

Analysis of the “China WEEE Directive”:

Characteristics, breakthroughs and challenges of the new WEEE
legislation in China

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Abstract

This thesis provides a systematic analysis of Regulations for the Administration of the Recovery and disposal of Waste Electrical and Electronic products (RAW, often referred to as “China WEEE Directive”) that came into force in China on 1 January 2011 and finds out how well RAW and its (likely) implementation will address the weaknesses and concerns raised from past policies and practices for management of WEEE (waste electrical and electronic equipment) in China. With this purpose, an analytical framework is constructed containing the main components in the upstream, midstream, downstream and overall stream of electronics based on their flow in China. The analytical framework is used to systematically examine the shortcomings of the earlier WEEE policies in China, the characteristics and breakthroughs of RAW as well as the concerns and challenges for its implementation. Through literature review and interviews with experts, the overall picture of the earlier WEEE policies is mapped out and the progress and achievements of the earlier WEEE policies during the last decade are discussed. The review of RAW highlights some breakthroughs of WEEE legislation in China and indicates how RAW tries to avoid the shortcomings of the earlier policies. Stakeholders’ reflections on RAW and the latest picture of WEEE management in China are presented based on a series of interviews and a community survey, in addition to literature review. Various concerns are found from different stakeholders and it becomes apparent that the core challenge for the implementation of RAW is the development of the WEEE collection network. Finally, several suggestions are provided for further consideration on the implementation of RAW.

Keywords: China, WEEE, policies, analytical framework, RAW

Executive Summary

Background and purpose

With the rapid increase of electrical and electronic equipment (EEE), the management of WEEE (waste electrical and electronic equipment) has become a global problem since the late 1980s. Some good practices of WEEE management have been seen in developed countries but development of WEEE management is moving slowly in many developing countries. China, known as the largest exporter of EEE and importer of WEEE in the world, plays a significant role in the global life cycle of electronics. The country is facing serious WEEE problems due to the quantity and toxicity of WEEE both from growth of domestic generation and the illegal dumping from developed countries.

In response to WEEE problems in China, the Chinese government has developed a variety of policies since 2000. But none of them issued before 2010 turns out to be a comprehensive WEEE-specific policy. These policies were not enough to guarantee a sound treatment of WEEE and construct an economic, environmental and ethical recycling and disposal system in China.

On 1 January 2011, the Regulations for the Administration of the Recovery and Disposal of Waste Electrical and Electronic Products (RAW in short), often referred to as the China WEEE Directive, was finally enacted. It aims to standardize the recovery and disposal of WEEE. Being the most important WEEE legislation in China, how RAW tries to overcome these weaknesses in earlier policies has not been studied systematically. Particularly, the breakthroughs, concerns and challenges of RAW together with the related reflections from stakeholders have not been analyzed.

As such, the purpose of this paper is to provide a systematic analysis on RAW and find out how well RAW and its (likely) implementation will address the weakness and concerns raised from past policies and practices for WEEE management in China. To achieve the aim, four research questions are proposed:

1. *What are the issues, concerns, progresses and achievements of the earlier policies on WEEE management in China?*
2. *In which ways does RAW plan to overcome the weaknesses of the old policies?*
3. *What are the reflections of the stakeholders in China on RAW?*
4. *What are the breakthrough, concerns and challenges of RAW? And how these concerns and challenges can be improved?*

Research Methodology

First, based on literature review, a framework to analyze the WEEE policies in China is constructed, reflecting upon the flow of EEE in China and main components of the upstream, midstream, downstream and the whole framework.

Second, literature review is continued to outline the past policies directly pertaining to WEEE management in China. The shortcomings, concerns, progresses and achievements of the earlier policies are identified. Interviews with policy experts in China are also employed in this part.

Third, framework analysis on RAW is employed to identify its characteristics and the breakthroughs. Accordingly, how RAW try to overcome the weaknesses of the earlier policies are identified.

Forth, stakeholder analysis is conducted based on interviews, literature review, and community survey. Subsequently, the reflections of stakeholders on RAW are displayed. These stakeholders referred to this paper include local governments, EEE manufacturers, qualified operators, informal recyclers (junk buyers) and consumers.

Then, a framework analysis on RAW is conducted again to analyze the concerns and challenges of RAW by combining stakeholders’ reflections, the characteristics of RAW and the shortcomings of earlier policies.

Main Findings

The earlier WEEE policies in China

There are three laws as the highest level legislation applicable for WEEE management in China, which are adopted by the Standing Committee of the National People's Congress (NPC). Besides these laws, the other policies before 2010 are the “rules” belonging to the third level legislation. No law was formulated at the second level before 2010. These policies can also be categorized into three types:

Type 1: policies that are based on the principle of pollution prevention to encourage eco-design and clean production.

Type 2: policies that mainly focus on the downstream of WEEE chain, with the principle of end-of-pipe treatment.

Type 3: policies that try to cover the whole life cycle of WEEE with the promotion of 3R and circular economy

The gradual development of these policies shows the rising attentions of the Chinese government on WEEE management in the past decade. It is found that the emerging of qualified operators like authorized WEEE treatment companies (AWTCs) in the private sector as well as the data recorded for the “Old for New” program become important indicators for the development of WEEE management in China. The shortcomings of these policies are found to coexist with the progresses of the WEEE legislation.

The main shortcoming of the earlier policies

In the upstream, Producer Pay principle placed on producers has been mentioned as quite general and merely an informative rule in some policies. It is not explicitly articulated within a concrete EPR scheme. There are not practical provisions for producer to make EPR effective.

In the midstream, consumer responsibilities are excluded in almost all the earlier WEEE policies of China. Besides, there is no specific collection strategies/mechanisms with compensations mentioned.

In the downstream, funding mechanism were seldom proposed for the end-of-pipe treatment of WEEE in the past policies. In addition, concrete standards for WEEE recycling and disposal are seldom specified.

Within the whole framework, first, the administration and supervision system are weak for most of the earlier policies. From a horizontal angle, there is no overall platform to coordinate the whole administration and supervision work engaged by several governmental bodies. From the hierarchal aspect, a strong administration and supervision scheme is difficult to be enforced. Secondly, the earlier policies cover different stages of WEEE management as well as

different category of WEEE without unified policy principles prepared by different government agencies.

In general, most of the earlier policies are not comprehensive WEEE-specific policies but general guidance without specific mechanisms to solve WEEE problems.

The characteristics of RAW and its breakthroughs

RAW is the first comprehensive WEEE-specific regulation in China placed at the second level WEEE legislation in China. It means that most of the earlier WEEE policies (the third level legislation) should follow RAW on the relevant provisions.

Regarding the whole framework, the scope of RAW is limited to five major items of discarded household appliances (DHA) for mandatory recycling. But RAW covers almost the entire stage (upstream, midstream and downstream) of the WEEE management system.

In the upstream, RAW specifies more concrete and clear responsibilities for producers. One of its main breakthroughs is that producers shall pay for the cost of WEEE recycling.

In the midstream, RAW proposes a multi-channel collection network and encourages all institutions and individuals to join the collection network, which never appeared in the earlier policies.

In the downstream, the funding mechanism of RAW is inspiring the actors in the downstream. Fund levied from producers is to be established to provide subsidies for qualified operators. RAW also specifies more concrete standards related to the recycling and disposal of WEEE in China. In addition, a licensing scheme is to be employed for the end-of-pipe treatment of WEEE, which allows only qualified operators to carry out the final treatment of WEEE.

The current development of WEEE management in China

The EEE producers in China such as Changhong and TCL are increasingly willing to pay attentions on WEEE recycling and get involved in the WEEE market by establishing their own recycling programs in the emerging WEEE industry.

Some local governments in different cities, among others Haikou, Wuhan and Fengcheng, have initiated with some interesting practices like huge recycling centers, WEEE collection shops and etc. for WEEE management. .

All qualified operators view RAW as a support. Facing the growing WEEE industry, most of them are planning to expand their current business with different strategies.

In addition, all the stakeholders have favorable view on the “Old of New” policy launched in June 2009 with the purpose of stimulating household appliance consumption. It has brought significant positive effects on WEEE collection and recycling in China.

The concerns and challenges for the implementation of RAW

In the upstream, it is rather doubtful whether producers are capable of financing all stages of WEEE management.

In the midstream, it is more difficult to ensure public participation for the implementation of RAW, when monetary incentives are not given and consumer responsibilities are excluded.

The construction of collection network in the midstream is the key challenge for the successful implementation of RAW as different difficulties are identified by various stakeholders. Particularly, financial issues are found to be of real concern by manufacturers, qualified operators and local governments.

In the downstream, qualified operators are limited and potential operators to enter the WEEE market will be restricted by the licensing scheme with relative high qualifications in order to kick out informal sector. Due to the huge volume of WEEE and the high qualifications required in the licensing scheme, it is difficult to ensure the local treatment capacity neither in big cities in China having limited qualified operators nor in Western China with very few qualified operators at least in the next four or five years. In addition, informal sector have not been well informed of the RAW. It is particularly difficult to address those who are dealing with WEEE not covered by RAW. In addition, a huge fund is needed to make a change at these areas of informal recycling center of WEEE.

Within the whole framework, the related responsibilities of local governments are not clearly identified and their administration and supervision systems are still weak for the enforcement of RAW. Besides, when the management of obsolete mobile phones will be covered by RAW is a big question.

Recommendations

In the upstream, producers should be encouraged to actively engage in WEEE recycling by establishing its own recycling program or in cooperation with qualified operators.

In the midstream, to improve the public participation of WEEE collection, consumers must be well informed of the approaches to treat WEEE properly, particularly for those products that are not covered by RAW. If possible, they may be required to pay collection cost of WEEE at the point of collection directly to share the financial burden of producers. To accelerate the construction of the collection network, the cooperation between qualified operators and EEE producers could be a win-win solution to reduce their financial pressures. Availability of sufficient funds for qualified operators to establish a collection network should be ensured by the state and local governments. Related collection practices may start as trials in some big cities. Besides, the informal recyclers are suggested to transfer business from informal WEEE recycling to WEEE collection. The collection model of the “Old for New” policy is suggested being kept as a part of the multi-channel collection network in light of its remarkable effect on collection.

In the downstream, information concerning the licensing scheme and related provisions should be delivered to informal recycling sector as soon as possible. Particularly, the places with severe WEEE problems in China like Taizhou and Guiyu, should be firstly targeted by more funds to make a shift. Tax exemption may be employed for the existing qualified operators. The information management and monitoring system on WEEE treatment should be well equipped by qualified operators, and ready for the supervision by related departments. To improve the unbalanced treatment capacity in different regions, a number of qualified operators should be assigned for each province for the mandatory construction of the recycling centers within a fixed period. This can be included in the WEEE treatment plan which is required to be formulated by the provincial environmental bureau and submitted to the Ministry of Environmental Protection.

Within the whole framework, local governments should formulate WEEE-specific sub-regulations as soon as possible as a way to implement RAW. The sub-regulations need to be based on the

assessment of the local WEEE situations and specify clear responsibilities for related department to enhance local administration and supervision on the implementation of RAW.

Evaluation of the effect of limited scope of WEEE in the next two or three years should be conducted. Based on the evaluation, the amendment of the scope of RAW should be put into agenda. Obsolete mobile phones should be included as priority.

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Abbreviations

AQSIQ	General Administration of Quality Supervision, Inspection, Quarantine of PRC
AWTC	authorized WEEE treatment company
BAN	Basel Action Network
DHA	discarded household appliance
EEE	electrical and electronic equipment
EPA	Environmental Protection Agency
EPB	environmental protection bureau
EPR	extended producer responsibility
NGO	non-governmental organization
NHA	new household appliances
MEP	Ministry of Environmental Protection of PRC
MII	Ministry of Industry and Information Technology of PRC
MOHURD	Ministry of Housing and Urban-Rural Development of PRC
MOC	Ministry of Commerce of PRC
MPS	Ministry of Public Security of PRC
MST	Ministry of Science and Technology of PRC
PRC	People’s Republic of China
PRO	producer responsibility organization
RAW	the Regulations for the Administration of the Recycling and Disposal of Waste Electronic and Electrical Products
RMB	Ren Min Bi, also called yuan (Chinese currency)
RoHS	Restriction of Hazardous Substances
SAIC	State Administration for Industry and Commerce of PRC
UNEP	United Nations Environment Programme
WEEE	waste electrical and electronic equipment

1 Introduction

The electronics industry has been playing an important role in the world in recent decades. It has transformed the world and modernized people's life by providing ubiquitous electrical and electronic equipment (EEE). EEE includes many domestic devices like personal computers, refrigerators, washing machines, mobile phones, and TVs. The amount of EEE put on the market every year is increasing rapidly driven by technological improvement in industrialized and industrializing countries (Widmer et al., 2005). The increasingly short life of products has led to huge volumes of relatively new EEE being discarded (Hopp et al., 2008). Meanwhile, it is too easy and relatively inexpensive for most users in developed countries to throw EEE in the trash or dump it somewhere, as they have few incentives to reuse or recycle used EEE. According to UNEP (2005), an EU citizen leaves behind 25 kg of waste electrical and electronic equipment (WEEE) each year and 20-50 million tons of WEEE are generated worldwide every year.

Concerning the definition of WEEE, there is no globally accepted definition for it for the time being. A general definition given by Wang (2008) and Widmer et al. (2005) states that WEEE is waste consisting of any broken or discarded electrical or electronic device. According to the OECD (2001), any appliance working with electric power supply that has reached its end-of-life would come under the scope of WEEE. This definition is used for WEEE in this thesis.

Being one of the by-products of industrialization, WEEE is chemically and physically distinct from other forms of municipal or industrial wastes. WEEE contains both valuable and hazardous materials (Widmer et al., 2005; Robinson, 2009). WEEE contains more than 1000 different substances, many of which are toxic, such as lead, mercury, arsenic, cadmium, selenium, hexavalent chromium, and flame retardants (including polybrominated biphenyls (PBB) and polybrominated diphenylethers (PBDEs) that create dioxin emissions when burned (UNEP, 2005; Widmer et al., 2005). WEEE also contains considerable amounts of valuable materials such as precious metals. 1 ton of WEEE contains up to 0.2 ton of copper, a really valuable material that can be sold for more than 500 Euros (Widmer et al., 2005).

Since the late 1980s with the rapid increase of WEEE, WEEE management has become a global problem (UNEP & UNU, 2009; Aydin, 2007). On one hand, large amounts of WEEE have been transported from developed countries to developing countries, due to strict environmental legislation, the difficulty and high cost of recycling WEEE in developed countries (UNEP, 2005). On the other hand, there is huge demand for raw material for production in some developing countries, where also lower environmental standards and informal or illegal WEEE recycling are quite common. In such developing countries, WEEE is usually re-processed without special handling and recycling methods, in order to recover reusable components and base materials, like precious metals. As a result, severe impacts of WEEE on the environment and human health are caused in these countries (SVTC & BAN, 2002).

1.1 Background of the study

Known as the largest exporter of EEE and importer of WEEE in the world (Williams et al., 2010), China plays a significant role in the global life cycle of electronics. On one hand, China is the second biggest generator of WEEE in the world next the USA. It gives rise to about 2.5 million tons of WEEE per year. The WEEE in China is expected to reach five million tons in 2015 (Qian, 2010). It is also the biggest EEE producer and exporter in the world. Merely in 2009, 1.18 billion units of EEE were produced in China (Ma, 2010). On the other hand, China is the main receiver for the exported WEEE from developed countries. Although such export and import are restricted under the Basel Convention on the Control of Transboundary

Movement of Hazardous Wastes and their Disposal¹ (1992), very significant amounts of WEEE have been continuously exported from developed countries to China through clandestine operations, legal loopholes, and by countries that have not ratified the convention (SVTC & BAN, 2002). For example, most of the WEEE produced in the United States was dumped illegally in China through the Hong Kong grey channels (Luther, 2007). Eight Australian ships carrying WEEE to China were seized in 2008 (Chen, 2010). The town Guiyu in the Guangdong Province of China has continuously attracted worldwide attention for WEEE trading and processing by extensive reports of NGOs (non-governmental organizations), including the Basel Action Network and Greenpeace China (Hicks et al., 2005). Guiyu has become the biggest WEEE treatment center in the world with huge amounts of WEEE imported from developed countries and other areas in China. Due to illegal imports, the incentive of fast profitability and lack of awareness, WEEE treatment is dominated by the informal sector in some coastal cities in China, in addition, where general efficiency of WEEE operation is low and toxics are directly released into the environment (Hicks, 2005; Wang, 2008; Mo et al., 2009). According to Williams (2010), merely in 2007, 0.9 million people were employed in WEEE recycling industry in China and 98% of them worked in the informal recycling sector.

Given the facts of the illegal dumping from developed countries, the growth of domestic WEEE and the informal treatment of WEEE, China is facing serious WEEE problems in quantity as well as in toxicity. The challenge for China to solve the WEEE problem is to prevent the harmful environmental and health effects while optimizing the economic values from WEEE (Williams et al., 2010). To solve WEEE problems, it is pointed out by UNEP (2009) that the common barriers for most countries are (i) policy and legislation, (ii) technology and skills and (iii) business and financing production. This paper focuses on WEEE policy analysis to explore the difficulties of WEEE management in China. Policies in this paper mean laws, regulations, rules, standards, technical guidance and norms.

In response to WEEE problems, the Chinese government has developed a variety of policies to tackle WEEE problems since 2000. The progress and achievements of these policies are remarkable. However, various defects and weaknesses of the earlier policies and lack of environmental awareness among stakeholders (like producers, governments, collectors, recyclers and consumers) are identified in various publications (Hou, 2004; Hicks et al., 2005; Guo, 2006; Mo et al., 2009; Huang, 2009; Alberts et al. 2010; Yu, 2011). The earlier WEEE policies in China are not enough to guarantee a sound treatment of WEEE and construct an economic, environmental and ethical recycling and disposal system in China (Hicks, 2005; Wang, 2008). With the determination of the Chinese government, a brand-new regulation for WEEE management in China, the Regulations for the Administration of the Recovery and Disposal of Waste Electrical and Electronic products² (RAW in short), came into force on 1 January 2011. RAW, the so called China WEEE Directive, aims to standardize the recovery and disposal of WEEE, eliminate the informal treatment and ultimately minimize WEEE and reduce its environmental impacts.

1.2 Research gaps and the meaning for the research

There have been a considerable number of publications (for instance: Mo et al., 2009; Guo, 2006; Hou, 2004; Yang et al., 2008; Jiang, 2009; Huang, 2009; Xu, 2010; Albert et al., 2010; Williams et al., 2010) pertaining to the earlier policies on WEEE management in China. Most

¹ The Basel Convention is the most comprehensive global environmental agreement to regulate and restrict the generation, management, trans-boundary movements and disposal of hazardous and other wastes, with aims to protect human health and the environment. Please see more information from <http://www.basel.int/convention/basics.html>.

² State Council. (2011). *The Regulations for the Administration of the Recovery and Disposal of Waste Electrical and Electronic products*. State Council document No.551. Retrieved from http://www.gov.cn/zwggk/2009-03/04/content_1250419.htm (in Chinese).

of them are about the introductions of various pieces of WEEE legislation in China, among which EPR is usually a focus. Some of them mention shortcomings of the policies. Yet, it is hard to find systematic studies on a particular regulation in light of the whole WEEE management system. Since RAW came into force only very recently, how this fresh regulation tries to overcome these weaknesses in earlier policies has not been studied systematically, though it is probably the most important WEEE legislation in China so far. The details of RAW and, in particular, the concerns of RAW and the reflections from stakeholders have not yet been well presented, although RAW has been briefly mentioned in the papers of Widmer et al. (2005), Hicks et al. (2005), He et al. (2006), Liu et al. (2006), Manomaivibool (2008), Ye (2007); Huang (2009) and Williams et al. (2010). More research is essential to understand the ability of the new regulation to improve WEEE management in China.

Due to China's important role in EEE production and WEEE treatment, it is urgent for China to solve the increasing WEEE problems. It is crucial to know how RAW, the so-called China WEEE Directive, as the first comprehensive law on the WEEE management in China, is implemented, enforced and met by stakeholders like producers, governments, users, recyclers and the like.

1.3 Aims, objectives and research questions

This paper aims to provide a systematic analysis of RAW and find out how well RAW and its (likely) implementation will address the weaknesses and concerns raised from past policies and practices for WEEE management in China. To achieve the purpose, it is essential to answer the following research questions:

1. What are the achievements, issues and concerns of the earlier policies on WEEE management in China?
2. In which ways does RAW plan to overcome the weaknesses of the old policies?
3. What are the reflections of the stakeholders in China on RAW?
4. What are the prospects, concerns and challenges for RAW? And how can these concerns and challenges be met?

1.4 Research scope and limitation

1.4.1 Scope

In order to analyze the regulation systematically, the study covers all the main stakeholders involved in the handling of WEEE generation and management. It looks at what actions/responsibilities are stipulated by the law for actors such as EEE producers, consumers, and in relation to operations such as collection and treatment, the administration and supervision of the regulation.

For the purpose to identify the weaknesses and progress of the past WEEE regulations, the study focuses on policy analysis referring to the legislation on WEEE management in China.

Within China, there is no particular geographical scope framed for the research. It looked into different stakeholders in different regions in China. For the time scope, the main focus of the research is the changes in the WEEE management since 2000, when the first policy related to WEEE prevention was launched.

1.4.2 Limitation

The main limitation for the research is the temporal and geographical scope. As the regulation was just effective in January 2011 and the research is expected to be due before June 2011. At this very beginning, some stakeholders might not have started to respond to the fresh regulation and take related actions. This could result in underestimating the effects of the regulation. Also, the wide territorial span of China makes it difficult to provide the whole picture of the implementation of the new regulation in the entire country within the time allocated for this study.

1.5 Methodology

In order to achieve the purpose and answer the research questions, the research objectives for the thesis can be summarized as below:

- 1) To outline the shortcoming, concerns and achievements of the past policies on WEEE management in China;
- 2) To identify the main characteristics of RAW and its breakthroughs;
- 3) To show the current practices, concerns from the stakeholders and identify the main problems of WEEE management in China as it is formulated and introduced; and
- 4) To identify the concerns and main challenges for the implementation of RAW and provide suggestions for overcoming such challenges.

The research approach has the following components:

First, a literature review is conducted to explore the policy instruments in existing WEEE policies, to construct the analytical framework for the WEEE policies in China. Combined with the EEE flow (chain) in China, the analytical framework is set up.

To achieve the first research objective, a literature review is continued to outline the past policies directly pertaining to WEEE management in China. In addition, interviews with policy experts are conducted in Beijing as a support to identify the perceived shortcomings of earlier regulations and initiatives. Subsequently, the issues, concerns and achievements of the past policies on WEEE management in China are analyzed.

Concerning the second objective, following the constructed analytical framework, an analysis of RAW is employed to identify its characteristics and the breakthroughs. Meanwhile, how RAW try to overcome the weaknesses of the earlier policies can be identified.

As for the third objective, stakeholder analysis is used to discuss the views of various stakeholders on RAW, based on semi-structured interviews with stakeholders including local governments, EEE producers, qualified operators, informal recyclers and policy experts. Shanghai Environmental Protection Bureau (SEPB) was interviewed for the reflections of local government. The reason to choose SEPB is that Shanghai is supposed to be very active in WEEE management, since it has the highest number of WEEE treatment companies (AWTCs) in China. The AWTCs listed by SEPB were also interviewed, mainly by phone, to provide the experiences and reflections from the formal sector. The same questions were asked to these qualified operators. It took in average 15-20 minutes to conduct an interview. One of the qualified operators replied to the questions by email instead of through a phone interview. For the reflections from EEE manufacturers, the giants in the EEE industry, which mainly produce the large household appliances covered by RAW, were selected for interviews. The author finally managed to access the environmental or CSR (Corporate Social Responsibility) departments in some enterprises, in particular, Haier, TCL and Changhong.

But, limited information on this “sensitive area” was provided through the interviews. Thus, the reflections on EEE manufacturers are supplemented by media reports. A face-to-face interview was conducted with a self-employer, Mr. Huang from Taizhou to gain the reflection from the informal recycling sector. His business is mainly about informal treatment of discarded mobile phones which are not targeted by RAW. To receive experiences and reflections from EEE users, the author joined a community survey project led by some NGOs in Beijing. The survey aimed to show the public awareness on RAW and WEEE issues.

The forth objective is addressed by analyzing the shortcomings of earlier policies, the characteristics of RAW, the reflections from stakeholders and the insights of the interviewed experts, following the structure of the analytical framework.

1.6 Outline of the research

The paper is structured in seven chapters.

Chapter 1

The current chapter presents the background information on the topic, the research objectives, research questions, scope, limitations and the methodology of the research.

Chapter 2

This chapter provides a brief policy context of WEEE management. The main policy principles and policy instruments employed in WEEE policies are outlined. Based on the theoretical background studies and the literature review on the research about WEEE flow in China, the analytical framework of this paper is constructed.

Chapter 3

This chapter reviews a series of publications on the earlier policies directly relevant to WEEE management in China. It reviews the progress and achievements of the WEEE policies since 1990s in China. Most importantly, it outlines the shortcomings of these policies according to the issues included in the analytical framework.

Chapter 4

This chapter explores the characteristics of the Regulations for the Administration of the Recycling and Disposal of Waste Electronic and Electrical Products (RAW), within the analytical framework developed in Chapter 2. These characteristics of RAW demonstrate the breakthroughs of WEEE legislation in China and further tell how RAW tries to avoid the shortcomings of the earlier policies as outlined in Chapter 3.

Chapter 5

This chapter presents the reflections of various stakeholders and current development of WEEE management in China. Based on the reflections, the paper displays the latest picture of WEEE management in China.

Chapter 6

Based on the previous chapters this chapter analyzes the concerns and challenges for the implementation of RAW according to the analytical framework, as well as some shortcomings of the earlier policies which influence the implementation of RAW. It also finds the

construction of a collection network to become the core challenge for the implementation of RAW.

Chapter 7

This chapter reviews the research questions and the research objectives presented in Chapter 1, and then it comes with conclusions and suggestions, followed by future research opportunities.

2 Analytical Framework

This chapter provides a brief policy context of WEEE management. The main policy principles and policy instruments employed in WEEE policies are outlined. Based on the theoretical background and the studies on the current WEEE flow in China, the analytical framework of this paper is constructed.

2.1 Policy context for WEEE management

Preventative policies on WEEE management have received much attention in the past decade (OECD, 2002; Goosey, 2004). These policies have focused on achieving waste minimization through waste reduction, followed by product reuse and materials recovery in order to avoid disposal to landfill and impact the environment (McDougall et al., 2001; Hopp et al., 2008). In EU, Directives on EEE have been established, which are 2002/95/EC on restrictions on the use of certain hazardous substances in electrical and electronic equipment (RoHS), 2002/96/EC on WEEE (European Commission, 2002a, b). The RoHS Directive bans the sale of new EEE containing a certain levels of lead, cadmium, mercury, hexavalent chromium, PBB, and PBDEs flame retardants. The WEEE Directive is designed to tackle the rapidly increasing WEEE stream and aims to minimize the impact of electrical and electronic goods on the environment by increasing reuse and recycling and reducing the amount of WEEE going into landfills. The Directive seeks to achieve these goals by making producers responsible for financing the collection, treatment, and recovery of almost all kinds of WEEE items and by obligating distributors to allow consumers to return their waste equipment free of charge. In Japan, the home appliances recycling law (HARL³) has been in force since April 2001, with aims to bring about high-quality waste treatment and efficient use of resources through the reduction of wastes and the full utilization of recyclable resources to realize a sound material-cycle society (Aizawa et al., 2008). In some Asian regions, like Korea, WEEE is regulated by the Waste Management Act, with the purpose of promotion of saving and recycling of resources under the Ministry of Environment (Ongondo et al., 2011). In China, WEEE issues were started to be added to a policy agenda since 2000 (Manomaivibool, 2008).

2.1.1 Policy principles for WEEE management

With regard to policy principles for WEEE management, the principles of 3R (Reduce, Reuse, Recycle), *pollution prevention* (or source reduction), *end-of-pipe treatment* and *extended producer responsibility* are usually introduced to solve WEEE problems.

- 3R

3R is meant to be a hierarchy in order of importance of handling WEEE. It emphasizes on pollution prevention at front of pipe rather than end of pile treatment of wastes. It has been gradually accepted that 3R patterns of behavior and consumer choices will lead to sustainability development which will benefit the environment, society and economy (USTC, 2007).

- *pollution prevention*⁴ (*source reduction*)

Pollution prevention is any practice which reduces the amount of any hazardous substance, pollutant, or contaminant entering any waste stream or otherwise released into the environment prior to recycling, treatment, or disposal. It includes equipment or technology

3 HARL was the first piece of legislation in Japan that directly deals with WEEE, which was enacted in 1998 and came into force three years after. Retrieved from <http://www.meti.go.jp/english/information/data/cReHAppre.html>

4 The definition of Pollution Prevention is established by US Pollution Prevention Act of 1990, for more information about it please refer to <http://www.epa.gov/p2/pubs/basic.htm>

modifications, process or procedure modifications, reformulation or redesign of products, substitution of raw materials and hazardous chemicals, and improvements in housekeeping, maintenance, training, or inventory.

- *end-of-pipe treatment*

End-of-pipe treatment is not pollution prevention at source but the approaches or methods in dealing with the product at its end-of-life⁵ (ILO, 2011; He et al., 2006), to control pollution concentrating on effluent treatment or filtration prior to discharge into the environment (United States Environmental Protection Agency [EPA], 2010). It is easy to understand that end-of-pipe treatment normally means additional expenses to companies and focus on the reduction of pollution load (EPA, 2010).

- *EPR*

EPR⁶ is a policy principle to extend the responsibilities of the manufacturer of the product to various parts of the product's life cycle, and especially to the take-back, recovery and final disposal of the product, in order to promote total life cycle environmental improvements of product systems (Lindhqvist, 2000), in line with Polluter Pays Principle (OECD, 2001). As a “founding principle to guide a shift towards a society based on sustainable production and consumption” (Tojo, 2004, p.i), EPR not only focuses on improving the end-of-pipe management of products, materials reuse, but also tries to improve products environmental performance by introducing different policy instruments throughout their life cycle.

Two main goals of the EPR principle are to promote upstream eco-design of new products primarily aiming to reduce environmental impacts from end-of-life management, and to ensure improvements of collection in the midstream and recycling efficiency in the downstream that induces high re-utilization of products, components and materials (Lindhqvist et al., 2007; van Rossem, 2008).

Designing an EPR system with clearly defined roles is essential for all stakeholders including governmental organizations, producers, consumers, and waste operators (Lindhqvist, 2000). EPR programs have been established to prevent WEEE pollution and promote waste minimization in OECD countries since the late 1990s (UNEP, 2005). Yet the idea of EPR was at the initial stage of being introduced in non-OECD countries for WEEE legislation (Lindhqvist et al., 2007). But developing countries has increasingly recognized the importance of EPR and propagated it in their WEEE management system (Lindhqvist et al., 2007; van Rossem, 2008; Huang, 2009; He et al., 2005; Kong, 2010; Widmer et al., 2005; Hicks, 2005; Hopp et al., 2008).

2.1.2 Policy instruments for WEEE management

Policy instruments including administrative, economic and informative instruments are concrete means of implementing policy principles. Administrative instruments are standards and control measures that incorporate a wide range of regulatory practices for related stakeholders to meet the purpose of a particular policy (van Rossem, 2008; Lee, 2002). Economic instruments are applied via taxation, subsidization or other financial incentives to stimulate prescribed behaviors or raise fund (van Rossem, 2008; Turner & Pearce, 1994). Informative instruments, primarily as supplements to other instruments, concern the

5 In this paper, the end-of-life of a product refers to the time point when the product's functionality no longer satisfies the requirements of the original purchaser or the first user, according to He et al. (2006).

6 EPR can be described with other terms such as “strategy” (Lindhqvist, 2000), “approach” (OECD, 2001), and “policy paradigm” (Manomaivibool, 2008). Each gives a special nuance to the definition.

collection and provision of information. They are used with the assumption that, people behave differently when they have better information and understanding (Tojo et al., 2008). The policy instruments for waste management have been comprehensively discussed by Tojo et al. (2008).

Further, the policy instruments applied in EPR programs have been extensively discussed in the papers of Tojo (2004), Lindqvist et al. (2007), van Rossem (2008) and Huang (2009). It is mentioned in Lindqvist et al. (2007) that the performances of policy instruments incorporate with a EPR program must be judged on how the policy instruments and their combination would contribute to the achievements of the two EPR goals. van Rossem (2008) outlined a package of policy instruments embedding EPR for WEEE minimization. Huang (2009) mainly focused on the informative, administrative and financial responsibilities for producers. It should be noted that policy instruments attached in EPR programs are not inherently EPR. They can also be employed in non-EPR programs (Lindqvist et al., 2007).

To establish a good WEEE management scheme, only to highlight the producer's responsibility is obviously insufficient. It is because that WEEE management is a complex social system which not only links with producers but also refers to other stakeholders like governments, users, and waste operators. Therefore, a structural framework of WEEE management should also address different policy instruments in non-EPR programs targeting on different stakeholders and activities of WEEE management, which is further discussed in Section 2.3.

2.2 Analytical Framework Construction

Policy instruments must be adapted to local contexts (Lindqvist et al., 2007) guided by certain policy principles. Considering local situations, Widmer et al. (2005) developed an indicator system to evaluate a particular WEEE management system, including the structural framework of legislation, society, economy, technology, the quality of the existing recycling system and its impacts on environment, human health and labor. This indicator system was also employed in the context of China through unity analysis. Widmer et al. (2005) indicates that the EEE flow existing in the very informal sector reflected a long tradition in waste recycling in China; that government intervention in China has not led to the purely profit-driven WEEE treatment system; and that relevant stakeholders have noticed the shortcomings of the WEEE system. It points to the issue that the WEEE flow together with relevant stakeholders should be taken into account for the analysis of a WEEE policy.

Subsequently, this paper tries to combine the process analysis (EEE flow) and stakeholder analysis to construct an analytical framework. The EEE flow is referred to the process of production, distribution, repair, collection and treatment, according to the EEE flow chart of China presented by Zhou (2006) and Wen and Jin (2010). For the convenience of analysis, the transportation of WEEE in the EEE flow is taken out of the scope of this thesis. Meanwhile, the EEE flow is further combined as upstream, midstream and downstream, which is elaborated as follows.

2.2.1 Upstream

EEE producers (including manufacturers, importers, designers and distributors) are the only actor in the upstream for WEEE management. They are directly targeted by various policy instruments of EPR, such as mandatory take-back of WEEE, payment for WEEE treatment, substance restriction, disposal bans, labeling and so on.

The producer should, typically, have financial responsibilities in an EPR system to finance a collection and recycling program for their share of returned WEEE and a share of orphan waste⁷. Producers may be required to take the responsibilities by establishing their own recycling program, cooperating with other manufacturers to found recycling programs or paying the state for the WEEE management of its share. The collected funds may be managed by a state commission or a private third-party organization (UNEP & UNU, 2009).

A good example of a well-designed EPR scheme is EU WEEE Directive. It addresses more clearly the issues of upstream design (van Rossem, 2008). Each producer is required to be responsible for financing WEEE management for his own products and provide a financial guarantee to cover costs for WEEE management, in order to give maximum effect to the concept of producer responsibility (van Rossem, 2008). Instead of financial responsibility, HARL in Japan stipulates that manufacturers are directly obliged to recycle and have a physical responsibility (Aizawa et al., 2008).

2.2.2 Midstream

Actors in the midstream include the users of EEE (households and professional users), repair/after-sale organizations and collectors. Accordingly, the responsibilities of users and repair/after-sale organizations as well as collection mechanism should be considered in the midstream.

- Consumer responsibilities could be regulated in the following ways:
 - *Return WEEE to authorized collector*
 - *Return WEEE to authorized collector free of charge*
 - *Pay for the final treatment of WEEE*

Besides producers, consumers may also be required to pay an advanced recycling fee for the target products or at collection stands. The fee collected from consumers could be used for local collection programs, the administrative costs for retailers collecting the fee in the midstream and the financial needs in the final WEEE treatment.

For example, the EU WEEE Directive and the HARL in Japan present different consumer responsibilities. WEEE Directive requires consumers to actively contribute to the success of WEEE collection by returning WEEE to public collection points. For this purpose, convenient facilities should be set up for the return of WEEE at least free of charge. In the HARL, it prescribes that consumers in Japan should pay a recycling fee for WEEE treatment at the time of collection (Aizawa et al., 2008).

● Collection

In the midstream of WEEE chain, collection is the key process for WEEE management. It determines the amount of material that is actually available for final treatment. More collection of WEEE allows for rather safe and more efficient recycling so as to keep more valuable WEEE components (e.g. metals) for re-use and prevent risks to human health and the environment (UNEP & UNU, 2009). When little WEEE is collected, the materials for the end-of-pipe treatment are lacking and the recycling chain cannot be established. Actually, various collection schemes are in place but their efficiency varies from place to place (UNEP & UNU, 2009).

⁷ Orphan waste is old electrical and electronic products whose producers no longer exist, according to the Irish EPA. Retrieved from <http://www.epa.ie/whatwedo/resource/weee/weeefags/>

2.2.3 Downstream

Downstream contains such elements as funding mechanism and recycling standards for WEEE treatment. There are two main stakeholders: qualified operators and informal recycling operators. A well-designed recycling standard system determines the safety and efficiency of the end-of-pipe WEEE treatment. The standard system may consist of qualifications for a licensing scheme, treatment target, technical standards and labor skills for treatment etc. The licensing scheme and environment friendly treatment technology may be applied to regulate the WEEE treatment entities. The recycling target for the collected WEEE shows the efficiency of treatment.

The funding mechanism is of importance to solve WEEE financial problems at the downstream (UNEP & UNU, 2009). It has been mentioned in Section 2.2.1 and Section 2.2.2 that there are two major categories of payment for WEEE treatment, Producer Pay Model and Consumer Pay Model. In almost all EU countries, the funding mechanism for WEEE treatment can be described together with PROs, as illustrated in Figure 1 shows.

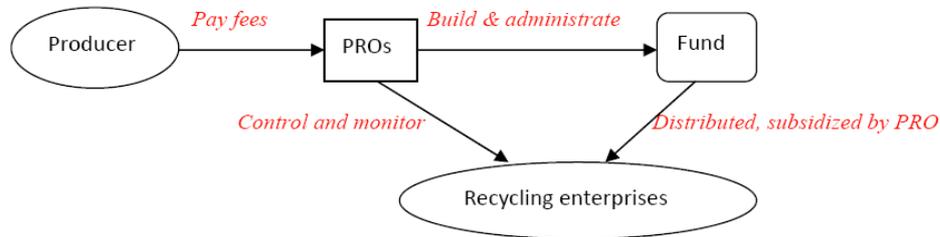


Figure 1 Producer Responsibility Organizations in EU countries
 Source: Developed by the author

PROs are cooperative efforts of producers to share EPR obligations among the members (Rolf et. al, 2005). The common function of all PROs is to collect fees and build a monetary fund. They act as a trustee to collect, administrate and distribute fees or allowances that are used for an environmentally sound recycling. The systems are designed either to cover a financial deficit of recyclers or to promote environmentally more sound recycling of WEEE (Streicher-Porte & Yang, 2007).

2.2.4 The whole framework

- *Administration and supervision*

A comprehensive WEEE system is regarded as a close interaction and communication among stakeholders in the WEEE chain (UNEP & UNU, 2009). To ensure the closed interaction, it is insufficient to only focus on which policy instruments and how they are placed on relevant stakeholders or the processes of WEEE management. The achievements of a policy are also determined by how it is enforced and implemented. The failed enforcement of a policy is usually due to either lack of administration and supervision by related government agencies or unclear responsibilities being assigned to them (Mo et al., 2009; Guo, 2006; Hou, 2004; Xu, 2010; Wang, 2008). Thus, the administration and supervision system should be considered for the whole framework of a policy.

- *System Coverage*

Usually, laws specify the scope of products mandated for compulsory collection, disposal and recycling. The scope could be defined based on the items of EEE such as TVs, air conditioners, personal computers, etc. For example, the scope of the EU WEEE Directive

(Table 1) has tried to cover all EEE used by consumers and the EEE intended for professional use (EU, 2002a).

Table 1 Scope of EU WEEE Directive

NO.	Category	Label
1	Large household appliances	Large HH
2	Small household appliances	Small HH
3	IT and telecommunications equipment	ICT
4	Consumer equipment	CE
5	Lighting equipment	Lighting
6	Electrical and electronic tools(with the exception of large-scale stationary industrial tools	E&E tools
7	Toys,leisure and sports equipment	Toys
8	Medical devices(with the exception of all implanted and infected products)	Medical equipment
9	Monitoring and control instruments	M&C
10	Automatic dispensers	Dispensers

Source from EU, 2002a

Besides the scope mentioned above, system coverage of a policy also links with how the EEE flow is covered by the policy. Due to different purposes of policies, different areas (upstream, midstream and downstream) of the EEE flow may be targeted by different policy instruments.

2.3 Analytical Framework

2.3.1 The analytical framework

Based on the literature review on the EEE flow and the analysis of experiences from mainly the European Union and Japan, an analytical framework is constructed for this thesis as shown in Figure 2.

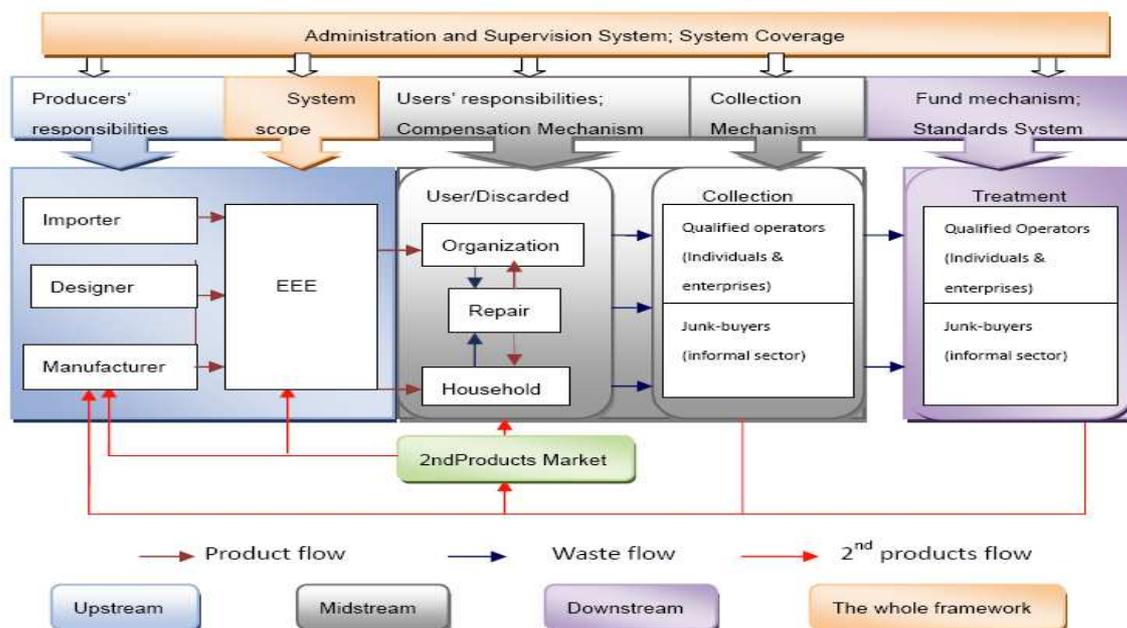


Figure 2 The analytical framework of the paper

Source: Developed by the author, inspired by Zhou (2006) and Wen & Jin (2010)

2.3.2 How the analytical framework is to be used in this paper

As Figure 2 shows, the upstream, midstream and downstream of the WEEE flow contain the main components discussed in Section 2.2. For example, the producer responsibilities are placed on the upstream. It is because producers are the only actor in the upstream and their responsibilities will be a focus for the WEEE policies analysis in the thesis, due to their important role stated in Section 2.2.1. Accordingly, in the midstream, although consumers are not the only actors, their responsibilities are highlighted instead of the responsibilities of other actors (repair/after-sale organizations), as it would be more meaningful to discuss consumer responsibilities for this paper. Besides consumer responsibilities, the discussion of collection mechanism for a policy analysis will be followed as it is directly connected with consumers and WEEE operators as mentioned in Section 2.2.2. It should be noted that the secondhand product market in the midstream only implies a part of the WEEE flow in China. It will not be a focus for the policy analysis in this thesis. In the downstream, the thesis analyzes how the policies are met by WEEE operators (qualified operators and junk-buyers) in the downstream as described in Section 2.2.3. It will also explore whether a funding mechanism is implemented in a policy and how the policy regulates the standards system for the final treatment of WEEE. For the whole framework, this thesis will analyze the administrative and supervisory role of government bodies, which refer to the different streams of the WEEE flow for the implementation of a policy, as mentioned in Section 2.2.4. In addition, the scope of a policy defined by the covered EEE products and the coverage of the WEEE flow are also the elements within the overall framework that will be discussed in the policy analysis.

Based on the above reasoning, first, this framework will be applied to systematically analyze the earlier WEEE policies in China, particularly to detect shortcomings and issues that are not covered in the Chinese policy interventions. Subsequently, this framework will be employed to explore the characteristics of RAW, the newest WEEE policy in China. Finally, the framework will also be used for the general analysis on the concerns and challenges of RAW. After the conclusions, suggestions for the successful implementation of RAW will be provided.

3 Development of WEEE legislation in China

This chapter reviews a series of publications on the earlier policies directly relevant to WEEE management since 2000 in China. It reveals the progress and achievements of these policies and most importantly, it outlines the shortcomings of these policies, structured according to the analytical framework.

3.1 The earlier WEEE policies in China

Since the 1990s, in response to the growing concern over how China will manage its increasing piles of waste electrical and electronic equipment (WEEE), the Chinese government has issued a variety of environmental policies relevant to WEEE management, as listed in Table 2.

Table 2 Policies directly relevant to WEEE management in China before 2011

Name in Chinese	Name in English	Major content	Major Purpose	Effective Date	Enacted by
关于加强限制进口类废物审批管理有关问题的通知	Notification on Importation of the Seventh Category Waste	Ban on the imports of the seventh category of waste including the abandoned computers, monitors, CRTs, copiers, microwave ovens ,air conditioners, video cameras, electric cooking devices, rice cookers, telephones , video games, televisions, picture tubes and refrigerators	Strengthen the management of imported waste	Feb.1, 2000	Ministry of Environmental Protection (MEP)
中华人民共和国清洁生产促进法	Law on Promotion of Cleaner Production of PRC	Introduction of " producer responsibility "; Encourages eco-design and the life-cycle approach for resource use and waste management	Promote cleaner production, increase the efficiency of the utilization rate of resources, reduce and avoid the generation of pollutants	Jan.1, 2003	The Standing Committee of the National People's Congress (NPC)
中华人民共和国固体废物污染环境防治法	Law on the Prevention of Environmental Pollution from Solid Waste	Disposal of municipal and industrial solid waste ; Use of solid wastes as raw materials.	Prevent the pollution caused by solid wastes	Apr.1, 2005	The Standing Committee of the National People's Congress (NPC)
废弃家用电器与电子产品污染防治技术政策	The Technical Policy on Pollution Prevention and Control of WEEE	Introduces principles of " 3R " and " polluter pays principle "; stipulates the general provisions for eco-design, the information disclosure of products, and environmentally sound collection, reuse, recycling and disposal of WEEE	Reduce the overall volume of WEEE, increase the reutilization rate and standards for WEEE recycling	Apr.27, 2006	MEP, MII, MoC, MST
电子信息产品污染控制管理办法	Management Methods on Control of Pollution Caused by Electronic Information Products	Chinese RoHS , recognizes six hazardous substances; Defines requirements for product labeling and hazardous substance level disclosure	Control and reduce the pollution caused by the wasted electronic information products to the environment, promote the production and sale of low-pollution electronic information products	Mar.1, 2007	MI, MEP, MoC, NDRC, General Administration of Customs of PRC, SAIC, AQSIQ
再生资源回收管理办法	Administrative Measures for the Recovery of Renewable Resources	Stipulate the standard of the whole process of collection transportation and disposal of renewable resources; Encourages renewable resources recovery and safe disposal	Promote the recovery of renewable resources, regulate the development of the industry of recovery of renewable resources, saving resources	May 1, 2007	MoC, NDRC, MEP, SAIC, MPS, MOHURD
电子废物污染环境防治管理办法	Administrative Measures on Prevention and Control of Environmental Pollution by Electronic Waste	EIA shall be undertaken for e-waste dismantling, utilization and disposal projects; Definition of responsibility of EEE manufacturers , importers and retailers	Prevent the pollution caused during the disassembly, recycling and disposal of WEEE; specifies responsibilities of relevant parties and the licensed scheme for WEEE recycling companies	Feb.1, 2008	Ministry of Environmental Protection (MEP)
中华人民共和国循环经济促进法	The Circular Economy Promotion Law of PRC	Specifies provisions on 3R of electronic products during the production, consumption and other processes	Promote the development of circular economy, improve the resource utilization efficiency	Jan.1 2009	The Standing Committee of the National People's Congress (NPC)
促进扩大内需鼓励汽车、家电“以旧换新”实施方案	The Implementation Methods of Old for New Program	Authorizes EEE sellers and WEEE treatment companies and provide subsidies to them; Compensation for consumers who replace their discarded EEE with a new one	Stimulates home appliances consumption and curb WEEE pollution	Jun.1 2009	MEP, NDRC, MII, etc.

Source: Compiled by the author

Note: Abbreviations in the last column of the table can be found in the Abbreviations List (Page III).

In Table 2, *Laws of the PRC* are the regulatory documents at the national level adopted by the Standing Committee of the National People's Congress (NPC), which is the legislative body of the highest level in China. All important aspects related to society and citizens must be prescribed in these laws, e.g. affairs concerning the sovereignty. Regulations (Ordinances) are laws at the state level (second level) adopted by the State Council and based on the highest level laws (Huang, 2009; Veenstra et al., 2010). They deal with matters required by the laws to

fulfill the provisions or principles in laws or matters within the administrative functions and powers of the State Council (Huang, 2009). Below the first two levels, there are local regulations and rules as the third level, which are made by the bodies under the State Council or the provincial people's congresses or their standing committees adhering to the laws and regulations, in light of the local conditions (Huang, 2009).

3.1.1 The highest level legislation for WEEE management in China

There are three laws at the highest level legislation applicable for WEEE management in China.

1 The Cleaner Production Promotion Law⁸

The Cleaner Production Promotion Law came into force in 2003, with aims to promote cleaner production, increase the utilization rate of resources, reduce and avoid the generation of pollutants in the course of production, services and use of products. It employs the principle of *pollution prevention* and the principle of 3R during the production process to reduce the generation and discharge of pollutants. It adopts measures to continuously improve design, use cleaner energy and raw materials and introduce advanced techniques and facilities (Eric et al., 2005).

2 The Law on Prevention and Control of Solid Wastes⁹

The law was launched in 2005 to prevent pollution caused by solid wastes. It classified wastes into three categories: industrial, municipal and hazardous wastes (Article 88). The law became the general guidance and regulations for solid waste management in China, including WEEE.

3 The Circular Economy Promotion Law of the People's Republic of China¹⁰

The Circular Economy Promotion Law of the People's Republic of China was brought into effect on 1 January 2009. It aims to promote the development of the *circular economy*¹¹ and realizing sustainable development. *Producer responsibilities* and system scope prescribed in the law are perceived to play a leading role for the development of the household EEE industry (Albert et al., 2010). EPR is adopted by this law as a principal norm which is mainly required of manufacturers: any entity producing products or packages within its scope subject to compulsory recycling is responsible for recycling. The system scope of the law is limited to air conditioners, refrigerators, washing machines, television sets, and personal computers. Recycling, together with information provision, distribution, and follow-up are the main responsibilities of producers.

3.1.2 The second level legislation for WEEE management in China

As seen in Table 2, there were not WEEE-specific regulations at the second level legislation in China before 2010. The first one is the Regulation for the Administration of the Recovery and Disposal of Waste Electrical and Electronic products (RAW) coming into effect on 1 January 2011. It will be further elaborated in Chapter 4.

⁸ National People's Congress (NPC) of PRC. (2003). *The Cleaner Production Promotion Law*. No.72. Retrieved from http://www.gov.cn/gongbao/content/2002/content_61640.htm (in Chinese).

⁹ NPC of PRC. (2004). *The Law on Prevention and Control of Solid Wastes*. No.31. Retrieved from <http://www.chinaacc.com/new/63/74/2004/12/ad55626111192214002264.htm> (in Chinese).

¹⁰ NPC of PRC. (2009). *The Circular Economy Promotion Law of the People's Republic of China*. No.4. Retrieved from http://www.gov.cn/flfg/2008-08/29/content_1084355.htm

¹¹ The *circular economy* is to employ 3R principle in the process of production, circulation, and consumption, which has become a national strategy in China (Veenstra et al., 2010).

3.1.3 The third level legislation for WEEE management in China

The main laws as the third level legislation pertaining to WEEE management in China are described in the following.

1 The Management Methods on Control of Pollution Caused by Information and Communication Equipment (also called electronic information products)

Known as China RoHS¹², this regulation drafted by the Ministry of Information Industry of PRC was enacted in March of 2007. It attempts to control and reduce the pollution caused by the discarded information and communication equipment (ICT equipment) to the environment, as well as to promote the production and sale of ICT equipment that contains less polluting substances. Being the counterpart of the EU RoHS Directive and with the application of *pollution prevention* principle, it consists of requirements for eco-design and restrictions on the use of six hazardous substances (lead, mercury, cadmium, hexavalent chromium, PBB or PBDEs) in ICTs.

2 The Administrative Measures for the Recovery of Renewable Resources¹³

The Administrative Measures for the Recovery of Renewable Resources came into force in May 2007. It is implemented to promote the recovery of renewable resources, save renewable resources and regulate the development of the industry of recovery of renewable resources. According to the law (Article 2), the renewable resources refers to various wastes which arise from social production and consumption in daily life, have already lost the entire or partial use value and may re-obtain useful value by way of recovery and processing. They include waste such as waste metal, waste electronic products, waste mechanical electrical equipment and spare parts, waste raw materials for the production of paper, waste light industrial raw materials, waste glass, etc. This is the first regulation targeting recycling industry in China. It requires business operations relating to the recovery of renewable resources to meet requirements set under the regulations related to industrial and commercial administration. A business license should be obtained for the recovery qualification (Article 6). The qualified operators should go through the archival filing formalities at related departments (Article 7). It also provides specific rules on the recovery of renewable resources.

3 The Administrative Measures on Prevention and Control of Environmental Pollution by Electronic Waste¹⁴

On 1 February 2008, the Administrative Measures on Prevention and Control of Environmental Pollution by Electronic Waste was enacted by Ministry of Environmental Protection. It is the first relatively comprehensive rules for WEEE management in China, with the purpose to prevent informal operations on the end-of-life treatment of WEEE, particularly for discarded household electrical appliances. In order to supervise and administrate stakeholders involved in WEEE treatment, the law proposed the list of authorized waste treatment companies (AWTCs) through a licensing system together with EIA (environmental impact assessment). The EIA document shall contains the details of their construction project, the treatment facilities, technologies, the analysis and prediction of the environmental impact that may be caused by the construction project, and the program for proper treatment of WEEE that cannot be completely dismantled, utilized or disposed of by the present project (Article 7). In other words, no entity (including the individual industrial

¹² Ministry of Information Industry (MII) of PRC. (2007). *Management Methods on Control of Pollution Caused by Electronic Information Products*. MII document No. 39. Retrieved from <http://www.amphenorlf.com/pdf/ChinaRoHSorder39.pdf> (in chinese).

¹³ Ministry of Commerce (MoC) of PRC, et al. (2007). *The Administrative Measures for the Recovery of Renewable Resources*. MoC document No.8. Retrieved from http://www.gov.cn/ziliao/flfg/2007-03/30/content_566242.htm (in Chinese).

¹⁴ MEP of PRC. (2008). *The Administrative Measures on Prevention and Control of Environmental Pollution by Electronic Waste*. MEP document No.40. Retrieved from <http://faolex.fao.org/docs/texts/cbn75002E.doc>

and commercial household) that has not been incorporated into the AWTCs list (including provisional list) may engage in WEEE treatment. Otherwise, they may be subject to a fine of RMB 50 up to RMB 500,000 (Euro¹⁵ 50,000).

3.1.4 Additional policies relevant to WEEE management in China

1 The Notification on Importation of the Seventh Category Waste¹⁶

In 2000, the Notification on Importation of the Seventh Category Waste was implemented, as a way of implementing the Basel Convention. It aims to ban imports of WEEE and to reduce the pollution caused by WEEE coming from abroad. The list of forbidden imports of WEEE is shown in Table 3. Since the trans-boundary transfer of WEEE became visualized, the ban on the imports of WEEE became the milestone of WEEE management in China, when the Chinese government, academic institutions and the public start to pay much more attention to environmental problems resulting from WEEE recycling starting from the year of 2000 (Yang et al., 2008).

Table 3 List of the forbidden imports of WEEE

List of forbidden imports of WEEE			
No	Product name	No	Product name
1	Air conditioners	11	Fax machines and teleprinters
2	Furnaces for radioactive waste	12	Video recorders and laser disk players
3	Refrigerators, freezers, etc.	13	Mobile communication equipment
4	Computers	14	Video cameras and digital cameras
5	Monitors	15	TV sets
6	Printers	16	Printed circuit boards
7	Computers' peripheral equipment	17	Thermionic, cold CRT and photocathode tubes
8	Microwave ovens	18	Components of ICs or moletrons
9	Electric pots and cookers	19	Photocopy machines
10	Telephone sets and videophones	20	Instruments and appliances used in medical science
21	Apparatus based on X-rays		

Source from: MEP document 19, 2000

2 The Technical Policy on Pollution Prevention and Control of WEEE (Technical Policy)¹⁷

The Technical Policy was implemented in 2006. It stipulates the general provisions of eco-design, the information disclosure of products, and the environmentally sound collection, reuse, recycling and disposal of WEEE. It also introduced *polluter pays principle* and 3R principle to prevent pollution caused by discarded ICT equipments by taking the whole life cycle perspective into account (Williams et al., 2010)

3 “Old for New” Policy¹⁸

In June 2009, six months after the launch of the Circular Economy Promotion Law, the “Old for New” (also called “home appliance replacement”) policy was carried out in nine pilot cities and provinces in China, with a subsidy plan of RMB 2 billion (Euro 0.2 billion) for buyers of new home appliances. The main purpose for the Chinese government who was facing the global financial crisis to launch the “Old for New” program was to stimulate home appliances consumption, and meanwhile to curb WEEE problems. To stimulate personal spending, consumers can sell their discarded household appliances (DHA) to recycling companies and

¹⁵ The exchange rate of Euro to RMB is normally between 9 and 11. 10 is used in this paper as the exchange rate of Euro to RMB.

¹⁶ MEP of PRC. (2000). *Notification on the import of the seventh category of wastes*. MEP document No.19.

¹⁷ MEP of PRC (2006). *The Technical Policy on Pollution Prevention and Control of WEEE*. MEC document No. 115. Retrieved from http://www.zhb.gov.cn/gkml/zj/wj/200910/t20091022_172404.htm (in Chinese).

¹⁸ MEP of PRC, et al. (2009). *The Implementation Methods of Old for New Program*. State council document No.44. Retrieved from http://www.gov.cn/zw/gk/2009-06/03/content_1331210.htm (in Chinese).

receive a certificate which they can give to retailers in exchange for a 10% discount on the purchase of new home appliances. To curb pollution, the replaced home appliances must be recycled and treated by qualified operators (Xinhua, 2010).

Five items of household appliances are subjected to the policy, which are refrigerators, air conditioners, washing machines and TVs. The main procedures of “Old for New” are described as below.

1. Determine EEE sellers and recyclers. EEE sellers and recyclers of DHA are determined through public bidding organized by local governments. Normally, one or two qualified WEEE operators of large scale are selected and authorized at the pilot cities or provinces. Authorized WEEE treatment companies (AWTCs) listed by municipal environmental protection bureaus are first considered for DHA collection and treatment. Other entities may also join the public bidding for the engagement of the operation of DHA. In short, the selected recyclers are not necessarily AWTCs but are usually AWTCs.
2. Collect DHA. Households may apply for the collection of DHA through internet or telephone provided by the selected recyclers. Then the selected recyclers will come to the household to collect the DHA and provide an “Old for New” receipt for the household.
3. Buy new household appliances (NHA). With the “Old for New” receipt, the household may buy a NHA from the selected EEE sellers with related subsidy provided by the Ministry of Finance of PRC and discount provided by the sellers. In order to ensure the transparency of the NHA prices, EEE producers should inform consumers about the sizes, prices and types of the NHA.
4. Treat DHA. The DHA should be treated only by the selected recyclers.
5. Apply subsidies. EEE sellers may apply for the subsidies at local financial bureaus with both the “Old for New” receipts and the invoice of the sold NHA. The selected recyclers may also apply for the subsidies at these departments with related documents.

Achievements of “Old for New” Policy

The achievement of “Old for New” policy is very remarkable. It has brought significant effects on NHA consumption and DHA collection and recycling. It is very welcomed by consumers, who have mainly contributed to the subsidy provided by the central government and satisfying incentives for consumers.

As told a private citizen Miss Zhang: “In the traditional way, if I sell my old washing machine to a recycler for 60RMB, I may pay 1998RMB for a new one. Thanks for the “Old of New” program, I can return the old one and get a new one only for 1658RMB¹⁹, with 200RMB subsidized by the government and 10% discount of the washing machine’s initial price.”

According to the Ministry of Commerce [MoC] of PRC (2011), up to 7 March 2011, the “Old for New” policy has been expanded to 35 cities in China and become an incentive for consumers to spend RMB 152.12 billion (Euro 15.212 billion) on household appliances 40,268,000 units, since this program started. Meanwhile, the recycled household appliances have reached 41,719,000 units. In the first three months of 2011, the households’ spending on NHA reached over RMB 40 billion (Euro 4 billion).

However, “Old for New” is just a temporary policy with the main purpose to stimulate consumption on household appliances under the circumstance of global financial crisis. Although it was extended to the end of 2012, it is difficult to be extended continuously. The

¹⁹ 1998 (price) – 200 (government subsidy) – 199.8 (10% discount) = 1598. 1598 +60 (lost recycling income) = 1658.

root reason is that the limited subsidy is unable to afford an unlimited implementation of the program (Li, pers. comm, Apr.25 2011).

3.1.5 Progress and achievements of the earlier WEEE policies in China



Figure 3 Progress of WEEE policies in China

Source: Developed by the author

The progress of the past policies for WEEE management in China can be summarized by Figure 3. These policies can be classified into 3 types according to Zhang (pers. comm, Apr.25 2011).

Type 1: The policies are based on the principle of pollution prevention to encourage eco-design and clean production. They give less attention to the end-of-pipe treatment of WEEE. The Law on Promotion of Cleaner Production of PRC is an example.

Type 2: The policies mainly focus on the downstream of the WEEE chain, with the principle of end-of-pipe treatment. They highlighted the qualification of WEEE treatment but not the source and generation of WEEE. For example, the Administrative Measures on Prevention and Control of Environmental Pollution by Electronic Waste.

Type 3: The policies try to cover the whole life cycle of WEEE from design to end-of-life with the promotion of 3R and circular economy, like the Circular Economy Promotion Law of PRC of 2009. 3R appears to be the key principle for this kind of policies.

As elaborated above, the increasing number of WEEE-specific policies with different policy principles being issued in the period following the year 2000 shows the rising attention of the Chinese government to WEEE management. The emergence of qualified operators like AWTCs in the private sector, as well as, the data recorded for the “Old for New” program became important indicators for the development of WEEE management in China. Nevertheless, the shortcomings of these policies are found to coexist with the progress. This will be explored in the next section.

3.2 The shortcomings of the earlier WEEE policies in China

The analysis of the shortcomings of the earlier policies is based on the literature review of various academic papers such as Williams et al.(2010), Mo et al. (2009), Guo (2006), Hou (2004), Xu (2010), Hicks (2005), Wang (2008), and Albert et al. (2010), and some other academic reports, as well as, the interviews with the policy experts Professors Zhang Tianzhu and Li Jinhui. The analysis is summarized in accordance with the analytical framework developed in Chapter 2.

3.2.1 Upstream

- Absence or Vagueness of producer responsibilities

EPR is the key principle for WEEE recycling and resource recovery legislation (Alber et al., 2010). It is suggested by Lindhqvist et al. (2007) that an effective EPR program for products should at least have a reasonable method of distributing the recycling costs to historical products, differentiate between new and historical products, prevent the occurrence of new, orphan products and free-riders in general and provide incentives for Design for the Environment (DfE)²⁰ in new product development. Although the *Polluter Pays* principle has been mentioned as general and informative rule in the Law on Promotion of Cleaner Production of PRC, the Law on the Prevention of Environmental Pollution from Solid Waste, and the Technical Policy on Pollution Prevention and Control of WEEE, it is not explicitly articulated with a concrete EPR scheme. Particularly, for the policies of type 2, which are the policies mainly focusing on the end-of-pipe treatment of WEEE, producer responsibilities are neglected. For example, the Administrative Measures for the Recovery of Renewable Resources.

3.2.2 Midstream

- Absence of consumer responsibilities and compensation mechanism

Compared with the consumer responsibilities specified by EU WEEE Directive and HARL of Japan mentioned in Section 2.2.2, it is found that consumer responsibilities are excluded in almost all the earlier WEEE policies of China. Among them, only the Circular Economy Promotion Law of PRC stipulates that consumers are obliged to join in the recycling system. Otherwise, their actions could be considered illegal (Article 15).

The reason that consumer responsibilities are seldom included in the Chinese WEEE legislation was further explained by Zhang (pers. comm., Apr.24 2011). It is because of the fundamental difference between the Chinese WEEE system and the ones in developed countries. In China, ordinary people seldom discard WEEE outdoors, particularly large household appliances, as WEEE is viewed as potentially valuable resources by them. With the existence of the informal sector, most Chinese people either store the WEEE at home then wait for junk buyers to come for collection, or have them repaired and then reused or donated. Meanwhile, in developed countries, almost no informal sector exists and WEEE is more likely to be waste for consumers, so most WEEE is mixed with other waste in landfills or incinerators, or mixed metal recycling if this behavior is unregulated. Thus, according to Zhang (pers. comm., Apr.24 2011), there is less necessity to regulate consumer responsibilities in China than in developed countries.

- No collection mechanism

No specific collection strategies/mechanisms with compensations are mentioned in the earlier policies. Junk buyers as individual vendors become the main actors for WEEE collection in China, which provide higher payment for consumers and opportunities for jobless people (Albert et al., 2010). Meanwhile, they trigger market disorder and chaos due to lack of specified consumer responsibilities, collection mechanism with related compensations and low environmental awareness of consumers in China.

²⁰ DfE applies various design approaches to prevent hazardous impacts on human health and the environment of a product, process or service. A DfE program conveys information regarding safer substances for production, as well as best environmental practices. More information is available from Basic Information: Design for the Environment (DfE). US Environmental Protection Agency. Retrieved from <http://www.epa.gov/dfe/pubs/about/index.htm>.

3.2.3 Downstream

- No funding mechanism

Despite being a significant factor to solve among WEEE problems, the funding mechanism was seldom mentioned in the past policies. Only the Law on the Prevention of Environmental Pollution from Solid Waste states that a fund for pollution prevention programs should be included in the environmental protection plan of the government (Article 6). However, it is not clear how the money collected in the fund is to be used (Zhou, 2006).

- Recycling and disposal standards

The past WEEE legislation in China seldom states the concrete standards for WEEE recycling and disposal. Even though mentioned, they are more like general guidelines than practical provisions.

3.2.4 The whole framework

- Limited system coverage

The China RoHS concerns the upstream of the WEEE flow with focus on the design, import, production and sales of ICT equipment. It directly affects whether an ICT equipment can be put on the market (Huang, 2009). But it is a regulation only about ICT equipment and a large number of discarded household appliances are not covered (Albert et al., 2010)

The Administrative Measures for the Recovery of Renewable Resources provide specific rules on the recovery of renewable resources. The concrete provisions (Articles 8, 9 and 10) are about the recovery of valuable discarded metals but waste electronic products are briefly mentioned in the law. It is more like a policy on waste metals and not issued especially for WEEE management. It is similar to the Law on the Prevention of Environmental Pollution from Solid Waste. It classifies wastes into three categories: industrial, municipal and hazardous wastes. WEEE is naturally included in the solid waste but not specifically highlighted.

In addition, Figure 4 clearly shows that the three policies, prepared by different government agencies, cover different stages of WEEE management without unified policy principles. With this regard, WEEE problems are difficult to be solved at its whole life cycle.

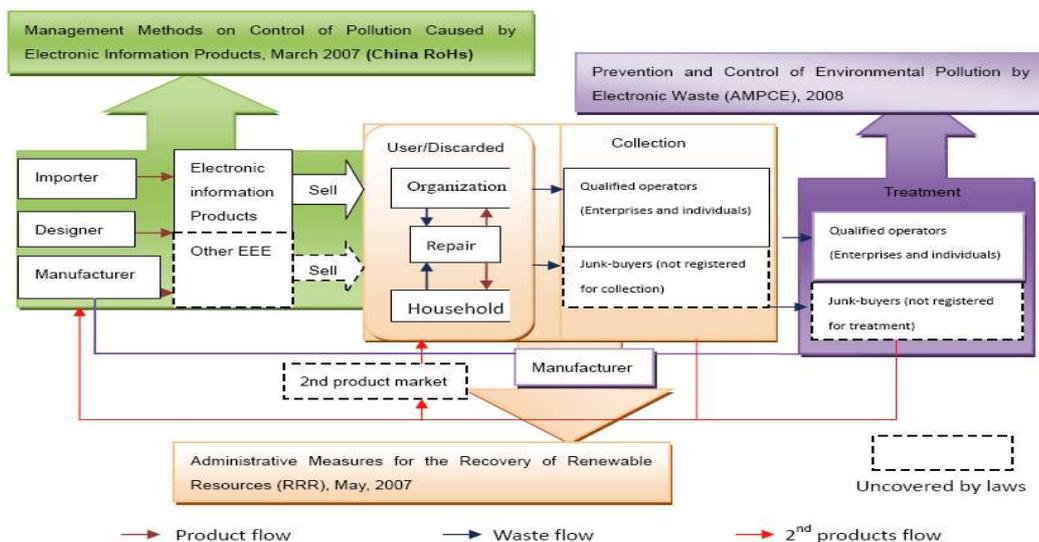


Figure 4 System coverage of three key WEEE policies in China
 Source: adapt from Wen and Jin, 2010

- *Weak administration and supervision*

The administration and supervision systems are weak for most of the earlier policies because of two main reasons. First, from a horizontal angle, a clear specification of respective responsibilities for related government agencies is missing. This can be explained by the fact that several governmental bodies are engaged in the formulation of WEEE legislation and follow-up within their own focus and territory (Zhou, 2006; UNEP & UNU, 2009). As can be seen from Table 2, several policies were issued by different ministries in China. For example, the China RoHS is governed by, in total, seven government agencies. Six ministries are involved in the implementation of the Administrative Measures for the Recovery of Renewable Resources. Among them, there is no overall platform to coordinate the whole administration and supervision work (UNEP & UNU, 2009). Secondly, from the hierarchal aspect, with the general policies issued by the central government, the provincial and municipal level governments may implement the policy according to their own interpretation of the policy. A strong administration and supervision scheme is thus difficult to enforce (Zhang, pers.comm., Apr.24 2011). For example, it has been mentioned above that the ban on WEEE importation was implemented in China in 2000. But, in reality, large amounts of WEEE are imported into China continuously (Shinkuma & Huong, 2009; Shinkuma et al., 2011). The main reason is that it is difficult for local authorities with their weak enforcement capacity to effectively restrict or prohibit WEEE trade driven by high profits (Zhang, pers. comm., Apr.24 2011; Williams et al., 2010).

- *A general perspective*

These policies based upon different policy principles play the roles as general guidance without specific mechanisms to make changes. 3R has been promoted vigorously in such policies that promote 3R (Manomaivibool, 2008), the Circular Economy Promotion Law is an example (Li, pers. comm., Apr.25 2011). It legitimizes, restricts and standardizes the second-hand EEE markets. It covers all aspects of household appliance circulation, including manufacturers, distributors, repair institutions, after-sales service institutions, recycling operators, and consumers. However, the Circular Economy Promotion Law is a general guidance both for EEE production and WEEE management. It is the same with the Law on Prevention and Control of Solid Waste, the provisions of which are general principles. There are no practical stipulations on the financial, technical and administrative aspects.

4 The characteristics of RAW

Within the analytical framework developed in Section 2.3, this chapter explores the characteristics of the Regulations for the Administration of the Recycling and Disposal of Waste Electronic and Electrical Products (RAW), which is often also referred to as China WEEE Directive. These characteristics of RAW demonstrate the breakthroughs of WEEE legislation in China and further tell how RAW tries to improve the shortcomings of the earlier policies as outlined in Chapter 3.

4.1 Introduction of RAW

RAW, the so-called China WEEE Directive, was enforced on 1 January 2011. As was mentioned in Section 3.1.2, it is the first WEEE-specific regulation in China as the second level legislation. The relevant provisions in the third level legislation are subject to RAW. Actually, the draft of RAW has been released for comments starting from 2004. On 25 February 2009, RAW was adopted by the State Council. It was enacted pursuant to the Law on Prevention and Control of Solid Wastes and the Circular Economy Promotion Law to regulate the recycling and disposal of WEEE in China, as well as, to promote the comprehensive resource utilization and the development of circular economy (Article 1). The China WEEE Directive was early considered as very important for the establishment of an entire management framework for WEEE recycling in China (Liu et al., 2006).

An almost two-year preparation period was given for RAW to be implemented on 1 January 2011. This transition period was decided by the government in order to have time for raising people's awareness on resource utilization and environmental conservation; determining the scope and the standards for the fund levy and its usage, the funding mechanism and so on; and the preparation of the supervising departments, as well as education of manufacturers, distributors, operators, and enterprises dealing with the recovery of WEEE (Central People's Government, 2009).

The implementation of the WEEE regulations will be carried out by local governments instead of the central administration, which should be in accordance with RAW (Yang et al., 2008). Local governments are expected to draft a detailed action plan to implement RAW according to their local conditions, but this is not mandatory (Li, pers. comm., Apr.25 2011).

4.2 The characteristics of RAW and its breakthroughs

4.2.1 The whole framework

- System coverage

As for the scope of RAW, RAW is limited to five major items of discarded household appliances (DHA) for mandatory recycling. These are televisions, computers, refrigerators, washing machines and air conditioners. These five items form the current scope of RAW, representing a significant percentage by volume and weight of the total WEEE produced by EEE users. The scope of RAW is determined and managed by the State Council, as shown in Figure 5. It might be possible for RAW to reduce or add certain items of DHA for mandatory recycling in the future. The scope of RAW is similar to HARL which originally covered the four largest sources of consumer WEEE in Japan (refrigerators, washing machines, TVs with CRT screens and air conditioning units). It should be noted that HARL was amended to incorporate LCD, plasma TVs and clothes dryers in 2008 (Aizawa et al., 2008).

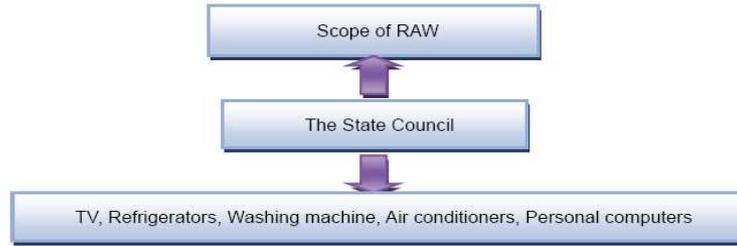


Figure 5 Covered electronic devices of RAW
 Source: Developed by the author

Figure 6 shows that RAW almost covers the whole stage (upstream, midstream and downstream) of the WEEE management system. It specifies the responsibilities of the manufacturers, importers, distributors, repair-shops of EEE, and operators and enterprises dealing with the recovery of waste electrical and electronic products as well as the administrative and supervisory role of the government.

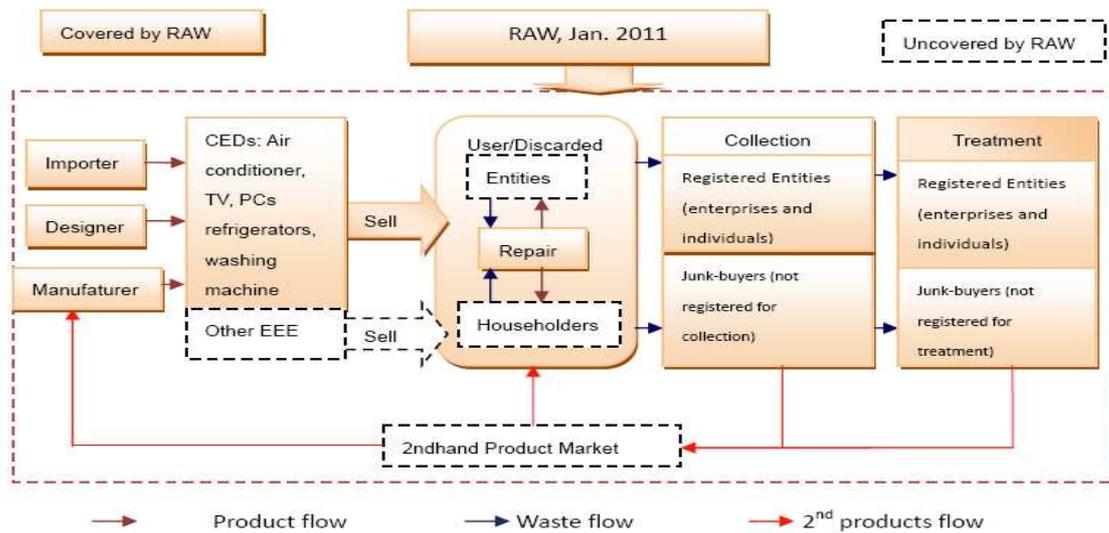


Figure 6 WEEE flow covered by RAW
 Source: Developed by the author

● Administration and supervision system

Like some earlier policies on WEEE management in China, RAW was jointly drafted by six ministries. Accordingly, the administration and supervision system in RAW is found in different ministries. As Figure 7 describes, the Ministry of Environmental Protection (MEP), the Ministry of Information Industry (MII) and the department in charge of comprehensive resource utilization are responsible for the formulation and revision of the scope, coordination of the implementation of RAW, as well as the supervision and administration of the disposal and recycling of WEEE. The Ministry of Commerce is in charge of the collection of WEEE. Other departments handling public finance, industry and commerce, quality supervision, taxation and the like are responsible for the administration to the extent of their functions (Article 4). Article 20 states that department of the State Council is responsible for comprehensive resource utilization and quality supervision. The Ministry of Environmental Protection and the Ministry of Information Industry should formulate related policies and technical specifications with respect to the disposal of WEEE. Provincial environmental protection bureaus shall cooperate with the departments of the same level in charge of

comprehensive resource utilization, commerce and industry and information technology to develop programs for the disposal of WEEE for their local regions. The provincial environmental protection bureau should report to the Ministry of Environmental Protection on local WEEE treatment plans (Article 21).

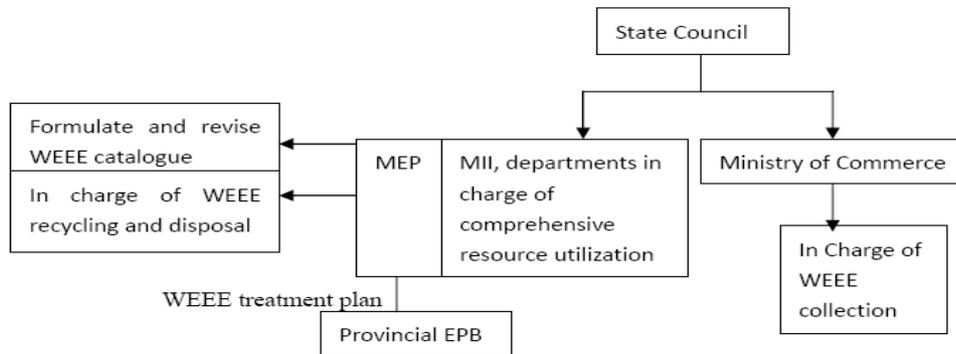


Figure 7 Administration and supervision system of RAW
 Source: Developed by the author

4.1.1 Upstream

- Producer responsibilities

Similar to EU WEEE Directive, RAW specifies more concrete and clear responsibilities for producers. It also legislates that producers shall cover the costs of collection, recycling and disposal (Article 7). Producers are required to use designs beneficial to recycling, choosing non-toxic non-hazardous substances and recyclable materials and adopt plans favorable to comprehensive resource utilization and innocuous disposal. Appliance distributors and service providers will also be obliged to collect WEEE from consumers (Article 10). Producers should also provide product information to aid recycling (Article 11).

4.2.1 Midstream

- Consumer responsibilities

As in earlier policies, consumer responsibilities are not included by RAW, either. This is further discussed in Section 6.3.

- Collection mechanism

Instead of setting standards on collection, RAW encourages all institutions and individuals to join the collection network in China. The multi-channel collection network was proposed by RAW (Article 5) as mapped out in Figure 8.

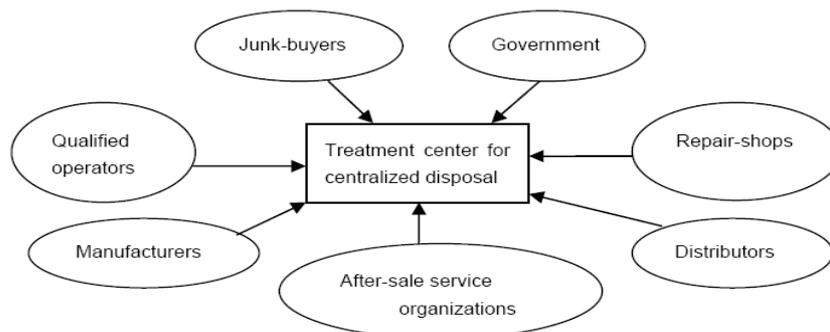


Figure 8 The multi-channel collection network proposed by RAW
 Source: Developed by the author

The reasons for RAW to adopt the multi-channel collection model are two. One is to take full advantage of current operators in the existing collection systems, since China has spontaneously formed some relatively fixed collection channels; particularly the model of “junk buyers pay and consumers sell” (Zhang, pers. comm., Apr.2011; Albert et al., 2010). A high percentage of WEEE in China was collected by junk buyers and then resold to informal WEEE treatment sector (Ye, 2007). The system saw some changes as new collection channels established by the “Old for New” program. The latter has led to that a significant amount of WEEE has been recycled by selected qualified operators, in cooperation with EEE manufacturers and distributors for WEEE collection and treatment. In light of the existing collection systems, it is difficult to establish new systems and might be costly to move to a new system (Zhang, pers. comm., Apr.24 2011). The other reason is that convenient and efficient recovery services are required by the huge number of Chinese people, due to the vast territory and large quantity of household appliances. Thus, all channels for WEEE collection should be applied in China.

In addition, RAW also standardizes the informative responsibilities of repair-shops and after-sales service institutions in the midstream. It requires that disposal and recycling information for WEEE must be provided to consumers at repair-shops and after-sales service locations (Article 11).

4.2.2 Downstream

- Funding mechanism

The funding mechanism of RAW is one of the most important breakthroughs of Chinese legislation for WEEE management. It is the first regulation that provides the financial resources to WEEE treatment, which remained to be solved in the past legislation. Similar to EU WEEE Directive, RAW stipulates that EEE manufacturers, consignees of imported electrical and electronic products, and their agents have obligations to make payments to the fund for WEEE collection and treatment. The fund is established to provide subsidies for qualified operators, considering the expenses of recovering and disposing of WEEE (Article 7). However, fundamentally different from the European systems with Producer Responsibility Organizations (PROs) as described in Section 2.2.3, the fund covered in budget will be collected, administrated and allocated mainly by the Ministry of Finance (Figure 9). A detailed sub-regulation on the funding mechanism will be formulated with specific rules on its collection, use and administration. The levy level for the fund will solicit the opinions of manufacturers, qualified operators, relevant industrial associations and experts (Article 7).

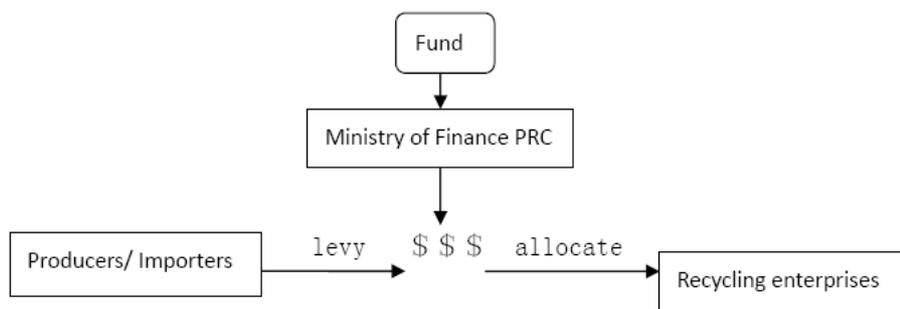


Figure 9 Funding mechanism of RAW

Source: Adapted from Wen & Jin, 2010

● Recycling and disposal standards

Compared with earlier policies, RAW specifies more concrete divisions of responsibilities and obligations related to the recycling and disposal of WEEE in China.

- 1) Government agencies, social organizations, enterprises and institutions should deliver WEEE to qualified disposal centers, and the assets write-off procedure should be followed as required (Article 13);
- 2) A licensing scheme should be applied for WEEE disposal. Any recovered WEEE that is resold after repair should meet mandatory requirements as stipulated in national technology specifications (Article 12);
- 3) Disposal of WEEE should comply with state requirements for comprehensive resource utilization, environmental protection, labor safety and human health safeguards; Obsolete technology and process as announced shouldn't be applied (Article 15);
- 4) Regular environmental monitoring system and information management system should be set up by disposal enterprises (Article 16).

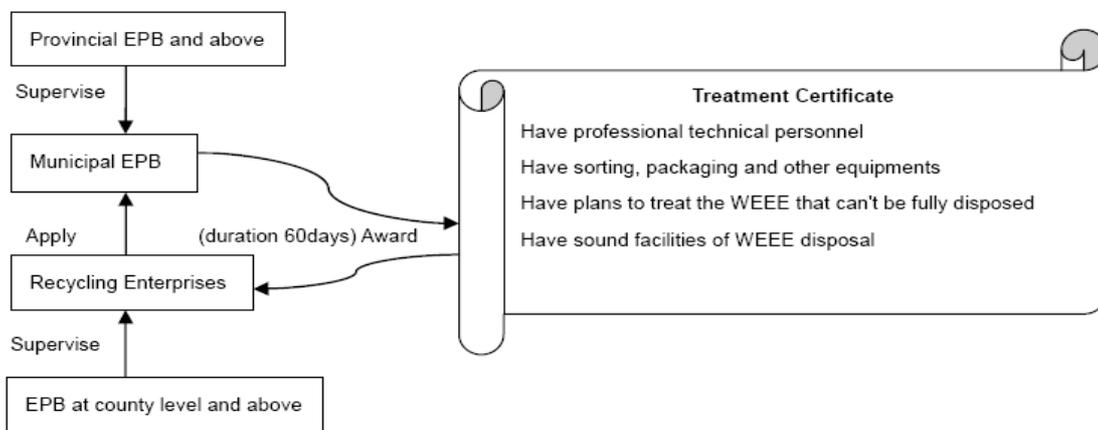


Figure 10 The licensing scheme of RAW

Source: Developed by the author

Particularly, it further restricts informal WEEE operators to engage in the dismantling, extracting of raw material, utilization, and disposal of WEEE. A licensing scheme (Figure 10) is to be employed for the end-of-pipe treatment of WEEE, which allows the final treatment of WEEE only by qualified operators. Unqualified operators could face strict fines ranging from RMB 50,000-500,000 (Euro 5,000-50,000) (Article 28). The licensing scheme is based on the sub-regulation of RAW, the Administrative Methods of WEEE Treatment Qualification, which was launched in the end of 2010. To apply for a treatment certificate, a recycling enterprise should submit specified application materials to the municipal environmental protection bureau (Article 8). The municipal environmental protection bureaus shall release the information provided by the recycling enterprises for more than 10 days, in order to collect public opinions or comments (Article 9). The procedure for the application should be completed in 60 days, within which the municipal environmental protection bureau shall go to the enterprise for onsite checking (Article 10). Article 19 stipulates that licensed enterprises should set an annual monitoring plan for emissions, which should be checked at least once in every half year by the environmental protection bureaus at county level or above.

The main purpose of the licensing scheme is to ensure safety and the environmentally sound processing of WEEE and solve the particular problem that: qualified WEEE operators pay more for WEEE because of the expenses of environmentally sound processing, which makes

it difficult for them to compete with informal recyclers who tackle WEEE with limited environmental protection measures at lower cost.

As above, the characteristics of RAW and some of its breakthroughs have been indicated. In order to know how RAW is met by the stakeholders in China, a stakeholder analysis is conducted in Chapter 5.

5 Stakeholders Analysis

This chapter presents the current development of WEEE management in China and the reflections of various stakeholders, including local governments, EEE manufacturers, qualified operators, informal WEEE operators and consumers in different areas of China. Based on the reflections the paper displays the latest picture of WEEE management in China, in order to analyze the concerns and challenges for the implementation of RAW in the next chapter.

5.1 Local governments

The reflections of local governments on RAW is based on the interview with an anonymous officer in Shanghai Environmental Protection Bureau (SEPB) in March of 2011, together with the review of a series of media reports on local WEEE management.

5.1.1 Reflections of SEPB

According to the personnel at Shanghai Environmental Protection Bureau (SEPB), for Shanghai, the local WEEE-specific regulations will be launched by the end of 2011. As a way to implement RAW, the local regulations will strictly follow the provisions of RAW. SEPB is relatively more confident for the implementation of the local regulations according to RAW, as there are fewer difficulties on WEEE management in Shanghai for several reasons (anonymous officer, pers. comm., Mar.5 2011). First, compared with some coastal cities in China, which receive huge amount of WEEE, Shanghai has a rather smaller scale of informal sector. Second, Shanghai has the largest number, eight, of AWTCs (Authorized WEEE Treatment Companies) in China. The WEEE treatment market is developing very fast in Shanghai currently. In other words, Shanghai is the most active city on WEEE management in China and more capable of WEEE treatment according the laws than any other city in China.

But it is difficult to answer if the whole volume of WEEE generated in Shanghai can be well treated by the AWTCs, as exact data on the WEEE volume is unknown (anonymous officer, pers. comm., Mar.5 2011). It was reported by China Household Electrical Appliances Association [CHEAA] in 2008 that more than 100,000 tons of WEEE are produced per year in Shanghai including nearly 8,000,000 units of household electronic appliances. Meanwhile, according to SEPB, there were seven AWTCs in Shanghai in 2009 and eight by spring 2011. In 2009, the general treatment capacity of these seven AWTCs for household WEEE (computers, refrigerators, air conditioners, washing machines and TVs) is 57,000 tons (equivalent to 1,981,000 units) and 21,000 tons for industrial WEEE per year (SEPB, 2010a). Assuming that the estimation of the WEEE volume in Shanghai is correct, it is clear that the WEEE treatment capacity in Shanghai is still far from sufficient to meet the volume of WEEE, which is also rapidly increasing.

Nonetheless, the WEEE treatment in Shanghai saw significant achievements since the implementation of the "Old for New" program in 2009. According to the data provided by SEPB, the seven AWTCs dealt with 22,000 tons of all kinds of WEEE in 2009, threefold the figure of the previous year. 517,000 units discarded household appliances (DHA) were recycled and treated in 2009 by three AWTCs selected for the "Old for New" program in Shanghai. Up to 30 January 2011, 4,428,646 units of DHA have been recycled by five AWTCs in Shanghai, and 99.13% of them (4,390,337 units) have been safely treated and treatment of the rest was to be continued (SEPB, 2010a).

It is told that the main WEEE issue in Shanghai is not the end-of-pipe treatment of WEEE but WEEE collection in the midstream (anonymous officer of SEPB, pers. comm., Mar.5

2011). Due to lack of collection network, a significant amount of WEEE does not reach AWTCs and the amounts of WEEE handled in the AWTCs were below their treatment capacity. Currently, there are two forms of WEEE collection in Shanghai: free collection and paid collection. Free collection is led by the government organizations in Shanghai. In May 2007, SEPB together with other three other governmental departments in Shanghai announced the Notice on WEEE Disposal and Recycling for Governmental Organizations. It is the first WEEE regulation that stipulates that all governmental departments in Shanghai should deliver their WEEE to qualified operators free of charge. The cost of WEEE disposal and recycling should be covered by the qualified operators.

5.1.2 Some other regions in China

Various WEEE management situations and related projects being planned or constructed in different provinces in China are frequently reported by the media or local governments in China.

1 Guiyu, Guangdong Province

As it has been briefly introduced in Section 1.1, Guiyu is renowned for being the largest center of informal WEEE treatment in China. It receives and treats huge amounts of WEEE from developed countries and other areas in China. In 2006 more than 300 private enterprises, 5,500 household workshops, and 60,000 workers were involved in WEEE recycling in Guiyu, recycling about 1.5 million tons of valuable resources (Lai, 2009).

According to Mr. Chen Xishi (2010), Town Secretary of Guiyu, a pilot project for the development of a recycling center was to be set up in Guiyu by the National Development and Reform Commission in 2005. The pilot project is to integrate the informal sector and construct a formal WEEE treatment center in Guiyu. The treatment center will be organized with four zones: disposal zone, recycling zone, pollution control zone and project management zone. Besides, the pilot program is to build an incineration power plant with daily treatment capacity of 600 tons and a water treatment plant to treat 30,000 tons of water per day. Each project will occupy 70 mu²¹ (4.732 hectares) in Guiyu. The locations for these projects have been marked and particular environmental evaluations have been done.

However, lack of financial support is the key obstacle to complete these projects. The construction of these projects is budgeted for nearly RMB 1 billion (Euro 0.1 billion) but the Guiyu government could only afford less RMB 10 million. For the investment of the pilot program, Guiyu has come to agreement with a famous enterprise in the Guangdong province, Guangye Group. But the local government of Guiyu is still searching for the remaining financial support from all social levels. Since the launch of RAW, it is recognized that RAW will bring an excellent opportunity for Guiyu for securing the funding. It is suggested that the administrative methods of the fund should be announced by the central government as soon as possible.

2 Wuhan, Hubei Province

In March 2009, it was reported that the first WEEE collection shop in China was opened in the Lvjingyuan Community in Wuhan, Hupei Province. As a new WEEE collection model, the shop opened in the community pays RMB 2 per kg for DHA (discarded household appliances) sellers. The shop was paid by investment from Shenzhen GEM²² High-Tech Co., Ltd, supported by the local government. It is planned that 20 collection shops in Qingshan

²¹ 1 mu = 0.0676 hectares

²² GEM (Green Eco-Manufacture) is a high technology enterprise specialized in resource recovering and recycling in China. GEM currently runs five large-scale industrial eco-parks and three WPC factories in southeast China, covering a total area of 198 acres. Please visit <http://www.gemhi-tech.com/en/index.html> for more information.

District and 300 collection shops will be opened in Wuhan within two years (Xiong et al., 2009).

3 Fengcheng, Jiangxi Province

In June 2010, the opening of a WEEE collection shop in Fengcheng city, Jiangxi Province, symbolized the first initiative for WEEE management of Jiangxi Province. Fengchen is one of the famous WEEE trade centers in China. Around 50,000 people work for the WEEE industry there. The collection shop was also paid by GEM in cooperation with Jiangxi government. GEM together with Jiangxi Province is planning to build a 10 km² WEEE recycling base with RMB 0.3 billion (Euro 0.03 billion) investment in the Jiangxi Province. Its annual WEEE treatment capacity will reach 50,000 tons (CHEAA, 2010).

4 Haikou, Hainan Province

It was announced by the Commerce Bureau of Haikou in March of 2011 that Haikou (the capital city of Hainan) is planning to build a comprehensive collection network in its communities. By 2015, 90% of the recyclers will be covered in a regulated system; all communities in Haikou will be provided formal collection facilities; 95% of WEEE in Haikou is expected to flow to licensed treatment centers; and the recycling rate should reach 80%. During 2010-2011, 259 collection points, three treatment centers, and two collective trading markets will be established, with investment of RMB 194.42 million (Euro 19.442 million). All the collection facilities, trading markets and treatment centers could be in the form of franchise chain. For those companies involved in WEEE final treatment, related subsidies will be provided to them. In addition, specific training will be delivered to their workers (Guang, 2011).

5 Yunnan Province

The first WEEE recycling center in the Yunnan Province, the Koolong bay WEEE recycling center was completed in the end of 2010, with RMB 0.12 billion (EUR 12 million) investment. It is one of the six recycling centers planned by the Yunnan government (Miu & He, 2010).

As above, the WEEE recycling projects led by local governments together with some enterprises show the active responses to WEEE issues in China. With the potential influences of the WEEE-specific policies, among them RAW being a key one, the regulated WEEE market is developing and expanding in China.

5.2 Qualified operators

In order to know the reflections on RAW from formal recycling sector, the author has attempted to reach the eight AWTCs in Shanghai. Seven of them (Table 4) accepted to take part in a semi-structured interview. It should be mentioned that two AWTCs (Shanghai Meixuan Environmental Technology Co., Ltd and Huafu (Shanghai) Environmental Protection Technology Co., Ltd) in the table mainly deal with industrial WEEE and not discarded household appliances.

Table 4 Seven AWTCs interviewed in Shanghai

No.	Company	Treat capacity	Founded in	Investment	Employee
1	上海新金桥环保有限公司 Shanghai Xinqiniao Environmental Co.,Ltd	1200,000units	2000	N/A	N/A
2	上海电子废弃物交投中心有限公司 Shanghai Central WEEE Co.,Ltd	N/A	2004	N/A	N/A
3	伟翔环保科技发展(上海)有限公司 TES-AMM Shanghai	10000T	2005	N/A	N/A
4	鑫广再生资源(上海)有限公司 Xinguang Recycling (Shanghai)CO.,Ltd	5000T	2006	12000,000US\$	N/A
5	上海美萱环保科技有限公司 Shanghai Meixuan Environmental technology Co.,Ltd	0	2008	50,000-100,000Euro	50-60
6	华福(上海)环保科技有限公司 Huafu (Shanghai) EnvironmentalProtection Technology Co., Ltd.	0	2008	12500,000US\$	50-60
7	森蓝环保(上海)有限公司 Sunland Environment Shanghai Co.,Ltd	600,000 units	2009	300,000Euro	>100

Source from: SEPB, 2010b

The questions for the semi-structured interview for the AWTCs are listed as below:

Q1. Have you heard about RAW and how do you perceive it?

Q2. Are you ready to apply for the new treatment licenses?

Q3. Does the launch of RAW change your businesses plan?

Q4. Will you apply for the fund levied by RAW? If you get the fund, how will you use it?

Q5. What is the main problem connected with disposal and recycling of WEEE for your company?

Q6. How do you collect WEEE? What is the main approach for the collection?

For Q1, all the principals²³ of the AWTCs interviewed have heard about the regulation after the draft RAW was released in 2004 and particularly from the local governments. They agree that RAW will re-shape the WEEE industry tremendously and they will be the first ones to share the growing WEEE market in China.

Regarding the preparation for new license application on WEEE treatment (Q2), AWTCs are in different status.

- “Old” AWTCs (Shanghai Xinjinqiao Environmental Co., Ltd and Shanghai Central WEEE Co., Ltd) are confident and ready for the application as soon as the sub-regulation is launched, as they entered the market relatively early and currently have a large WEEE market share.
- “Young” AWTCs (Sunland Environment Shanghai Co., Ltd and TES-AMM Shanghai) are less confident but ready for a new license application. They regard their small-scale WEEE treatment as an advantage, compared with newcomers.
- Newcomers (Shanghai Meixuan Environmental technology Co., Ltd and Huaifu (Shanghai) Environmental Protection Technology Co., Ltd.) who were just listed as AWTCs in last two years, are not confident but they are planning for the application. As they are unsure how the local sub-regulation will look like, they are just trying to follow current policies to treat WEEE properly and continuously to improve the treatment technology to meet application standards.

For Q3, all these AWTCs answered that they were planning to expand their business on WEEE treatment. The approaches for WEEE business development mentioned by AWTCs are outlined in Figure 11.

²³ See the list of the interviewed principals from the seven AWTCs at the end of the paper (personal communication section).

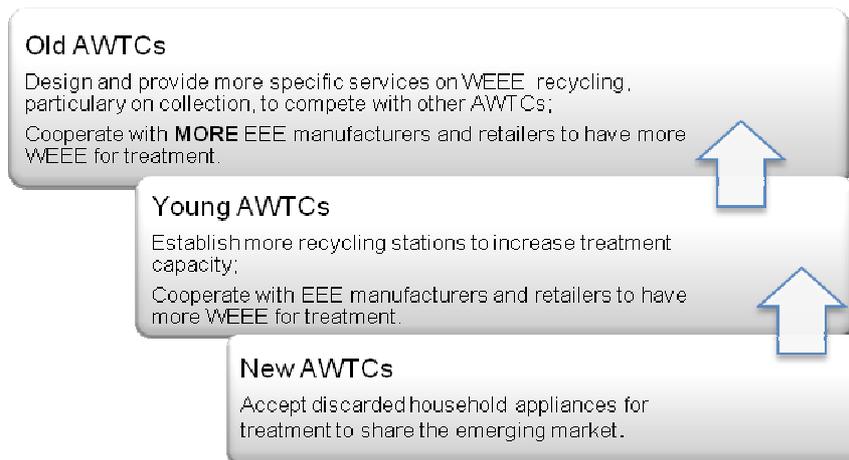


Figure 11 The business development approaches of AWTCs

Source: Developed by the author

“New” AWTCs who only treat industrial WEEE containing precious metals from manufactures are planning to expand their business to the recycling and treatment for discarded household appliances. Old AWTCs responded that they will put in more investment in technology to improve treatment efficiency and expand their WEEE business to an even larger scale. For instance, Xinguang Recycling (Shanghai) Co., Ltd has already built six recycling stations outside Shanghai. The establishment of more stations is under planning. Besides, Xinguang is in discussion with some big EEE producers like Sony in China for cooperation.

For Q4, the author was told that the fund set by RAW is absolutely welcome. But a fund is actually not the main issue for these big AWTCs. All of them expressed that they may survive in the market without subsidies. But in order to expand their business, they still need to apply for the fund set by RAW. The reasons are found under Q5.

For Q5 and Q6, WEEE collection is the most common and main concern of these AWTCs. It is well recognized that the WEEE collection network has not been formed and the construction of the network is very costly. Although these AWTCs have relatively less financial stress, huge funds will be needed to set a comprehensive collection network to have more WEEE collected. As for the collection approaches of these AWTCs, they can be summarized in the following four ways.

1. Feed in by EEE retailers forced by the “Old of New” program. To date, there are five AWTCs on Table 4 that have been selected for the “Old for New” program. It means that all the replaced household appliances have to be sent to these five AWTCs. This has become the main source of WEEE for these AWTCs. It has significantly reduced the gaps between the actual amounts of treated WEEE and the treatment capacity of these AWTCs in the past years. They have come close to reach their treatment capacity.
2. Voluntary submission of WEEE from governmental organizations. For example, Xinguang Recycling (Shanghai) Co., Ltd became one of the receptors for the WEEE from Shanghai governmental departments, thanks to the launch of the Notice on WEEE Disposal and Recycling for Governmental Organizations in 2007. Also, Shanghai Xinjinjiao Environmental Co., Ltd provides online services for WEEE submission from all the governmental organizations in Pudong District, Shanghai.

3. Collection by setting collection facilities in local communities. For example, Sunland Environment Shanghai Co., Ltd has set up a few community collection facilities in Shanghai. However, as the establishment of community recycling facilities requires high investment (mainly due to the expensive land rent in Shanghai), it is still difficult to see the community facilities in most areas of Shanghai. It was also told by Xinguang Recycling (Shanghai) Co., Ltd that community recycling facilities are what they really want to build but they still are unaffordable for them.
4. Collection by providing online and hotline services. It is common that online and hotline services are provided mainly for WEEE collectors by AWTCs, which allow AWTCs to collect WEEE from WEEE collectors with a considerable amount of cost saving on logistics. Few of them provide the services to individual households only to collect one or two pieces of discarded household appliances.

5.3 Informal recycling sector

Taizhou, an important harbor city on the southeast coastline of China, is famous for informal recycling of WEEE. A large amount of international goods is coming in and out of the harbor in Taizhou, together with illegal WEEE import and trading. It is among the most serious and active cities involved with informal WEEE recycling and trades. A large amount of informal recyclers in the area are conducting WEEE dismantling and material recovery (Wang, 2008).

In order to get views from the informal sector, the author interviewed an owner of a self-employed firm in Taizhou, Mr. Huang. Mr. Huang's firm mainly deals with discarded mobile phones illegally in Taizhou, with investment nearly RMB 1 million (Euro 0.1 million). Mr. Huang answered the following questions:

1. *Have you been impacted by the past WEEE policies?*
2. *What kind of WEEE do you treat? Where and how do you collect them?*
3. *Do you know of RAW?*
4. *What will you do when RAW is implemented?*
5. *How much you will lose if you have to leave this industry?*

First, it is told that the informal sector for WEEE treatment in Taizhou have been more and more regulated in the past years due to relevant policies in the past several years. Mr. Huang and his counterparts have been supervised more frequently by the local government. Nevertheless, the informal sector in Taizhou is still there without any reduction on its scale. Usually, the doors of the informal operators are closed when the officials come and opened after they go away. It is because the local government has not tried to restrict the informal sector by banning the business as they are very easily to be bribed by local informal recyclers.

Mr. Huang responded that he has not been informed about RAW and it would most likely be the same for most of his counterparts in Taizhou. However, Mr. Huang appeared to be unworried about the implementation of RAW. The reason is that mobile phones have not been covered by RAW for mandatory recycling. For the collection of WEEE, Mr. Huang answered that the discarded mobile phones in his firm are usually collected from different regions in China by his own employees and almost half of them are imported from abroad. The collection cost is relatively low compared with the high profit.

5.4 EEE manufacturers

In this part, the WEEE treatment strategies and attitude towards RAW of the main EEE manufacturers in China are explored, by reviewing relevant media and academic reports as

well as interviewing with the related persons²⁴ in the main EEE manufacturers including Haier Group, Changhong Electric Co. Ltd and TCL Corporation.

● Haier

Occupying 5,500 square meters of factory building in Qingdao, Shandong Province, Haier has risen to be world's No.1 brand of consumer appliances and has more than 70,000 employees around the globe. It realizes a turnover of RMB 135.7 billion (EUR 13.57 billion) in 2010 (Haier, n.d.). In 2004, Haier chose to join the national pilot project²⁵ launched by the National Development and Reform Commission (NDRC) for WEEE treatment in Qingdao, becoming the first to develop itself as a recycling economy enterprise in China. Actually, Haier has stopped to use any hazardous substances for EEE production since 2007 (Liu, pers. comm., Mar. 10 2011). Over the years Haier gradually recovered all kinds of discarded home appliances handled 20 million units per year initially and its operation reached 60 million units per year eventually. In 2009, Haier recycled 574 tons of copper, 12,000 tons of iron, 540 tons of aluminum and 2, 760 tons of plastics (Haier, 2010). With the disassembling line reaching the leading domestic level, Haier project aims to build China's first national green demonstration base for recycling waste household appliances (Gong, pers. comm., Mar.10 2011).

● Changhong Electric Co. Ltd

Locating in Mianyang, Sichuan Province, Changhong Electric Co. Ltd is a key household electric appliance manufacturer and distributor based in China, with around 60 years history. Changhong produces TVs, air conditioners, refrigerators, mobile phones, etc. It has been the No.1 TV sellers in the Chinese market for the last seventeen years. One-third of Chinese families are using Changhong TV. Changhong reaped RMB 116 million in net profit in 2009, an amount 3.72 times the amount it earned in 2008. In 2009, the firm sold RMB 12.53 billion worth of TVs, and its sales of air conditioners and refrigerators totaled RMB 5.98 billion (Changhong, n.d.). The most important development in relation to recycling is the establishment of Changhong Engineering Technology Center in early 2008, focusing on the research and the application of waste home appliances recycling technology as well as green design. In the same year, Changhong built the first cathode ray tube (CRT) recycling line in China, with subsidies of RMB 6 million from the Ministry of Industry and Information Technology, Ministry of Science and Technology, and Sichuan provincial government. It has become the largest waste home appliances recycling base in the Western China (ChinaCSR, 2008). In 2010, Changhong invested RMB 5 billion to build the largest WEEE treatment center called Changhong Gerun Recycling Co., Ltd in Sichuan province. Changhong Gerun is to equip six treatment lines, with treatment capacity 2 million units per year. It will mainly deal with the five household electrical appliances regulated by RAW (Baiinfo, 2010).

● TCL Corporation

TCL Corporation, established in 1981, is a global leader and technology innovator in consumer electronics, mobile communications and home appliances. TCL employs 51,673 people in over 80 operations, including 18 R&D centers, 20 manufacturing bases, and more than 40 sales offices around the world. With 2009 global sales of USD 6.49 billion (including 14.28million TV sets and 16.12 million mobile handsets), and serving more than 100 million consumers worldwide, TCL is currently comprised of four business divisions: multimedia, communications, home appliances and technology electronics (TCL, n.d.).

²⁴ Please see the details of the interviewees at the end of paper (personal communication section).

²⁵ Please refer to the details of the national pilot project in the paper of Huang Zhen (2009).

In 2009, to pursue pollution-free recycling as well as treatment and utilization of waste home electronic products, TCL together with O'Meet who is widely renowned for its advanced technology in the treatment of discarded home appliances initiated their joint efforts toward the recovery and treatment of waste from home appliances in Tianjin, by leveraging TCL's advanced modern corporate management system and powerful capital operation capacity, and O'Meet's extensive experience in environmental protection and mature dismantling and recovery technologies. This project is expected to be completed in 2012 with total investment RMB 30 billion (Euro 3 billion) (China Electronics News [CEN], 2009). According to the CSR report of TCL (2011), due to the involvement in the "Old for New" project, TCL enjoyed remarkable strength in retail sales of home appliances and sold 30 million units of household appliances and recycled 31.109 million units in 2010. In the same year, TCL started to establish two environmental protection companies for WEEE treatment. One is TCL Huizhou Environmental Protection Co., Ltd in Huizhou, Guangdong province, occupying 130,000 square meters with annual treatment capacity of 150,000 tons for hazardous waste and 20,000 tons for WEEE. The other one, TCL-AOBO Environmental Protection and Development Co., Ltd., is located in Tianjin, Hebei Province, with the territory of 280,000 square meters. TCL-AOBO will be a high-tech environmental protection venture. The company will also import equipment and technologies from Japan and Europe to build a world class waste electronics and electrical appliance disposal enterprise. Its treatment capacity is 100,000 tons (3,000,000units) initially and will reach 300,000 tons per year eventually. The company started to work on 13 April 2011 (Shi & Kang, 2011). These two WEEE treatment bases are expected to provide 400 jobs, produce 37,840 tons of iron, 3,220 tons of copper, 2,374 tons of aluminum, reduce 327,000 tons of industrial WEEE, 6,640 tons of SO₂ emission and save 2,480,000 tons of coal in 2011 (TCL, 2011).

The implementation of RAW brings opportunities for increasing business on WEEE treatment. But concerns arise among the household EEE manufacturers in China. The reason is that competition in the business of domestic electric appliances is extremely intense in China and the profit per household appliance is usually trivial (Gong, pers. comm., Mar.15 2011; He et al., 2006). These EEE manufacturers are worried that a possible result for the EPR in RAW will cause an increase of the unit prices of the products, as manufacturers will be levied for providing financial resources for WEEE treatment. As mentioned by these EEE manufacturers, they are likely to struggle with the increasing product prices because of fierce competition. One option for them is to try to expand their business to WEEE treatment, as a way to recover parts of the money required by the government to be used for WEEE treatment. TCL is a good example.

5.5 Consumers

In order to know the reflections of EEE users, the author joined E-waste Civil Action Network (ECAN²⁶) in Beijing for the undergoing community survey project during April of 2011. The data for the community survey was collected by the volunteers of ECAN and the author worked with data processing. The author is encouraged by ECAN to use the related data in this paper. The community survey was aimed to map out people's choice on WEEE collection, the public awareness of WEEE issues and their consensus on RAW. The survey was conducted in four communities in Beijing in April of 2011. The four communities are Juer Community, Dongsibatiao Community in Dongcheng District, Zhonghaifenglian Community in Haidian District and Dachenggang community in Xicheng District. The reason to choose these four communities is that citizens there are assumed to have higher environmental awareness than the people in other communities, as they have held various

²⁶ ECAN was formed in 2010 and organized by a group of young people from various NGOs in China, including Greenpeace Beijing, GSEAN, Friends of Nature, etc.

activities for the education of environmental protection some months ago (Lai, pers. comm., Apr.10, 2011). In total 346 questionnaires were delivered and 342 of them were collected.

Figure 12 shows basic information about the interviewees. It should be noted that 35.7% of the interviewees are in the range of 41-65 years old and 27.7% of them are above 65 years old. The fact in China is that these "elder people" normally have relatively low education, such as high school, junior school, elementary school and below. On the other side, most interviewees at 18-40 years' age (34.7% of the interviewees) actually have rather high education. It means that the 49.3% of the interviewees with education from colleges, universities and research institutions are dominated by people in ages from 18 to 40. How age and education are related to the community survey is further discussed in Chapter 6.

Basic Information of the interviewees								
Age (Years Old)		%	Gender	%	Monthly Income(RMB)	%	Education	%
7-17		1.9	Male	47	<1000	5.7	elementary school and below	7.2
18-40		34.7	Female	53	1001-2000	21.7	Junior school, high school, technical secondary school	43.5
41-65		35.7			2001-3000	33.1	colleges, universities or reseach institutions	49.3
>65		27.7			3001-5000	20.6		
					5001-10000	13.5		
					>10000	5.3		

Figure 12 Basic information of the interviewees
Source: data from ECAN

The main survey questions and the results are shown as below.

● Questions

- Q1. To what degree do you agree that WEEE could be hazardous to the environment?
A. Highly agree B. Agree C. Disagree D. Highly disagree
- Q2. To what degree do you agree that WEEE could be hazardous to the human health?
A. Highly agree B. Agree C. Disagree D. Highly disagree
- Q3. To what degree do you agree that discarding WEEE does not mean a waste of resource?
A. Highly agree B. Agree C. Disagree D. Highly disagree
- Q4. What is the main consideration for you regarding the treatment of WEEE?
A. If it is collect by qualified operators B. If it is hazardous to the environment
C. If it could be recycled safely D. If it can be collected at my door
E. If the price provided by collectors is satisfying
- Q5. How do you usually deal with discarded household appliances?
A. Join "Old for New" program B. Sell to qualified operators
C. Sell to secondhand market D. Sell to junk buyers
E. Donate F. Store at home
G. Discard somewhere H. Others
- Q6. Do you know when RAW was implemented in China?
A. 1992 B. 2005 C. 2011 D. don't know
- Q7. Where did you hear about RAW?
A. Newspapers and TV B. Governmental propagation
C. Websites D. Friends and relatives
- Q8. To what extend to you agree that if WEEE treatment is to be by producers?
A. Highly agree B. Agree C. Disagree D. Highly disagree

Q9. Do you think it is reasonable if consumers are required to pay for WEEE treatment?

- A. Very reasonable
- B. Reasonable
- C. Unreasonable
- D. Extremely unreasonable

● Results

Results of Question 1, 2, 3 are shown in Figure 13. It indicates that WEEE issues have been widely recognized by the interviewed residents in the four communities in Beijing. More than 75% of the interviewees highly agree that WEEE is both hazardous to human health and the environment.

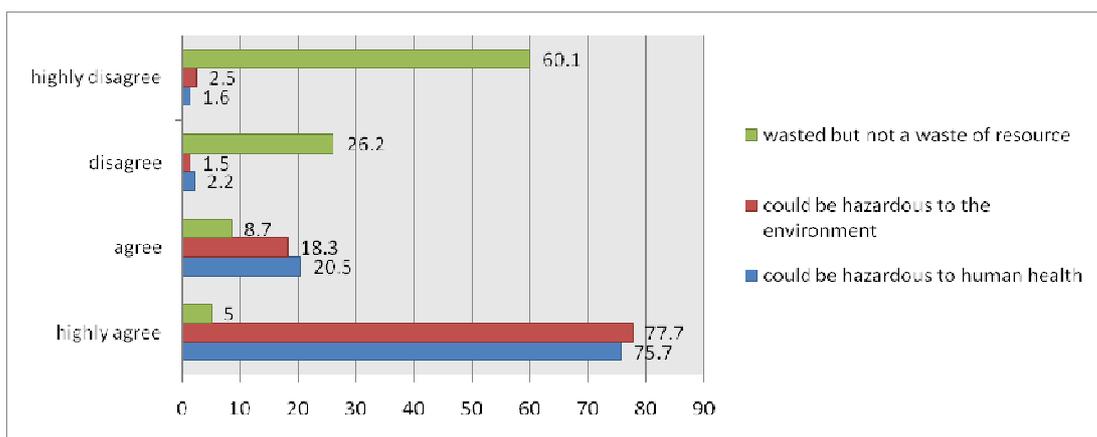


Figure 13 The interviewees' awareness on WEEE issues (%)

Source: Data from ECAN

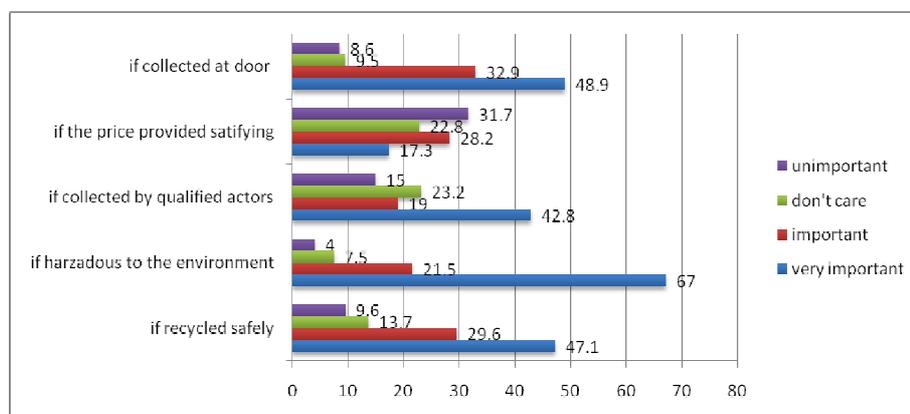


Figure 14 The interviewees' considerations to deal with WEEE (%)

Source: Data from ECAN

Figure 14 illustrates the answers of Question 4. It indicates that most people (88.5%) consider environmental issues to be the reasons for proper treatment of WEEE. 61.8% of them agree that it is important to have discarded household appliances (DHA) collected by qualified operators. In addition, 76.7% of them care about if DHA is recycled safely. It means that the people in the four communities have reasonably high environmental awareness. Meanwhile, 81.8% of interviewees seem to view convenience as an important factor for them to be motivated to handle WEEE properly.

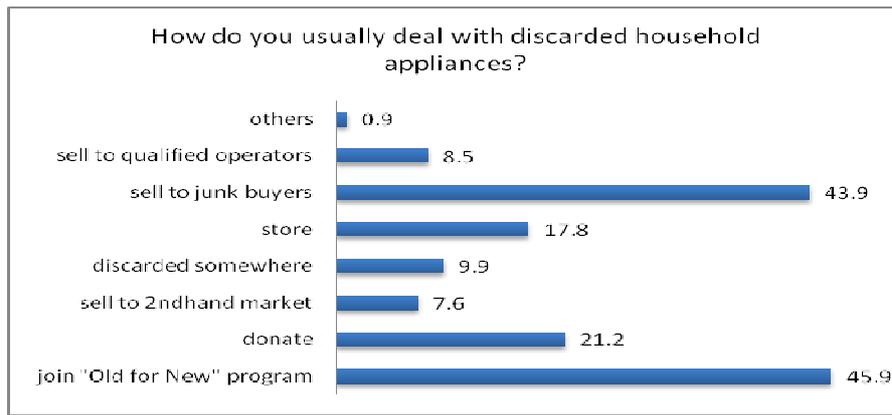


Figure 15 The interviewees' choices on dealing with discarded household appliances
 Source: Data from ECAN

The results of Question 5 are presented by Figure 15. Although Figure 13 and Figure 14 reveal that the interviewees have relatively high environmental awareness on WEEE, Figure 15 shows that except the group joining the "Old for New" program (45.9%), most households (43.9% of total) still choose to sell DHA to junk buyers considering convenience and the given payment. Only 8.5% of them sell them to qualified operators. The "Old for New" policy is affirmed to be an effective collection approach which provides higher incentives. Meanwhile, it means that the interviewees' choices on how to deal with DHA are motivated by monetary incentives.

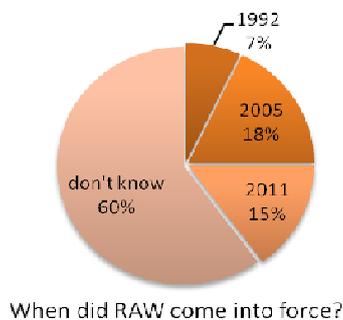


Figure 16 The interviewees' consensus on the time of RAW implemented
 Source: Data from ECAN

Question 6 is responded to as shown in Figure 16. It illustrates that even though RAW has been effective for 4 months, 85% of the people interviewed replied that they did not know when RAW came into force. The figure actually is higher than expected as citizens have never been particularly informed of RAW. The truth is that RAW does not set any obligations for consumers and directly goes to WEEE industry. Whether ordinary people should be part of RAW will be further discussed in Chapter 6.

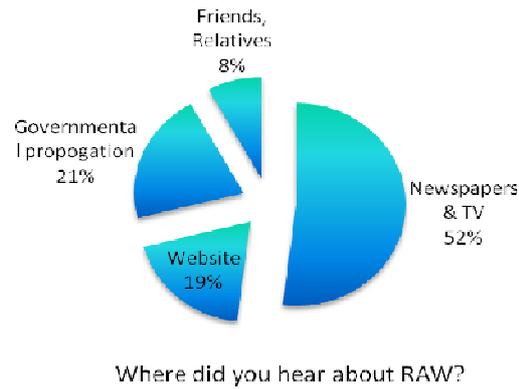


Figure 17 The interviewees' approaches to know about RAW
Source: Data from ECAN

For Question 7, its results are described in Figure 5.5.6. It is found that for 15% of interviewed people who know about RAW, more than half of them (52%) heard about RAW from newspapers and TV. Only 21% of them learned it through governmental propagation such as bulletins and banners. Internet is widely used in China but only 21% of them knew about RAW from website.

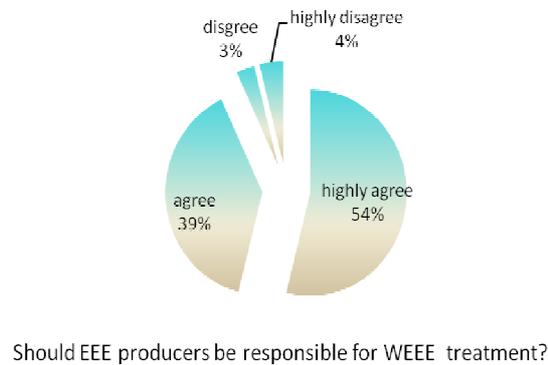


Figure 18 The interviewees' consensus on producers' responsibilities for WEEE treatment
Source: Data from ECAN

The answers of Question 8 in Figure 18 show that most interviewees (93%) suggested that EEE producers should be responsible for WEEE treatment.

When it comes to the results of last question (Figure 19), it displayed that 62% of interviewees expressed that it is reasonable for consumers to pay for WEEE treatment. Even though, it is doubted that if they will really pay for WEEE treatment since discarded household appliances are still valuable for most interviewees and they choose to store, donate or sell them out with incentives (Figure 14). In addition, most of them insist that EEE producers should be responsible for WEEE treatment (Figure 18).

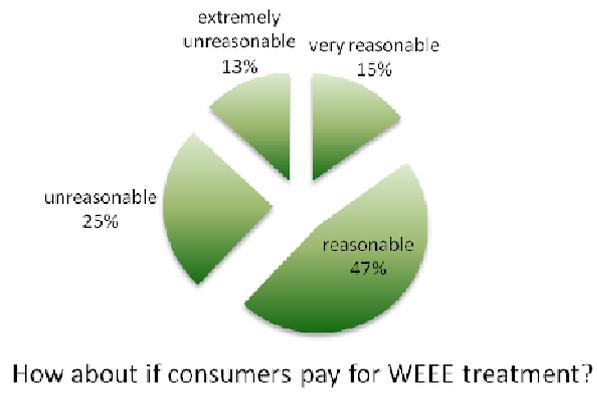


Figure 19 The interviewees' consensus on consumers' responsibility for WEEE treatment
Source: Data from ECAN

6 Analysis: concerns and challenges of RAW

Based on the previous chapters, this chapter analyzes the concerns and challenges for the implementation of RAW following the analytical framework, as well as some shortcomings of the earlier policies which influence the implementation of RAW.

6.1 Upstream

RAW is a double-edged sword for EEE manufacturers in the upstream. On one hand, the implementation of RAW is to bring greater stress for producers in China, since more concrete producer responsibilities have been specified, as it is reflected by EEE manufacturers in Section 5.4. Although the “Old for New” program is in their favor, as it enhances the corporations between qualified operators and EEE manufacturers, effectively stimulates the consumption of EEE and significantly increases the turnover of EEE manufacturers, it is a temporary policy to be ended in 2012. Meanwhile, most consumers suggested (93% of the interviewees, as illustrated in Figure 18) that producers should be responsible for WEEE collection and treatment. Concerns of manufacturers are their ability to finance all stages of WEEE management, including collection, transportation and final treatment of WEEE.

On the other hand, RAW, together with some earlier policies has been positively influencing EEE manufacturers in the upstream. The EEE producers in China, such as Haier, Changhong and TCL, are increasingly willing to pay attention to WEEE recycling and get involved in the WEEE market to seize the growing opportunities in the emerging WEEE industry. It is recognized that joining the WEEE industry is a win-win solution for these manufacturers facing fierce competition and gaining low profit in the household appliances industry. Recycling of WEEE will not only bring more resources of EEE production and gain more profits by selling additional recycled resources to others, but also to fulfill the responsibilities required by RAW. It is believed that WEEE recycling centers, increasingly being built by investments made by EEE manufacturers, will play a more and more significant role for the environmentally sound recycling and disposal of WEEE in China.

6.2 Midstream

- Consumer responsibilities

It is a concern that public participation for the implementation of RAW is difficult to be ensured when consumer responsibilities are excluded. The reason of excluding consumer responsibilities has been explained in Section 4.2.3. At the first glance, they seem to be specified unnecessarily. Because the key principle of RAW is EPR and its main policy instruments are found in the downstream such as funding mechanism and licensing scheme. Located in the midstream, consumers even need not to care about how WEEE is collected after the implementation of RAW, since the multi-channel collection model is encouraged and the collected WEEE can only be treated by qualified operators in the downstream. That is, no matter how WEEE is collected, it should be ensured that they will be recycled safely in the downstream.

Nevertheless, it should also be noticed that most items of WEEE are still out of the scope of RAW. Producer responsibilities are not assigned for those manufacturers producing the uncovered products. At least, the final treatment of these uncovered products cannot be guaranteed. Besides, for those covered products, whether and when WEEE can be treated only by qualified operators cannot be guaranteed, either. What is more important, public participation is always essential for the implementation of the policies. Considering the high population in China, public participation appears to be the most crucial for WEEE collection and the supervision on the implementation of the laws. But it would be rather difficult to

ensure public participation for the implementation of laws where consumer responsibilities stand by.

● **Collection: the core challenge**

Considering the reflections from all related stakeholders and the unique WEEE management status in China, it is found that the construction of the multi-channel collection network proposed by RAW becomes the key task as well as the core challenge for the implementation of RAW. Locating in the midstream of the EEE flow, the multi-channel collection network proposed by RAW is very important for the rest of the strategies to address the downstream such as the licensing scheme, funding mechanism to be meaningful. It becomes the core challenge because the establishment and maintenance of a multi-channel collection system is based on all related stakeholders’ participation as well as legal administration and supervision of governmental agencies. But difficulties are found among related stakeholders according to Chapter 5.

For most consumers, they are unwilling to pay for the recycling of WEEE but it is more attractive for them to sell the discarded household appliances (DHAs) to individual vendors both for convenience and financial benefit. As it is indicated by the community survey (Section 5.5), although most interviewees seem to have reasonably high environmental awareness, 43.9% of them (Figure 15) still choose to sell discarded household appliances to junk buyers after the launch of the “Old for New” policy which actually provide attractive incentives. There are two reasons to explain this. One is the DHAs sold by these 43.9% of interviewees are not the items covered by the “Old for New” policy. Another reason is that the “Old for New” becomes unattractive if these interviewees do not intend to replace the DHAs with new ones. They prefer to discard them with similar convenience and good payment provided by junk buyers. It should be noticed that the figure (43.9%) could be much higher if the survey is done in “normal” communities before the launch of “Old for New” policy.

Further, it can be assumed reasonably that the rather high environmental awareness of the most interviewees is a result of previous relevant education on environment protection delivered to them. This is because the environmental awareness of the elder generation who are more than 40 years old (63.4% of the interviewees) are supposed to be low, due to their relatively rather low education (50.7% of the interviewees), as described in Figure 12. It means that related education could help people well recognize the WEEE problems. But high awareness on these issues seems to be unable to change citizens’ behavior to treat DHAs properly. In other words, public participation for WEEE problems solving cannot be ensured solely by the increase of environmental awareness. Therefore, it seems to be necessary to include consumer obligations to the law in China.

Anyway, the tradition that consumers sell DHAs to junk buyers is difficult to change if no incentive is provided for consumers. The “Old for New” program is a good example. It highly stimulates households to deliver targeted DHAs to qualified operators by providing an easy way to collect DHAs as well as monetary incentives for consumers.

It is true that convenience (if discarded household appliances can be collected at doors) is the main consideration to motivate consumers to deal with WEEE properly, as Figure 14 shows that 81.8% interviewees prefer to have DHAs collected at their doors. However, considering the current collection situation in China, most qualified operators are still unable to provide convenient collection services for individuals, as it is indicated in Section 5.2.

For qualified operators, it has been repeated during the interviews that the construction of the collection network is their common bottleneck. In the past, they could not collect a satisfying amount of WEEE to meet their treatment capacity. Currently, the “Old for New” program is feeding the qualified operators with much more WEEE than they collected before. But they would most likely face problem of insufficient input materials again as soon as the “Old for New” program is terminated in 2012. Although they are considering building more collection facilities, it means an extremely high investment that is unaffordable without state subsidies.

For local governments, some interesting and good practices for WEEE collection initiated by local governments in different areas have been introduced in Section 5.1.2. The “Old for New” program is running smoothly in the pilot regions, with much more WEEE collected and treated by selected qualified operators. But it should be admitted that the construction of the WEEE collection network has not been highlighted in most governmental agenda in China, which put economic development as priority. Considering the wide geographical span in China, there is a long way for the establishment of a comprehensive WEEE collection network led by local governments.

For EEE manufacturers, as can be seen from the recycling projects initiated by EEE giants, they have more focus on the end-of-pipe treatment of WEEE, while WEEE collection in the midstream is relatively neglected. It might be explained by the fact that the collection responsibilities for EEE manufacturers are not particularly specified by RAW and other policies. It is also because those manufacturers, who have invested a lot on the end-of-pipe treatment of WEEE, are still unable to pay sufficient attention to WEEE collection.

In short, the preferences of consumers on convenience and price, high collection cost for manufacturers and qualified recyclers, small incentives and weak enforcement of local governments are all obstacles for the construction of the multi-collection network. Further, it is a concern how a large enough amount of WEEE should be collected and transferred to the limited qualified operators, particularly when the “Old for New” program is terminated.

6.3 Downstream

A growing formal WEEE recycling market in China is seen in the downstream, driven by some EEE giants, local governments and qualified operators. In order to survive in the low profit but high competition industry and share the growing WEEE market, EEE giants prefer to directly engage in WEEE treatment by setting up recycling centers to recover reusable resources for EEE production and achieve better profit margins, rather than contract with qualified operators for WEEE treatment which means no profit. Concerning local governments, it is positive that some of them have started to work on the WEEE recycling projects (Section 5.1.2) and it is believed that the initiatives of these local governments will motivate other local governments to engage in WEEE management. As concerns qualified operators, most of them are planning to expand their current business with different strategies, as outlined in Section 5.2. Despite of these, some concerns remain in the following areas.

- Informal recycling sector

To date the informal recycling sector seems not to have been well informed about RAW, including the stringent specifications for the qualification of WEEE recycling as well as the strict penalty in case of violation of the law. It can be seen that RAW has not started to be enforced in the informal recycling sector in China, even in Taizhou where severe WEEE issues exist. For areas famous for informal WEEE recycling such as Taizhou and Guiyu, shifting themselves to be a formal collective WEEE treatment center could be a good choice.

But lack of funds is the key obstacle for them to do so.

- Licensing scheme

The licensing scheme of RAW is regarded as a key instrument to shape the WEEE industry, by demanding strict standards for those who wish to enter the formal WEEE treatment market and kicking out the informal operators. Since most qualified operators are well equipped for the treatment facilities, skills and technologies, it is believed that they will be the first licensed recycling companies according to the sub-regulation of RAW: Administrative Methods of WEEE Treatment Qualification²⁷. One possible result of the licensing scheme is that a significant amount of WEEE will flow to the limited qualified operators for the qualified recycling companies will increase slowly due to relatively stringent approval requirements. Therefore, it is a concern if the large volume of WEEE in China could be treated merely by the limited qualified operators currently.

In addition, the treatment capacity is really unbalanced between Eastern and Western China. It is found that most qualified operators are currently located in Eastern China, particularly in the Yangtze River Delta area. On the contrary, they are extremely scarce in Western China. Only one can be found in Lanzhou city, Gansu Province (North West of China) and one in Sichuan Province (South West of China). Obviously, a huge gap exists between the East and West of China concerning WEEE treatment capacity. The WEEE treatment capacities in Western China need to be improved urgently. But how the treatment capacity in Western China could be improved under the licensing scheme with relatively high requirements for qualified operators is a concern, too.

- Funding mechanism

The funding mechanism is the key breakthrough of Chinese WEEE legislation. It is to make EEE manufacturers be responsible for financing and put EPR into effect in China. In addition, it will help to tackle the financial problems for WEEE management. For example, it is perceived to forward the pilot projects in Guiyu mentioned in Section 5.1.2. It might allow the qualified operators to expand their collection network.

Because the sub-regulation for the funding mechanism is still under formulation so the details of the funding mechanism remain a big question for all related stakeholders. Deep considerations should be placed on two factors. One is the levy level for the fund, which seems to determine the direct effects of the funding mechanism. If a too high fund is levied from producers, it might threaten the EEE manufacturers in China who already struggle in the market with low profit margins. If too low, it might have little effect on solving the financial problems for WEEE management, particularly for the construction of a collection network. In light of this, RAW has mentioned that the opinions of manufacturers, qualified operators, relevant industrial associations and experts will be taken into account for the levy level (Article 7). In this way, it is expected that a relatively reasonable level of levy can be outlined. Another concern is how the fund will be used and supervised, which is also very important for the successful implementation of the fund mechanism. As mentioned in Section 4.2.3, the fund is to be controlled and allocated by the Ministry of Finance. But who is supposed to supervise the use of the fund is not specified by RAW.

6.4 The whole framework

- Administration and supervision system

²⁷ It was enacted on 1 January 2011 by Ministry of Environmental Protection, as one of the sub-regulations of RAW. Retrieved from http://www.zhb.gov.cn/gkml/hbb/bl/201012/t20101217_198804.htm (In Chinese).

A real concern for the administration and supervision system exists on local level, as gaps always exist between the central and local systems. WEEE issues have been highlighted by the central government, but they may be treated differently by the locals, according to how the local governments evaluate the situation. For some areas where WEEE management is not a key issue, the implementation of RAW may not be enforced. Meanwhile, in some regions where WEEE issues are serious, the enforcement of the law cannot be ensured by related departments because of lack of monetary incentives. Taizhou could be such an example. Therefore, it is important for local governments to formulate sub-regulations identifying clear responsibilities for related departments, as a way to implement RAW. In order to formulate sub-regulations, the common problem for local governments in China is lack of (trustworthy) data. For example, Shanghai met difficulties in estimating the WEEE volume in the city when evaluating local situations.

- System coverage

Although RAW covers almost the whole stage of the WEEE flow, the scope of RAW appears to be very limited. Only five items of WEEE are targeted. A huge amount of non-brands EEE and “white box” (electronic products put together by component assemblers without a brand name affixed to the devices) cannot be ensured sound treatment in China. Second, all the other common items of EEE like mobile phones, microwave ovens are unlisted. Nonetheless, it is arguable if the limited scope of RAW is a disadvantage. There are several reasons for RAW to cover these five items of large household appliances as priority. First, they are produced and sold with much larger volumes than other products (excluding mobile phones). Second, compared with products of small pieces like mobile phones, it is more difficult for consumers to deal with discarded large household appliances (DHA) and more costly for manufacturers to recycle due to large volume and big sizes of covered DHA and high logistic costs as well. But recycling of them with large volumes tends to be more profitable for recyclers and prevents more of WEEE pollution. Another reason is that, for the policy itself, it could be easier to implement RAW by limiting the range of covered devices. From these aspects, a relatively narrow scope of RAW is not necessarily a drawback of RAW.

However, a concern is when and how the schedule for mandatory recycling of the other EEE can be formulated, particularly, mobile phones. The mobile phone market in China has been growing rapidly in the past decade. There were around 649 million mobile phone network subscribers in China by the end of January 2009, and the number of out of use mobile phones is increasing at an average rate of 110 million units per year (Huang, 2009). It can be imagined that the issues of wasted mobile phones are becoming more and more significant in China. How the significant amount of other WEEE such as mobile phones could be properly collected and treated is worrying. Thus, the management of obsolete mobiles phones should be put on related stakeholders’ agenda urgently.

In general, the concerns and challenges for the implementation of RAW are found in the framework and are summarized below:

- To have producers in the upstream pay for WEEE recycling is a breakthrough of RAW. But whether producers are capable of financing all stages of WEEE management is rather doubted.
- It is more difficult to ensure public participation for the implementation of RAW, particularly when incentives are not guaranteed and consumer responsibilities are excluded.
- Construction of the collection network in the midstream is the key challenge for the successful implementation of RAW as different difficulties are found from stakeholders.

Particularly, financial issues are found with manufacturers, qualified operators and local governments.

- Qualified operators in the downstream are limited and potential operators to enter the WEEE market will be restricted by the licensing scheme with relatively high qualifications in order to kick out informal sector. Due to the large volume of WEEE and high qualifications of the licensing scheme, treatment capacity cannot be ensured neither in big cities with limited qualified operators nor in Western China with very few qualified operators at least in the next four or five years.
- Informal sector have not been well informed of the RAW. Particularly, those who are dealing with uncovered WEEE are difficult to be phased out. In addition, a huge fund is needed to make a change in these areas with informal WEEE treatment at large scale.
- The related responsibilities of local governments are not clearly identified and their administration and supervision systems are still weak for the enforcement of RAW.
- When the management of obsolete mobile phones will be covered by RAW is a big question. Besides, orphan wastes are neglected so the recycling of a huge amount of non-brands or historical WEEE cannot be ensured.

7 Conclusions, suggestions and future research opportunities

This chapter reviews the research questions and the research objectives as elaborated in Chapter 1 and then presents conclusions and suggestions, followed by future research opportunities.

7.1 Conclusions

The following research questions proposed in Section 1.3 led the paper to the end.

- 1) *What are the issues, concerns, progresses and achievements of the earlier policies on WEEE management in China?*
- 2) *In which ways does RAW plan to overcome the weaknesses of the old policies?*
- 3) *What are the reflections of the stakeholders in China on RAW?*
- 4) *What are the concerns and challenges of RAW? And how these concerns and challenges can be improved?*

The first research question is discussed in Chapter 3 by reviewing the earlier policies directly relevant to WEEE management in China. On one hand, starting from the ban of WEEE imports in 2000, the central government has put increasing attentions on WEEE management and the development of more WEEE-specific legislation in China. On the other hand, the shortcomings of the past policies are outlined according to the analytical framework. In the upstream, EPR is proposed but producer responsibilities have not been clearly articulated. In the midstream, consumer responsibilities and collection mechanism are seldom mentioned in the earlier policies. Only the “Old for New” program provides compensation mechanism for consumers, which brings significant effect on WEEE collection. In the downstream, non-availability of specific funding mechanism is the key problem existing in the earlier policies. When seeing the whole framework, it is found that the unclear responsibilities among various governmental bodies create concerns, as they are jointly responsible for the implementation of the same policy. Weak supervision and administration system is the main problem for local governments to implement the policies in China. In addition, the system scope among these policies is usually limited.

To answer the second question, the characteristics of RAW are explored in Chapter 4 following a brief introduction of RAW. The analysis follows the analytical framework. It is found that RAW managed to address some of the weaknesses in the earlier policies. In the upstream, EPR is proposed more concretely with clearer allocation of responsibilities. The producers are to provide payment for the WEEE recycling in China. The responsibilities for WEEE recycling are extended to the repair institutions and after sale organizations in the midstream. In the downstream, a funding mechanism is proposed. This has never appeared in the earlier policies and it is regarded to be another key breakthrough of RAW to solve the long-term existing financial issues of WEEE treatment. Besides, more concrete disposal and recycling standards are outlined for the end-of-pipe treatment of WEEE. Among them, a licensing scheme and a particular sub-regulation are launched. For the whole framework, RAW appears to be the most comprehensive regulation for WEEE management in China, which covers almost all the stages of WEEE flow from the generation of WEEE to the end-of-pipe treatment. According to these improvements, RAW is believed to be an impetus for the management and development of the Chinese WEEE disposal and recycling industry.

The third question is answered in Chapter 5, through interviews and review of some publications, in order to learn how RAW is perceived by stakeholders in practice. The interviews were conducted with various stakeholders such as local government, EEE

companies, users, and the formal and informal recycling sectors. The breakthroughs of RAW are further confirmed. It is evident that RAW is creating a more favorable environment for the investment into WEEE recycling, particularly for EEE manufacturers and private operators; and that RAW is driving some local governments to act on WEEE management for the development of a WEEE industry. Meanwhile, through personal communication with stakeholders, concerns for the implementation of RAW were identified. These are brought together and discussed in Chapter 6 when addressing the fourth question.

The fourth question is about the concerns and core challenges for the implementation of RAW. It is answered in Chapter 6, based also on the data and analysis in the former chapters. Concerns are found among all stakeholders mentioned in Chapter 5. The construction of a multi-channel WEEE collection network remains to be the key challenge during the implementation of RAW. The construction of the multi-channel collection model requires high public participation, while different stakeholders indicate likely difficulties in achieving this.

7.2 Suggestions

Considering the concerns and challenges, the following suggestions for the successful implementation of RAW should be carefully considered.

- Upstream

Concerning producers' abilities of financing all stages of WEEE management in China, more and more producers should be encouraged to actively engage in WEEE recycling by establishing its own recycling program or in cooperation with qualified operators. The emerging WEEE industry in China influenced by RAW will definitely bring both huge economic benefits and competitive power for WEEE operators. This is the reason why the EEE giants such as TCL and Changhong are doing so.

- Midstream

Consumers must be well informed of the problems of WEEE and the specific obligations should be given to them to have WEEE properly treated, particularly for those products that are not covered by RAW. Ideally, it would be good to require consumers to pay collection cost of WEEE at the point of collection directly rather than make producers increase EEE prices combining collection cost. This would transfer part of producers' financial burden on WEEE recycling to consumers as well as to ensure that consumers play a concrete role in WEEE problem solving. It is believed that it will not be a substantial financial burden for consumers who can afford new EEE. At least, more than half of the interviewees (62%) perceive it reasonable. Besides, local governments, related NGOs and media may continuously involve in various activities for propagation and education of consumers, particularly to inform consumers of the importance to handle WEEE properly and of the proper approaches to treat them. In this way, public participation could be highly improved.

To accelerate the construction of the collection network, sufficient funds for qualified operators to establish a collection network should be ensured by the state and local governments. Or, they may cooperate with EEE producers and set up a collection network jointly. The cooperation between them seems to be a win-win solution to reduce their financial burden. The responsibilities for WEEE collection together with WEEE recycling need be highlighted for manufacturers through various approaches such as official notices or media dissemination. Related collection practices may start to be applied in some communities as trials in big cities. Besides, the informal private operators are suggested to transfer their

business from informal WEEE recycling to WEEE collection. The collection model of the “Old for New” policy is suggested being kept as a part of the multi-channel collection network in light of its remarkable effect on collection.

- Downstream

For the informal recycling sector, information concerning the licensing scheme and related provisions should be delivered there as soon as possible. The places with severe WEEE issues in China like Taizhou and Guiyu, should be firstly targeted, stressed and supported by more funds to make a shift. Tax exemption may be employed for the onsite qualified operators. For qualified operators, the information management and monitoring system on WEEE treatment should be well equipped and ready for the supervision by related departments. The data from the information management should be ensured as one of the trustworthy data sources on WEEE management. To improve the unbalanced treatment capacity in different regions, a number of qualified operators should be assigned for each province for the mandatory construction of the recycling centers within a fixed period. This can be included in the WEEE treatment plan which is required to be formulated by the provincial environmental bureau and submitted to the Ministry of Environmental Protection.

- The whole framework

It is necessary for local governments to formulate WEEE-specific sub-regulations as a way to implement RAW. The sub-regulations should be based on the assessment of the local WEEE situations including the WEEE volume at local levels. They should specify clear responsibilities for related departments, the supervision of which should be monitored and informed to the public. In this way, it is believed that public participation and the administration and supervision of WEEE management at local level could be further enhanced.

For the scope of RAW, it is better to evaluate the effect of limiting the covered items of WEEE in the next two or three years. Based on the evaluation, the possible amendment of the scope of RAW should be put into agenda. Disregarding, mobile phones should be covered as priority then.

7.3 Further research opportunities

Due to the time and geographical limitations, some research opportunities remain to be explored. For examples, the effect of the EPR scheme in the upstream, the strategies for the construction of a collection network in the midstream and the status of the licensing scheme and the funding mechanism in the downstream are in the view of the author worth exploring.

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Appendix (personal communication)

- **WEEE policy experts**

Prof. Li Jinhui: Department of Environmental Sciences, Qstinghua University, Deputy Director of the Solid Waste sub-Committee of Chinese Society of Environmental Science and Executive Secretary, Basel Convention Coordinating Centre for Asia and the Pacific. Interview, Beijing, Apr.25 2011

Prof. Zhang Tianzhu: Department of Environmental Sciences, Qstinghua Univestiry, one of the formulators of the Circular Economy Promotion Law of PRC. Interview, Beijing, Apr.24 2011

- **NGO**

Lai Yun. WEEE treatment Project. Greenpeace. Personal communication, Beijing, April, 2011.

- **EEE producers**

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Ma, Junlin. Previous EMS of Motorola China. Beijing, Phone Interview, Shanghai, Mar. 20, 2011.

- **Local governments**

Anonymous officer. Shanghai Environmental Protection Bureau (SEPA). Shanghai. Mar.5, 2011.

- **Qualified operators**

Ms Teng Fei. Shanghai Central WEEE Co.,Ltd. Phone Interview, Shanghai, Mar. 6, 2011.

Ms. Qian Yueping. Xinguang Recycling (Shanghai) Co.,Ltd. Phone Interview, Shanghai, Mar.8, 2011.

Mr. Wang Yanxiao. Sunland Environment Shanghai Co.,Ltd. Phone Interview, Shanghai, Mar. 7, 2011.

Ms. Melody Lin. TES-AMM Shanghai. Phone Interview, Shanghai, Mar. 13, 2011.

Mr. Sun Rongxin. Shanghai Meixuan Environmental technology Co.,Ltd. Phone Interview, Mar. 13, 2011, Mar. 15, 2011.

Mr. Zhang Zhixian. Huafu (Shanghai) EnvironmentalProtection Technology Co., Ltd. Phone Interview, Shanghai, Mar. 15, 2011.

Mr. Yang Yicheng. Shanghai Xinjinqiao Environmental Co.,Ltd. E-mail contact. Mar, 2011.

- **Informal WEEE recycler**

Mr. Huang. Self-employer for informal WEEE treatment. Personal communication, Shanghai, Mar.28, 2011.