

***Part 4: Political Economy for Implementing  
EPR Policies***



## *Chapter 1*

### **POLITICAL ECONOMY FOR IMPLEMENTING EPR-BASED POLICY INSTRUMENTS**

*by*

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#### **SUMMARY**

In light of the growing use of extended producer responsibility (EPR) as a principle that underpins environmental policy instruments among OECD member states since the early 1990's, this paper attempts to draw some lessons from the implementation of EPR programmes to date. The paper evaluates the results of different types of EPR programmes, analyses the institutional and structural factors that influence the results and the measures to overcome barriers, and suggests what types of products are most suitable for certain types of EPR programmes.

The focus of the evaluation is on four product groups, namely packaging, small consumer batteries, electrical and electronic equipment (EEE) and cars, for which EPR programmes have been used widely among the OECD member states. Approximately 20 programmes, which have been implemented for a

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relatively long time and have taken different approaches (e.g. style of enforcement, responsibilities given to the producers), have been evaluated.

The evaluated results include: collection, reuse and recycling rates; the stimulation of innovation (e.g. design for reuse/recycle/end-of-life management, reduction of toxic substances at source, change in a product system); the costs of implementation; soft effects (e.g. capacity building, generation and diffusion of information, improved communication between the upstream and the downstream); approaches to overcome barriers such as existing and orphaned products and free riders. The difference in the calculation method of collection/reuse/recycling rates, in the range of end-of-life management that is covered by the paid fee, as well as the question on the reliability of the data, posed limitation when comparing the results.

When discarded, products selected for evaluation pose threats to the environment and human health due to their high volume (e.g. packaging, cars), and/or hazardous substances in their parts and materials (e.g. batteries, cars, EEE), making it difficult and costly for conventional waste management facilities to handle them properly. EPR programmes have been used both for durable, complex products (e.g. cars, EEE) and for non-durable simple products (e.g. packaging), and compared to the latter, the former add difficulties in the management of EPR programmes. EPR programmes are most effective in reducing waste generation and increasing recycling where there is a potential for design changes of the product that can reduce the costs of recycling.

In determining the scope of an EPR programme, the consumers' ability to distinguish the difference between the products covered by an EPR programme and those uncovered (e.g. different types of batteries) should be considered. An EPR programme that covers all similar products may help avoid confusion and free riders. When a product covered by an EPR programme contains products covered by other EPR programmes (e.g. tyres in cars), governments either co-ordinate the coverage of these products, or delay implementation of a programme to avoid an overlap.

Voluntary programmes seem to work best when the product contains a high amount of valuable resources at post consumer stage (e.g. cars), however they suffer from free rider problems. Involvement of governments in an EPR programme, on the other hand, reduces free rider problems, achieves higher collection/reuse/recycling results, and stimulates design for end-of-life management without consumers demanding it (e.g. cars, EEE). Among the programmes evaluated, there is a definite shift from voluntary initiatives of producers to the programmes where governments are involved (either mandatory legislation or negotiated agreements).

Mandatory numerical targets have been effective in achieving high collection/reuse/recycling rates. While collection targets help increase separate collection from the rest of the waste stream and reduce littering, reuse and recycling targets drive design changes and technical improvement, leading to the reduction of environmental impacts of discarded products not only at their end-of-life, but also at source. Due to the uncertainty as to when a product comes to its end-of-life, it is non-trivial to set collection targets for durable products (e.g. EEE, cars).

Substance/landfill bans and the mandatory achievement of recycling rates for specified materials have been powerful components of some of EPR programmes that trigger product re-design and development of alternative substances. Threat of a ban often encourages increased collection and recycling (e.g. batteries).

The establishment of a successful collection system is the prerequisite for a successful EPR programme. Achievement of high collection rates requires 1) adequate financial incentives for consumers, 2) convenience for consumers (e.g. size, weight and ease of handling of the discarded products, distance to the waste bins) and/or 3) information to consumers. Particular problems with a conventional deposit-refund system can be overcome by combining the deposit refund system with an advance disposal fee system. Some retailers participating in the collection of old products experienced increase in customer numbers.

In introducing an EPR programme, issues such as the number of producers and distributors that exist in the market, the financial and physical capacity of the individual producers to establish and manage the end-of-life management system of their products, the number and capacity of existing end-of-life managers in the market, must be considered. Use of an existing physical infrastructure, skills and knowledge for collection and recycling (e.g. local governments, retailers, recycling facilities) facilitates fast and efficient implementation of an EPR programme. The ownership and management of existing infrastructure can be adjusted for EPR programmes.

For non-durable, relatively simple products (e.g. packaging, some batteries), producers often organise a collective collection and recycling infrastructure. The properties of these products allow the advance fees on new products paid into a collective financial system to reflect actual collection and recycling costs of the products sold.

Properties of durable, complex products (e.g. EEE, cars), on the other hand, make a collective financial system ineffective at stimulating design change. Individual financial responsibility presents an important opportunity to

stimulate design changes that ultimately minimise the cost of recycling, but it fails to address orphaned products and requires an appropriate collection system where brands and properties of collected products can be easily distinguished. A last-owner-pays system, when coupled with individual physical responsibility, can be an effective measure to promote design change, but create disincentives for collection.

In order to improve the evaluation, consistent measuring and reporting of performance level and costs of EPR programmes is necessary, requiring additional research and/or co-ordination among the different EPR programmes. Further research is also required on the influence of different types of EPR programmes on eco-design and innovation.

## **List of abbreviations**

EEE: electrical and electronic equipment

ICT: information and communication technology

PRO: producer responsibility organisation

RoHS Directive: Directive of the European Parliament and of the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment

WEEE Directive: Directive of the European Parliament and of the Council on waste electrical and electronic equipment (WEEE)

## 1. Introduction

Extended producer responsibility (EPR) is an environmental policy approach in which a producer's responsibility, physical and/or financial, for a product is extended to the post-consumer stage of a product's life cycle (OECD, 2001). Current trends indicate an expansion in the application of EPR-based policy instruments to new products and waste streams in OECD Member countries.

There are a number of factors that are important to consider when designing institutional and financial arrangement of EPR-based policy instruments. These include, *inter alia*, government institutional factors, institutional factors between firms, characteristics of products covered under EPR programmes, and uncertainty associated with the implementation. These factors, together with the actual financial and structural implementation mechanism, may influence issues such as free-riding, need for information dissemination, transaction and administrative costs, competition and trade. However, there is not sufficient information and research indicating the relation of these factors with various EPR-based policy instruments and with the achievement of policy goals.

The purpose of the paper is to review and analyse the relation between various institutional and market factors surrounding EPR-based policy instruments and their implementation.

The paper focuses primarily on selected policy instruments that have been widely used by OECD countries to implement EPR programmes, namely take-back requirements, advance disposal fees and deposit-refund systems.<sup>2</sup> The roles of requirements accompanying the three instruments (*e.g.* informative responsibility, targets for collection, reuse and recycling, substance and landfill restrictions, minimum recycled material content requirements), as well as other EPR-based/supporting policy instruments that are used in combination with these three instruments (*e.g.*, material taxes), will also be examined wherever appropriate. EPR programmes for products widely addressed by the OECD Member countries (*e.g.* packaging, small consumer batteries, automobiles, electrical and electronic equipment - EEE), being in place for a relatively long

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<sup>2</sup> These three instruments are often used in combination within one EPR programme, and many of the phenomena found in implementation may be common for all the three instruments. Thus, unless specified, the discussion in this paper the discussion in this paper concerns the implementation of EPR programme in general.



period, introduced by different level of governments (national, state, local), and using some or one of the aforementioned policy instruments, are selected to illustrate the concrete implementation. The paper does not attempt to make a comprehensive description of specific EPR programmes. Instead, elements of different EPR programmes are introduced to illustrate issues relevant for discussion.

Literature on the subject produced by the OECD constitutes the primary source of the study. It is complemented, to the extent possible, by review of academic articles, publications and professional magazines, as well as personal communication with actors in OECD countries.

The five sections on this paper review and analyse institutional and market factors surrounding the EPR-based policy instruments. These inter-relating factors include: government institutional factors (Section 2); institutional factors between firms (Section 3); characteristics of the products (Section 4); financial and physical implementation mechanisms (Section 5); transaction and administrative costs (Section 6) and competition and trade (Section 7). Based on the findings from Section 2 and 7, conclusion is made (Section 8).

## **2. Government institutional factors**

This section discusses some of the factors related to the allocation of roles and responsibilities among the governmental actors that affect the formulation and implementation of EPR programmes. The section first discusses the challenges and strengths connected to diversified regional requirements, followed by seemingly contradictory aspirations of some local governments in implementing EPR programmes. Observed constraints linked to the division of responsibility among government bodies, as well as effects associated with nationwide targets are also reviewed.

### **2.1 *Diversified regional programmes***

Although the specifics vary from country to country and from product to product, regional (state, provincial, prefectures, canton) as well as local governments often play a crucial role in formulating and implementing EPR programmes. Regional governments in some countries with federal political and administrative structures establish their own EPR programmes (*e.g.* Canada, USA). In others, regional governments may be responsible for issues such as certification of recycling plants (*e.g.* EEE in Switzerland) and establishment and management of collection system (*e.g.* packaging in Japan). In some EPR programmes, local governments are responsible for setting up systems for collection and sorting of the discarded products covered by the respective EPR

programmes (e.g. packaging in France and Japan, batteries in Sweden, part of EEE in the Netherlands, Sweden and Norway).

## 2.2 *Differences in collection system*

With regard to source separation and collection, differences in economic incentives, such as refunds or disposal fees, for consumers in neighbouring regions or countries may lead to unwanted transfer for disposal. For instance, the deposit-refund system for aluminium cans in Sweden suffered from the empty cans brought from outside Sweden. Similar problems may occur within a country where one region has a deposit-refund system, and the neighbouring region does not have one (e.g. United States and Canada). If a take-back requirement were introduced with an end-user pay system in one region but not in the adjacent region, some discarded products covered by the take-back requirement in the former would most likely be transported to the latter, either by private consumers or waste dealers. The problem of “abuse” of the deposit-refund systems has been solved by the introduction of different types of marking system (e.g. bar code system in Sweden, marking on top of the can in the individual states in the United States), or reducing the size of the refund. Östhammar, a small Swedish municipality, which introduced a deposit-refund system for batteries, experienced very little abuse despite the absence of a deposit-refund system in adjacent regions, partly because of a relatively small size of the refund (0.25 SEK: 0.03 Euro)<sup>3,4</sup> (Lindhqvist *et al.*, 1990). It can be noted that the size of the refund can be relatively small as an incentive for consumers to bring back the used products (Lindhqvist, 2000).

Difference in convenience for consumers between the neighbouring regions may also induce illegal disposal and/or transboundary movement of waste. In Japan, the EPR programme for packaging assigns responsibility for collection and sorting of packaging waste to local governments, which also allows each local government to set up its own collection system. With the full introduction of the EPR programme for packaging in 2000, one city requires consumers to separate their waste (packaging as well as non-packaging waste) into as much as 16 different categories (Tanaka, 2001b). Upset and confused, consumers started to bring their non-separated waste to the neighbouring

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3. Throughout the document, the following exchange rate was used: 1 SEK = 0.1093 €, 1 CHF = 0.7647 €, 1 NOK = 0.136 €. (Forex, 2002).

4. The community achieved roughly 100% collection rate for alkaline manganese batteries, while the national average is approximately 25% (Lindhqvist *et al.*, 1990).

communities (Tanaka, 2001b). Allegedly, some citizens even moved to neighbouring communities to avoid this duty.

### 2.3 *Differences in other requirements*

Establishing a tailor-made system that meets different requirements set forth by the respective regional governments can be costly for industries operating nationwide. Differentiated design of products that serve the same function (*e.g.* different marking system) is an example of such requirements. Electronic industry in the United States has expressed concerns that in order to meet the different requirements set by the respective regional governments, it might be necessary to establish small scale recycling plants in several locations, leading to an inefficient situation where economies of scale cannot be utilised (Davis, 2002).

Industry's responses suggest strong preference towards uniform systems. In the United States, producers of nickel-cadmium rechargeable batteries, when faced with development of legislation at the state level,<sup>5</sup> established a nationwide voluntary take-back programme themselves (Fishbein, 1997). Producers of EEE in Canada as well as the United States voiced their preference to have a harmonised system across the nation when some states/provinces started to develop their own EPR legislation (NEPSI, 2001; Betts, 2002).

Differences in standards related to the quality of recycling, such as achievement of certain reuse/recycling targets from specific materials, emission standards, workers' health standards, are often reflected in the differences in the cost of recycling. This may lead to an increase of recycling activities with lower standard, thus lead to more severe environment and health impacts from the recycling activities. It may, in turn, put recycling plants with higher standard in an uncompetitive position. Similar can be said about the introduction of landfill restrictions by a single region. When the State of California banned landfilling of cathode ray tubes, it was feared that it would result in transboundary shipment of discarded cathode ray tubes collected in California to the adjacent states (Smith, 2002).

Challenges surrounding differences in requirements within a nation are parallel to the diversified requirements set by different nations. Battery producers, when faced with stringent restriction in the use of mercury set up in EU, allegedly sold their products with higher mercury content in nations with

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<sup>5</sup>. 13 states introducing legislation on battery labelling and removeability, out of which 8 also had take-back requirements (Fishbein, 1997).

less stringent requirements (Lindhqvist, 2002). Export of waste EEE to developing countries under the name of/as one possibility of recycling has raised strong concern due to unacceptable consequences of lower recycling standards in these countries (Puckett *et al.*, 2002).

#### 2.4 *Contradicting aspirations of local governments*

Prior to the introduction of EPR programmes, aside from the discarded products recycled by private actors due to their economic value (*e.g.* cars, glass bottles, aluminium cans, large batteries), it was local governments that were primarily responsible for the management of most of the discarded products generated from households. Development of EPR programmes for the latter often causes dilemma for local governments.

On one hand, they would wish to avoid costs necessary to maintain and upgrade their waste management system to deal with different types of waste that require special care (*e.g.* EEE, batteries) and to introduce more extensive source separation. Indeed, though not necessarily stated explicitly, reducing the financial burden for local governments related to waste management is one of the objectives of many EPR programmes.

On the other hand, local governments may not necessarily be ready to give away responsibility associated with waste management, both with respect to self-interest in employment (public choice theory) and with respect to controlling. In fact, in countries such as Sweden and Finland, introduction of EPR programmes were regarded as a breakthrough that allowed privatisation of waste management, which had been monopolised by local governments (Tarasti, 1998; Jobin, 1997). Resistance of local governments to give away their authority of managing household waste was also perceived when a battery importer in the Netherlands try to obtain necessary permits to take back used batteries by utilising his own distribution network (Struijk, 1992).

This rather contradictory stance of local governments on EPR programmes seems to be reflected in the formulation and actual implementation of the programmes. In Ontario, Canada, after lengthy discussion among various stakeholders, it was agreed that industry would cover up to 50% of the expenses for collection and recycling of packaging materials (financial responsibility), while local governments bear the rest of the financial as well as physical responsibility.<sup>6</sup> Although the responsibility on the side of producer was rather

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<sup>6</sup> Bearing the *financial responsibility* “means that the producer will cover all or part of the expenses, for example, of the collection, recycling or final disposal of the products he is manufacturing”, while *physical responsibility* refers to

weakened due mainly to the dominant negotiation power of the industry (Gaynutdinova, 2000), most of the stakeholders participating in the discussion process, including the local governments, were perceived to be satisfied with the outcome (van Rossem, 2002). In Japan, responsibility for the collection and source separation under the EPR programme for packaging remained in the hands of local governments, partly because of the necessity of the local governments to secure employment of their own staff (Morishita, 1997).

Some EPR legislation (*e.g.* packaging in Germany and Sweden, EEE in Sweden) requires producers to consult with local governments when setting up a collection/recycling system. On one hand, it would help secure the easy access to the collection depots for consumers. On the other hand, it may increase the cost of setting up the infrastructure for collection and/or recycling, as found in the initial implementation of the German EPR legislation for packaging. Due partly to a rather short timeframe given to the producers to set up the system, the Producer Responsibility Organisation (PRO) that coordinate the system on behalf of the individual producers had to rely on existing infrastructure for collection and recycling, who were in many cases local governments. The binding period of the contract with some of the local governments, which was up to 20 years, have been considered as invalid.

The requirement of consultation with local governments may also make it difficult for individual producers to set up its own collection infrastructure. Some municipalities in Sweden refused to consult with an EEE manufacturer in Sweden who wished to establish an alternative collection system, on the ground that a PRO that represents the majority of EEE producers already established collection depots (Lindhqvist, 2002).

## **2.5 Allocation of responsibility among government bodies**

Some countries with federal political and administrative structures provide governments at the regional level (state, province, canton) with wide range of authority to establish and implement their own waste-related legislation (*e.g.* Canada, the United States).<sup>7</sup> Jurisdiction over waste management is often

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the situation where “the manufacture is involved in the physical management of the products and/or their effects.” (Lindhqvist, 2000).

<sup>7</sup>. For example, in Canada, aside from waste management in federal land and facilities regulated by federal legislation and transboundary movement of waste, responsibility related to waste management is in the hands of provincial governments (Estin *et al.*, 1993; OECD, 1998d). In the United States, state governments can establish environmental regulations that are broader in scope or more stringent than federal programmes, while they must

reflected on the respective roles assigned to the different levels of governments in the formulation and implementation of EPR programmes. Limitations of the national governments to establish uniformed requirements may pose challenges both for the industry covered by an EPR programme and for society at large.

However, even when the jurisdiction of federal/national governments can be limited, they could facilitate the formulation and implementation of EPR programmes in various ways.

In Canada, though federal government cannot directly enforce a take-back requirement, it has been promoting establishment of EPR programmes at the provincial level by providing information (Bury, 2001). Concrete measures include development of a guideline, organising a series of workshops, and establishment of a website. Establishment of a nationwide voluntary take-back and recycling programme of rechargeable batteries in the United States was facilitated greatly by the revision of federal legislation (Fishbein, 1997). The revised legislation established standardised national labelling and removeability regulation, which released the industry from putting different labels in accordance with the requirements from the respective states (Fishbein, 1997). It also made it unnecessary to fill out hazardous waste manifest and use hazardous waste haulers when transporting discarded nickel-cadmium batteries (Fishbein, 1997). The United States Environment Protection Agency has supported and participated in the discussion of multi-stakeholder groups on the establishment of take-back programme for electronics optimal in the United States (NEPSI, 2002).

It should be noted that though countries with federal political and administrative structures have the common characteristics of having governments and legislation at the state/provincial/canton level, the extent to which the regional governments have their jurisdiction differs from issue to issue, and from country to country. Countries such as Germany and Austria are federal republics but have central governments and have wider jurisdiction than the examples given before.<sup>8</sup>

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receive approval for the implementation and enforcement of federally established regulatory programmes (OECD, 1998d).

8. In Germany, a state (land) is only permitted to issue waste management legislation when “the federal competence to issue legislation is not or is not fully used”, while enactment of federal legislation generally requires consent of the chamber consisting of representatives from the states (Bundesrat) (OECD, 1998d).

Further, overlapping/unclear responsibility among government bodies, as well as conflicts relating to the area of authority and interest of ministries, have posed challenges to the formulation and implementation of EPR programmes with coherent and clear objectives. For example, as many as five ministries share the responsibility for the EPR legislation for packaging in Japan. The compromise of the respective ministries is manifested in the relatively small allocation of producer responsibility in the legislation (*i.e.* financial responsibility for recycling when the recycled materials have negative monetary value) (Morishita, 1997).<sup>9</sup>

## 2.6 *Nationwide targets and rural areas*

In most of the non-federal states, as well as the member states of European Union who have the obligation to implement EU Directives that incorporate the concept of EPR (*e.g.* cars, EEE), collection/recycling targets are set nationwide. In this case, efforts of establishing efficient collection/recycling systems may be concentrated in the urban areas where the majority of discarded products are generated, thus most efficient in achieving the nation-wide target. This may make sense from commercial point of view. However, this may reduce the resources allocated for the improvement of rural areas facing equal, if not more, waste problems. It would also reduce the possibility of creating/maintaining local employment, which would often contradict to goals to enhance local employment in rural areas.

On the island of Lesbos in Greece, virtually everything is dumped in the landfill without any source separation. National targets have lead the Producer Responsibility Organisation (PRO) of packaging materials to concentrate its efforts in big cities, while little or no activities were observed on the island. The only waste dealer on the island receives no support, neither from the government, nor from the PRO.

Setting up national collection and/or recycling targets may also lead to the establishment of PROs that operate nationwide, which may limit the possibility of establishing a local collection and recycling system. Åre, a ski resort in northern Sweden, was planning to establish a local collection and recycling system. With the introduction of the Swedish EPR programme for packaging, a PRO was established, where most of the packaging producers participated, including the companies that would have sponsored the initiative in Åre. This lead to the elimination of a viable local initiative, partly because the industry

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<sup>9</sup>. At the OECD workshop where this paper was presented, representatives of the Netherlands and the United States shared the same constraints (Veerman, 2002; Hickie, 2002).

who started to pay the fees to the PRO did not wish to sponsor the local programme any longer. The central system introduced by the PRO did not allow the sought-for flexibility to meet various local requirements, such as instalment of collection bins aesthetically preferable for a ski resort, and visit of haulers with higher frequency. Moreover, the local recyclers, who used to agree to collect the waste from Åre, refused to do so, seemingly for fear of upsetting the central system (Fadeeva, 2002).

### **3. Institutional factors among firms**

Following the review of governmental setting and its influence on the implementation of EPR programmes, this section discusses how private actors surrounding the product chain covered by EPR programmes may affect/be affected by the implementation of EPR-based policy instruments. The section first reviews the existing private actors other than producers in the market, and their influence on the formulation and implementation of EPR programmes. It subsequently examines how characteristics of the producers themselves affect the implementation of EPR programmes, focusing on the issue of their choice between cooperation and competition.

#### **3.1 *Private actors other than producers***

Besides the producers themselves, private actors involved in the different parts of the product chain may affect the formulation of EPR-based policy instruments, who may also influence/be affected by the implementation of EPR programmes. From life cycle perspective, the actors affected most may be those who have been/are/will be involved in activities related to recycling, collection and transportation, and manufacturing of materials and components.

#### **3.2 *Actors involved in recycling***

Recycling business for some discarded products, such as cars, glass bottles, large computers and equipment with metals, have existed on a commercial basis due to the value of the products, materials or components contained in the discarded products. On one hand, the existing infrastructure and expertise of these recyclers may facilitate the implementation of EPR programmes. On the other hand, just as seen in the case of local governments, these actors may fear the introduction of an EPR programme could jeopardise their business. Challenges facing their survival may be even more immediate, considering that the size of many of the recycling businesses is small, and that the conventional practice of most of the pre-existing recyclers may not meet the standard set in an EPR programme (*e.g.* environmental standards, workers' health and safety standards, fiscal control).



Government as well as private actors (manufacturers) have been dealing with these issues in various ways when formulating and implementing EPR programmes. Car manufacturers in Sweden have collaborated with selected technically well-equipped dismantlers in an effort to enhance the dismantlability/recyclability of their cars (Tojo, 2001). Similarly, some EEE manufacturers in Japan, in the process of establishing sophisticated recycling facilities to meet the EPR legislation for large home appliances, collaborated with recyclers that already had state-of-the-art technologies (Sony, 1999; Matsushita, 1998).

EPR programmes for products containing hazardous substances (*e.g.* EEE, cars) often demand that the discarded products are recycled and treated in recycling plants certified by the government. In order to make sure that their products are recycled in a proper way, producers, or the organisation that collectively fulfil the responsibilities of the producers (Producer Responsibility Organisation: PRO), contract only with recyclers with high standards (*e.g.* EEE in Switzerland, cars in the Netherlands and Sweden). In some cases PRO may set their own standard for recycling which is even higher than the governmental standards (*e.g.* EEE in Switzerland) (Bornaman, 2002).

Use of recyclers with advanced technology, together with the requirement of achieving collection and recycling targets, have helped establish a steady and increased supply of recycled materials with a stable quality. EPR programmes for plastic packaging in Norway, as well as for cars and EEE in Sweden, helped secure the availability of a certain type of recycled plastics, enabling a Norwegian furniture producer to use these recycled plastics as a raw material for a chair (Lee, 2002).

Introduction and enforcement of stringent requirements would inevitably lead to the disappearance of recyclers that do not have resources/capacities to meet the requirements for certification, which is positive from environmental point of view. However, it may not be socially and politically acceptable under certain circumstances, which necessitates the measures to help survive smaller recyclers that may not have the resources and capacity to practice in an environmentally acceptable way. The scope of take-back requirements given to the producers at the initial phase of the EPR programme for cars in Japan is said to be limited to auto shredder residues, car air conditioners with freon gases and air bags, so that the existing dismantlers and recyclers could keep their business (Togawa, 2002). One of the Japanese car manufacturers has been developing relatively inexpensive recycling technologies that are easily adoptable by small-scale dismantlers and scrappers (Himeno, 2001). The company has been disseminating information about these technologies to the dismantlers and

scrappers through newsletters. It also has a demonstration plant accessible for anyone (Himeno, 2001; Tojo, 2001).

### 3.3 *Actors involved in collection*

Aside from the local governments, retailers may be the main actors that have been involved in collection of discarded products.

In some cases, retailers have been involved in the collection of discarded products that have relatively limited distribution channel. An importer of a special type of batteries in the Netherlands has established his own collection network, utilising the fact that only specific retailers (retailers of telecommunication equipment) sell the type of batteries he is dealing with (Langrova, 2002). EPR programmes for large home appliances in Japan assign responsibility for collection to retailers, considering the possibility and business practice of utilising reverse logistics (*i.e.* taking back a similar old product when delivering a new product).

Responsibility for collection assigned to retailers is often limited to the extent such as the take-back of a discarded product when selling a similar new product (old-for-new), of discarded products from households, of discarded products that have similar functions as those the retailer is currently selling, and/or of products that the retailer him/herself sold. The combination of such limitation varies among the programmes.

Retailers may be engaged in collection not only because they sell similar products, but also because they are conveniently located for consumers. In the deposit refund system for aluminium cans and PET bottles in Sweden, local super markets serve as collection depots. Car manufacturers in Sweden are considering the expansion of collection network by involving car dealers (Rydén, 1995).

Taking advantage of the consumers' preference to convenience and existing distribution network, some convenience stores in Japan started a new business as a dealer of second hand products (Tanaka, 2001b). The stores take back large home appliances that are less than certain years old, and pay a small sum to consumers (Tanaka, 2001b). This is very attractive to consumers who are, under the EPR programme for EEE with end-user pays system, obliged to pay for collection and recycling of discarded products otherwise.

Retailers have resisted participating in the collection in various instances. Involving retailers in a planned deposit-refund system trial for batteries experienced resistance in Denmark, presumably as it was not clear if the retailer

would be compensated for the extra work associated with the collection in a future system and in deposit-refund systems for other products (Lindhqvist *et al.*, 1990). In the process of developing the EPR programmes for packaging, Japanese retailers strongly refused to participate due to the limitation of space and cumbersome process of dealing with end-of-life products (Tanaka, 1999). Retailers of electronic products in, for instance, Canada, have shown resistance in collecting discarded products, as they fear that involvement in the waste collection would diminish their image (Lindhqvist, 2002). When introduction of visible, advance disposal fee was discussed, retailers of consumer EEE in the Netherlands feared that they would not be able to actually get the fee from the consumers due to the low margin and price competition (Stevens, 1999). Examples of the measures to overcome such resistance include compensation fees (*e.g.* deposit refund system for aluminium cans and PET bottles in Sweden) and convenience (*e.g.* batteries in Switzerland, the United States).

### **3.4      *Material and component producers***

Virtually all the EPR-based policy instruments may contribute to the increase of the supply and use of recycled materials, which would compete with virgin materials. In some cases, manufacturers of virgin materials became involved in the recycling of the same materials prior to the implementation of the instruments (*e.g.* glass, aluminium).

When use of specific materials is restricted under an EPR programme, the manufacturer of a product would need to find material and component manufacturers that can supply him/her with materials and components that enable him/her to meet the requirement. Similar situation occurs when the recycling target set under an EPR programme cannot be met with the materials and components currently used. In both cases, the current suppliers to the product manufacturer should modify the supplied material/component, or they would lose customers. Whether the material/component manufacturer modifies a product or not would depend on the importance of the product manufacturer as a customer (Lindhqvist, 2001).

Various material restriction requirements (*e.g.* PVC, halogenated compounds) facing product manufacturers urged some material manufacturers in Japan to modify their products. They thought that environmental differentiation may be the way for Japanese material manufacturers to survive against their fellow competitors abroad (Nakanishi, 2001b). Just as the existing recyclers with high advance technology participate in/help establishing an infrastructure for an EPR programme, skilled material producers participate in the development of recyclable materials (*e.g.* cars in Sweden and Japan) (Tojo, 2001).

Introduction of EPR programmes for complex products (*e.g.* cars) may help promote an efficient circulation of used components. Prior to the enactment of EPR programmes for cars, a car manufacturer in Japan started to establish a network with existing recyclers to communicate the availability of specific car parts.

#### **4. Producers**

National EPR legislation/negotiated agreements typically set merely the framework for the allocation of responsibility and requirements, while leaving the means of implementation to the producers. Experiences of implementing EPR-based policy instruments to date have been that in most cases, producers cooperate rather than compete with each other in fulfilling their tasks, as seen in practices such as creation of Producer Responsibility Organisation (PRO) and collaboration among the producers, including the industry-wide voluntary initiatives and common research and development projects. However, as illustrated in the lengthy discussion around the proposed EU Directive on Waste Electrical and Electronic Equipment, elements of competition have emerged, in particular among the producers of complex products.

##### **4.1 Cooperation among the firms**

Implementation of the EPR programmes for packaging typically involved establishment of a PRO, an entity that fulfils the requirements collectively on behalf the producers, as represented by, among others, Duales System Deutschland AG (DSD) in Germany. Similar has been seen for the implementation of EPR programmes for products such as batteries (*e.g.* the Netherlands, the United States), cars (*e.g.* the Netherlands), EEE (*e.g.* Switzerland, Norway, the Netherlands, Sweden), and used-oils (*e.g.* Canada). National EPR legislation sometimes explicitly mentions the possibility of joining a collective system or contracting with the government through negotiated agreements in place of fulfilling their responsibilities individually (*e.g.* packaging in Germany, France, the Netherlands, EEE in the Netherlands).

In general, it can be argued that the larger the number of producers, the higher the tendency for the producers to create a PRO. Among the EPR programmes for packaging, the number of companies (packers, fillers, importers and distributors) participated in the PRO amounted to 19,150 in Germany, more than 9,600 in one of the systems (Eco-Emballages) in France, and about 10,000 (packers and importers) in Sweden (DSD, 2000). Setting up an individual logistical arrangement would be difficult and costly for domestic small and medium sized enterprises, relatively small importers and importers from developing countries (OECD, 2001).

Although the structure and roles of PROs vary, reflecting the requirements set forth by legislation/negotiated agreements, their primary task is to set up and manage an infrastructure that enables their member producers to meet take-back requirements, often accompanied by collection/recycling targets. PROs often try to utilise the existing infrastructure, and engage, negotiate and contract with a variety of entities who have been engaged in collection, transportation, and recycling. They may also engage in the development of infrastructure themselves (*e.g.* collection, transportation and recycling of plastics in the case of DSD in Germany).

The activities of PROs are typically funded by the specific fees collected from the producers. The fee structure as well as the management of the financial flow (collecting money from its member and re-distributing it to entities physically carrying out the end-of-life management) has an important implication to the implementation and result of EPR programmes. The structure, roles and financial mechanism of the PROs will be discussed further.

Cooperation among the firms on the issues surrounding end-of-life management is not limited to meeting the requirements set forth in mandatory EPR programmes. As discussed in Section 0, a common wish of industry to avoid inconsistent regional requirements drove the establishment of a nationwide voluntary take-back initiative of batteries in the United States. Car industries in Europe developed a common manual for dismantlers and scrappers (ENDS, 1999).

Industry associations often play an instrumental role in facilitating the cooperation. They may set up an internal committee for specific issues related to environment and end-of-life management of their products (*e.g.* cars and EEE in Sweden, Japan). The car association in Sweden (BIL) conducted a joint research programme for the design for end-of-life management (Tojo, 2001). It also provides its member with the list of recyclers with high-level performance (Kvist, 2001). Prior to the enforcement of the legislation that gives producers physical responsibility for recycling, EEE manufacturers in Japan established a common demonstration pilot plant to examine the feasibility of various recycling options (AEHA, 1998; Tojo, 1999).

Such collaboration enables producers to gain new knowledge and information, which may be prohibitably expensive for individual firms to find out themselves. Industry associations also help reducing the transaction costs of individual members by way of representation and information provision. Sometimes different branches of the industry association become members of a PRO, thus reducing the burden of the individual members to negotiate with the

PRO themselves (e.g. EEE in Sweden). They also update their members with upcoming legislation and its implication to their members.

#### 4.2 *Competition among the firms*

Despite the wide spread phenomena of cooperation among the firms in fulfilling the mandates set forth in EPR programmes, elements of competition have emerged, most prominently among the manufacturers of EEE and cars.

One of the major disputes surrounding the proposed EU Directive on Waste EEE (EU WEEE Directive) has been if the producers fulfil their financial responsibility on their own, or collectively. The opinion of the industry as well as the government has been divided, with some of the prominent manufacturers of EEE having been strongly supporting the individual responsibility (ENDS, 2002a; AeA Europe *et al.*, 2002). The main argument for individual responsibility is to reward the efforts of the manufacturers that produce products with higher recyclability (including the lesser use of hazardous/environmentally harmful substances) and lower costs for recycling, by differentiating the fees producers have to pay.<sup>10</sup>

A research in 2001 clearly showed that manufacturers of cars and EEE in Sweden and Japan are both striving for design for end-of-life management, in order to reduce the future costs for recycling. Individual companies, sometimes in collaboration with material manufacturers, have been working on the development of recyclable plastics. Some of the firms have established strong communication channels with selected recyclers to get feedback about the recyclability of their products. Competitions have been observed among the EEE producers in the area of material restriction as well, in particular the development of lead free solders. Respective EEE producers in Japan, in compliance with the EPR legislation enforced in 2001 that assigns individual physical responsibility to the producers, manage at least one recycling plant to deliver knowledge from the downstream to the upstream and to grasp actual recycling costs (Tojo, 2001).

Competition between the firms may affect/be affected by some of the legislative development. EPR legislation for cars in Sweden is built on individual responsibility, and requires producers to internalise the future recycling costs in the price of a new product and to keep aside the future recycling costs in a transparent system (a balance sheet of annual report or

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<sup>10</sup>. The European Parliament and the European Council of Ministers finally agreed on the text of the two Directives on waste EEE (WEEE Directive and RoHS Directive) in October 2002.

insurance).<sup>11</sup> The system allows the increase in the recyclability of a car to be reflected on the price of a new product, thus giving incentives for producers to strive for design for end-of-life management. During the development of the legislation, car manufacturers jointly presented their position paper to express their preference of the introduction of a system that allows the implementation of an individual system (Rydén, 1995). The forthcoming EPR legislation for cars in Japan also has an element of individual responsibility. Producers must announce the recycling fee for the respective cars they produce, which is paid by consumers at the time of purchase. Just as the Swedish system, the fee should be used for the recycling of the new car itself, though the fee will be put in a publicly managed fund.

Both EEE and car manufacturers seem to feel high pressure from consumers on environmental issues in general, especially when consumers regard them as environmentally conscious companies. In an annual survey by a major Japanese business newspaper, both EEE and car industries are among the top industries “that incorporate environmental consideration in their business activity” (Nakanishi, 2001a). However, consumers’ demand related to end-of-life management seems to be scarce (Tojo, 2001).

In the area of packaging and batteries, aside from the individual initiatives (e.g. a battery importer in the Netherlands, see Section 0) companies prefer the solution of joining a PRO. It should be noted, however, that a PRO that manage the physical flow of the products collectively could still, at least theoretically, introduce differentiated financial arrangement, thus making producers financially responsible in an individual manner.

#### **4.3      *Characteristics of products***

Closely related to the choice of the governments and firms with regard to the implementation of EPR-based policy instruments are the characteristics of the products, including, *inter alia*, the number of existing products, durability, and the cost of end-of-life management.

### **5.          *Number of existing products and durability***

Currently there are approximately 700 million automobiles in the world (Bilbranschen, 2001), which are used, in average, for about 12 years. The increase of portable electronic products in recent years, with the estimated

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<sup>11.</sup> The legislation was enforced in 1997, replacing an advance disposal fee system that was run since 1975.

number of worldwide sale in 2001 to be 600 million units, suggests rise in the use of rechargeable batteries (Langrová, 2002).

A challenge facing the implementation of take-back requirements for durable products such as cars, EEE and rechargeable batteries is the handling of products on the market prior to the introduction of an EPR programme (existing products), and products whose producers cease its operation (orphaned products).

It has been argued that requiring producers take-back of existing durable products would give, if any, very little incentives for design change. Observed exception could be when producers have opportunities to actually communicate with recyclers. Producers of large home appliances in Japan, who, upon the introduction of EPR legislation, have been involved in the physical recycling of discarded products, mentioned that recycling of existing products provided them with learning opportunities for design for end-of-life management (Tojo, 2001). Communication with the recyclers may not necessitate the involvement of producers in the physical recycling. As discussed earlier, some car manufacturers in Sweden have been actively communicating with recyclers. What is common between the two systems (cars in Sweden, EEE in Japan) is that producers are fulfilling their responsibility in an individual manner.

Some producers argued that making producers responsible for the take-back of existing products and achievement of certain recycling targets may violate the principle of the prohibition of retroactive law (Ford 2002; ENDS 2000a), However, the application of the retroactive law differ significantly from country to country.

Legislation deals with this issue in several ways. For example, the Swedish Ordinance on Producer Responsibility for Cars has two systems (advance disposal fee system for existing cars, individual financial responsibility for new cars) running in parallel. EU Directive on End-of-life Vehicles limits the responsibility of producers to finance the take-back and achievement of certain recycling targets of new cars during the first 5 years, while subsequently extending the responsibility to all the cars on the market. The Dutch EPR legislation for EEE similarly introduced a differentiated starting time. For the first 6 years, producers take back discarded products from retailers on old-for-new basis, while take back their own products from aggregation sites<sup>12</sup> and repair companies (brand-based responsibility). After that, all the take-back

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<sup>12.</sup> An aggregation site refers to an intermediate storage site prior to transportation to recycling facilities.



responsibility will be brand-based. Proposed EU WEEE Directive gives individual, financial responsibility to producers for take-back and achievement of certain recycling targets of new products<sup>13</sup>, while making all the existing producers collectively responsible for existing products.

Setting collection targets for durable products in percentage have been difficult, due to, for instance, the difficulty of determining the denominator (total amount of discarded products in a certain year), changes in the type and weight of products in the market. Moreover, products such as batteries may stay in the drawers of consumers for a long time (hoarding effects). Proposed EU WEEE Directive gives EU Member States a collection targets in absolute figure (4 kg per person per year). The fact that all the existing EPR programmes for EEE in Europe already achieved a result higher than the proposed targets (*e.g.* 5.1 kg in Switzerland in 1999, 7.2 kg in Norway in 2001, 10 kg in Sweden in 2001-2002) may suggest the difficulty of estimating the appropriate targets (Türk, 2001; Elektronikkretur AS *et al.*; 2002, Swedish EPA, 2002).

Estimating the costs of end-of-life management of durable products in advance poses challenges in establishing an appropriate financial mechanism, which will be discussed further in Section 0.

## **6. Cost of end-of-life management**

If a product is made of non-hazardous materials that already have an infrastructure for recycling on a business basis prior to the introduction of EPR programmes (*e.g.* glass bottles, aluminium cans), the main sources of additional costs would be on the establishment and/or reinforcement of a collection network, as well as transaction costs with existing actors. Increase in collection may require additional recycling facilities, but as long as there is enough demand on the market for increased recycled materials, the expenses for building new plants would be covered within the market mechanism. Here, it may be useful to introduce EPR-based policy instruments that stimulate collection (*e.g.* take-back requirements with collection targets as found in most of the countries for packaging, deposit-refund system), and the demand on recycled materials (*e.g.* minimum recycled material content target for paper in the United States) (Lifset, 1992). Additional expenses occur if introduction of a new system to distinguish products covered by a programme and those not covered become necessary (*e.g.* introduction of a bar-code system in the deposit-refund system for aluminium cans in Sweden).

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<sup>13</sup>. Products put on the market later than 30 months after the enforcement of the Directive.

For a product that had an infrastructure for end-of-life management on a business basis prior to the introduction of EPR programmes, but contains hazardous substances and/or materials whose treatment has not been economically feasible (*e.g.* cars), costs regarding the upgrade/selection/monitoring of recycling facilities that would meet additional requirements (*e.g.* proper treatment of hazardous substances) should also be considered. In this case, in addition to the policy instruments to stimulate collection and demand on the recycled materials, instruments such as substance restrictions (*e.g.* EU Directive on End-of-life vehicles, proposed EU Directive on the Restriction of the use of certain hazardous substances in EEE: RoHS Directive) may promote design change upstream. Meeting the requirements set in the forthcoming implementation of the EU Directive is one of the main reasons for the Japanese car industry to reduce hazardous substances (Tojo, 2001). Countries where recycling plants for EEE already existed prior to the introduction of take-back requirements (*e.g.* Switzerland, Sweden), also introduced standards to secure environmental/health standard of recycling activities.

Introduction of EPR programmes for products that has no infrastructure for collection and/or recycling on a business basis (*e.g.* consumer batteries, most of EEE, PET bottles, plastic packaging) requires initial investment costs for establishment of necessary infrastructure for collection and recycling, as well as consultation with existing actors (*e.g.* local governments involved in collection). In this case, various EPR-based instruments mentioned so far could be useful. However, the choice and priority could be different depending on the characteristics of the products.

Collection of some of these products (*e.g.* consumer batteries, small EEE) has experienced significant challenges (Tojo *et al.*, 2001; Türk, 2001). Establishment of a system based on individual financial responsibility requires an identification system at the recycling plants, unless a producer sets up an individual collection system. In such cases, instruments promoting design change upstream, such as requirements restricting the use of certain substances or material tax, instead of take-back requirement as such, may give higher incentives for design change. Several examples, such as elimination of mercury in some batteries and development of lead free solders among electronic industry, have shown the effectiveness of material restriction requirements in driving innovation. Introduction of a material tax on batteries using cadmium in Sweden, which is 300 SEK (33 Euro) per kilogram of batteries (*e.g.* 15 SEK for a battery weighing 50 g) could explain the reduction of the sale of batteries from 328 ton in 1997 to 190 ton in 1998 (Langrova, 2002).

## **6.1      *Physical and financial implementation mechanism***

This section discusses some of the key functions that need to be fulfilled in order for an EPR programme to work, and how these functions are actually implemented. These functions include collection and sorting, recycling, information provision to/contract making with actors involved in collection, sorting and recycling (*e.g.* consumers, retailers, recyclers, producers), reporting to the authorities, environmental quality control of recycling activities, and financial management. The section examines who fills these functions in what manner under different existing programmes. Issues about the distribution of costs will also be mentioned. It then attempts to shed some light to functions that can be fulfilled by a PRO that may be different from its traditionally perceived roles.

## **7.            *Collection and sorting***

In the mandatory take-back programmes, primary actors responsible for collection and sorting include retailers (*e.g.* packaging in Germany) and local governments (*e.g.* packaging in France, the Netherlands and Japan, batteries in the Netherlands). For durable products that used to be collected primarily by local governments (*e.g.* EEE), retailers and local governments often share the responsibility for collection (*e.g.* Japan, Sweden, the Netherlands, Norway). In some programmes, both producers and retailers are responsible for collection (*e.g.* EEE, old-for-new basis, in Sweden, batteries in Switzerland, packaging in Sweden).

Once discarded products are collected, they are often gathered at aggregation sites. Some legislation assigns responsibility for establishing these aggregation sites to producers (*e.g.* EEE in Japan and Sweden) and local governments (*e.g.* EEE in the Netherlands). Producers of EEE in Japan are required to establish these aggregation sites that are easily accessible for consumers and retailers. Similarly, producers of EEE in Sweden, upon request, must consult with local governments as to the location of aggregation sites.

In reality, individual producers and retailers often gather together and establish one or more PROs, which would make necessary arrangement to fulfil the responsibility on their behalf. The PROs can be established together with the actors responsible for recycling (producers). The PROs would then establish a network by contracting with new and existing actors, such as waste management company and local governments (*e.g.* packaging in Germany, EEE in Sweden). The PRO for packaging in Germany established a collection network partly independent from the municipal collection system, while EEE in Sweden utilised the collection infrastructure that already existed prior to the

introduction of the system. In the case of EEE retailers in Sweden, while their responsibility for collection is fulfilled mostly by the PRO, they are still responsible for informing their customers of the local collection depots.

When producers are responsible for fulfilling certain recycling targets, they (or their PRO) may contract with retailers and have them facilitate collection to fulfil their requirements (*e.g.* deposit refund systems for aluminium cans and PET bottles in Sweden). In order to meet a rather high collection target (90%), the PRO for battery producers in the Netherlands initiated a collection programme at schools (Langrova, 2002). Similarly, the PRO for rechargeable battery manufacturers in the United States, which runs the nationwide voluntary take-back initiatives, have been developing their collection network through four channels: retailers, communities, businesses and public agencies, and manufacturers themselves (Fishbein, 1997). Retailers participating in the scheme are provided with collection containers and possibility of postal service free of charge once the containers are full (Fishbein, 1997). The PRO for batteries in Switzerland, whose original role is to manage financial flow of the system, provide retailers with collection containers as well, despite the fact that retailers are by law responsible for accepting the batteries from consumers free of charge (Jordi, 2002). Retailers have been also used as collection depots in an individual collection system (*e.g.* batteries in the Netherlands).

The review above illustrates that physical infrastructures arranged by the PROs, at times required by law, seem to try to make it convenient for consumers through means such as setting the collection depots either at the place where consumers are used to go (*e.g.* use of municipal waste collection system) or at the place they go anyway (*e.g.* retailers, school). The establishment of collection network by a PRO that operates nationwide may, in turn, make it difficult for individual producers to establish their own collection depots. An EEE manufacturer in Sweden, wishing to establish an alternative collection system, requested consultations with municipalities. However, the consultations were refused, on the ground that a PRO that represents the majority of EEE producers already established collection depots (Lindhqvist, 2002).

Besides convenience, financial incentives for consumers help achieve high collection rates. With this regard, deposit refund systems have been found to be useful in achieving high collection rates (Lindhqvist, 2000). Deposit-refund system for beverage containers in British Columbia, Canada as well as in the State of California have achieved relatively high results, despite the fact that consumers have to bring the empty containers to collection centre which may not be located in the vicinity of their houses (Robinson, 1996; Lindhqvist, 2002).

A study of beverage container recycling systems in Germany, Sweden and Switzerland, all of which has achieved high results (above 85% for aluminium cans in 1997), showed that fees for consumers were highest in a “bring” system (Switzerland), middle in a kerbside collection system (Germany), and lowest in a deposit-refund system (Sweden) (Vanthournout, 1998). The result suggests that implementation of a deposit-refund system may not be necessarily the most expensive, as often perceived.

## **8. Recycling**

Virtually all the take-back programmes make producers responsible for recycling. In most of the implementation to date, it is the PROs who make contracts with recyclers to fulfil the responsibility assigned to producers. However, as previously discussed, producers in some programmes (*e.g.* cars in Sweden, EEE in Japan) fulfil their responsibility in an individual manner.

Car manufacturers in Sweden have both the physical and financial responsibility of recycling of the cars that are put in the market after the introduction of the EPR programmes for cars. They contract directly with dismantlers and negotiate the size of the fees for recycling (Kim, 2002).

In response to the introduction of the EPR programme for EEE in Japan, two networks for transportation and recycling were developed. Prominent manufacturers of EEE in Japan, without establishing a PRO, take part in one of the two networks, and cooperate with each other in the establishment of aggregation sites, take-back networks as well as recovery and treatment facilities. However, each manufacturer manages at least one treatment plant, and tries to compile and communicate information from the downstream to the upstream, accumulate knowledge on recovery technology, and grasp the actual cost for recovery and environmentally sound treatment of their discarded products (Tojo, 2001).

Introduction of take-back programmes is often accompanied by requirement of environmentally sound treatment of the discarded products, components and materials. The requirement takes the form of specification of treatment methods of specific components and materials and/or certification of recycling plants (*e.g.* EEE in Switzerland, Japan, Sweden, proposed EU WEEE Directive, cars in Sweden).

Some PROs (*e.g.* cars in the Netherlands, EEE in Switzerland) established their own stringent standards for the recycling activities to secure an environmentally sound treatment of the discarded products of their members (Kim, 2002, Bornand, 2002). One of the PROs for EEE in Switzerland also

inspects the recyclers periodically and tries to make contracts with the best recyclers from the respective cantons (Bornand, 2002). Although car manufacturers in Sweden fulfil their responsibility individually, they establish a PRO that, among other things, provides its members with a list of recyclers with high environmental performance (Kim, 2002).

With the aim of enhancing the smooth implementation of the EPR programmes, some PROs (*e.g.* for plastic packaging in Norway, or cars in Sweden) have also been active in finding/cultivating the market for recycled materials (Lee, 2002, Kim, 2002).

## **9. Information provision**

Responsibility of providing information to the public may be assigned by law to producers and retailers (*e.g.* EEE in Norway and Sweden, batteries in Switzerland) and to the government (*e.g.* packaging and EEE in Japan, partly EEE in Norway).

When information provision does not correspond to the interest of the actor that is responsible for its provision, enforcement of such informative responsibility may not be easy. In Norway, after one year and a half of the implementation of the EPR programme for EEE, the authority found that five of the biggest retail chains failed to fulfil the informative responsibility (ENDS, 2000b). Continued failure would mean the payment of fines up to 1,500 NOK (204 Euro) per day per shop (ENDS, 2000b).

However, some of the PROs have been quite active in providing information. Most of the existing PROs list information provision to the public as one of its roles. Their activities include providing the public with brochures (*e.g.* EEE and batteries in Switzerland, packaging in Spain) and campaign through TV broadcast (*e.g.* batteries in Switzerland and the United States). They also provide information about the results of the programmes, upcoming events, relevant legislation, list of retailers/local governments that consumers could contact when they wish to return the discarded products. The PRO for batteries in Switzerland has been providing information to the retailers about their responsibility for collection (DSD, 2000; El Kretsen, 2002; Bornand, 2002; Jordi, 2002; Fishbein, 1997).

## **10. Reporting and monitoring**

Most mandatory take-back programmes require private actors involved in the collection and recycling (producers and retailers) to report to the authorities about their achievement. In the system where PROs make necessary

arrangements that enable producers to fulfil their responsibilities, it is the PROs who gather such data and present to the authorities. Sometimes producers are also required to inform the authority of their plan of fulfilling their responsibility (*e.g.* EEE in the Netherlands).

Even when a recycling system exists for a substantially long time, reasonably accurate data on the situation surrounding the end-of-life management may not be grasped by the authority. In Sweden, an advance disposal fee system for cars was introduced in as early as 1975, with the aim of reducing the cars abandoned in nature (Lindhqvist, 2001). The system gives an incentive to the last owner to return the car to a scrapper by providing the last owner with a premium in exchange of the deregistration certificate provided by the scrapper. The size of the premium is determined by the government. In 2001, due to the alleged increase of the number of abandoned cars in nature, the government substantially increased the level of the premium given to the last owner when he/she returns the end-of-life vehicle.<sup>14</sup> Meanwhile, a campaign was initiated to collect such cars, which announced that as much as 1 million cars had been abandoned in nature. Through the course of a research where information was gathered from a number of different entities (*e.g.* NGO in charge of the campaign, government, PRO), it turned out that the number most likely close to the actual situation was 40,000, only 4% of the number originally stated (Lindhqvist, 2002). The lack of adequately accurate data is striking, especially considering the fact that reducing the littering is one of the main objectives of the system. Convincing data concerning abandoned cars could also not be found from a number of other European countries, including Germany, the Netherlands, France and the United Kingdom (Kim, 2002). Similar lack of data was also found with regard to the battery collection in Sweden, despite the fact that different legislation concerning the collection and treatment of batteries exist since 1984 (Langrová, 2002).

Increased communication of individual producers with recyclers, as well as enlistment of recyclers with high performance by the PRO, may help grasp the actual situation surrounding end-of-life management of cars.

## **11. Financial Management**

As previously mentioned, when a PRO manages the physical infrastructure on behalf of individual producers, it is typically the fees paid by the members that finance the activities of the PRO. Aside from the recycling fees further

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<sup>14</sup> From 500 SEK (55 €) to 700 SEK (77 €) for cars up to 7 years old, 1,200 SEK (131 €) for cars between 7 and 16 years old, and 1,700 SEK (186 €) for cars more than 16 years old (Kim, 2002).

discussed below, the members of the organisation may pay fees such as entrance fees as well as annual membership fee (*e.g.* packaging and EEE in Sweden). The recycling fees are often charged as advance disposal fees based on the amount of products that are put on the market.

When a PRO coordinates with actors involved in end-of-life management, such as local governments, retailers, recyclers and dismantlers, opportunities for producers to interact directly with these actors are naturally reduced. Indeed, one of the reasons why the individual producers have a third party to deal with the actual arrangement is that they do not want to involve in the time consuming process of dealing with different actors (Lundgren, 2001). In such cases, the feedback an individual producer gets with regard to the end-of-life management of their products, such as the degree of difficulty of handling the product, value contained in the products (reuseability, recyclability, dismantlability, and value of the recovered parts/recycled materials) may be limited to the size of the recycling fees.

When the fees are differentiated in accordance with the cost of end-of-life management, it gives incentives to the producers to change the design of the products to reduce the cost associated with the end-of-life management. Differentiation of the fees among the packaging materials have induced significant changes, such as reduction in the use of composite and plastic packaging, increase in the use of reusable packaging and major reductions in volume and weight by alternation of container shapes and sizes (OECD, 1998b).

Differentiation of the fees for complex products, such as EEE and cars, that reflects the actual costs of end-of-life management of individual products, faces challenges, due to the relatively large number of materials and components used in the products, practical difficulty of distinguishing one product to another, and the like. The durability of these products make the calculation of the future recycling costs very difficult, as it would require consideration on uncertainty arising from issues such as the timing of the products to be discarded, the development of recycling technologies, changes in the price of recycled materials, and changes in legislation regarding recycling requirements. Among the packaging materials, differentiation of the recycling fees among different types of plastics has not been implemented, either.

The fee structure most commonly used in the take-back programmes for these complex products is advance disposal fees that set flat rate for similar type of products, managed as a “pension system” (*e.g.* EEE aside from information and communication technology (ICT) equipment in the Netherlands and Sweden, EEE in Switzerland, cars in the Netherlands). In Switzerland, an advance disposal fee per kilogram of battery sold is determined via legislation.



These fee structures have been criticised for their inability of promoting design change, but they would effectively cover the costs for end-of-life management (Bornand, 2002).

A challenge facing the advance disposal fee system for durable products managed as a pension system is the management of the fund. The size of the reserve in the Dutch EPR programmes for cars increased more than 4 times in 6 years,<sup>15</sup> although the proportion of the amount put to the reserve out of the total income is reduced from more than 70% in 1995 to less than 10% in 2001 (Kim, 2002). Although the size of the advance disposal fee has been reduced twice: from 113 Euro in 1995 to 68 Euro in 1998, then to 45 Euro in 2001, which is considerably lower than the costs of treating one car today; it is still criticised to be too high (Kim, 2002). A PRO for EEE (large and small consumer EEE) in the Netherlands was criticised by the industry that the large amount of reserve lead to comparatively high advance disposal fees.<sup>16</sup>

The two examples above illustrate the difficulties of setting the reasonable size of the advance disposal fee managed as a “pension system”. The sufficient level of reserve may be different, depending on the issues such as the durability of the products covered by the system, the number of new products sold and discarded products collected, and characteristics of the producers participating in the system (*e.g.* large *versus* small, domestic *versus* import).

In the case of EPR programmes for cars in the Netherlands mentioned above, increase of new cars that are sold (more than 200,000 between 1995 and 1999), as well as the high number of exports of second hand cars (about 30% of the cars deregistered in the Netherlands), are perceived to be the two main reasons for a rapid increase of the reserve despite the decrease of the fee (Kim, 2002).

Regarding the EPR programme for EEE in the Netherlands, two mis-estimation contributed to the development of reserve: 1) the number of actually collected was lower than estimated; and 2) the actual cost of recycling was lower than estimated (Veerman, 2002). With this regard, the management of fund for products whose sale is decreasing (*e.g.* nickel-cadmium batteries) may require attention. Together with the threat of ban and high material tax, the sale

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<sup>15.</sup> From less than 40 million € in 1995 to more than 170 million € in 2001 (Kim, 2002).

<sup>16.</sup> The size of the reserve in 2000 was more than 65% of the expenditure in the first year, as opposed to nothing in the case of PRO for ICT equipment. (ENDS, 2001a; Mayers, 2002).

of nickel-cadmium batteries in Sweden dropped from 328 ton in 1997 to 190 ton in 1998. Lack of reasonably accurate data on the collection level would make it difficult to adjust the level of advance disposal fees in accordance with the amount of batteries collected.

Alternatives to the advance disposal fee system run as a pension system include payment of future recycling costs at the time of purchase and end-user-pay system. The Swedish EPR programmes for car, which allocate individual physical and financial responsibility for recycling of the new cars to the producers, allow producers to internalise the future recycling costs in the price of the new products, while keeping aside the cost of future in a separate account within the company. Though there is a risk of orphaned products, the system has the advantage of providing producers with incentives for design change (Tojo, 2001).

Use of recycling insurance has been suggested in Sweden as an alternative financial mechanism for durable, complex products that ideally reflect the costs of future recycling of individual products in the price of the premium, while guarantee the risk of orphaned products. A number of manufacturers, including a car importer in Sweden and some wood cutting equipment producers, started to buy the insurance.

In the Japanese EPR programmes for EEE, producers are fulfilling their responsibility in an individual manner, while the end-user pays for the collection and recycling of discarded products. Individual producers must announce the recycling costs in advance. Though the initial fees announced by prominent producers turned out to be the same, it may still induce competition among the producers, as the size of the fees was considerably lower than the estimated actual recycling costs. However, end-user pays system has a risk of attracting illegal dumping/unsorted dumping.

In Switzerland, where industry initiated a voluntary EPR programme for EEE already in 1994, different financial systems (*i.e.* advance disposal fee systems and end-users pay system) co-existed when the law was first enforced in 1998, which created confusions among the consumers. Revision of the law been proposed so that all the discarded EEE can be brought back free of charge (Bornand, 2002).

Another form of financial mechanism often used in an EPR programme is a deposit-refund system. One of the main objectives of a deposit-refund system is to secure a high collection rate of discarded products. A traditional deposit-refund system, which forces the producers to make the deposit exactly the same as the refund, often runs into financial difficulty, as the system is financed

solely on the unclaimed deposit, interest generated from the deposit and revenue from recycling. In this system, ironically, the higher the collection rate becomes, the more difficult the financial management becomes.

The Swedish deposit-refund system for aluminium cans and PET bottles is a combination of deposit-refund system and advance disposal fee system. In this system, the size of the refund is set so that it is large enough to secure collection rates, while the deposit (combination of the traditional deposit plus advance disposal fee) is adjusted to cover the cost for managing the system while paying the refund. This hybrid system is used for the advance disposal fees for cars as well.<sup>17</sup>

## **12. Distribution of costs**

“Costs may be distributed according to market power irrespective of where the legal obligation is placed” (UK Department of Trade and Industry, 1999). The number of entities fulfilling the same function in an EPR programme and their relative importance in handling the product covered under the programme have influenced distribution of costs, as well as degree of competition.

The Swedish advance disposal fee system for cars provide the last owner with incentives to bring the car to a scrapper by giving them a premium. The size of the premium has been adjusted so that the amount of recycling fee that the last owner pays to a scrapper is lower than the premium paid to the consumers. It has been observed that the change in the size of the scrapping premium is closely related to the amount of fees that a scrapper demands, who has a stronger negotiation power than the consumer.

Similarly, it has been observed that retailers have been receiving relatively high compensation in the Swedish deposit refund system for aluminium cans. Among the actors responsible for collection and recycling, retailers, who have more products to handle than material producers or fillers, have the highest negotiation power.

## **13. Roles suited for PROs**

The review of functions that constitute financial and physical implementation mechanism of take-back programmes seem to suggest that the roles of PROs are much more diverse than what have been assumed in literature

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<sup>17</sup>. Another form of a deposit-refund system has been used in Korea, where producers are the receiver of the refund. The system is currently under revision (MOE, Korea, 2001).

(i.e. fulfilment of responsibility mandated by legislation or what the members of the organisation commits to do on behalf of the producers). Different types of roles include securing the quality of recyclers' work, provision of information about the content and results of the programmes to the actors in the chain (consumers, producers, retailers, local governments), provision of information about other actors (e.g. recyclers) to the producers, reporting and monitoring of the end-of-life management activities, cultivating the market for recycled materials, and management of a guarantee fund.

These roles may not necessarily directly fulfil the roles of the individual producers. Rather, they may support the primary roles of the producers as well as other actors involved in the implementation of the programme and make it sustainable in the long run. Some of these roles may not necessitate the establishment of a new entity, but may be fulfilled within the existing industry association. For example, the aforementioned PRO for cars in Sweden is a part of Swedish car manufacturer and wholesaler association. Similarly, The Association for Electric Home Appliances in Japan manages the transfer of recycling fees from the consumers to the producers (RKC, 2002).

### **13.1 *Transaction and administrative costs***

Transaction costs are those costs that arise through an exchange of assets between actors. This section discusses the transaction costs for actors involved in the implementation of EPR programmes (e.g. producers, retailers, local governments, recyclers, consumers, PROs) related to the respective implementation mechanisms. The section does not intend to quantify the transaction costs for individual programmes. Instead, it attempts to highlight factors that may affect the transaction costs for the respective actors, and the advantages and disadvantages for other actors.

## **14. Transaction costs surrounding collection and sorting**

Contract making and communication with actors such as local governments, which are necessary for the fulfilment of responsibility allocated to producers, are often carried out by PROs on behalf of the producers. On one hand, negotiation through PROs reduces the transaction costs for individual producers, as well as for the local governments who would otherwise need to communicate with different entities wishing to establish different paths for collection. This is especially the case when the number of producers covered under a take-back programme, and/or the number of actors involved in collection and sorting, is high. However, as experienced in the Swedish ski resort, implementation of an EPR programme by a nationwide PRO may reduce the possibility of adjustment to the local conditions. It may also hinder the

establishment of alternative solutions by individual producers and thus influence competition.

Introduction of EPR programmes per se may increase the transaction costs for consumers. Consumers need to sort discarded products covered by the respective programmes from the rest of the waste stream and bring them to the collection depots. They also need to learn about the system.

Transaction costs for consumers can be reduced by increasing the convenience. Measures taken include establishing collection depots that are easily accessed by the consumers, providing collection bags/containers for discarded products (*e.g.* batteries in Switzerland, various municipal collection system, kerbside collection system by DSD in Germany), and providing clear information about their tasks (*e.g.* source separation) and possibilities (*e.g.* acceptance of discarded products free of charge). Having one system for the same type of product would also help reduce the transaction costs for consumers related to information. Financial incentives can be used to counter-balance the transaction costs (*i.e.* deposit refund system).

Involvement of retailers in the collection network may increase convenience for consumers, but would increase the retailers' transaction costs in terms of time and space. Measures taken for compensation include making it convenient for retailers (*e.g.* batteries in Switzerland and the United States), paying some fee (*e.g.* deposit refund system in Sweden), and publishing of the participating retailers, which may give them market advantage (*e.g.* batteries in the United States).

## **15. Transaction costs surrounding recycling**

Just as collection, contract making and communication with actors such as recyclers and dismantlers, which are necessary for the fulfilment of responsibility allocated to producers, are often carried out by PROs on behalf of the producers. It reduces the transaction costs for individual producers, as well as for the recyclers. However, having another entity in the middle would limit the opportunities for individual producers and recyclers to communicate. The value for the producers to communicate with recyclers may depend on, for example, financial mechanism, type of products (complex or simple), size of the producers, and if they are domestic manufacturers or importers.

## **16. Transaction costs surrounding financial management**

The transaction costs for producers and actors involved in the management of infrastructure would reduce when individual producers do not have to

involve in the financial management of the system (*e.g.* calculation and determination of advance disposal fees, negotiation and payment to recyclers in different regions). However, it may reduce the possibility for the individual producers to get feedback for the design for end-of-life management.

#### **17. Transaction costs surrounding reporting**

Reporting to the authority on the result of the implementation would generate transaction costs for producers. It would also add transaction costs for the authority who needs to make sure that producers submit the results, and to aggregate the information gathered from individual producers. When the producers delegate the management of the physical implementation of their responsibility to a PRO, the PRO typically undertakes reporting as well, which would reduce the transaction costs both for individual producers and the authorities.

#### **18. Others**

As reviewed earlier, industry fears that difference of requirements between neighbouring regions would increase the transaction costs. When some provinces in Canada started to establish take-back requirement for used oils that were different with each other, a representative of the industry association explicitly mentioned their concern over the increase in transaction costs for its member companies (Van Rossem, 2002). Similarly, the manufacturers of EEE in the United States and Canada raised their concern over the development of regional EPR programmes (Betts, 2002, Davis, 2002). Enforcement of the federal legislation related to the labelling and removeability requirement for rechargeable batteries in the United States is perceived to “have cost saving implication for industry which formerly had to deal with a patchwork of inconsistent legislation in different states” (Fishbein, 1997).

It should be noted, however, that the allocation of jurisdiction at regional governments would allow, among others, flexibility, implementation of measures specific to the local needs, and prompt implementation of measures in the absence of action at the national level. Moreover, development of the regional EPR programmes, as seen in the United States for the rechargeable batteries, may trigger expansion of the programme to the national level.

When industry associations participate in a PRO on behalf of the individual producers, it would reduce the transaction costs both for the producers and the PRO.

## **19. Competition and trade**

This section examines the implication of the implementation of EPR programmes to competition and trade, focussing on the effects on the actors (*e.g.* producers and PROs, local governments, recyclers, importers). The section does not attempt to make a comprehensive review of the implication of EPR programmes to these two issues. Instead, issues that have actually been raised through the implementation of the EPR programmes are presented to illustrate the concrete implication. Discussions surrounding the EPR programmes and its potential effects on trade to date suggest that actual implementation of EPR programmes have not been in conflict with trade regime (OECD, 1998a; OECD, 2001, Salzman, 2002). Thus, the implication of EPR programmes to international trade regime as such is excluded from the scope of this paper.

### **19.1 Competition**

The existence of a dominant PRO in a country, though it may not actively prevent competitors from coming into market, may effectively hinder the establishment of alternative collection/recycling systems. A local government who already went through a consultation process with a PRO, of which the majority of the EEE producers in Sweden became a member, refused to have a consultation with an individual EEE manufacturer. Implementation of the Swedish EPR programme for packaging by a nationwide PRO prevented a system that allows adjustment to the local necessity. The PRO for packaging in Germany has been criticised for its abuse of its dominant market position (ENDS, 2001b).

When there exists only one PRO for an EPR programme, its potential monopolistic behaviour may be of concern. Not having an alternative system to compare or participate, producers may have to accept fees set by the PRO even if they exceed the actual implementation costs. The PRO for large and small consumer EEE in the Netherlands has been challenged by the industry for setting up relatively high recycling fees (ENDS, 2001a). The PRO for packaging in Germany has been accused of being the only dominant collective system operating nationwide and for its high charges (ENDS, 1998).

When there are only one or a limited number of the recycling facilities, costs for end-of-life management may become high. In Switzerland, where there is only one recycling company for batteries, the current fee for recycling batteries is 4.8 CHF (3.24 Euro) per kilogram of batteries, which is perceived to be very high compared to other recyclers in Europe (Langrová, 2002). Recycling of batteries outside of Switzerland would be difficult as waste management is subject to the proximity principle.

In relation to the implementation of EPR programmes for EEE, the Fair Trade Council in Japan published guidance with regard to the application of Anti-Trust Law on the collective measures taken in relation to recycling activities. The Council clarified, among others, that collaboration in the establishment of take-back system as such would have little possibility to violate the Anti-Trust Law, as long as the proportion of the price of recycling costs as compared to the price of the product is small, and if the companies participating in the collaborative system does not unreasonably refuse the participation of other small and medium-sized companies. It also stated that if the participating companies decide on the common recycling fees, it would constitute violation of Anti-Trust Law (Kousei Torishiki Inukai, 2001).

Regarding the market for end-of-life management, creation of collective systems may effectively limit the competition among the actors participating in the end-of-life management by making it difficult for the existing actors (*e.g.* waste collectors, haulers, recyclers) to carry out their activities or for other actors to enter the market (Kousei Torihiki Inukai, 2001). One of the two PROs for EEE in Switzerland has exclusive contracts with only one transportation company, and does not allow its members to use others, thus hinders another transportation company to come into the market (Rizzotti, 2002). The PRO also selects one EEE recycler from each Canton, who meets the stringent environmental and quality criteria set by the PRO, and all the products collected through the system managed by the PRO only go to the selected recyclers (Rizzotti, 2002). This may reduce the expenses for the PRO/producers/consumers and may help secure high recycling standard. However, this may also lead to the disappearance of recyclers not selected by the PRO, and may give the PRO an excessive bargaining power.

It has been pointed out that when a PRO has to establish a collection/recycling system in relatively short time period, it may effectively lead to the preferential treatment of existing actors, *e.g.* local governments, and private collectors. This would put the PRO in a weaker position in the negotiation process (OECD, 2001). A PRO established in response to the German EPR legislation for packaging ordinance had to contract with existing actors partly due to the necessity of establishing the collection and recycling network in a short time period. The validity of some of the contracts with the duration of up to 20 years has been challenged.

Some programmes use unemployed labour force with subsidies, or use, for instance, prison labour (EEE in the United States). This may, on one hand, have positive effects such as mitigating unemployment and helping the prisoners gain some professional skills. However, it may make it difficult for market-based



recycling to establish itself, as commercial recyclers would not be able to survive in the price competition.

When an EPR programme suffers from a large proportion of free-riders, the participating companies would be put in a disadvantageous positions, as they would end up paying for the free-riding companies. The problem of free riders often leads to the introduction of mandatory programme (Tojo *et al.*, 2001).

Introduction of mandatory deposit refund system for certain types of packaging materials in Germany have been facing protests from domestic producers, retailers, as well as importers. When the deposit-refund system is imposed only for certain type of products, which is often the case, it would risk giving competitive disadvantages to the producers using that packaging materials.

The EU Committee of the American Chamber of Commerce raised concern on the implication of the proposed WEEE Directive to competition. It stated that the financial responsibility “could create a disincentive for non-EU based manufacturers of electronic and electrical equipment to enter the EU market” (American Chamber of Commerce, 2000). The fact that the domestic manufacturers would bear the same burden makes the validity of the argument questionable.

## **19.2 Trade**

Potential effects for importers include information costs, relatively high compliance and reporting costs, and low volume/non-standard packaging or products (OECD, 1998a; OECD, 2001).

Additional information costs for importers can be reduced through measures such as notification of the upcoming legislation, provision of information and opportunities to participate in the consultation process. An industry association representing the importers could serve as a window for such a process, and could also facilitate information collection. For products whose materials and components are produced worldwide (*e.g.* EEE), information costs for material and component suppliers could rise.

Relatively high compliance and reporting costs for importers have been avoided by the establishment of collective compliance schemes (*i.e.* PROs). Although unfairly high fees on importers could be imposed, the authors have not come across such cases.

As experienced in the early days of the EPR programme for packaging in Germany, non-standard packaging material in the importing country (*e.g.* jute bags used for exporting coffee from Colombia and metal straps used on wool bales from Australia) may suffer from not being recognised as recyclable products (OECD, 2001). In the case mentioned above, the situation was resolved with the PRO approving these materials as recyclables (OECD, 2001).

The introduction of mandatory deposit-refund system for certain types of packaging materials in Germany has been facing protests by importers from France and England on the ground that it would violate free movement of goods within the European Union (ENDS, 2002b). It may give *de facto* disadvantage to foreign producers who may have difficulties in participating in the system. The change of packaging material solely for one region/one country could be costly. The trade implication of the Danish mandate of the use of refillable containers for beers and soft drinks has been discussed at length, which is now replaced by the mandatory deposit system for both refillable and non-refillable containers.

The legality of the proposed RoHS Directive was challenged due to the alleged introduction of substance ban prior to the finalisation of risk assessment. It was argued that it would create technical barrier to the trade of WEEE, violating the international trade regime (American Chamber of Commerce, 2000).

Export of products, components and materials that contain hazardous substances (*e.g.* EEE) to the developing countries have raised concern (Puckett *et al.*, 2002). Difficulty of distinguishing between second-hand products and products that are exported for recycling, lack of recycling standards imposed on producers/recyclers in the exporting country, lower/non-existing recycling standards and inexpensive labour in the importing countries, non-membership to the Basel Convention on the Transboundary Movement of Hazardous Waste, are among the factors that contribute to the increase.

Increase of trade over the Internet may effectively let private persons and importers escape from take-back requirements. However, the PROs for EEE in Sweden and Switzerland to date have not experienced serious challenges (Ghandi, 2002, Bornand, 2002).

## **20. Conclusion**

As seen, the implementation of EPR-based policy instruments affect/are affected by various interrelated institutional and market factors. A factor that may bring benefit to one actor, or to one aspect of an instrument, may increase

burden on the other. A balance between these benefits and costs requires careful attention.

This concluding section attempts to highlight the relation of the studied factors that are affecting the implementation of selected EPR-based policy instruments, namely, take-back requirements, deposit refund systems, and advance disposal fees. The section does not attempt to specify the relation of these factors in a form of function. Instead, it intends to summarise some of the important institutional and market factors as well as their relation that have been illustrated in the paper through observation of actual implementation.

### **20.1      *Relation of factors affecting take-back requirement***

The main steps involved in the fulfilment of a take-back requirement include *collection* of discarded products covered by the EPR programme and *recycling* of the products, including the proper treatment of residues. Actors and issues surrounding these two steps may be different. Thus these two steps will be discussed separately.

### **20.2      *Collection***

The majority of take-back programmes carry out collection in a collective manner, and utilise existing infrastructure for collection, namely local governments and, in some cases retailers (dealers), by law or through contracts with Producer Responsibility Organisations (PROs). Aside from their existing infrastructure, a somewhat contradicting aspiration of local governments, who wish to secure their own employment while trying to avoid costs, may explain the continuation of their involvement in collection. Exceptions include take-back programmes for cars in some countries, where neither local governments nor dealers are involved in collection in the existing systems.

Establishment of a collective body that manage infrastructure for collection has the possibility to reduce transaction costs for all parties involved (*i.e.* consumers, producers, local governments, retailers). This is especially the case when the number of the producers covered under a take-back programme is high (*e.g.* packaging). A collective system is especially attractive for small and medium-sized enterprises and small importers, who risk facing relatively higher difficulties in setting up their own collection system. However, it may reduce the possibility of adjusting the infrastructure so that it meets local conditions (*e.g.* packaging in Sweden). It may also create barriers to individual producers who wish to establish their own collection network (*e.g.* EEE in Sweden) and thus be a barrier for innovation of a product system. Moreover, it may hinder

new actors to enter the market for collection and transportation (*e.g.* EEE in Switzerland).

When retailers are involved in collection, their inconvenience from increased transaction costs is often compensated. If the retailers are responsible for take-back requirements together with producers, the relative strong negotiation position of retailers may allow them to secure high compensation in the price of the product or by direct compensation through the EPR systems (*e.g.* aluminium cans in Sweden).

The selection of the actors involved in the collection, as well as the measures for collection, determines the convenience of consumers, and requires product specific consideration.

### **20.3     *Recycling***

Giving producers financial and/or physical responsibility for recycling of the discarded products is the core of take-back programmes. Although the majority of take-back programmes physically carry out recycling requirements in a collective manner, whether their financial responsibility should reflect the actual costs of the end-of-life management of products that they themselves produced or not (individual *versus* collective responsibility) has been debated, especially for complex, durable products (*e.g.* EEE, cars). The main rationale for the individual financial responsibility has been to give incentives to the producers to change the design/material use of their products upstream so as to reduce problems at source.

PROs for simple, non-durable products (*e.g.* packaging) typically allocate financial responsibility to the individual producers based on the type of materials used in the products and the amount of the products they put on the market. Various programmes experienced the decrease in the total amount of packaging put on the market, as well as increased use of materials that yield higher reusability/refillability/recycleability.

In the case of complex, durable products (*e.g.* cars, EEE, rechargeable batteries), differentiation of fees that reflect the actual costs of end-of-life management of individual products face various challenges due to, for example, the complexity in structure, components and materials, difficulty of distinguishing between different products and of estimating the future recycling costs. In order to cover the recycling costs of existing products and to avoid additional costs to overcome these challenges, advance disposal fees managed as a “pension” system has been used in most cases.

As found in the case of collection, existing infrastructure and expertise for recycling has been also utilised. Not all the existing recyclers may have the capacity to meet with the recycling standards set by legislation or the PROs, and may force some recyclers to disappear. The tendency of non-well performed recyclers to disappear would be higher if the recycling infrastructure is managed by a PRO who has more control than the recyclers.

The fact that only the recyclers with high environmental performance survive is good from environmental point of view, and also is a natural consequence of market economy. However, the transition towards a new system may bring up issues such as increase of unemployment and social instability. Consideration to these issues may affect the formulation of legislation that help the existing recyclers to improve their performance and bring forward the overall recycling activities in a positive direction (*e.g.* cars in Japan).

A simultaneous introduction of equal and adequate recycling standards nationwide/among the neighbouring regions would facilitate the growth of sound recycling industry. Use of subsidised labour force (*e.g.* subsidised unemployed workforce, use of prison labour) may make it difficult for the commercial recyclers to compete, thus may hinder the growth of sound recycling industry. When collected products are exported to developing countries or exported for recycling, caution should be taken so as to avoid dumping of waste. The exporters should see if the products would be used as second-hand products, and recycling standard of the importing countries should be examined.

Management of recycling infrastructure by a collective body would reduce transaction costs for producers as well as recyclers. However, when recycling of the products relate directly to the design of their own products (*e.g.* EEE, cars), it becomes useful for producers to gain knowledge on recycling, as they could reduce the recycling costs by changing their design. When producers wish to contact recyclers directly (*e.g.* cars in Sweden) or involve in recycling themselves (*e.g.* EEE in Japan), a collective body may help reduce the transaction costs by providing a list of recyclers with high performance (*e.g.* cars in Sweden), or help manage the financial mechanism (*e.g.* EEE in Japan).

When material and component producers of complex products spread worldwide (*e.g.* EEE), unlike the producer of the final products, these material and component producers are not likely be represented in the consultation process of the development of legislation that affect the final products. They may face an increase in information costs to keep up with the development of various legislation abroad.

## 20.4 *Relation of factors affecting advance disposal fees*

While an advance disposal fee system is a financial mechanism most widely used for take-back programmes, the actual implementation varies mainly in two areas: how to determine the level of fees, and how to manage the collected fees. The difference in these two areas may have a strong implication to various factors reviewed in the paper.

One of the important aspects regarding the determination of the fees is if the fees reflect the difference in the actual expenses and social costs of end-of-life management of individual products. Stability of the flow of discarded products and less fluctuated price of the recycled material, as well as the shorter life of the products, facilitates establishment of differentiated fees for simple products (*e.g.* packaging) that reflect the characteristics of different material used, as experienced in various take-back programmes for packaging. However, characteristics of durable, complex products put higher challenges.

The flat fee structure for the same type of products (*e.g.* all the TV belonging to a certain range of size) and for the same type of materials (*e.g.* all types of plastics) regardless of the degree of the ease of end-of-life management would discourage producers to strive for making upstream changes. In Japan, the industry-wide flat fee structure is regarded to be in conflict with the competition law. On the other hand, the management of differentiated fee structure would most likely require higher transaction costs than the flat fee structure. However, as discussed below, if the flat fee is combined with pension system, as typically found in most of the flat fee system, the difference in the transaction costs could be offset by the amount of necessary reserve in the fund.

The management of the collected fees could be categorised into two: a pension system, as found in most of the advance disposal fee systems, and the system where the fee collected at the purchase of a new product will be used for the recycling of the same product in the future. Some pension systems established a relatively large reserve, especially at the initial stage, partly due to the lack of data on the amount of discarded products collected. The necessity of having a high reserve, connected to the relatively high disposal fees set on the new products, was questioned by the participating producers (*e.g.* EEE and cars in the Netherlands).

The sufficient level of reserve may be different, depending on the issues such as the durability of the products covered by the system, the number of new products sold and old products collected, and characteristics of the producers participating in the system (*e.g.* large *versus* small, domestic *versus* import). When the sale of new products is increasing/constant while the number

discarded products collected is decreasing, the fee would be reduced (*e.g.* cars in the Netherlands). Meanwhile, if the sale of the new products is decreasing while the number of discarded products collected is increased/constant, the fee would most likely be increased. Lack of adequately accurate data for collection may make it difficult to determine the right size of advance disposal fees (*e.g.* batteries in Sweden).

When differentiated advance disposal fees are put on the price of the new products and the collected fee is managed by individual companies (*e.g.* cars in Sweden), funding for orphaned products would be of concern. Use of recycling insurance with differentiated premium, which has been initiated in a smaller scale in Sweden, may serve as a guarantee for funding for end-of-life management of orphaned products. As discussed in Section 0, use of recycling insurance also decreases transaction costs for individual producers to negotiate with recyclers and to secure the management of their cars in high quality.

Another factor that affects the size of the fee is the power relation between the PRO and other actors. When the PRO has a relatively high negotiation power over the existing recyclers (*e.g.* the PRO selects among a number of existing recyclers), the cost of recycling could be cut down (*e.g.* EEE in Switzerland). On the other hand, when the recyclers have a relatively high negotiation power among the actors involved in end-of-life management, they may claim and manage to obtain higher recycling fees (*e.g.* cars in Sweden).

The advance disposal fee could be either visible, explicitly on top of the price of the new products, or internalised in the price of the products. Visible fee has the advantage of making consumers aware that they are paying the recycling costs. However, it may face refusal from the retailers who are afraid that the fee is not collected due to the severe price competition of the products and negotiation power of consumers (*e.g.* EEE in the Netherlands and Japan).

If the size of the fee becomes significantly high in proportion to the price of the product itself, it may raise concern from the fair competition point of view.

### **20.5 *Relation of factors affecting deposit-refund systems***

A main challenge facing the deposit refund system is that it would induce transboundary movement (*i.e.* illegal import) of discarded products (*e.g.* experiences in United States, Canada and Sweden). Indeed, just as the end-user pay system would induce illegal dumping to avoid the costs, deposit-refund system would attract illegal import to get some money.

One way of decreasing the cheating is the introduction of a bar-code system or other suitable marking system. Moreover, illegal import could be diminished by making the size of the refund relatively small (*e.g.* battery in Sweden). Experiences showed that the size of the refund can be modest to give incentives for consumers to bring back products to the collection depots.

Deposit-refund systems in most cases are carried out collaboratively, partly to secure convenience/keep the transaction costs down. Industry-wide implementation would also reduce transaction costs for individual companies. Retailers can be selected as collection depots for consumers' convenience. However, as noted above, the relatively strong negotiation position of retailers may allow them to secure high compensation (*e.g.* aluminium cans in Sweden). Systems where less number of collection depots are set up at relatively less convenient locations (community collection centres) have also achieved high results (*e.g.* British Columbia, Canada, California, the United States).

A traditional deposit-refund system, which forces the producers to make the deposit exactly the same as the refund, often runs into financial difficulty, as the system is financed solely on the unclaimed deposit, interest generated from the deposit and revenue from recycling. Alternatively, a combination of deposit-refund system and advance disposal fee system can be used. In this case, the size of the refund is determined independent of the size of the deposit. The size of the refund should be just as large enough to enhance collection rates, while the deposit (combination of the traditional deposit plus an advance disposal fee) should be big enough to manage the system.

As one of the main objectives of introducing a deposit-refund system is to reduce littering, adequate monitoring system should be in place to follow the result.

Although a deposit-refund system often is perceived to be a very expensive system, this may not be true if compared with the programmes that achieve equally high results. Aside from the initial installation costs, implementation costs as well as transaction costs may not necessarily be higher than a "bring" system.

Introduction of a mandatory deposit-refund system often raises concern on the competition and trade. It may give *de facto* disadvantage to foreign producers who may have difficulties in participating in the system. When the deposit-refund system is imposed only for certain type of products, which is often the case, it may give competitive disadvantages to the producers using that packaging materials. Changing the packaging material solely for one region/one country could be costly.



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## *Chapter 2*

### *Discussant Commentary on*

#### **POLITICAL ECONOMY OF IMPLEMENTING EPR-BASED POLICY INSTRUMENTS**

*by*

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The authors provide a useful review of key issues, factors and constraints related to the implementation of EPR schemes. This overview is comprehensive and based on practical examples drawn from a variety of countries.

Summarising the substance of the paper would not be helpful and would not pay credit to the richness of the analysis. I will rather make a few remarks in relation to selected key issues presently studied in OECD: governance, financial mechanisms and recycling.

#### **1. Governance**

Good governance is a key condition of sustainable development and the paper rightly reviews two aspects: public institutions and private sector organisations.

*As for public institutions*, the need for coherence and continuity is essential, but seems particularly difficult to meet with the great variety of EPR systems, objectives and actors: local vs. regional and national goals and schemes; potential conflicts with other local socio-economic objectives.

*Public sector governance will be improved if objectives are clear.* This is well known, but particularly relevant with EPR having multiple objectives. Here we can refer to Margaret Walls' paper stressing the need to specify the environmental objective that EPR policies are designed to achieve. Public institutions at different (regional, local, national) levels will adhere if objectives are clear and coherent. The paper presents useful analysis of this key issue.

A recent OECD study on "*Improving Policy Coherence and Integration for Sustainable Development: a Checklist*" [OECD 2002] develops a list of criteria to ensure policy coherence at the level of institutions, *i.e.*:

- A common understanding of sustainable development. Translate: of EPR objectives.
- *Clear commitment and leadership.* Translate: EPR-related institutions.
- *Specific institutional mechanisms to steer integration.* Translate: need for an EPR "institutional catalyst" and feed-back mechanisms between different institutions.
- *Effective stakeholders involvement.* Translate: effective channels between responsible institutions and EPR players.
- *Efficient knowledge management.* Translate: effective diffusion of EPR related technologies.

The paper rightly underlines the potential conflicts between EPR and *regional employment objectives*. This issue is of particular relevance since many OECD countries implement so-called "bottom-up" policies to combine regional environmental protection and employment creation. We are presently reviewing these policies (several hundreds of cases in OECD countries). A large proportion of these "bottom-up" approaches relate to waste management and recycling. *The integration of regional EPR policies with regional employment creation schemes could be further investigated.*

*For the private sector,* the paper provides important and useful insights on the role of private organisations, in particular Producer Responsibility Organisations (PROs). These organisations are essential to the "governance" of EPR, in particular to achieve economies of scale, reduce transaction costs and disseminate information. In this respect, PROs can contribute effectively to technical innovation (see Candice Steven's paper).

However, two possible obstacles can be mentioned:

1. The risk of *anti competitive behaviours* of PROs (e.g. exclusion of small firms, market entrance barriers).
2. The numerous *pitfalls and weaknesses of voluntary approaches*, in particular, business as usual, regulatory capture, poor monitoring, free riding and transaction costs [see OECD 2003]. These shortcomings of voluntary approaches can make the implementation of EPR particularly delicate.

On the issue of *transaction costs*, the paper provides a very useful analysis showing the multiple sources of transaction cost and proposes ways to reduce these costs. These multiple cost sources, plea for the implementation of *simplified EPR systems*.

## **2. Financial mechanisms**

This is an intriguing and challenging issue for the economist and raises a fundamental question: should we aim at incentive or financing systems? In other words, should EPR related taxes, charges and fees be designed to minimise at source the production of environmentally harmful products, or to finance safe disposal, recycling or reuse, or both?

Here I see a nice complementarity with Margaret Walls' paper. Whilst Tojo and Hansson provide a useful review of the existing financing mechanisms and requirements and their complexities, M. Walls rightly shows that *each objective should have a separate instrument* and that the ultimate goal should be to minimise the total cost of managing waste products, *i.e.* external and private costs. Hence policy instruments should be designed to achieve this goal.

## **3. Recycling markets**

The paper underlines that virtually all take-back programmes make producers responsible for recycling and the key role of PROs. Section 1 provides useful insights on the issues related to recycling markets and organisations, indicating that there are no universal ready-made organisation, depending upon the types of goods (simple or complex durables), the effectiveness of recycling plants etc.

Whether recycling markets are properly functioning (or at all existing), is a key issue that we are currently studying at OECD. Let me mention some of the issues:

*When there is a small number of producers, e.g. an oligopoly like in the case of the automobile industry, and when recycled materials have a real economic value, producers do not use PROs, but have direct contracts with recyclers.*

In this case, producers have a large control of the life cycle and can impose their prices. The consequence on EPR are twofold: On the one hand, it is not in the producers' interest to encourage a high quality, expensive recycling; this works against the EPR objectives. On the other hand, in order to optimise the life cycle, producers will have an incentive to modify their products (design for the environment).

*When there is a large number of producers, whose products are costly to recycle with small markets (e.g. plastics and used tyres), public intervention (regulations) is needed to push the creation of PROs (e.g. Eco-emballages in France).*

Therefore the issue of recycling markets is central for a good functioning of EPR, in particular when successful EPR schemes result in large quantities of recyclable products. The OECD is presently analysing how these markets works, or don't work and how they could be made more efficient in particular for 4 waste streams: plastics, used tyres, lubricating oils and construction and demolition waste.

PROs can be subject to free riding when participation is not mandatory. One way to minimise free riding is to set up a *level playing field* through common minimum standards for waste disposal, recovery and recycling. This is why OECD is presently working to develop so called "Environmental Sound Management of Waste" (ESM), *i.e.* common good practices for the management of waste destined for recycling. An OECD Council Act is being elaborated.

### **Concluding remarks**

This paper, once more, indicates the complexities and subtleties associated with EPR: multiple objectives, multiple agents, multiple products, multiple dimensions. The challenge we are facing is to keep EPR within manageable proportions. If it becomes too complex, cumbersome and conflicting with other objectives, it will lose its effectiveness and legitimacy. The best, and probably, only way to foster EPR is to be extremely vigilant as to its economic rationale. This was the very purpose of this workshop to shed some light on this and pave the way for economically sound and well managed EPR policies.



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***Part 5: EPR and the Cost-sharing Issue***



## *Chapter 1*

### **SEGMENTED SOCIETY: EXTENDED PRODUCER RESPONSIBILITY AND THE COST-SHARING ISSUE**

*by*

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#### **1. Introduction**

In waste administration of today, the responsibility of producers to carry out recycling and appropriate waste disposal is expanding, at least in developed countries. By the Product Liability Law, rules have been already established as an institution to define the circumstances and the kind of responsibilities that producers should take for damages occurred during the consumption process of their products. In the discipline of waste management policy, it has been proposed as an idea to hold producers responsible for implementing recycling and appropriate disposal of the discard products, even when consumers found no defects in the products during the consumption process. Many countries have introduced this idea as practical institutions, as so-called Extended Producer Responsibility (hereinafter referred to as EPR).

In this article, the background for introducing EPR is overviewed in relation with “Segmented Society”(after-mentioned), and issues of sharing responsibilities emerging from the introduction of EPR, as well as the issue of cost sharing which arises as a new subject, are examined.

## **2. Formation of Segmented Society**

The characteristics and the aims of EPR are to 1) shift the municipalities' responsibilities for waste disposal (a part or all of physical responsibilities and financial responsibilities) to the producers in the upper stream of the product chain, and to 2) give incentives to the producers to take environmental conservation into consideration when designing their products. From the standpoint of viewing the physical responsibility as an inherent characteristic of EPR, among the three methods of EPR defined by OECD (2001), "product take-back requirement" and "performance standards" will be taken into consideration in this article, excluding "economic instruments".

Now, let us examine why it is necessary to expand the responsibility of the producers to the products discarded after consumption. It is definitely because of the significant increase in the amount of waste generation and its deleterious effects. In order to clarify the effectiveness and issues related to EPR, it is important to properly understand an economic mechanism where such tendency has developed.

Mass waste-producing and throwaway society is a reality existing as a result of the market's evaluation and adjustment under current social regimes. In a society like this, we are facing problems such as shortage of disposal site and environmental damage caused by waste disposal.

However, simply recognizing that the problem is the reality existing as a result of the market mechanism is not enough to find a proper solution. What is more important is to pay attention to the mechanism where the function of the market mechanism works to create the waste problems, In other words, it is necessary to focus on the "process" of adjustment made by the market mechanism.

Given that there is a flow of goods such as production, distribution, consumption, disposal and waste treatment, currently production is carried out by producers, distribution by distributors, consumption and disposal by consumers, and waste management of municipal waste is conducted by public sector.

In the process of production, distribution, consumption, disposal and waste management, what is the principle that each unit follows in their decision-making process as an economic agent? The producers' priority in production is not to make waste processing easier. Needless to say, it is rational to think that they make decisions in such a way to maximize the profit and minimize the costs of their production. It should be reasonable to say that they

choose returnable bottles or one-way containers based on the same criterion of judgment. The distributors should make the same kind of judgment as the producers.

With regard to the consumption and the waste disposal by the consumers, while there are some movements or notions to review the recent throwaway-life style, the general standard has been to seek for convenience and low price so that their degree of satisfaction are maximized. In other words, consumers have also been acting without giving consideration to waste disposal.

Now, let us consider the performance standards of the public sector, which exists in the final point of the flow of goods. While many municipalities recently started to conduct sorted collection and recycling of valuable resources, it had been their basic principle to appropriately manage the wastes, viewing its quality and quantity as given. In other words, they had been focusing on implementing the appropriate management of generated waste, without causing interference with the actions made by the producers, the distributors and the consumers. It has been already made clear that this system of the public sector has reached the limit.

In each process of production, distribution, consumption and disposal, each economic agent make decisions of their actions based on their own principles such as profit maximization, cost minimization or utility maximization. As long as the public sector does not make any interference with these decision-making processes, the adjustment by the market mechanism works to create a system where production, distribution, consumption and disposal are done without giving consideration to the waste management, thus establishing a socioeconomic system with mass waste production.

That is to say, though the flow of goods is consecutive, the economic agents concerned in the process is segmentalized and making individual decisions based on their own preference, without pondering whether it is socially desirable. This is the reality of the economic society of today. Consequently, the socioeconomic system as a whole is vastly deviated from the social optimum, generating significant social costs or social loss, particularly in the waste management process. Let us call a society with such socioeconomic system a “Segmented Society” (Ueta, 1992).

### **3. EPR and Reallocating Responsibilities of Appropriate Waste Disposal and Recycling**

The socioeconomic system is segmentalizing the product chain and keeping the system of production, distribution, consumption and disposal that

goes without considering about the waste management. Now, the task is to establish a system where each economic agent makes decisions in consideration of appropriate waste disposal and recycling, so that the impact on the environment could be reduced and the recycling of resources is enhanced. In order to do so, it is necessary to integrate the segmented socioeconomic system. In this context, the question we have to ask is what would be the meanings and effects of EPR.

Under the segmented socioeconomic system, the producers, the distributors and the consumers remain unaware of the issues such as environmental pollution, destruction of nature and regional conflict brought by mass waste generation, therefore, they have no incentive to change the mass waste-producing and throw-away industrial structure and life-style. With regard to general goods and services, as long as the market mechanism as an automatic adjustment structure functions properly, consumers can gain necessary information to change their performance by recognizing the increase or decrease of demand and supply caused by price fluctuations as signals. The price signals persuade, or rather, economically force the producers and the consumers to change their performances. By contrast, in the segmented socioeconomic society, agents concerning the process of production, distribution and consumption behave individually based on their own principle, thus making the public sector solely responsible for the treatment of mass waste generation. There is no system to communicate the issue of waste problem and the relevant costs to all of the concerning agents, thus making no signals or incentives for each agent to change their performances.

These signals and incentives are not self-generating and need to be created institutionally. The most fundamental and plain way is to reallocate the responsibility of conducting waste management taken solely by the local municipalities, so that the above-mentioned signals and incentives would work appropriately. The damages and costs resulting from mass waste generation and its deleterious effects have been entirely borne by the public sector and local residents near the concerning facilities in the final point of the product chain. In order to reallocate such damages and costs to the upper stream of the product chain, various methods can be assumed including making a product charges or charging for hazardous substances found in the products. As described in the definition of EPR by OECD (2001), the most apparent characteristic of EPR is that, while the responsibility for processing the discarded products after its life cycle has been conventionally taken by local municipalities, EPR reallocates the responsibility by holding the producers responsible for the appropriate treatment and recycling of the products.

The question we have to ask here is what would be changed by reallocating the responsibility from the local municipalities to the producers. There are many common characteristics in the contents of the responsibility for the appropriate waste management conventionally borne by the local municipalities, and the responsibility for the appropriate waste management and recycling that EPR imposes on the producers. However, in the strict sense, they are different in many cases, therefore, it is necessary to carry out specific examination on case-by-case basis, as it is not suitable to discuss this issue by and large. Let us now suppose that the content of the responsibility is equally the appropriate waste management. In this case, what would be the meaning of shifting the responsibility from the municipalities to the producers? Since the waste disposal conducted at the cost of public sector will be covered by the private sector, it means a significant difference in relation with the primary payer of the costs for waste management. The term “primary defrayer” indicates that the costs arising from the responsibility given to the producers may shift to other party. Consequently, it is important issue that who will be the ultimate payer as a result of the shift. This issue will be described in detail later.

Now, let us consider what impact would it have on efficiency by changing the allocation of responsibilities for waste treatment. Under a circumstance where Coase’s theorem (Coase, 1960) apply, it has been said that changing the initial allocation of responsibilities would have no impact on the efficiency, since negotiations would be carried out between the concerning<sup>1</sup> agents. However, from the viewpoint of efficiency, shifting the responsibility of waste management from the municipalities to the producers has a meaning that goes beyond the circumstance assumed in Coase’s theorem. What is important is to note that the meaning is not only to change the allocation of responsibilities concerning waste management, but also to integrate the segmented socioeconomic system that has been a factor to produce mass waste disposal. By shifting the responsibility, the producers would incorporate the losses the costs resulting from mass waste generation to their own economic calculation for the production. As a result, they would have incentives to minimize such damages and costs and to improve their product design or selection of materials so that they would be more environmentally sound products. Which is to say, the change in sharing of responsibilities institutionally creates incentives to fundamentally remove the causes of mass waste generation, and in that context, it contributes to realize dynamic efficiency.

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1. More thorough investigation is necessary with regard to relationship between efficiency and laws or rules concerning responsibilities. See Mishan (1981) for the sharpest criticism for Coase’s discussion.



The second characteristic of the sharing of responsibilities in relation with EPR is that the reallocation of the responsibilities includes two kinds of responsibilities, namely a physical responsibility that is to actually implement the appropriate waste disposal and recycling, and a financial responsibility to bear the relevant costs. When we compare EPR with other economic measures for implementing waste management, such as emission charges and product charges, EPR can be characterized by the fact that it imposes specific engagements regarding the appropriate waste disposal and recycling as the physical responsibility. In general, an economic measure would give incentives to the agent that is regulated by the measure, but the agent would be able to decide their responses on their own. On the contrary, as EPR specifically regulates what should be done with regard to the appropriate waste disposal and recycling as the physical responsibility, the agent subject to EPR do not have any choice whether to fulfil the physical responsibility or not. They would only be allowed to consider how efficiently (*e.g.* cost efficiency) they could achieve the imposed physical responsibility. In this sense, it is possible to regard EPR as a kind of direct regulation. For example, when a numerical target is set as a recycling rate,<sup>2</sup> it would be a direct regulation and it could be regarded as a mandatory recycling system. In this case, the recycling rate is set as a target without giving consideration to the efficiency, at least in the context of static efficiency. Therefore, it is not efficient from a general economic point of view. The intension of setting such numerical target is rather to have it act as a trigger in creating technological innovation to achieve the target, so that the costs to comply with the target shall be balanced out. By emphasizing the physical responsibility, it becomes easier to demonstrate a clear principle for determining the direction of the technological innovation, therefore, it is all the more important to present a precise target. It should also be noted that if we try to achieve the same effect by imposing tax, the tax rate could become quite high and cause too much burden.<sup>3</sup>

#### **4. EPR and the Issue of Cost Sharing**

Primarily, EPR is a concept to reallocate the physical responsibility concerning waste disposal, however, it also reallocates the financial responsibility, as it involves the issue of sharing the costs that arises anew. When the responsibility shifts from the local municipalities to the producers, it means that the primary of the costs for the appropriate waste disposal and

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<sup>2.</sup> German Packaging Ordinance is a typical example.

<sup>3.</sup> In regard to this point, it is necessary to conduct strict comparative examination with so-called policy mix, such as combining tax imposition and subsidization.

recycling changes from the public sector to the private economic agents. In general, few people would object to the promotion of recycling in principle. However, when it comes to realizing the idea, it tends to be difficult because of the new issue of cost sharing, in either case of introducing EPR or other public policies. The agent that becomes responsible for the financial responsibility must bear additional costs, therefore, when the change brought by the reallocation is quite drastic, it could be difficult to reach an agreement on the introduction of the policy. This matter of cost sharing often becomes a controversial point among the concerning agents, and there are several theoretical and political issues involved. In this article, the discussions are focused on the issues in relation to EPR and PPP (Polluter Pays Principle).

The first question we have to ask here is whether it is possible to say that EPR is an applied form of PPP. PPP is regarded as a fundamental principle in the issue of cost sharing concerning environmental policy measures, however, we need to clarify whether it follows from this that EPR is created as a result of applying PPP to the waste problems. Turner (2000) describes “green dot” system in Germany as a system established as “an attempt to make polluter pay”, thus regarding EPR as an applied form of PPP.

When it comes to actually applying PPP, there are considerable controversial issues such as what kind of cost should be included in the scope of PPP, or what should be done when the polluters are not in bankruptcy. However, the most important point in relation with EPR is the question of who is the polluter. When we regard EPR as an applied form of PPP, who would be the polluter? In relation with EPR, the polluter is not the direct emitter of wastes. It is rather the agent who is able to integrate the agents acting individually under the segmented socioeconomic system by controlling the product chain, thus reducing the social costs and losses generated by the current product chain. The polluter in EPR is the agent who is able to reduce the social costs generated by the product chain; in other words, it is the agent who is capable of playing a decisive role in controlling the product chain.

The same argument is developed by OECD; by taking as an example the pollution problem of automobile exhaust, OECD (1992) also argues that the polluter should be described as an economic agent who has a decisive role in pollution problems and capacity to perform most efficiently in the pollution chain, rather than an agent who directly emits the pollution, taking into consideration economic efficiency and facility in administrative management.<sup>4</sup>

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<sup>4</sup>. The author was given instruction on this point by Mr. Yosuke Asaki, in the doctoral program of Graduate School of Economics, Kyoto University.

It follows from the above discussion that the polluter in EPR is not the direct emitter of wastes, but it is the agent who created the structure of mass waste generation, by not utilizing their capacity to control the product chain. When we consider the reason why they did not use their controlling power, it must be because the system of sharing the responsibility was not established in such a way to enhance them to do so. It means that we are facing an issue of choice with regard to the methods of sharing the responsibilities for the appropriate waste disposal and recycling. From this viewpoint, it is possible to say that EPR is an institutional policy measure that places responsibilities to the agent who has the controlling power, so that they would actually exercise the ability. At the same time, the rules regarding sharing of responsibilities will be an institutional foundation for creating a recycling-oriented society, where the abatement of waste generation, promotion of reuse and recycling are incorporated within the society.

Now, some references to several remaining issues should be made.

The first issue is to investigate the concepts of controllability of the product chain and the agent's controlling power more thoroughly. Various indexes can be supposed, such as technological capacity for recycling, exclusive procession of knowledge and information and options in product design. In general, it is the final producers that have such abilities, however, examinations on possible exceptions should be carried out with regard to the contents and the conditions of the exceptions.

Secondly, it requires some consideration whether it is appropriate to regard the agent who has the controlling power as the same agent who is capable of conducting optimum control of the product chain, including waste treatment, at the minimum cost. If so, it seems possible to utilize the concept of "cheapest cost avoider" (Calabresi, 1970), a concept proposed in relation with a compensation system for traffic accidents, to have a similar formulation for the agent who has the controlling power. If not so, more specific definition would be required to clarify the cases where they would not be regarded as the same.

Thirdly, it is necessary to define both the positive aspects and problems of separately discussing the issue of allocation of responsibility (the physical responsibility in EPR) and the issue of cost sharing (Hosoda, 1999). By separating these two issues variety of the options for the institutional design of EPR significantly increases; therefore it is evident that more flexibility would be secured in the establishment of the institution. However, when separating the issues of allocation of the responsibilities and cost sharing, it should be carefully examined whether the result would be the same with the case when they are not separated, with regard to the structures of incentives and allocation

of the responsibilities. This point is in relation with the issue of shifting the costs and its incidence. More specifically, it means that even when both the physical and financial responsibilities are imposed on the producers at the same time, these responsibilities may still be shifted to the consumers, suppliers of raw materials and laborers through the market mechanism. It may be possible to minimize the needs to make the shift itself by technological innovation, however, with regard to which of the above cases would emerge to what extent, it should be examined on a case-by-case basis, as it depends on the market structure of the concerning product, as well as on the conditions of the industrial organizations. In addition, the consequential result would not be the same with the case where only the physical responsibility was reallocated and the relevant costs are imposed on the other agent. Accordingly, even if the physical responsibility is imposed on an agent who has the controlling power and we separate the issue of cost sharing from the issue allocation of responsibilities, it still remains as an important issue of the institutional design to define an agent as the primary of the costs.

## **5. Conclusion**

EPR is not a definitive concept yet, however, it is a very attractive concept as it institutionally creates dynamic movements of the producers in order to contribute to the establishment of a recycling-oriented society. While it is still in a developing stage as a policy measure, it has already been introduced in many countries and there is increasing number of actions taken as experimental approach. It is necessary to implement an ex post evaluation of such experimental approach and existing institutions, in order to evolve the institutions and the policy measures relevant to EPR, as well as to keep making efforts to clarify the position of EPR within the system of public policy which aims to contribute to the establishment of a recycling-oriented society.

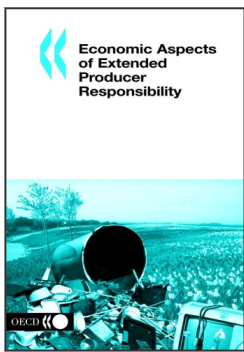
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