

# Policy Design and Producer's Strategy under Extended Producer Responsibility: Economic Responsibility

Yiping Zhao<sup>†</sup> and Jun Ohya<sup>†</sup>

**Abstract.** Through extend producers' environmental responsibility to cover the whole product life-cycle, policy of extended producer responsibility (EPR) is intended to improve the end-of-life products (E LPS) management performance as well as to motivate product improvement and re-design from the early stage of production. Economic responsibility is the most challenging burden for producers under EPR. In this paper, major practical programs to assign economic responsibility to producers are identified and discussed. Effectiveness and difficulties in each program are compared and analyzed. Accordingly improving potentialities for EPR policy makers and favorable responsive strategies for the producers are investigated. A win-win scenario is provided with the purpose to provide larger incentives to producers, recyclers and customers.

**Keywords:** Extended Producer Responsibility (EPR); Policy Design; Responsive Strategy

## 1. Introduction

With the rapid development of industrialization and civilization, both the production and consumption are increasing stringently to such a great extent that various wastes discharged from the whole process has overloaded the ecological capacity of the natural system of the earth. Among these environmental pollution problems, the solid waste management has caused particular attention by the people not only due to the huge amount and the complicated diversities, but also owing to its' close relationships with the production and consumption styles by us human beings. The inefficiency and failure of the traditional solid waste management soundly proves that without a fundamental change of the traditional production style, the problem of solid waste management could not possibly be solved through simple end-of-pipe treatment and disposal. The manners of how the products are designed and produced fundamentally decide how much solid wastes will be produced, recycled and left

to be disposed. In other words, the producers have the real power on the final environmental performances of the used products at the post-consumption stage. Therefore in order to better solve the solid waste management problems, a "cleaning production" [1][2] promotion activity occurred around the 1980s but turned out also to be unsuccessful because the economic system is reluctantly to take any environmentally friendly strategies except it has been linked with their economic benefits.

On the basis of decades of the practical experiences of the solid waste management as well as the promotion of cleaning production, it has been gradually realized that as the major economic beneficiary of the production and distribution, the producers also has the most significantly decisive influence on their products after consumed, although few producers have the incentives to invest to this potential costly non-business field. However, on one other hand, even the whole world could not sustain the "external cost" caused by the solid waste any longer. Consumption of various new products seems not to be a purely enjoyable behavior to larger and larger extent. In this background, the extended producer responsibility, or in short the EPR [3][4], has been forwarded in late 1980s with the basic idea to assign the external cost caused by discarded products to their producers in order to economically motivate the real-influence-carrier to take corresponding responsibilities and carry out effective measure to improve the life cycle environmental performances of their products even after consumption stage.

Basically, to assign extended economic responsibility to producers is the most important conceive of EPR principles as well as related programs. At the same time it is also the most difficult part in terms of designing a practical EPR program. It is easily understandable that any EPR program, which is to simply assign an extra cost to the concerned production, will result in a higher risk degree of disobey for the corresponding companies, because it seems that no revenue will be generated by participating such a program. In practice, the existing EPR programs have caused quite a few unexpected chaos in the market, for example the application of WEEE directives in European Commission areas. By examining the practical experiences and failures already achieved in such countries as EU members and Japan etc, it is found that uneven distribution of the economic responsibility and potential revenues are the major cause of such chaos. The interrelationships among key stakeholders on especially the economic level, needs to be investigated in order to better promote the application of EPR programs and achieve the originally expected result that to improve the whole life-cycle environmental performances of products on real market basis. In other words, in order to

<sup>†</sup> Graduate School of Global Information and Telecommunication Institute, Waseda University

better promote the application of EPR, the function and responses by the market have to be considered and attached higher importance when designing an EPR program.

By examining the characteristics and inefficiencies of typical existing EPR programs, this paper firstly studied the influences of EPR programs on several key stakeholders. Potential cost and revenues of each stakeholder are focused and win-win situation is emphasized with the purpose of providing larger incentives to those key stakeholders. Marketing promotion strategies are mainly considered as designing more effective EPR programs on one hand and developing more favorable responsive strategies for concerned stakeholders on the other. It can be concluded that negotiating mechanisms need to be better developed among the governmental and other key stakeholders in the market.

## 2. EPR Programs and Stakeholder Systems

### 2.1 Crucial Types of EPR Programs

In EPR program, the economic responsibilities assigned to the producers are mainly embodied as the cost for collecting, recycling and properly disposing the end-of-life products, or in short EOL products, in question. Specifically, it means that the producers have to pay for the related costs in collecting and recycling their products after discarded. The motivation to design this kind of responsibility is that along with the requirement of paying for the post-consumption environmental cost of their products, the producers will give more consideration of the post-consumption environmental performance of their products. For example, the producers will re-design their products to be more easily reused and recycled so that the related costs will be decrease. Even if the eco-design changes could not be able to be achieved in time, the external cost which is traditionally contained by the municipal society and the residential area also internalized to the consumers usually believed real beneficiaries of the products, i.e. the producers.

In practice, according to the diverse situations in different countries and industries, there are generally two major ways to assign the economic responsibilities: (1) an extra charge paid by the customers when they throw away the used products; and (2) an extra fund that producers need to finance to set up as they sell new products in the market.

The first model is typically represented by the EOL products management system in Japan. For example, for throwing away an used television, the owners need to pay 2700 JPY recycling fees per set; for refrigerator, it is 4600 JPY; for washing machine, 2400 JPY; for air

conditioner, 3500 JPY. The above amount is just the recycling fees paid by the users, excluding around 2000 JPY per set for the transportation. As for discarding an automobile, around 18,000 to 25,000 JPY needs to be paid per car including the transportation fees. Ever since the enactment of the Basic Law for Establishing a Recycling-Based Society in May 2000 [5], this consumer-pay EOL products collecting and recycling system achieves satisfying result till now.

On the other hand, the second model can be represented by the EOL automobile collecting and recycling system in Germany. According to the “Ordinance on the Disposal of ELV's and the Adoption of Road Traffic” in Germany, all the related costs for collecting and recycling the EOL vehicles are contained by car manufacturers through setting up a special end-of-life car management funds. For those cars already existing in the market, the funds will be financed by a special project by the manufacturers, and for those new cars going to the market, special recycling fees will be charged for each car at the selling point and managed by a third-party fund management company. Under this ordinance, the owners could be able to return their old cars to designated collecting spots for free.

In either system, the recyclers do not need to pay for the total or the major part of the recycling fees. This is mainly due to the fact that at the beginning stage of designing EPR program, collecting and recycling EOL products were costly business, which will lead to serious problems of illegally dumping, waste export and so on. Thus EPR was designed to provide subsidies to sustain the recycling business. But in some other places, recycling EOL products is quite a profitable business, such as the discarded cars recycling in the US. Meanwhile, with the development of recycling technologies as well as the increase of the scale economic effects, the profitability of recycling business will also be improved. This intrinsic uneven distribution of the potential cost and revenue of recycling EOL products among the key stakeholders has already hindered the smooth application of some of the existing EPR programs. Before specifically discussing the effectiveness of existing economic responsibility assignment programs, key stakeholders in terms of applying EPR will be studied in the next section.

### 2.2 Characteristics of Stakeholder System under EPR

By considering the material flow, informative flow and especially the monetary flow within end-of-life product collecting and recycling system implied by an EPR program, almost all the economic entities along the product life cycle chain are stakeholders for the application of EPR, as shown by Fig. 1.

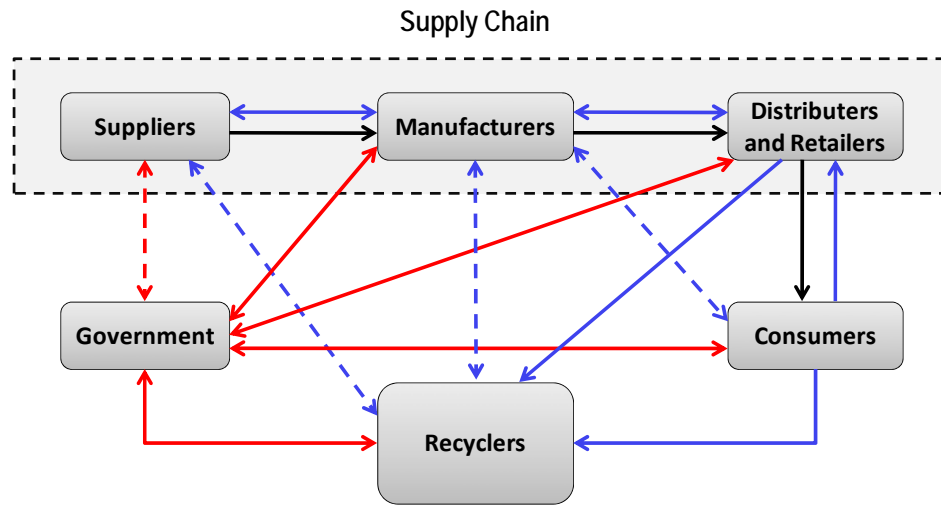
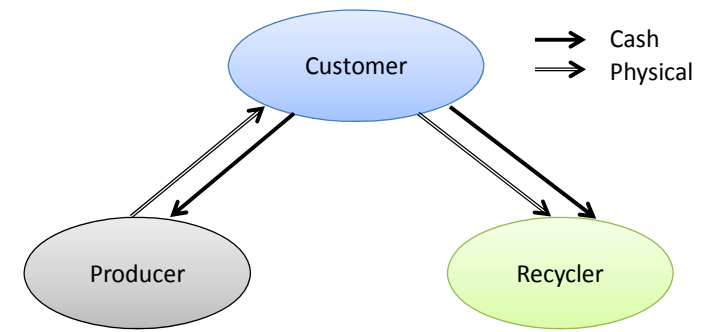


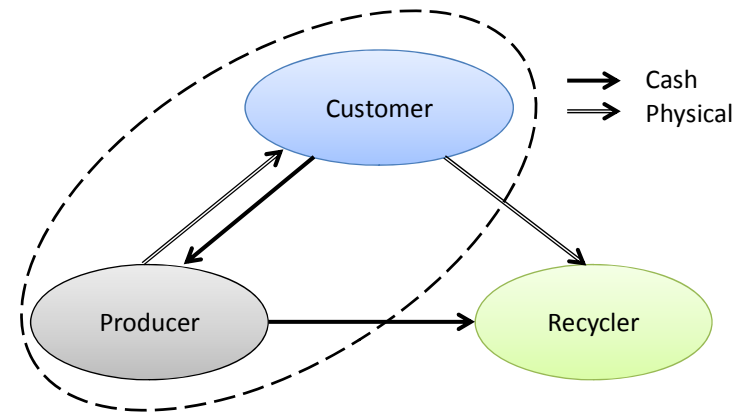
Figure 1 Stakeholder System under EPR

As discussed above, normally the customers or the producers will directly pay for the cost of recycling business in an EPR program. Based on the payment from either entity, the recyclers can run their business and sell the recycled materials or products to the market as the outcome. In fact, the monetary flow of the extra-charged recycling fees has very complex impacts to almost all the stakeholders in Fig. 1. In general, however, the producers who represent the upstream production and distribution system, the consumers who represent the consumption process and the recyclers who represent the EOL products collecting and recycling system, can be treated as the three key stakeholders of the EOL products collecting and recycling system, because of the economic relationships among them. Thus the stakeholder system to be discussed will be narrowed down as shown in Fig. 2.

Furthermore, according to the theory of micro-economics, it could be easily proved that under each situation of the customer-pay program and the producer-pay program, the customers are definitely the actual containers of the extra costs that are regulated by EPR programs. This is because that the increased costs, even directly paid by the producers, will cause the increment in the prices of the product as sold in the market. The price increment will then be paid back



(a) Customer-pay Program



(b) Producer-pay Program

Figure 2 The Key Stakeholder Relationships and EPR

by the customers eventually. To this extent, the producers and customers can be viewed as one stakeholder when considering the influence of the economic responsibility under an EPR program, i.e. the payer. And the recycler can be viewed as the other in the name of the receiver.

### 3. Problems with Current Programs and Improving Potentiality

#### 3.1 Incentives and Inefficiency Identified

No matter in which case discussed above, it is quite obvious that the payers of the cost of the recycling business, and the receiver of potential revenues earned through carrying out recycling business are not the same entity. This situation, which differs from the traditional consideration of any other situations during the economic operating processes, is a particular feature of the EPR program and also one of the most significant difficulties for practices. In the following of this section, we explore the internally conflict situation by examining the two major EPR programs with considering the following four questions: (a) whether the collecting of EOL products is improved; (b) whether the recycling performance of the EOL products is improved; (c) whether more environmentally friendly products are developed and produced; and (d) whether the purchase of more environmentally friendly products are increased. Obviously, these four aspects are created according to the original initiatives as well as the fundamental purpose of developing EPR principles and programs.

Firstly, the so called customer-pay EPR programs, such as in Japan, regulate that the customer directly pay for the recycling costs of the discarded products they used. The customers' environmental consciousness will be correspondingly increased under such programs. On the other hand, however, the amount of the EOL products returned by the end-users is also decided by the environmental consciousness and responsible attitude of the customers. Although such kind of system works well in Japan, we can hardly anticipate a satisfying result similar to Japan in the other countries, for the sake of diverse social background, e.g. the people's ideological difference. As for the question (b), because the recyclers have zero economic risk since it delinks from the recycling performance, the only motivation for the recyclers to improve recycling performance comes from earning more profits by selling more second-hand materials and products. In other words, the recycling of EOL products will be increased only if the second-hand product market is developed sufficiently. A satisfying recycling performance can be achieved by learning the case of the end-of-life vehicle recycling market in the United States. As for the question (c), although the producers are required to take the physical collecting responsibilities and related informative responsibilities, they are lack of direct economic motivations in some degree to change the product design to increase reusability and recyclability of EOL products. As for the question (d), because the recycling fees are charged to the customers in terms of the same group of products, such as the television set, there would be no difference for the customers between new

environmentally friendly products and traditional uneasily recycled ones. No demand, no market. As a result, the developments of new greener products are also probably unattractive to the producers compared with other purchasing preferences by the customers.

Secondly, under the so called producer-pay EPR program, direct economic cost or motivations will be provided to the producers. As for the question (a), free return mechanism is potentially able to perform better than previous program; despite that cooperative actions of the customers are one of the prerequisites. As for question (b), the second type of EPR program has no difference from the first type. As for question (c), since the design improvement of products have strong link to the economic benefits, it can be supposed that the producers have larger motivations to carry out eco-design development. But problems are still existent as no matter how easily recycled the products are, producers could not be able to share the potential earnings. The motivation for eco-design in this EPR program type is not great enough in this sense. As for the last question (d), for the sake that the added recycling costs into the product's price could be changeable in different recyclability levels, the purchasing behaviours will be more easily directed to the more environmentally friendly products. Such situation will in turn provide the producers with larger incentives to carry out eco-design as aimed at originally as forwarding the EPR principles.

#### 3.2 A Win-win Scenario

Based on the above analysis, it can be concluded that neither of the two major types of EPR program, i.e. customer-pay program and the producer-pay program, can achieve the original aims for apply EPR ideally. Taking the three key stakeholders of producers, recyclers and customers into consideration, incentives for any stakeholder to carry out desired behaviours are all insufficient.

Firstly, there are some incentives for producers to improve eco-design of their products under the producer-pay program. Nonetheless, to develop more recyclable products is obviously less attractive, comparing to the development of a multiple-functional or upgraded products, to the producers. The customer-pay EPR programs won't allow the producers to benefit from the potential revenues. Therefore, complying EPR is still an extra cost for the producers. Without participating in recycling process, it will also become very difficult for the producers to improve the recyclability of their products and in turn affect the recycling performance in the end. Secondly, due to the lack of reasonably containing the cost of recycling the EOL products, the recyclers will also be lack of sound incentives to carry out the cost management and make the recycling business more economically efficient. The development of the second-hand

market will become the beneficiary strategy for only the recyclers and the potentially competing situation for the producers, who will only benefit from selling new products. In the end, the development of either recycling technologies or the second-hand product market will be limited, and thus the dilemma between the economic profits and ecological performance of EPR program to be implemented will be further enlarged. Thirdly, in both program types, returning a used product by its final owner is majorly dependent upon to the environmental consciousness of the consumers. Neither the customer-pay nor the producer-pay program provides the customers with enough incentives to return used products and to participate in the EPR programs. Meanwhile, the development of desired greener products is also hindered due to the insufficiency of effective market demand.

The inefficiencies existing within current EPR programs are quite intrinsic and mutually affected. In order to design a more effective EPR program, especially in terms of the economic responsibility assigning program, all the three key stakeholders as well as the major influential parameters need to be taken into consideration and a win-win situation has to be oriented. Such a win-win situation described above should have the following important features: (1) there should be a sharing mechanism of the cost and revenues between recyclers and producers, so that both of the two significant stakeholders could have the economic incentives to improve the recycling of EOL products; (2) the customers could be able to meet their needs for new products as take environmental protection responsibilities; and (3) there should be both the market drives and cost-saving motivations for the producers to develop more recyclable and environmentally friendly products, which is actually the first important goal of applying EPR.

#### 4. EPR Policy Re-design and Producer's Strategy

According to the above analysis and studies, both the policy maker and the concerned producers need to carry out corresponding improvement measure in order to set up such a win-win EPR program.

On the policy maker side, the recycling process and second-hand product market need to be studied more carefully first as to decide where the break-even point (BEP) is for the business of EOL product recycling under specific technological and second-hand market conditions. Different cost-revenue sharing mechanisms should be developed for the scenario below the BEP as well as the scenario above it. With this new mechanism, the recycler will contain certain degree of the recycling cost even the recycling scale is below the BEP and at the same time the producer will be provided with the chance to share the benefits when the recycling scale is over the BEP. Although a complete assignment of the recycling cost

to the recyclers is not feasible at all, the larger the cost assigned to the recyclers, the greater the recyclers' motivation will be to improve recycling performances to decrease the cost. Likewise, although a complete assignment of the recycling benefits to the producers is not feasible at all, the larger the profit potentially shared by the producers, the greater the producers' motivation will be to improve the products' recyclability to increase the recycling revenues. In this way, both the recycling of EOL products as well as the eco-design of new products will be promoted as expected.

On the responsive producer's side, the marketing measures should be carried out to attract the customers' interest to purchase more environmentally friendly products, and at the same time to be more supportive to return the discarded products. The marketing promotion instruments could be more widely utilized by the producers as their strategies to respond to EPR programs. For example, a special monetary value could be assigned to the products that are already in the market and needed to get returned. As the consumers purchasing new products, larger discount can be provided if the customers return their products and used the assigned value to replace part of the price for purchasing more environmentally friendly products. In this mechanism, the customers will benefit from returning the used products directly on one hand, and the producers are able to create more new methods to promote the distribution of their new greener products on the other. Moreover, the producers could be able to benefit from both the increased amount of EOL products collecting as well as the promotion of new product market.

Obviously, all the three key stakeholders could be able to benefit from the new win-win EPR programs; and the interrelationships become positively mutually promoting. Compared with traditional EPR programs, the new program has much greater benefits and much less negative effects.

#### 5. Conclusions

The application of EPR has encountered various kinds of practical problems, among which the conflict of the economic interests among key stakeholders should be contributed as the first major cause. By studying the major types of EPR programs and the interrelationships among the key stakeholders concerned, the main problems existing within current EPR programs are identified. We then forwarded an improving win-win scenario, under which all the key stakeholders will be benefitting. In order to apply a win-win EPR program into practice, the policy makers or the government need to assign more reasonable distribution mechanism of the economic responsibilities between the recyclers and producers. Meanwhile, the producers need to utilize more marketing promotion instrument to motivate the active participation by the customer. It can be concluded that the interest of all the key stakeholders, the development of market for both second-hand products and more environmentally friendly products, as well

as both the regulatory instrument and marketing promotion instruments should be considered in an integrated way, so that a more motivating EPR programs can be designed to provide larger economic incentives to all the key stakeholders, and to ensure the ecological goal to be achieved at the same time.

### References

- [1] T. Jackson, "Clean Production Strategies, Developing Preventive Environmental Management in the Industrial Economy," Lewis, BocaRaton, 1993.
- [2] Johannes Fresner, "Cleaner production as a means for effective environmental management," Journal of Cleaner Production, Volume 6, Issues 3-4, September 1998, Pages 171-179
- [3] Lindqvist, T. "Extended producer responsibility in cleaner production," Unpublished doctoral dissertation, International Institute for Industrial Environmental Economics, Lund University, Sweden
- [4] Tojo, Naoko, "Extended Producer Responsibility as a Driver for Design Change, Utopia or Reality?" PhD thesis, Lund University, Sweden
- [5] Matsumoto Yuichi, "On the Basic Law for Establishing the Recycling-based Society," The journal of economics of Kwansai Gakuin University, Vol. 57, No. 2, pp. 85-101, Jun. 2003