Construction of Electronic Waste Recovery and Utilization System from the Perspective of Circular Economy

Caihong Chen
Fuzhou University of International Studies and Trade, Fuzhou 350202, Fujian, China
*Corresponding author email: caihongchen@fzfu.com

Abstract. There is a wide variety of electronic waste, including refrigerators, air conditioners, washing machines, televisions, computers and other knock-out products. E-waste, if properly recycled, will release significant economic, resource and ecological benefits. However, there is a situation that illegal recycling workshops occupy a dominant position in the e-waste recycling market in China, and many formal enterprises' recycling and processing capacity cannot be effectively utilized and played. Based on the concept of "reduction -- recycling and processing -- recycling", this paper comprehensively analyzes the recycling, processing and utilization of electronic waste, and systematically constructs the recycling and utilization system of electronic waste, which is of great significance for protecting urban ecological environment and realizing circular economy.

Keywords: Electronic waste, Recycle and re-use, Circular economy, Construction.

1. Introduction
Electronic products are closely related to People's Daily life. In the era of rapid economic and technological development, China is one of the countries with the most consumption ability. Due to the rapid upgrading of electronic products, the generation of e-waste is also rising rapidly. According to the UN's Global E-Waste Monitor 2020, the amount of e-waste generated worldwide in 2019 increased by 21 percent in just five years, with Asia producing the largest amount of e-waste, at around 24.9 million tons. With the increase of the consumption scale of electrical and electronic products in China, the recycling market scale of electronic waste also rises. However, in the market economy, each subject is linked together, and the government, producers, recyclers and consumers jointly build an e-waste recycling and utilization system. Only by connecting e-waste classification with terminal treatment and resource utilization, can the waste be effectively treated and resource recycling and utilization be realized through fine and reasonable separation.

2. Status of electronic waste recovery and treatment

2.1. Analysis of electronic waste recovery
In 2018, the battle against pollution continued to advance, further reducing the use of primary resources, and promoting the rapid growth of China's total renewable resource recovery. The recycling situation of waste electrical and electronic products in China during 2014-2018 is shown in Table 1.
Table 1. Recycling of electronic waste in China from 2014 to 2018

| Project                      | Unit       | 2014    | 2015    | 2016    | 2017    | 2018    |
|------------------------------|------------|---------|---------|---------|---------|---------|
| the number of recovered      | units      | 13583   | 15274.0 | 16055.0 | 16370.0 | 16550.0 |
| recycling volume increased % year on year | ten thousand units | 18.8%   | 12.4%   | 5.1%    | 2.0%    | 1.1%    |
| the recovered weight         | ten thousand tons | 313.5   | 348.0   | 366.0   | 373.5   | 380.0   |
| recovered weight increased % year on year |               | 18.8%   | 11.0%   | 5.2%    | 2.1%    | 1.7%    |

As can be seen from Table 1, the number of e-waste recycling continued to rise from 2014 to 2018, with a slow year-on-year growth. The same recovered weight increases year by year and the corresponding year-on-year growth rate declines in reverse. Affected by domestic and foreign economic, affected by the economic situation at home and abroad, the domestic renewable resources market volatility is not strong, the weak, the main varieties of renewable resources price continued to fall, renewable resources recycling enterprise profit decline, 2014-2015 electronic waste recycling value is characterized by falling even negative situation in figure 1. In 2016, is China's "much starker choices-and graver consequences-in" the start of the implementation, countries pay more attention to implement the concept of green development, renewable resources recovery industry as an important part of circular economy, from the source to reduce energy consumption and environmental pollution, renewable resources recovery and utilization level enhances unceasingly, the electronic waste recycling value showed a trend of rapid rise. In 2018, the economic pressure is downward, which reduces the growth rate of e-waste recycling value.

Figure 1. The recycling value of electronic waste in China from 2014 to 2018

2.2. Analysis of current situation of e-waste disposal
(1) Current status of consumer treatment of e-waste
With the progress of science and technology and the improvement of consumers' living standards, electronic devices such as mobile phones and computers are upgraded much faster than electrical equipment, and consumers tend to update and scrap electronic products very quickly. Relevant surveys show that the scrapping period of electronic products is generally shorter than its normal prescribed period. The discarded e-waste will not be disposed by garbage classification points like kitchen waste in household garbage. Consumers know that e-waste still has a certain residual value, but they cannot find a suitable way to dispose of the waste. Because mobile computer equipment often involves a lot of personal privacy, if through informal channels, non-standard manufacturers may disclose personal information, precaution and safety issues, making many consumers still remains in the disposal of abandoned electronic waste, and other appliances waste choose travelling traders, the recycle for swimming if vendor has the qualification is not very care about.
(2) Current status of e-waste disposal in the recycling market

Electronic waste should be handed over to formal recycling companies through formal channels, so as to ensure the sustainable development of the renewable resource industry, and at the same time to reduce environmental pollution and realize circular economy. However, the relevant investigation shows that 80% of the waste home appliances in the market fall into the hands of wandering traders, and less than 20% of them enter the formal recycling channels. It can be seen that the amount of recycling channels owned by renewable resources recycling enterprises is relatively low. These data mean that there is still a long way to go before China's e-waste disposal can truly achieve the goal of effective recycling.

2.3. Analysis of the development status of renewable resources recycling industry

At present, China's renewable resource recycling industry is still in its infancy and has a huge market space. The main reason is that although China's renewable resource industry develops rapidly, it is still far from the market's demand for renewable resources and the resource utilization is not high. Because of this situation, China is stepping up policy support and system standardization in the field of renewable resources utilization, constantly introducing favorable policies, and accelerating solid waste treatment and reuse from all levels, especially the development of resource recycling and reuse. New recycling models emerge one after another; the active participation of social capital in the renewable resource recycling industry is conducive to further opening up the recycling field.

3. Analysis of problems in the process of recycling electronic waste

3.1. The publicity of the new recycling mode is not high and its social influence is insufficient

The country issued the relevant policy system, encourage the development of renewable resources industry "Internet + recycling" new model, by using the Internet to build building trading platform, using the Internet, big data to carry out the information collection, data analysis, flow monitoring, etc., realizing the intelligent logistics between upstream and downstream enterprises, perfect the system of renewable resources recovery. However, in real life, these new recycling modes do not play their due role. They are not popular and even many people are not aware of these recycling platforms, such as "Love recycling, Amway green, and Help home" and other platforms. Moreover, the website design functions of these platforms are not complete, and communication channels need to be further improved.

3.2. The government's subsidy for dismantling the fund will not arrive on time

In 2019, the total recovery and dismantling amount of the whole industry will remain stable, and domestic formal dismantling enterprises are heavily dependent on dismantling fund subsidies. Therefore, it is still difficult for the industry to develop, and the subsidy standard needs to be further optimized. The income of China's e-waste recycling industry mainly comes from the sale of dismantling materials and the subsidy of dismantling fund, among which the subsidy of dismantling fund is the most important source of income for recycling enterprises to survive. And issued by the government of dismantling fund subsidies mainly comes from the producers of electric and electronic products and imported electric and electronic products of the consignee or representative, the current subsidy funds to make ends meet, unsustainable, and subsidies process after 1 to 3 years time, fund subsidy cannot arrive in time, in turn, affects the healthy development of renewable resources recovery industry.

3.3. Dismantling the market chaos, regulatory measures are not in place

More than half of the e-waste generated by consumers is collected by wandering traders, making most of the e-waste flow to illegal recycling workshops. This situation occurs mainly because the formal channels are not known to consumers, and even if they have environmental awareness, they do not know the contact information of the formal recycling enterprises. At present, e-waste is first collected by
wandering traders, then simply disassembled and classified and finally entered the formal channel. This is a current mode of recycling market, but this mode causes serious pollution to the environment, which is not desirable. Many illegal recycling workshops can account for more than half of the market share, which indicates that China's dismantling market is chaotic and the supervision of illegal dismantling is not in place.

4. Implement the concept of green development and build a recycling system for electronic waste

4.1. Publicity and Promotion system
On the one hand, consumers' awareness of environmental protection should be enhanced. Mass media, such as TV programs, official microblog, WeChat and other platforms, should popularize scientific knowledge of environmental protection and infiltrate the concept of environmental protection into People's Daily work and life. In this way, the new recycling mode will be useful and people will no longer choose informal channels. On the other hand, it is necessary to promote the new recycling mode platform in various occasions, such as garbage classification points and transportation vehicles, and develop the resource recycling APP to improve personalized help.

4.2. Policy support and producer responsibility system
In terms of tax policies, it is necessary to give tax incentives to support the development of the industry in a certain period of time. The direct recovery of electronic waste from consumers by recycling enterprises cannot offset the input tax, which will undoubtedly increase the recovery cost of the recycling industry. In terms of tax policies, it will be deducted according to a certain deduction rate. In terms of the subsidy issuing process, a certain proportion of fund subsidies can be issued in advance according to certain evaluation criteria to maintain the normal operation of the recycling enterprises. As mentioned above, the fund subsidies mainly come from producers. If raw materials are not renewable, the collection standard will be raised, so as to force producers to research, develop and design products made from renewable raw materials.

4.3. Recovery market regulatory system
Peddlers have caused serious damage to the ecological environment through door-to-door purchase, paid recycling, brutal dismantling, dissolution and other treatment methods. If the recycling market does not allow wandering traders to enter, it will obviously affect the survival of many people. In this case, by limiting the business scope of wandering traders, various wastes that do not need to be dismantled can be recovered from consumers, such as waste paper, waste plastics, waste tires, etc., but the wastes involved in dismantling work are not allowed. Violates the regulation privately manages to retract the management qualification.

4.4. Based on reverse logistics recovery trading system
Structures, like taobao, a recycling trading platform, the previous electricity trading is the seller to the buyer, and the platform with the aid of reverse logistics mode, launched by consumers, selling electrical waste on the platform, through the system to match, the original manufacturer and dismantling ability is based on the principle of who is who is in charge of production, by the express industry, electronic wastes by Courier service. If there is no dismantlement ability, the dismantlement enterprise with relevant qualification shall be entrusted.

5. Conclusions
Electronic waste recycling concept should follow the "source reduction, recycling, renewable cycle" the order, only real source reduction, in order to fundamentally solve the environmental pollution, and to truly realize the source reduction, only to develop the renewable resources recovery industry, realize the production of renewable cycle, to solve the environmental pollution, waste and the plight of the city.
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