

ISSN 1816-6075 (Print), 1818-0523 (Online)  
**Journal of System and Management Sciences**  
Vol.1 (2011) No. 3, pp.67-78

## **International experience of EPR and its enlightenment on China---take WEEE for example**

Fangqun Xing<sup>1</sup>, Cent ER<sup>2</sup>, Jie Xiong

<sup>1</sup>Beijing Jiaotong University, <sup>2</sup>Tilburg University

*09120683@bjtu.edu.cn, aprilcc16@gmail.com*

**Abstract:** This paper compares the legislative difference of physical responsibility and economic responsibility in the developed countries and districts. Learning from the comparison analysis of the cognizance, we can find a proper way for China to determine the one who should undertake physical responsibility and economic responsibility, and the method of performance. In this way, we can make full use of WEEE which are recycled and disposed in our country, moreover, it can provide reference for the debut of “regulations of recycling, managing and disposing WEEE”.

**Keywords:** Extended Producer Responsibility, WEEE, waste household electrical and electronic equipment, physical responsibility, economic responsibility

---

### **1. Introduction**

Waste Electrical and Electric Equipment (WEEE) is any appliance using an electric power supply that has reached its end-of-life or any electrically powered appliance that no longer satisfy the current owner for its original purpose, the traditional disposal of electronic waste was direct landfill, incineration, causing environmental pollution and waste of resources, taking the sustainable development into account, many developed countries and districts have chosen Extended Producer Responsibility (EPR) for electronic Waste Recycling.

In China, the management and legislation of WEEE mainly focus on the area of waste household electrical and electronic equipment. In Jan.1, 2011, the State Council signed a law into effect called the “Waste Electrical and Electronics Equipment recycling regulations” (“Regulations”). TV, air conditioning, refrigerators, washing machines and micro computer became the first formal 5 categories in accordance with national standards for recycling and dismantling. The law also makes the recycling of many other discarded appliances regular and have regulations to abide by. Although the Regulations have pointed out the responsibility of all related aspects, but the division of responsibilities is too general for practice, making the “Regulations” still imperfect so and some loopholes.

At present, some scholars engaged in the study of EPR in WEEE, Foreign scholars mainly focused on the national requirements and implementation of effective legislation of EPR system. China scholars focused on learning the recovery model in developed countries, and also the chosen of recovered channels and the division of stakeholders too. However, there is few study on the source of waste household electrical and electronic equipment in China - both domestic and import studies. This paper aims at the comparison of legislation in Physical responsibility and Economic responsibility in developed countries, from which we can find a suitable division for China's physical and economic responsibility, so as to the high efficiency of recycling and reuse in waste household electrical and electronic equipment, it can also ensure that “Regulations” in China effectively implemented and enforced, as well as the promulgation of Improved regulations.

## **2. Status of Waste Household Electrical and Electronic Equipment**

### **2.1 The Sources of Waste Household Electrical and Electronic Equipment**

The Sources of waste household electrical and electronic equipment including production made in China and the illegal import ones. According to statistics, during the “Twelfth Five-year” period, there will be about 50.5 million refrigerators, 62 million washing machines and air conditioners more than 120

million beyond their life-cycle, with an average replacement of 10 million refrigerators, 12.5 million washing machines, and air conditioning for 24 million every year, Many cities in China are facing WEEE problem (chinabyte.com, 2011).

There are almost 80% WEEE from the all over the world come to Asia, and 90% of that comes into China (gmw.cn, 2010). For the purpose of reducing environmental hazards caused by the WEEE, developed countries have established strict environmental standards more or less. For developing countries, the tremendous economic value in WEEE makes people crazy. On the other hand, because of weak enforcement, the prevention of illegal WEEE trade in China is inefficient, making the illegal imports from developed countries or districts to be another source of waste household electrical and electronic equipment.

## **2.2 Recycling Methods of Waste Household Electrical and Electronic Equipment**

For a long time, there are three ways of recycling, first, through the petty dealer crossing street, or the manufacturer's recovery, after that, the old ones will soon be available on the flea market; Second, through donations, the WEEE went to western region, Hope Primary School and other specific districts and people; Third, dismantling and processing raw materials for precious metals involved, it can be processed by individual workshop easily, Given the current situation, the third way is the typical processing mode in China.

At present, there are some household electrical and electronic equipment manufacturers like Changhong, TCL, Haier, Lenovo, Green Eco-Manufacture (GEM) and so on. On the very beginning of the “Regulations”, they have engaged in the field of recycling waste household appliances. For example, there is a recycling team aimed for environmental protection in Changhong in 2006, the team has an ability to dispose more than 2 million units of WEEE once a year (hexun.com, 2011). These self-built recycling departments are becoming the main destination of waste household electrical and electronic equipment.

## **2.3 Physical Responsibility and Economic Responsibility in**

## **Recycling WEEE**

Despite there are some legal rules about Physical responsibility and Economic responsibility when facing recycling process of waste household electrical and electronic equipment, unless more detailed rules, or the "Regulations" implementation will come to problems in specific aspects.

In the case of the physical responsibility, as items stipulated in the "Regulations", e-product manufacturers are encouraged to engage in the collecting and recycling of WEEE themselves. And the WEEE recycled should be handled by some qualified corporations. However, these corporations can't make the most of the advantage when collecting and disposing WEEE for the reason that customers send WEEE to peddlers everywhere.

When it comes to the economic responsibility, the "Regulations" indicates that government can set up a foundation for the purpose of providing subsidy to WEEE recycling and superintending the manufacturers and traders to meet their obligations in WEEE recycling. They can get preferential duty rates if they do well in conformity with the "Regulations", but the rates haven't been set yet. There are still some problems below. For instance, manufacturers bear the additional charges for WEEE recycling which will bound to bring the factory price up, people will have to pay more for e-product because company will forced to pass along rising cost. And expenses standard, the level of subsidy are uncertain, all the factors above will directly impacts on the implementation of the "Regulations".

## **3. Foreign Advanced Experience of EPR**

Most countries and districts in the world have the same five species of household electrical and electronic equipment legally like the "Regulations" in China, in order to treat the household electrical and electronic equipment properly, Differing rules are evident across all countries in the world between Physical responsibility and Economic responsibility, with some countries selected for more detailed case study analysis, responsibility, trends and differences in national systems, we can know more about recycling and processing.

### **3.1 Physical Responsibility**

Physical responsibility means that the producer is required to physically handle the end-of-life management.

### **3.1.1 Japan**

Producers should recycle WEEE in designated places; consumer should leave them back to retailers or transportation companies; retailers have an obligation to recycle the discards and have a responsibility to send WEEE to designated locations.

### **3.1.2 United States of America**

The legislation of recycling of WEEE diverse from each other all over the country, take Washington for example. Manufacturers should cooperate with existing WEEE collectors, meanwhile, pay allowance to retailers, charity organization, transporters and local authorities so as to encourage them become marketing Participant.

### **3.1.3 Netherlands**

The responsibility of recycling is mainly undertook by NVMP, NVMP is a non-profit organization which is set up by the producers for business benefits, and almost all manufacturers and importers in Netherlands are NVMP members.

### **3.1.4 Germany**

WEEE are mainly collected by local authority and Municipal enterprises, the collection system is made up of 4500 collection spots operated by local governments, 30000 spots for commercial purposes and 1000 spots established by producers (Feng & Lu, 2010).

### **3.1.5 Sweden**

The recycling system consists of marketing system and community recovery system. When purchasing new products, consumers can get the similar product free of charge by turning over the WEEE to retailers. The other way of collecting WEEE is sending them to the e-waste container set up in community.

### **3.1.6 South Korea**

Manufactures are responsible for collection, recovery, recycling, treatment and disposal of WEEE waste, the local government acts as a supervisor.

### **3.1.7 Taiwan Province**

Semi-official organizations play an important role in WEEE recycling area, in July.1, 1998, the Environmental Protection Agency (EPA) established a "Resource Recycling Management Committee" to deal with recycling problems. It resulted in more and more trader' participation, they separate

WEEE from other garbage and then recycle each of them. The physical responsibility beard by different countries and districts is shown in Table 1.

Table 1: Bearers of Physical responsibility in different countries and regions

|                                   | Japan        | State of Washington                                    | Netherlands | Germany           | Sweden    | South Korea                                | Taiwan province            |
|-----------------------------------|--------------|--|-------------|-------------------|-----------|--|----------------------------|
| bearer of Physical responsibility | manufacturer | manufacturer shares responsibility with WEEE collector | NVMP        | municipal company | community | manufacturer and local government together | semi-official organization |

By comparing vary physical responsibility in developed countries or districts; we can divide it into three types: Manufacturers, government and third party organizations, the rest are consumers, retailers, and collectors. In most countries, WEEE recycling responsibilities are shared between producers and local authorities.

### 3.2 Economic Responsibility

Economic responsibility is when the producer covers the whole or an extensive part of the cost associated with the end-of-life management.

#### 3.2.1 Japan

Recovery costs are shared by the producers, retailers and consumers. When buying new products, the customer is required no additional charge, However, they are in duty bound to pay extra fees for recycle when they discard old product. The fees they have to pay is between 2400-4900 yen, which consists of transportation fees, recycling fees and so on (Ramzy Kahhat, 2008).

#### 3.2.2 United States of America

There is no fee collection and payment system exists. The producers are permitted to operate their own plan; WEEE collection systems have been established by producers alone and supervised independently by local authorities.

#### 3.2.3 Netherlands

The end-user who buys new products is required to pay extra exchange to retailers, the latter hand it to producers regularly and the producers have to pay for the products they sold every two month to NVMP for handling cost.

#### 3.2.4 Germany

The collection expenses would be covered by the local authorities, while the other fees like transport cost and disposal cost fall on the producers and

importer, the producers should report the product they launched into the market and the operating factor to the local authorities, any violation by the producers will result in a fine of up to 1,000 Euros made by Environmental Bureau.

### **3.2.5 Sweden**

Incidental expense is allowed, all articles in the store are ticketed with the extra recycle fees, which fall on a combination of producers and government, recovery points are located in stores, it's operated by the local authorities, as for other fees such as the cost of recycling system is undertaken by producers, they can derive the cost from sale scale.

### **3.2.6 South Korea**

An obligation is imposed on producers to recycle and dispose WEEE properly. According to law, when customers are looking to purchase new e-product, they can place the responsibility of disposal of the same kind electronic wastes on their respective producers and distribution agents (not necessarily homogeneous).

### **3.2.7 Taiwan Province**

Producers are formed through semi-official organization so as to pay for disposal cost of WEEE to government; commercial declaimer can consult the allowance given by the local authorities, then they can collect recyclable materials at public places, provided WEEE will receive material. Table 2 indicates how responsibilities have been apportioned in countries and districts examined above.

Table 2: Bearers of Economic responsibility in different countries and regions

|                                   | Japan  | State of Washington                                       | Netherlands   | Germany   | Sweden   | South Korea                             | Taiwan province  |
|-----------------------------------|--|---|---|---|--|---|--|
| bearer of Economic responsibility | 1.The manufacturer and the dealer, customer shared in the expense of recycling 2.customer should pay extra expense for discard product | manufacturer pays recycling expense and transport expense | 1.customer pay extra expense to retailer when purchasing new product<br>2. the manufacturer pay disposal fees to NVMP | 1.the collection fees be paid by local government<br>2.transport expense and disposal expense fall on manufacturer and importer | 1. The manufacturer and the government shared in the expense of recycling<br>2. recovery point funded by local government<br>3. the manufacturer burden the running cost of recycling system | the full cost fall on the manufac-turer | semi-official organizations are responsible to pay WEEE disposal charges to the local government |

On cognizance of economic responsibility in developed countries and districts mostly centralize on transport charges and waste disposal, The individual concerned who paid for them are producers first, then consumers for a small part, it also consistent with the purpose of ERP policy in developed countries and districts, the ERP policy is targeted to extend the responsibility of producers in the field of WEEE.

#### 4. Development of WEEE Recycle and its Enlightenment to China

##### 4.1 The Enlightenment of WEEE Disposal to Civil Market

Nowadays, some centralized treatment plants have been established by manufacturers themselves. Their business is enlarging and gradually becoming the main force of recycling. We can see it from Figure 1 below.

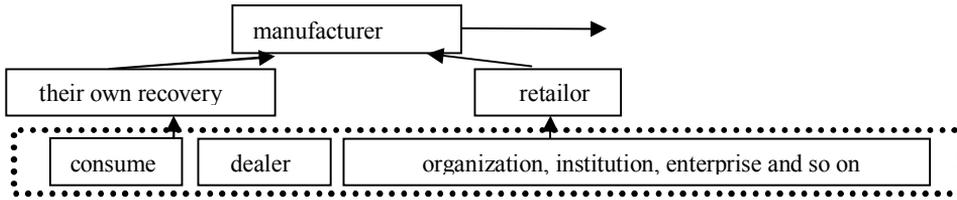


Fig. 1: Flow graph of WEEE recycling mode with the dominance of manufacturer

This recycling mode belonged to the pattern of the manufacturers which is set up by themselves. They are the risk bearer of Physical responsibility and in charge of WEEE disposing and recycling, end-users and street traders are the primary owners of waste household electrical and electronic equipment, in customer's opinion, it's a better way to sell the WEEE to street trader than manufacturers. Physical and financial responsibility for WEEE remains with the producer in China, where the provision for collection of WEEE is the task of producers.

Given the current circumstances, a paying system is needed to adhere to such recycling mode, Construct new mode of recycling plan with learning the experience from Washington State, There are three methods for WEEE recycling, first, from collection spots set up already, second, from retailers alliance, third, from cooperative street traders. For the last two items above, manufacturers can establish a long-term trade relationship with them, via the retailers, the experience of Japan can be very useful such as being bound to recycle waste household electrical and electronic equipment while selling new ones, and then deliver it to an indicated place for adaptive reuse, for the street traders, because of their high mobility, manufacturers have traditionally been responsible for the operation of civic amenity sites for e-waste, essentially, local authorities should also give a subsidy to street traders in order to make them the major collector and classifier of WEEE.

In order to find a solution to shortage of recycling e-waste, the experience of Taiwan province could be used for reference to improve that, manufacturers can work out a system of inducement to encourage customers to contribute to the WEEE recycling. In terms of the customers who send waste household electrical and electronic equipment to indicated place for recycling on their own initiative, manufacturers can subsidize not only a cash prize to these people, but a discount when purchasing new e-products.

#### 4.2 Recovery and Disposal of E-Product by Illegal Importation

At present, we cannot make full use of WEEE because of the weakness in high technology which is applied to e-product making. So there is no formal executing agency for recycling WEEE up to now, conversely, the recovery of

WEEE is mostly in individual workshop, they dispose the e-waste recycled in a non-environmental action. With regard to solve the WEEE recycling, it is the government's duty and burden for the collection, recovery, recycling, treatment and disposal of WEEE waste. Any others who want to find a good solution both in theory and practice may be of no use.

The general strategy of taking government as the forerunner to promote WEEE recycling is suitable to China's actual conditions. We can see the situation from Figure 2.

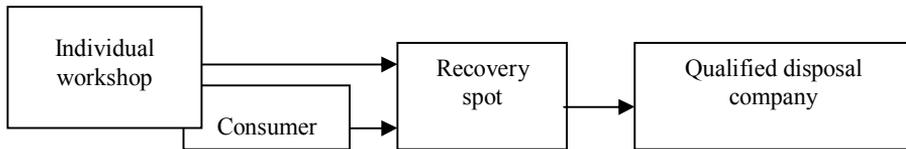


Fig. 2: Flow graph of WEEE recycling mode with the dominance of government

In this mode, local authorities have physical responsibility and economic responsibility for the collection of packaging waste and are compensated for their role in the system. They can recycle WEEE in this three ways, first, referential experience from the Netherlands shows that we can set up a nonprofit organization which is responsible for recycling and disposing WEEE waste. second, through the study and acquisition of advanced technology from Sweden, local authorities can set up collection points in villages and communities, third, In given policies like old-for-new service that the government has been following would lead to good results, whatever the solution may be, local authorities should prevent WEEE from extending into the secondary market or remote mountain provinces, they may co-ordination with the manufacturers, invite some powerful commercial combines in, they bear the physical responsibilities for WEEE waste, while the financial responsibility lies ultimately with the manufacturers. Finally achieve the goal of win-win situation.

## 5. Conclusions

This paper discussed the responsibility of recycling of WEEE from both domestic and imported which can be divided into two parts, Physical responsibility and Economic responsibility. The study is for the purpose of identifying the responsibility of various aspects in recycling. But it's only studied in discoloration qualitatively which can not fix certain rights for everyone involved, therefore an analysis of the stakeholders of WEEE recycling is needed, and a Game Analysis on this basis can arrive at a better conclusion. This is the weakness of this paper, and puts forward the direction of the further research.

## Acknowledgements

Thanks to my Master's tutor Yacan Wang, she gives me great help to this article. Thanks to Cent ER and Jie Xiong, Thank you all the referenced authors and books, without their inspiration, it's difficult to finish this thesis. Thanks to my classmates, they make my thesis more perfect.

## References

Feng, H. J. & Lu M. Z.(2010). On the operational model of waste recycling system in Germany. *Urban Problems*,96(2),86-90

Kahhat, R. et al.(2008). Exploring e-waste management systems in the United States. *Resources, Conservation and Recycling*,52(7),955-964.

<http://www.hdcmr.com/bgfree19567.html>, 2010-12-27.

Spicer, A.J. & Johnson, M. R.(2004). Third-party demanufacturing as a solution for extended producer responsibility.*Journal of Cleaner Production*,12(1), 37-45

A, Y.(2007). Overview of Current foreign electronic wastes' recovery. *Enviroment*,11,34-36.

Li, B.(2007). A Comparison between Japan and China on the Pollution Situation and Recycling Countermeasures of Waste Home Appliance. *Journal of Jiaxing University*,2,34-39.

Zeng, Y. G.(2007). Overview of US E-waste Recycling Legislation. *Information Technology & Standardization*,5.10-15.

Gregory, J. & Kirchain, R.(2007). A comparison of North American electronic recycling systems. *Proceedings of the 2007 IEEE international symposium on electronics and the environment*, Orlando, FL,227–232.

Lan, Y. & Zhu, Q. H.(2009). Waste Electronic & Electrical Equipments Management System Based on the Stakeholder Theory.*Commercial Research*,5,9-12.

Stevens, A.(2005).Redeeming and Recycling of Consumer Electronics in the Netherlands. *Household Appliance Technology*,7,66-68.