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Policy of extended producer responsibility (case study)

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Abstract

The concept of Extended Producer Responsibility (EPR) is a policy principle to promote environmental improvement of products and manufacturing systems. Approach to Extended Producer Responsibility (EPR) in various Asian and European countries to increase public awareness and concern about the government's environmental impact of products and production processes, encourage sustainable design, as well as end-use products that focus on the improvement of environmental performance of products and manufacturing systems product.

Introduction

The concept of Extended Producer Responsibility (EPR) is a policy principle to promote environmental improvement of products and manufacturing systems. Lindhqvist (2000) states that there are four main objectives EPR, namely: source reduction (resource conservation / natural materials), waste prevention, design compatible products more environmentally friendly, as well as using closed loop approach to promote sustainable development (OECD, 2001). EPR is defined as an approach to environmental policy relating to the responsibility of a producer, where physical and/or financial, for a product is extended to the post-consumer stage of the product life cycle. There are two related features of EPR policy: (1) shifting of responsibility (physically and / or economically; fully or partially) to the upstream producers and away from the city, and (2) to provide incentives to producers to incorporate environmental considerations in the design of their products (OECD, 2001).

EPR is a policy approach that requires manufacturers to finance the cost of waste collection and recycling of designated products (Nahman, 2010; Nash and Bosso, 2013). The main function of the EPR is to shift financial management responsibilities and / or physical waste from local government authorities and the general taxpayers to producers. Environmental costs of treatment and disposal could then be incorporated into the cost of the product. This creates the settings to get the existing market, so it truly reflects the environmental impact of products, as well as where consumers can make choices as they wish based on environmental price signals (OECD, 2001). EPR aims to shift the financial or physical responsibility for ending the life of the product to the beneficiary of the product, so an increase in producer have incentives to provide environmentally friendly products with efficient use of materials containing less hazardous materials (Jacobs and Subramanian, 2012). Intensive use of EPR is expected to improve the design of environmentally friendly products, their prevention and recycling (Rotter, 2011).

Increasing public awareness and concern about the environmental impact of products and production processes, ought to encourage the design and use of sustainable products. An excellent example of the EPR approach, which focuses on the performance of the product life cycle in the environment (Subramanian *et al*., 2009).

EPR

Lindhqvist (2000) has conducted a synthesis of studies, starting with the early work related to developing and defining the concept, and extending through the experience to further explore and apply the principles of EPR schemes for various products in a number of countries. His research aims to contribute to an understanding of how to create a policy that encourages the development of more environmentally adapted products and systems research products specifically developed the concept of EPR as a policy principle to promote

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environmental improvement of products and product systems, and identify possible approaches to key issues in implementation of EPR. Lindhqvist (2000) make a scheme for the characteristics of the different models for implementing EPR are classified into five types of EPR:

1. Informative responsibility implies a responsibility to provide information about products and environmental effects. This responsibility is based on legal requirements and dependence on the goodwill of the manufacturer.
2. Physical responsibility means that the manufacturer is required to physically handle the end-of-life product management.
3. Economic responsibility is when a manufacturer includes the whole or a large part of the costs associated with end-of-life management of products.
4. Liability implies that the manufacturer is responsible for all damages caused by the product during its life cycle.
5. Owner responsibility is a part of all the other responsibilities. Owner responsibility arises when producers continue to maintain a good legal ownership of the products. One obvious example is leasing.

Lease (2002) in a project Institute for Local Self-Reliance waste to wealth program explain the different approaches in different countries in Asia. Japan, Korea, and Taiwan that have introduced EPR programs for a variety of items including containers and packaging, equipment, and consumer electronics. Since its introduction, many laws have been modified and most of the countries are trying to develop effective legislation. In the deposit-refund system in Korea, manufacturers and importers, not consumers, pay the deposit to the "special account for environmental improvement" and refunds paid from the account based on the level achieved improvements to their products. Unfortunately, deposit refund systems fail to motivate manufacturers to collect and treat waste as deposits are far less than the costs for the collection and processing of waste. Therefore, producers found it more economical to recycle rather than lose the deposit. Government plans to increase the amount of deposits. Below the deposit-refund system-Taiwan, state achieve 80% recycling rate for PET bottles within three years of program initiation established by the government to producers.

Spicer and Johnson (2004) in his study reviewed ? three EPR approaches to waste electrical and electronic equipment through Original Equipment Manufactures (OEM) takeback, where manufacturers take direct responsibility, where responsibility takeback is pooled together through a consortium of manufacturers, and a third party where the takeback "Provider Responsibilities Product (PRP) contracted to take responsibility for end-of-life in three ways, 1) OEM takeback, referring to the EPR system in which the OEMs themselves are taking responsibility for the physical and economic production of the products they have. Each company manages their own demanufacturing facilities where their products are disassembled for remanufacturing, recycling, or environmentally sustainable outcomes, 2) Pooled takeback, referring to the EPR approach in which the physical and economic responsibility for the product is assumed by a consortium of manufacturers, usually grouped by product category, and 3) Third party takeback EPR is defined as an approach in which private enterprise assumes the responsibility for the end-of-life products on behalf of the OEM. OEM will pay the cost for a PRP who will then promise to ensure that the product manufacturers retirement in a way that is environmentally responsible and in accordance with the laws of the EPR. PRPs should be set to maintain the security and adequate financial provision for financial risk management. The results obtained are the benefits and challenges of third party demanufacturing in detail as one approach to Extended Producer Resposibility (EPR) system for complex products.

McKerlie *et al.* (2006) using EPR approach covers both upstream and downstream stages of the product life cycle. Thorpe *et al.* (2005) stated that learning from European and Canadian management program highlights the importance of designing EPR programs with clear laws that promote sustainable product design by providing a variety of signals to producers. Recommendations were developed to promote EPR in Canada. In his research McKerlie *et al.* (2006) make a recommendation to advancing EPR in Canada by reducing the ecological footprint and improve the efficiency of the material with 90% n by setting policies that promote sustainable product design, material and the closed-loop system of innovation in service delivery with reduced resource and energy use, and to reduce environmental and health risks posed by rising levels of waste.

Walls (2006) in a study assessing whether the policies that fall under the umbrella of the EPR can spur "Design For Environtment" (DFE) and summarizes the economic literature on this issue and explain conceptually how the policy will affect the design. The conclusion reached is that some DFE-particularly the reduction in the use of materials and products can be achieved by streamlining the most EPR policies, including producers take-back of product and combined cost/subsidy approach Voluntary take-back of products with the target

recycling rate. In a purely voluntary approach, companies in the industry agreed to set up take-back systems for their products and establish recycling goals. There are no laws or government regulations mandate compliance and no penalties for not meeting goals. In the United States, voluntary take-back program of this type include Rechargeable Battery Recycling Corporation (RBRC), which is a manufacturer of rechargeable batteries that pays the cost to operate the system of collection and recycling. Others are the Carpet America Recovery Effort (CARE), which is created by an agreement between the U.S. carpet manufacturers that emerged from the 2002 memorandum of understanding between the manufacturers and some state governments and the U.S. Environmental Protection Agency. Combined cost/subsidy approach is advance recycling fee (ARF) combined with a recycling subsidy. An ARF earn money that can be used in a variety of ways. Effects of policy incentives is highly dependent on both the type of ARF and what to do with income. A " back-end " subsidies - both recycling subsidy per unit of product per pound of recycled or recyclable materials - leading to quite different policy instruments of the ARF where revenue is used to cover waste management costs or cover the cost of infrastructure, in lump-sum fashion. I will discuss these differences in more detail in the next sectionHowever, none of the alternative policies as currently implemented, is likely to have a major impact on other aspects of the DFE.

Bury (2010) reviewed how EPR shifts responsibility for the operation and funding of end-of-life waste management programs for a wide range of problematic and hazardous wastes and products from the city and taxpayers to producers. With the exception of a few programs in the provinces of New Brunswick and Quebec, which are described in the article, the majority of these programs are funded through the use of the price mechanism of visible eco-fees added at the point of purchase. In conclusion Bury (2010) argues for eco-fee-inclusive prices that will advance the goal of EPR by making producers more directly responsible for their product design by internalizing end of life management costs. Cost internalization would make manufacturers directly responsible for the financing of EPR programs without passing on visible fees to consumers, and serves to help avoid the kind of controversy which occurred in Ontario with visible eco-fees. Cost internalization and differential costs representing product environmental impacts. In addition it will provide clearer information to consumers when supported by a communication plan, to increase awareness of the environmental cost andit could be compatible with the mechanism of differential costs will reflect the environment and recycling costs.

Kojima *et al.* (2009) stated that China and Thailand have developed regulations on e-waste recycling with common characteristics such as financial responsibility for the collection of producers and subsidies. Although the proposed system makes sense, considering the fact that e-waste is a traded commodity markets, there are two main difficulties in implementing EPR in developing countries. First, it may be difficult for the government to raise funds from the manufacturer or importer if the smuggled, imitation, or small shop-assembled products have a large share in the market. Second, the system creates incentives for recycling collectors and to report the number of e-waste collected to get additional subsidies from the fund. Other policy measures such as enforcement of pollution control regulations in the informal recycling, prevention of smuggling, and the protection of intellectual property rights must accompany EPR policy. The results Tong and Yan (2013) shows that as one of the manufacturers of electronic products and electronic waste (e-waste) in the world, China has been expected to play an important role in the evolution of global governance based on the idea of EPR, both to create ways new strategies for manufacturers to make their products end of life, or to reshape the ways of production and consumption with a fast-growing market.

Wiesmeth and Häckl (2011) examined the concept of EPR from an economic standpoint. Particularly the importance placed on the concept of economic feasibility EPR policy, which should guide decision-making in this context. In addition, the importance of the core EPR principle of 'integrating signals throughout the product chain' to incentive structures are indicated by the experience of Germany. These examples refer to consumption of packaging sales, refill drinks package and collection of waste electrical and electronic equipment. As a general conclusion, the interaction between the principles of economic and technological development should be observed carefully when designing incentive-compatible EPR policy.

Özdemir *et al*. (2012) stated that the primary purpose of environmental laws derived from EPR is a leading manufacturer for recycling initiatives and promoting the use of end product desired product design environment. Our findings indicate that the opportunity to redesign encourage more manufacturers make improvements, but the reluctance of producers to cover the initial investment can substantially reduce the effectiveness of the legislation and the

amount of recycling.

Mayers and Butler (2013), very limited previous studies on the detailed operation of the PRO. The case was presented as a typical example illustrating the operational challenges in implementing EPR PRO face, like how PRO gain an understanding of waste management infrastructure and legislation in each country, collecting enough rubbish volume using cost-saving settings, and maintain uninterrupted collection, treatment, and recycling service. Case studies provide new insight and context on the practical implementation of EPR regulations relevant both policy makers and researchers

Hickle (2013) described a comparative policy analysis through the lens of regulatory efforts EPR for electronic waste, with a particular profile of the program in the State of Minnesota and the Province of Ontario. Both approaches broadly reflect many considerations and governance policies and program themes that dominate EPR programs in each country. This article offers recommendations for collaborative work between the United States and Canada to explore the consistency between the program and other complementary strategies to support EPR.

EPR profit

Before the government took steps to select the EPR as a policy, it is important to evaluate whether and / or how it should be done. Government policy makers might want to use the following decision criteria that are typically used for environmental policy considerations (and applicable in the case of the government contemplating EPR) to assist with the evaluation. When designing a new strategy, it is important to carefully consider how to fit the EPR within the spectrum of national environmental policies, objectives and priorities. Costs and benefits of a given approach should be considered in relation to the cultural context in which decisions are made. Last is, policy makers must consult with stakeholders. Based on OECD (2001) commonly used decision criteria for EPR include consideration of environmental policy: environmental effectiveness, economic efficiency, equity and distribution effects, feasibility and cost of administration, with the coordination of the institutional framework, political and social acceptance, adjustment costs associated with the transaction (and those associated with the operation of the program), and incentives for environmentally compatible product innovation.

EPR policy if designed properly, can be a driving force to avoid the waste and pollution and promote associated reductions across many sectors of the economy. Further benefits of EPR based on OECD (2001) may include, reduced number of landfills and incinerators and accompanying environmental impact, reduced burden on the city to the physical requirements and / or finance of waste management; encourage recycling and reuse of products or parts thereof; improve the ease and timeliness of product disassembly for recycling or reuse, reduce or eliminate potentially harmful chemicals in products; increase cleaner production and products; promote a more efficient use of natural resources; improve relations between the community and the company; encourage more efficient and competitive manufacturing; promote the integrated management of the environment by placing emphasis on product life cycles, and improve materials management.

Jacobs and Subramanian (2012) has tested the economic and environmental implications on product improvement and shared responsibility in the supply chain. We use a two-echelon model composed of a supplier and manufacturer to determine the impact of product collection and recycling incentive benefits in the recycling process and the profits generated in the integrated and transfer of power from the center to the branch (decentralized) supply chain. Decentralization for supply chains, we show how the division of responsibilities for product improvement between echelons can increase the total supply chain profits and suggested contract that can increase profits. To test the performance of both the economy and the environment associated with the division of responsibilities, we propose to construct the social welfare benefits that include supply chain, consumer surplus, and externality associated with the extraction of natural materials, consumer products, and disposal of products nonrecycled. Results of this study indicate that the value for both companies anticipate or subject to product recovery legislation, and social planners are trying to balance economic and environmental impactsensure fairness of such legislation.

One of the most important steps in designing effective EPR scheme is the formation of clear policy and program objectives are clear. Objectives should be transparent and made in relation to specific environmental improvements, conservation of natural resources or conservation, and energy consumption. While this section lists the goals and objectives suggested by member countries and participants in the workshop discussion of the stage EPR, not comprehensive (OECD, 2001). Recommendations on how to achieve effective implementation of EPR and efficiently, including increased incentive design, incorporating reuse and repair, expand the scope of products, managing material flow downstream, and increase operational efficiencies through the design

of a fair allocation of costs (Gui *et al*., 2013).

EPR policy instruments

EPR policy instruments along with the steps based on OECD (2001) are as follows;

1. Take Back Requirement

The most active use of EPR, based on two voluntary and mandatory schemes; 1) voluntary take-back of products with the target recycling rate . In a purely voluntary approach, companies in the industry agreed to set up take-back systems for their products and establish recycling goals. There are no laws or government regulations mandate compliance and no penalties for not meeting goals. In the United States, voluntary take-back program of this type include Rechargeable Battery Recycling Corporation (RBRC), which is a manufacturer of rechargeable batteries that pays the cost to operate the system of collection and recycling and 2) Combined cost/ subsidy approach is Advance Recycling Fee (ARF) combined with a recycling subsidy. An ARF earn money that can be used in a variety of ways. Effects of policy incentives is highly dependent on both the type of ARF and what to do with income. A " back-end " subsidies-both recycling subsidy per unit of product per pound of recycled or recyclable materials-leading to quite different policy instruments of the ARF where revenue is used to cover waste management costs or cover the cost of infrastructure, in lump-sum fashion. I will discuss these differences in more detail in the next section. However, none of the alternative policies as currently implemented, is likely to have a major impact on other aspects of the DFE, is the product take back. EPR is applied to a particular product (eg. a car), product category (eg. electrical and electronic products) or waste streams (eg. packaging) will be taken back or refunded. These types of programs are often associated with the target for the collection and recycling and / or reuse. In most cases, the manufacturer was given the responsibility (or as under the voluntary system, taking responsibility) of the meet targets for reuse, recycling and collection through laws, regulations or other agreements unless such conditions of participation in the PRO or the initiation of recovery schemes individuals, have been met.

Take-back requirements, pioneered in the German Packaging Ordinance in 1991, is now being applied to a wide range of products including batteries, tires, cars, computers, used oil, oil filters and containers, refrigeration, white goods and electronic product (it takes back used pesticide containers and is being expanded to other wastes such as seed bags, fertilizer bags, bale wrap), to many OECD countries, including Australia , Canada, Japan, Korea, Norway and the European Union (EU). The EU EPR as a reference, because they have driven EPR activity (Webinar, 2011).

2. Economic Instruments

In addition to the use of take-back requirement assignment of responsibility on the manufacturer to the end of life management of their products to meet the policy objectives, economic instruments can also be used towards the same goal. Listed below is an economic instrument that can be used to implement EPR policy. These instruments provide direct financial incentives for actors to implement EPR. Examples of economic instruments that can be targeted to meet the goals of EPR including deposit / refund schemes, advance disposal fees, and taxes/ or subsidies (government to give credit to the income tax to anyone who is investing in recycling infrastructure, this is as a direct subsidy to the capital).

3. Deposit / Refund Schemes

In the system of deposit / refund schemes, payment (deposit) is made when the product is purchased and fully or partially refunded when the product is returned to the dealer or special care facility. Traditionally, deposit / refund refund schemes have focused primarily on beverage containers. Although the success rate of this scheme, little activity has grown beyond a drink container. (Although they have been used in the Member States to a limited extent for other product categories such as consumer batteries, fluorescent light bulbs, tires, and a shopping bag.)To encourage more environmentally friendly choice of materials, the cost of which is applied to a particular product and returned when the product is returned.

a. Advance Disposal Fees

An Advance Disposal Fees (ADF), in the context of EPR, will be charged on specific products or groups of products based on the estimated cost of collection and treatment methods. Fees are paid at the point of sale. A fee may be charged by the government or by the private sector organization based industries. The role of retailers and distributors in this scheme should be set at the design stage program.

b. Material Taxes

A core feature of the EPR policy is that they put some of the responsibility for an end of life product, the environmental impact on the original manufacturer and seller of the product. The aim is to provide an incentive for manufacturers to make design changes that reduce waste, increase recycling such products and reusability, reduce the use of materials, and streamlining product (McKerlie *et al.*, 2006).

The results achieved in a short period of time suggests that the evolution of the implementation of the

EPR concept in Portugal was very successful through an assessment of the evolution of waste management, with a particular emphasis on the performance brought about by the adoption of some EPR scheme, which is being developed for packaging (general, pharmaceuticals and crop protection products), used tires, used mineral oil, end-of - life vehicles (ELV), waste electrical and electronic equipment (WEEE), portable and car batteries and industrial batteries, with not only in terms of quantitative but also qualitative (contributing to the improvement ? reduction of environmental performance). However, there is still room to improve the long-term impact of EPR and is highly dependent on policy instruments (fiscal, information and monitoring) that can positively influence the context in which the scheme operates EPR (Niza *et al*., 2014).

Subramanian *et al.* (2009) studied the effect of design parameters on the EPR policies and incentive products in the supply chain for durable products. Our models remanufacturable manufacturer supplying products to customers during some years. Manufacturers invest in two design attributes of product that the impact of the costs incurred by the supply chain performance, which affects the environmental impact of products during use, and remanufacturability, which affect the environmental impact of the product during use. Consistent with the policy objectives of EPR, producers and customers are asked to share the environmental costs incurred during the life cycle of the product. Customers have a continuing need for the services and products to optimize the cost of replacing the product and the cost incurred during use. We show how the costs for the use and post-use can be used as a lever to encourage the design of products that benefit the environment. Subramanian *et al.* (2009) analyze the impact of supply chain coordination in design choices and discuss the benefits and contracts that can be used to achieve coordination, both symmetric and asymmetric information on customer attributes.

Subramanian *et al.* (2009) investigated the influence of both the EPR legislation and supply chain coordination in product design decisions. They discussed a variety of contracts that can help achieve coordination between customers and producers and lead to a more favorable product design. In a different setting, Plambeck and Wang (2009) examined the impact of e-waste regulation on new product introduction frequency and quality of the product. Atasu *et al*. (2009) focus on the efficiency of the existing WEEE regulations and concluded that social planners should take into account the cost of recycling and environmental impacts of different product groups to design effective legislation.

Nahman (2010) discusses various approaches to implementing EPR for various types of packaging waste in South Africa, focusing specifically on their effectiveness in stimulating the improvement of post-consumer packaging materials for recycling. In particular, the approach adopted in a plastic bag, steel beverage can, glass and polyethylene terephthalate (PET) industry was examined. It is found that industry initiatives (such as in the industry can, glass and PET) can be effective in stimulating recovery in a developing country context. In contrast, in the case of South Africa, compulsory, government regulations legislation (as in the plastic bag industry) have not been effective in stimulating improvement. However, this does not mean that voluntary initiatives are always more effective than mandatory rules. Instead, it is likely that the different results for plastic bags as opposed to other packaging waste stream in South Africa can be explained by different characteristics. Moreover, in the case of glass and PET, the main incentives behind voluntary initiatives is the desire to avoid the rule of law as applied in the plastic bag industry. Therefore it can be said that the mandatory regulations in the plastic bag industry have indirect effects to stimulate improvements in glass and PET industry.

Research on waste electrical and electronic equipment in Thailand. Some members of the Organisation for Economic Co-operation and Development (OECD) have relied on the principle of EPR to address this problem, with varying degrees of success (Manomaivibool and Vassanadumrongdee, 2011). Some non-OECD countries, including Thailand, are developing a program and look for lessons from the first mover. This study aims to provide an understanding of both the context and of the EPR program for on waste electrical and electronic equipment proposed for Thailand. It finds that EPR mechanisms in general, and the proposed buy-back system financed by product fees in Thailand in particular, have a strong potential to consolidate the collection of waste electrical and electronic equipment for the formal recycling sector by offering end users monetary incentives. On the negative side, this is an expensive combination of policy instruments and the institutional design of the governmental fund is rigid. Policy effectiveness may be beneficial in order to reduce the monopoly of government funding, as well as the introduction of cost to promote eco-friendly products.

Li *et al*. (2012) stated that the most effective way to collect used products is through the manufacturer. In addition, government policies EPR can benefit

remanufacturing activities, promote the sale of remanufactured products, and increase supply chain profits. We also show that more producers benefit when consumers are more willing to pay for a remanufactured product. Although economic theory supports the use of EPR to stimulate the prevention and recycling of waste, the EPR system is implemented in Europe is often criticized as a result of the lack of incentives for prevention and green product design. We study the design of reverse supply chain channel consisting of a manufacturer and a retailer. Manufacturers create new products and sell them through retailers in the previous period. Products used for remanufacturing collected at the end of the previous period. In the current period, re-sold products at lower prices, along with new products. Products used can be collected either by the manufacturer or retailer. A minimum percentage for product re-enforced by government policy through the EPR.

EPR models

Various models of the EPR has developed one of which was developed by Walls (2006) that showed that the variable recyclables processing affect in curbide and paid collection of recyclables, in addition to the manufacturers must pay for recycling of waste and the costs passed on to consumers. One of the principles in the EPR program funding policy is to incorporate costs into the product price EPR (Bury, 2010), internalization of environmental costs into product prices are consequently influence consumer behavior changes. Therefore producers should check their waste reduction strategy (Mckerlie *et al.*, 2006).

Fleckinger and Glachant (2010) construct a model of product differentiation to analyze the welfare properties of EPR programs. Each manufacturer must comply with the requirements of decision which forced him back to collect and treat the waste associated with its products. In line with reality, Fleckinger and Glachant (2010) assumes that producers organize themselves either individually or in collaboration with established Producer Responsibility Organization (PRO).

Brouillat and Oltra (2012) presents an agent-based simulation model that models both economic and physical relationship between the companies, and consumer recycling. This framework allows the investigation of the relationship between physical environment variables (the waste stream, the flow of virgin material) and economic agents in the chain of decisions that the company strategy of product innovation, consumer choice and the development of recycling activities. This study high lights the value of using agent-based modeling as a tool to investigate the effect of operational waste prevention policies on economic decisions and technology agency. We focus on three types of EPR instruments, the cost of recycling, subsidy, and norms. Simulation results show that the impact of each instrument depends on the policy design, particularly at the level of rigor and reward systems are implemented. We show that only the tax-subsidy system and stringent norms could lead to radical innovation and significant changes in product design. In the case of tax-subsidized, the impact is more dependent on the effects of innovation, whereas in the case of the norm that mainly relies on the selection effect

Cahill *et al.* (2011) states that the ratio of EPR implementation for packaging waste and waste electrical and electronic equipment is presented for a representative sample of eleven European Union countries (Austria, Belgium, Germany, France, Ireland, Italy, the Netherlands and the UK, Bulgaria, Czech Republic (as two recent accession states) and Switzerland).based on five indicators: stakeholders and responsibilities; compliance mechanisms; role of local authorities, financing mechanisms as well as the advantages and limitations, with four countries (France, Belgium, Ireland, and the UK) selected for analysis of more detailed case studies. Similarities, trends and differences in national systems are highlighted with a special focus on the role of local governments and their relationships with manufacturers who are required and the effect on the operation and success of any system. On the whole, EPR for packaging has been successfully applied in the rest of Europe in terms of Directive targets. This suggests that the EPR system is applied in different European, especially an opinion on the legitimacy of local government stakeholders. Local governments are involved in the establishment and operation of national EPR systems, consulting on aspects of system design (contractual agreements, financing, coordination mechanisms and communication systems), and law enforcement activities. While manufacturers consistent and communicate with the local government in the implementation of the National EPR, as well as the forum for stakeholders for transparency and consultation on the design aspects of the system.

Conclusion

EPR policies for packaging waste and waste electrical and electronic equipment in eleven EU countries (Austria , Belgium , Germany, France,

Ireland, Italy, the Netherlands and the UK, Bulgaria, Czech Republic (as two recent accession states) and Switzerland) are overall for the packaging has been successfully applied in the rest of Europe in terms of the directive targets. While the EPR policy in the United States, shows that the manufacturer has implemented a voluntary program to collect and recycle the products, but these efforts have proved to be effective in capturing a significant amount of waste products. EPR policies for various types of packaging waste in South Africa has stimulated improvements stimulate repair of post-consumer packaging materials for recycling by implementing take-back requirement that local government support.

EPR policies in various Asian countries (Japan, Korea, and Taiwan) for containers and packaging, equipment, and consumer electronics with a deposit-refund system has failed to motivate manufacturers to collect and treat waste as deposits is much less than the cost of collection and sewage treatment. While in Thailand the application take back requirements on waste electrical and electronic equipment, has been carried out with the system repurchase product recycling, collection, and provision of incentives for the end user.

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