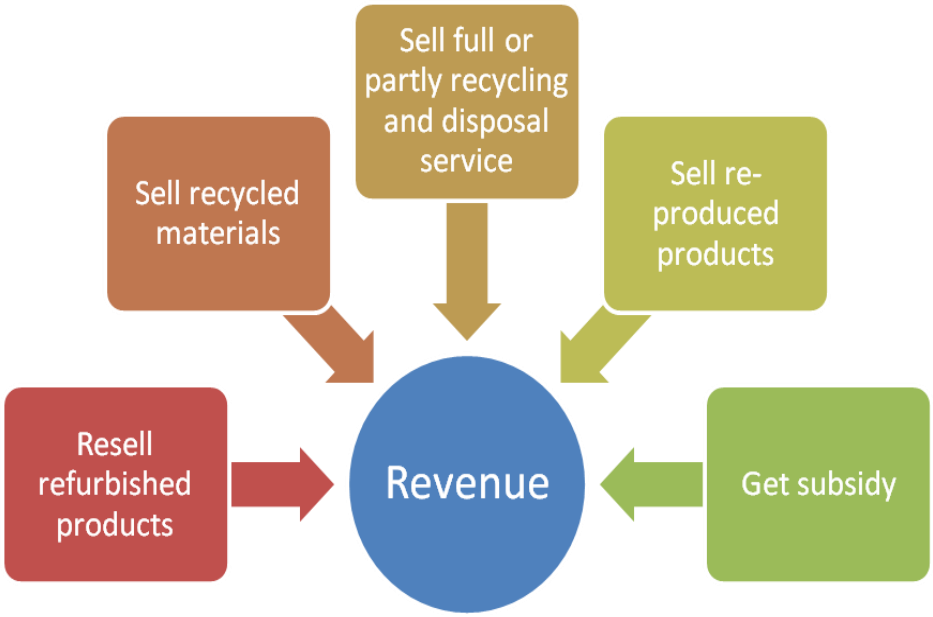

Figure 19: Revenue model

6.2.6 Mode of direct investment

The entry mode is the final defined issue in business model because the selection of direct investment mode should be based on considerations of what kinds of sources foreign investors most need. The discussion is between joint venture and wholly foreign owned enterprises. The chosen mode can bring more favors and less operation risks than the other.

A joint venture is recommended because of the following reasons:

1. European investors have advantage in technology and know-how skills, that is domestic companies need.
2. European investors have no experience to manage a very complicated e-waste collection system, they need local partner's help in communicate with all e-waste providers.
3. The investment is high, and investment return easily become badly if business did not manage well. A joint jointure will reduce risk in high investment and increase profit probability.
4. The EE manufacturers owns technology in e-waste testing, repairing; completed logistics and distribution system, that is the reverse logistics system of e-waste and same distribution system for reproduced products. Furthermore, EE manufacturers are very interested in e-waste processing business.
5. The communication with various levels of Chinese government needs experienced and well-relation communicator, EE manufacturer is such a communicator.

All in all, the joint venture is the most suitable investment mode for European investors entry market. As the EE manufacturer is the best candidate of joint party.

To sum up, the Chinese e-waste market for large scale processing facilities is developing, the maket potential is huge and recently market growth is accelerating. The chanlleges are: high investment and possibility in low investment return; the existence of illegal recyclers impacts the efficiency of collection systems and business operations. The recommendations of this thesis are subject to help European investors to decide whether they should invest a large scale processing facility in China. If the investment plan was decided, this thesis offers a proposal on how to

do this kind of business in China, especially in the efficient revenue based on the definition of business scope, products/service and target customers. The author selects JV as entry mode.

6.3 Further research

This study provides suggestions on e-waste processing business model in China. The study explored the potential areas and pointed out the three most potential cities to start e-waste processing business in China. For European investors, it's the first step research. If they intend to invest a large scale processing facility in China, they need to do further research about the potential cities. The purpose of further research is to specify factors of proposed business model. Therefore, a subsequent research needs to collect detailed market information in the three most potential cities. The research questions for further research are recommended as following.

- What are the plans of these cities in environmental protection industry? Are there any incentives for foreign companies to invest environmental protection industry?
- What's the attitude of local governments for informal e-waste processing? Do they have any practical methods to regulate the illegal sectorem?
- How many e-waste do generate annually? And the estimated composing kinds and types in e-waste.
- Are there any EE producers that could be the potential joint partner? What kinds of products they produce as well as their distribution channel? How about their relation with local government?

- What is the circumstance in e-waste collection? Both informal and formal sectors will be studied.

The answers of above mentioned questions help European investors make a decision on which city is adapt to invest initially, and other issues like, jointly party selection, products definition as well as collection system building. All these issues needed to be identified before the large –scale e-waste processing facility investment.

REFERENCES

Journals:

Elias A., Cavana R. Y., 2006, Stakholder Analysis for Systems Thinking and Modelling, Journal of School of Business and Public Management, Victoria University of Wellington, p. 1-5

China's Plastics Statistics Yearbook, 2006, Projections from 2006 onwards, Chis Info-Consultant

Hans J. S., 2001, Applying Stakeholder Theory to E-Government:
Benefits and Limits, University at Albany / SUNY, Center for Technology in Government, p. 1-11

Hagelüken C., Meskers C., 2008, Mining our computers, Proceedings of Electronics Goes Green vol. 2008+, p. 623-628

Henrik Selin and Stacy D. VanDeveer, 2006, EU management on E-waste, Environment, vol. 48-10, p. 6–17

Liang B., and Wang J. W., Xu J. Q., 2007, The research of WEEE resource in China, Environmental Science and Technology, vol. 30, p. 47-52 (in Chinese)

Lee P., 2008, How to establish and sustain a joint venture in China, Markets journals of Reed Sinopharm Exhibitions, Beijing, China

Liu X. B., Tanaka M., Matsui Y., 2006, Electrical and electronic waste management in China: progress and the barriers to overcome, Waste Management &Research, vol. 24, p. 92-101

Lin C. K., Yan L., and Davis A. N., 2002, Extended Producer Responsibility and the Problem of Discarded Computers in China: An Exploratory Proposal for Environmental Protection. Georgetown International Environmental Law Review, vol. 14-3, p. 525-576

MacArthur Foundation, 2004, Guidelines for Stakeholder Identification and Analysis: A Manual for Caribbean Natural Resource Managers and Planners, Caribbean Natural Resources Institute

Mitchell R., Agle B., and Wood D., 1997, Towards a theory of stakeholder identification and salience: defining the principle of who and what really counts, Academy of Management Review, vol. 22-4, p. 856-886

Netemeyer R.G., Krishnan B., Pullig C., Wang G., Yagci M., Dean D., Richs J. and Wirth F., 2004, Developing and validating measures of facts of customer-based brand equity, Journal of Business Research, vol. 57, p. 209-224

Powell S., 2003, the challenges of establishing successful joint ventures in China, an interview to John Child, Management First

Veenstra A., Wang C., Fan W.J., Ru Y. H., 2009, An Analysis of E-waste Flows in China, Int J Adv Manuf Technol, vol. 47, p. 449-459

Wei S. S., Zhang K.J., 2008, E-waste in China, 2008 the International Conference on Intelligent System and Knowledge Engineering

Wang F., 2008, Economic conditions for developing large scale WEEE recycling infrastructure based on manual dismantling in China, Delft University of Technology and University Leiden

Weber T., Gruhn V., 2005, From an e-business revenue model to its software reference architecture, University of Leipzig

Yang J.Q., Lee H., 2002, Identifying key factors for successful joint venture in China, Industrial management & Data System, vol. 102/2, p. 98-109

Yang J., Lu B., Xu C., 2007, WEEE flow and mitigating measures in China, Waste Management, p.1589-1597

Zhang L. H., Goffin K., 1999, Joint Venture Manufacturing in China: an exploration investigation, International Journal of Operations & Production, Vol. 19, p. 474-490

Books

Baker M., 2007, Marketing strategy and management, Macmillan Publishers Limited, 4th edition

Doole I., Lowe R., 2001, International Marketing Strategy - Analysis, Development and Implementation, Thomson Learning, 3rd edition

Freeman R. E., 1984, Strategic Management: A stakeholder approach. Pitman Boston, p. 55-58

Hollensen S, 2004, Global marketing, Pearson Education Limited 3rd edition

Keegan W.J., 2001, Global Marketing Management, 2001, Prentice Hall, 7th edition, p. 229-269, 399-400

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

Levy Y., 2005, The Five Strategic Market Forces, World Wide Panorama: Market

Porter M., 2008, On competition, update and expanded edition, Harvard Business Review, p. 03-19

Porter M., 2008, On competition, Harvard Business School Publish Corp., p: 4-21

Saunders M., Lewis P., Thornhill A., 2009, Research methods for business students, Pearson Education Limited, 5th edition, p. 20-413, 480-525

Sullivan A., Sheffrin S. M., 2003, Economics: Principles in action, Pearson Prentice Hall. p. 153- 167

Terpstra V., Russow L.C., 2000, International Dimensions of Marketing , South-Western College, 4th edition

Legal documents

European Union, 2003, WEEE Directive 2002/96/EC

European Union, 2003, RoHS Directive 2002/95/EC

The Standing Committee of the National People's Congress (NPC) of the People's Republic of China, 2002, Cleaner Production Promotion Law

The Ministry of Information Industry of the People's Republic of China, 2006, Measures for the Administration of Prevention and Treatment of Pollution by Electronic Information Products

The Ministry of Environment Protection of the People's Republic of China, 2009, The Ordinance on the Management of Waste Electrical and Electronic Products,

Beijing Municipal Development and Reform Commission, 2006, The 11th 5-year Plan

The Ministry of Environment Protection, 2009, The investigation programmes for Planning the 12th 5-year Plan

National Development and Reform Commission, 2006, The 11th 5-year Plan

Internet sources

Anna Mantzaris, 2005, Working to end the global e-waste epidemic, access on 12/11/09, available
at http://www.techsoup.org/learningcenter/hardware/archives/page9679.cfm

Boehlje M., Ehmke C., 2010, Capital investment analysis and project assessment, Purde University, access on 02/02/10, available at
http://www.ces.purdue.edu/extmedia/ec/ec-731.pdf

BusinessDictionary, 2009, Field research definition, access on 10/10/09, available at http://www.businessdictionary.com/definition/field-research.html

Business Link, 2009, Joint ventures and partnering, access on 24/05/09, available at http://www.businesslink.gov.uk/bdotg/action/layer?r.l1=1074404796&r.l3=1073864682&topicId=1073864682&r.lc=en&r.t=RESOURCES&r.i=1075411631&r.l2=1074404799&r.s=sc&=en

Buzzle.com, 2009, What are the elements of culture, access on 19/10/09, available at http://www.buzzle.com/articles/what-are-the-elements-of-culture.html

Cai H.Y., Shi W, 2009, The current situation of e-waste management and suggestions, Gootech (in Chinese), access on 06/01/10, available at
http://solidwaste.chinaep-tech.com/solutions/67088.htm

China Nonferrous Metal Association, 2007, Qingdao New world Company explores to set up e-waste collection system (in Chinese), access on 23/10/09, available at
http://www.chinacmra.org/a/xunhuanjingjilingyu/shifanxiangmu/2009/0806/2361.html

Electronics Takeback Coalition, 2009, Facts and figures on e-waste and recycling, access on 12/10/09, available at
http://www.computertakeback.com/Tools/Facts_and_Figures.pdf

E-waste guide info., 2009, E-waste Composition, access on 02/07/09, available at http://ewasteguide.info/facts_figures

Fastcompany, 2007, The Global electronic waste problem, access on 06/09/09, available at
http://www.fastcompany.com/multimedia/slideshows/content/electronicwaste.html?page=5

EpidemiologData , 2010, Analysis and intepretion, access on 06/02/10 available at http://203.208.37.132/search?q=cache:KwmkyYsHVz0J:www.epidemiolog.net/evovig/DataAnalysis-and-interpretation.pdf+data+analysis+and+interpretion&cd=1&hl=zh-CN&ct=clnk&gl=cn&st_usg=ALhdy2-SsDwtAcpdptQDT4qzM-oX3xC23w

Family House International, 2009, Qualitative research methods overview, access on 21/09/09, available at
http://www.fhi.org/NR/rdonlyres/etl7vogszehu5s4stpzb3tyqlpp7rojv4waq37elpbyei3tgmc4ty6dunbccfzxtaj2rvbaubzmz4f/overview1.pdf

Family House International, 2009, Qualitative research methods Participant Observation, access on 21/09/09, available at
http://www.fhi.org/NR/rdonlyres/ed2ruznpftevg34lxuftzjiho65asz7betpqigbbyorggs6tetjic367v44baysyomnbdjkdtbsium/participantobservation1.pdf

Family House International, 2009, Qualitative research methods In-deepth interviews, access on 21/09/09, available at http://www.fhi.org/NR/rdonlyres/eprvylcljxmbssmuizj3rcnycde2pnlowtoa7nxedbjl23jqjpitifimwv6v2tmsmyocepirpjpfrd/interviews1.pdf

Fortune Recycling Group, 2009, Company profile, access on 14/11/09, available at http://www.fortunegroup.net/en/online_01.asp

Hangzhou Municipal Environmental Protection Bureau, 2009, Company profile, access on 07/04/09, available at http://www.hzepb.gov.cn/art/2009/2/6/art_2645_49665.html

Investopedia, 2010, Calculation of payback, access on 05/02/10, available at http://www.investopedia.com/terms/p/paybackperiod.asp

Investorwords, 2010, Definition of cast, access on 05/02/10, available at http://www.investorwords.com/5221/variable_cost.html

Kaiyan, 2009, Company statistics, access on 12/11/09, available at http://njkaiyan.manufacturer.globalsources.com/si/6008825944245/Homepage.htm

Khetriwal D.S., Widmer R., Schluep M., Eugster M., Wang X. J., Lombard R., Ecroignard L., 2006, Legislating e-waste management: progress from various countries, Swiss e-waste guide, access on 25/07/09, available at: http://ewasteguide.info/Sinha-Khetriwal_2006_ELNI

Kuusakoski Recycling Oy, 2009, Company Brochure, access on 02/03/09, available at http://www.kuusakoski.com/inet/Kuusakoski/COM/AKPMedia.nsf/Resources/kuusakoski_yleisesite_eng.pdf/$file/kuusakoski_yleisesite_eng.pdf

Liang C.H., 2009, Fuji Xerox- Sample Company of electronic waste collection (in Chinese), Renmin Net, access on 29/12/09, available at http://www.cn3r.com/Article/ShowArticle.asp?ArticleID=9451

Managementtools, 2009, Customer segmentation, access on 27/01/09, available at http://www.bain.com/management_tools/tools_customer_segmentation.asp?groupCode=2

Marketsearch, 2009, Qualitative reserch, access on 06/08/09, available at http://www.marketresearchworld.net/index.php?option=com_content&task=view&id=394&Itemid=42

Managementhelp, 2010, Competitive Analysis, access on 15/01/10, available at http://managementhelp.org/mrktng/cmpetitr/cmpetitr.htm

Managementhelp, 2009, Market reseach, access on 03/08/09, available at http://managementhelp.org/mrktng/mk_rsrch/mk_rsrch.htm

12manage, 2009, What is marketing mix, access on 12/11/09, available at http://www.12manage.com/methods_marketing_mix.html,

Mindtools, T2009, The Marketing Mix and 4Ps, access on 12/11/09, available at http://www.mindtools.com/pages/article/newSTR_94.htm

Mindtools, 2009, SWOT analysis, access on 23/04/09, available on http://www.mindtools.com/pages/article/newTMC_05.htm

Moffatt M., 2008, The Market Power Theory of Advertising Economics Glossary, About.com, accessed on 19/09/09, available at http://economics.about.com/library/glossary/bldef-market-power-theory-of-advertising.htm

Municipal Information, 2009, The launch of Trade-in Policy at Qingdao City (in Chinese), access on 12/10/09, available at

http://industry.yidaba.com/jydq/200911/19145921100110010000015659.shtml

Pike research, 2009, Global E-waste crisis is working, but the tide will turn in 2015, access on 16/11/09, available at http://www.pikeresearch.com/newsroom/global-e-waste-crisis-is-worsening-but-the-tide-will-turn-in-2015

Qingdao New World Technology, 2009, Company instruction (in Chinese), access on 09/12/09, available at http://www.qdxtd.com.cn/AboutUs

Qingdao Development and Reform Comminssion, 2009, To Motive the development of Qingdao National Trial Projects for Cyclic Economy (in Chinese) , access on 12/05/09, available at http://www.qddpc.gov.cn/ReadNews.asp?NewsID=5490

Quickmba, 2009, SWOT analysis, access on 22/04/09, available at http://www.quickmba.com/strategy/swot

Quickmba, 2009, Foreign market entry mode, access on 08/07/09, available at http://www.quickmba.com/strategy/global/marketentry/

Rockford College, 2010, Business model Template, access on 01/02/10, available at http://www.rockford.edu/resource/resmgr/docs_communityed/link2.doc

Reuters, 2009, E-waste problems, access on 27/09/09, available at http://www.reuters.com/article/environmentNews/idUSTRE58E5JF20090915

RecyclingBiz, 2008, Changhong builds CRT recycling line in Sichuan, access on 20/02/09, available at http://www.recyclingbizz.com/glass/LA833636.html

SearchCRM, 2009, The definition of customer segmentation, access on 31/01/09, available at http://searchcrm.techtarget.com/definition/customer-segmentation

Solving the E-waste Problem, 2008, Annual report, access on 09/08/09, available at http://www.step-initiative.org/

Solving the E-waste Problem, 2009, E-waste Take-Back System Design and Policy Approaches, access on 19/05/09, available at http://www.step-initiative.org/pdf/white-papers/StEP_TF1_WPTakeBackSystems.pdf

Technology soup, 2008, Environmental Protection Agency 2008 E-waste Statistics, access on 28/07/09, available at http://blog.techsoup.org/node/484

TES AMM, China, 2009, Company instruction (in Chinese), access on 07/07/09, available at http://www.tes-amm.cn/about_us/index.asp?bd=01

Toodoc.com, 2009, Strategic-management-A-stakeholder-approach, access on 13/11/09, available at http://www.toodoc.com/Strategic-management-A-stakeholder-approach-pdf.html

Uiah, 2010, Comparative study, access on 05/02/10, available at http://www2.uiah.fi/projects/metodi/172.htm

Wang X. J., Ling L., Peiry K., 2007, China's Social and Economic Needs for Circular Economy and EPR mechanisms, College of Environmental Sciences Beijing University, China National Institute of Standardization, Kummer Eco Consult, Switzerland, access on 01/02/10, available at http://ewasteguide.info/wang_kummer_2007

Weinkauf K., 2009, Recycling E-Waste is Profitable for Everyone, access on 10/10/09, available at http://ecotality.com/life/?s=E-waste&searchsubmit

Wordpress, 2010, Stakeholder Identification, access on 13/01/10, available http://oneminuteba.files.wordpress.com/2009/09/stakeholder-identification4.png?w=300&h=322

Xinhua Net, 2008, To establish green-channels for development recycling industry (in Chinese), access on 27/06/09, available at http://haiyuan.678114.com/Html/zhizao/feigong/20081112A9057ED7_2.htm

Yang J.X, 2008, China's role in the management of the global e-waste challenge, Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, access on 23/03/09, available at http://www.weee-forum.org/att/literature/2008%20-%20WEEE%20Forum%20Vien na%20Conference%20-%20%20Keynote%20-%20Jianxin%20Yang.pdf?weeeforum=cbe17431eb84744670b687ba63f638f7

Zhuang, S, 2006, Industry Distribution of Foreign International Companies at Yangze Delta Area, Information Platform of Shanghai (in Chinese), access on 16/09/09, available at http://cnshu.cn/cwgl/241303.html

Agencies or organizations websites

Environment agency, UK, www.environment-agency.gov.uk

E-waste guide info., http://ewasteguide.info

National Bureau of Statistics of China (in Chinese), http://www.stats.gov.cn/tjsj/

Recycle works, www.recycleworks.org/ewaste/index.html

Solving the E-waste problem, http://www.step-initiative.org/

The Central People's Government of the People's Republic of China (in Chinese), available at http://www.gov.cn/flfg/2005-06/21/content_8289.htm

The Ministry of Environment Protection P.R. China (in Chinese), www.mep.gov.cn

The Ministry of Commerce, P.R. China (in Chinese), http://www.mofcom.gov.cn/

United States Environmental Protection Agency, http://www.epa.gov/

APPENDICES

Appendix 1: Questionnaires for interview

Governmental agency

Respondents:

Ministry of Environment Protection of People Republic of China

Beijing Municipal Commission of Development and Reform, Department of environment and resource application

National Development and Reform Commission

Chengdu Municipal Environmental Protection Bureau

Interview questions:

- What's the agencies' function in e-waste management?
- What are the implementation policies in order to match Regulation on the Administration of the Recovery and Disposal of Waste Electrical and Electronic Products (short after as RDWEEP) from your agencies?
- What are the long-term plans to manage e-waste recycling?
- In your opinion, how about the current situation of e-waste recycling in China? Comparing with other leading countries, what aspects should be improved?
- How about the situation of current licensed recycling companies? In your opinion, what are they short of to meet the requirement of law?
- What are the policies to develop these licensed companies' development?

1.1 Research institutions and trade associations

Respondents

China Resource Recycling Association

Interview questions:

- Generally speaking, the current status of e-waste recycling in China, like how many discard EE products are dumped annually? What's

percentage in unofficial disposal? The business status for e-waste recycling, profit or not?

- What are the factors which result in recycling companies' margin or non-profit?
- What are the gaps comparing with leading countries in technology, market situation, collection system, awareness of public etc?
- How many companies in e-waste recycling in China? How many are local companies, JVs (Joint ventures) and WFOEs (Wholly Foreign-owned enterprises)?
  How about these companies' business and average profit percentage?
- What's situation of e-waste recycling in Beijing, Guangzhou and Qingdao? Are there any local regulations to manage and support e-waste recycling? If yes, what are these?
- For Chinese e-waste recycling companies, what are their advantage and disadvantages comparing with JVs and WFOEs? Comparing with European enterprises, what are Chinese local companies' disadvantages?
- How about Chinese companies' technology in e-waste disposal comparing with advanced countries' situation?
- What are the other joint efforts to develop e-waste recycling in China? (or What are the factors to influence e-waste recycling business in China?)
- How about e-waste official and non-official collective channel in China or local places?
- What's price of recovering material from e-waste and primary material?
- For Finnish companies in e-waste recycling, what are you recommendations before they start business in China?
  What are your suggestions for them if they choose to set up a joint venture?

NGOs

Respondents

Greenpeace

Interview questions:

- What's the opinion on e-waste recycling and disposal in China? 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 China?

1.2 EE producers

Respondents

Changhong Electronics Group

Qingdao Haier GroupKonka Electronics Enterprises

Interview questions

- What are the basic data of company? Including companies' size, business scope, main shareholders' structure, products type, manufacturing situation
- What are companies' strategies to response the published 'The ordinance'?
- What are the collective channels of companies' sold products?
- How companies to deal with the collected e-waste? Will they transmit to licensed companies?
- What are problems companies met to do e-waste collection and recycling? How do manage these problems?
- What's the opinion on Changhong Electronics and Haier Electronics had set up their own recycling product lines?
- Are companies interested to establish their own recycling product

line? And why are interested or not?

1.3 EE sellers

Respondents

Suning Appliance

Yongle Appliance

Interview questions:

- What are the basic data of companies? Company mode, business scope, size (how many outlets in China and in local), the annual sales, how many EE products sold in each classification yearly?
- How the outlets to deal with logistics and storage?
- At research area, the price of transportation and storage?
- What are companies' strategies to response the published 'RDWEEP''?
- Did companies start to collect used products? How did collect them (channel, methods, collective price, collective cost etc)? How did deal with collected e-waste?
- Are companies interested to establish their own recycling product line? And why are interested or not?

E-waste collectors

Respondents

Guangzhou Tianren Recover Co. Ltd.

Beijing Balizuang (Unofficial)

Interview questions

- For official companies, what are the basic data? Business scope, establish date, collective number annually.
- How much of collection price for discard products?
- How do they collect e-waste
- How to deal with these EE products? Resell, recycling or others?
- How do they transport and store e-waste?
- What are their predictions on e-waste collection after issued of

'RDWEEP'

- Comparing between official and unofficial collectors, what are their advantages and disadvantages?
- What are their profit models?
- For official companies, what are their problems in e-waste collection? What are their suggestions for improvement?
- Are companies interested to cooperate with foreign companies to do e-waste recycling product line? And why are interested or not?

1.4 E-waste recycling companies

Respondents

Huaxing Environment Protection Development Company

Qingdao New World Environment Technology Company

Fuji Xerox Aike (Suzhou) Co., Ltd.

Haier e-waste sampling project

Guangdong Qingyuan Waste Recycling Center

Interview questions

- What are the basic data of companies? Establishment date, registered capital, mode of companies, employee number
- What kinds of e-waste to be treated, and disposal number, standard and percentage?
- 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?
- How companies to transport and store these collected waste?
- What are companies profit model and profit percentage? If profit in margin or loss, what are the main factors to result in?
- What are companies' main customers?
- Did they get any subsidy from local governments or any other favorable support policies? If yes, what are these? If not, why? What policies they hope to get from governments?
- How do they compete with illegal competitors? What are their

advantages and disadvantages? What are suggestions to restrain the 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?

Appendix 2: GDP Ranking of Chinese Municipals (2009)
Unit: RMB

1、Shanghai, GDP total value:1.3698 trillion

2、Beijing, GDP total value: 1.0488 trillion

3、Guangzhou, GDP total value: 821.5 billion

4、Shenzhen, GDP total value: 780.6 billion

5、Suzhou, GDP total value: 670.1 billion

6、Tianjin, GDP total value: 635.4 billion

7、Chongqing, GDP total value: 509.6 billion

8、Hangzhou, GDP total value: 478.1 billion

9、Qingdao, GDP total value : 440.9 billion

10、Wuxi, GDP total value: 440 billion

11、Foshan, GDP total value: 430 billion

12、Ningbo, GDP total value: 396.4 billion

13、Wuhan, GDP total value: 396 billion

14、Chengdu, GDP total value: 390.1 billion

15、Dalian, GDP total value: 385.8 billion

16、Shenyang, GDP total value: 385.5 billion

17、Nanjin, GDP total value: 377.5 billion

18、Dongguan, GDP total value: 371 billion

19、Tangshan, GDP total value: 356 billion

20、Yantai, GDP total value: 346 billion

21、Jinan, GDP total value: 301.7 billion

22、Zhengzhou, GDP total value: 300.6 billion

23、Changsha, GDP total value: 300.2 billion

24、Ha'erbin, GDP total value: 280 billion

25、Shijiazhuang, GDP total value: 277 billion

26、Quanzhou, GDP total value: 270 billion

27、Changchun, GDP total value: 258.8 billion

28、Nantong, GDP total value: 255.5 billion

29、Weifang, GDP total value: 250 billion

30、Wenzhou, GDP total value: 243 billion

31、Zibo, GDP total value: 230 billion

32、Fozhou, GDP total value: 229.6 billion

33、Shaoxing, GDP total value: 222.3 billion

34、Daqing, GDP total value: 222 billion

35、Changzhou, GDP total value: 220 billion

36、Xi’an, GDP total value: 219 billion

37、Dongying, GDP total value: 206.5 billion

38、Xuzhou, GDP total value: 200 billion

39、Jining, GDP total value: 200 billion

40、Handan, GDP total value: 200 billion

41、Taizhou, GDP total value: 196.5 billion

42、Linyi, GDP total value: 195.8 billion

43、Luoyang, GDP total value: 191.9 billion

44、Jiaxing, GDP total value: 181.5 billion

45、Weihai, GDP total value:179.5 billion

46、Baotou, GDP total value: 170 billion

47、Jinhua, GDP total value: 168.1 billion

48、Changzhou, GDP total value: 167.8 billion

49、Hefei, GDP total value: 166.4 billion

50、Nanchang, GDP total value: 165 billion