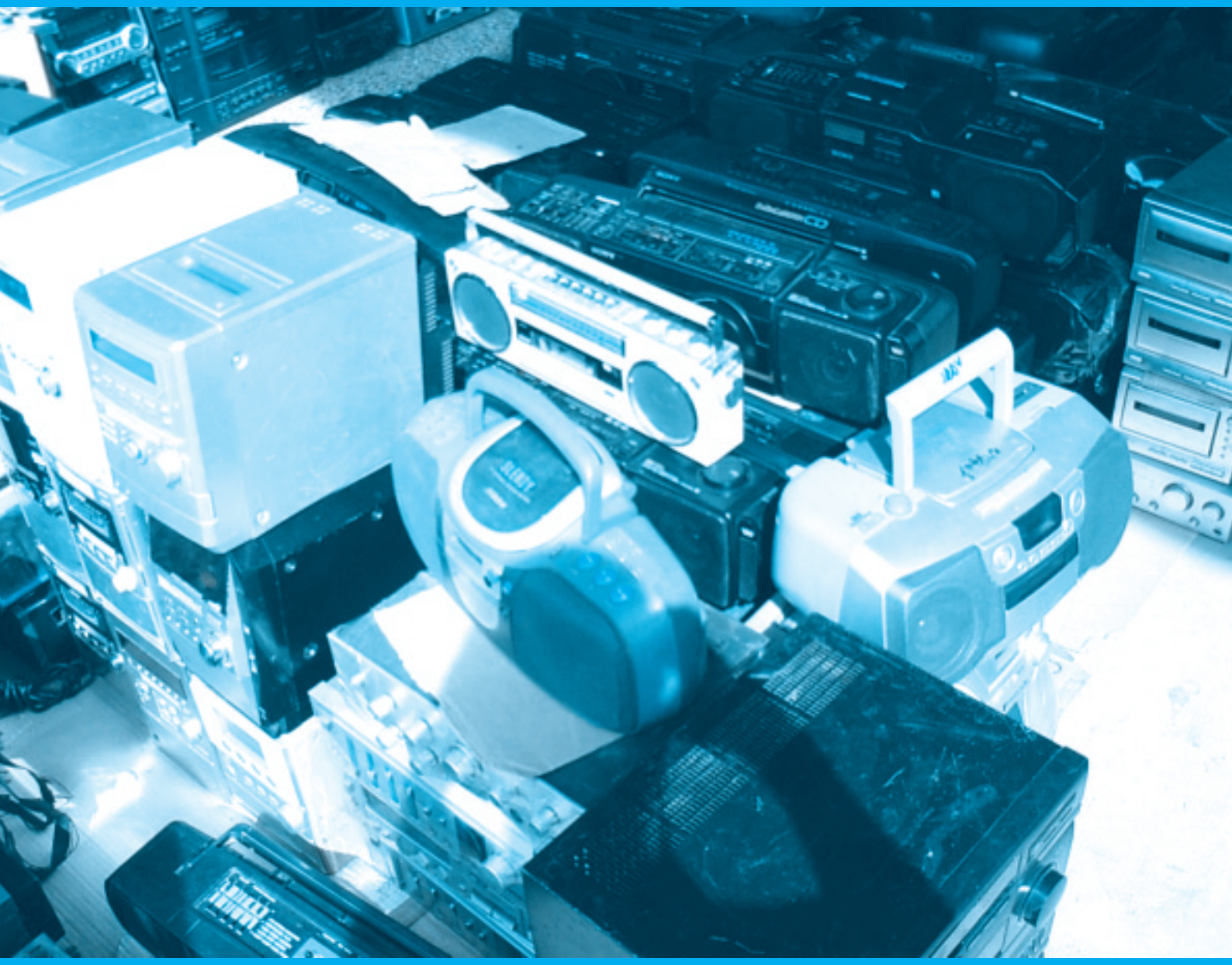
Section II

EPR Policies in Developed Countries



2. Application of EPR to Recycling Policies in Japan, Korea and Taiwan

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Introduction

The idea of making manufacturers play a significant role in the after-use stage of products dates back to the early 1970s. At that time, municipalities in Japan began arguing that producers of products such as plastics, home appliances and tires should be responsible for the after-use stage. These products were called "tekisei-shori-konnanbutsu", which means "goods difficult to be treated properly". The primary argument for making producers responsible for these products was the higher cost for municipalities to treat them. The Advisory Council of Tokyo's Metropolitan Government on Waste Management seriously discussed the concept of "tekisei-shori-konnanbutsu" intensively from 1973-74.

In response, producers formulated industrial associations to help ensure proper recycling. These associations promoted the development of recycling technologies and pilot collection programs. Municipalities also began to invest in new facilities to treat wastes more effectively. However, the responsibilities of producers were not clearly defined in formal regulations by central government and municipalities in the 1970s.

It was not until the 1990s that the term of *Extended Producer Responsibility* (EPR) was widely discussed as a governmental policy principle. In 1994, the Organization for Economic Co-operation and Development (OECD), as a leading international organization, embarked on a project to conceptualize EPR on the policy level. In 2001, OECD published a governmental manual that introduced EPR to OECD member governments as a potential policy alternative for waste management. The concept of EPR suggested by OECD had two significant features: 1) shifting of responsibility from municipalities to manufacturers; and 2) providing incentives to manufacturers to undertake Design for Environment (DfE), which involves integrating environmental considerations into product design and development[2] (OECD 2001). The

[2] Martin.C and Ursula.T 2001

inclusion of EPR principles in policies spread throughout the world, even to non-OECD countries, in large part due to the merit of reducing municipal expenditures (Lindhqvist 2000).

Affected by this movement, Asian countries swiftly launched new recycling schemes to make their traditional recycling structures more efficient based on EPR principles. In particular, Japan, Korea and Taiwan, countries with limited territories and natural resources constraints, led the way in applying EPR at the policy level. However, each of these countries developed their own version of recycling structures, despite following the general EPR concept.

In this paper, the authors aim to analyze the performances and problematic issues of EPR policies in Japan, Korea and Taiwan, with a focus on e-waste recycling (in case study form). Each of the three countries has implemented EPR policies in order to regulate e-waste over the past five to ten years and has undergone a process of trial and error to construct an effective e-waste recycling structure. Furthermore, because the legislative background and policy development for e-waste recycling greatly varies among the three countries, this comparative study covers a wide range of e-waste recycling policies found in Asian countries. In addition, the authors also hope the results of this study will be used as a reference for countries considering the implementation of EPR policies in the near future.

Japan
Current situation of EPR policy

The EPR policy in Japan started with the enactment of the Law for Promotion of Effective Utilization of Resources (LPER) in 1992. It was seen as one way to impose the 3Rs (Reduce/ Reuse/ Recycle) on manufacturers (Yamaguchi 2000). However, the law is intended to encourage voluntary activities of manufacturers in the design for environment and recycle and other waste reduction practices, by imposing several recycling-related stipulations, such as a list of items to be recycled and recycling targets. In 1997, the Law for Container and Packaging Recycling (LCPR) came into force. This legislation, affected by the enactment of the German Packaging Ordinance, was the first compulsory law based on EPR.

In 2000, the Fundamental Law for Establishing a Sound Material-Cycle Society (FLMS) was enacted. This law promotes a shift from a one-way society to a recycling-based society and features EPR as one of the basic principles in waste treatment. According to the FLMS, EPR involves manufacturers bearing a certain amount of responsibility over their own products from the production/usage stage to the after-use stage (SSRL 2000).

Furthermore, the FLMS states that the necessary costs to ensure the formation of a “Sound Material Society” should be shared among different actors, such as the national government, municipalities, manufacturers, and consumers in a proper and fair way. This stipulation established that manufacturers are not the only actors that should

bear the required cost. This was to become one of the main characteristics of EPR policy in Japan. Moreover, when it comes to deciding the properness and fairness of cost sharing, the FLMS also established that the ability to pay and the ease in collecting fees are essential elements to be considered.

With the above understanding of EPR, individual laws came into force one by one that reviewed the characteristics of different recyclable items (Figure 2-1). Each individual law had various stipulations on how to impose responsibility on the manufacturers and to share cost among relating actors.

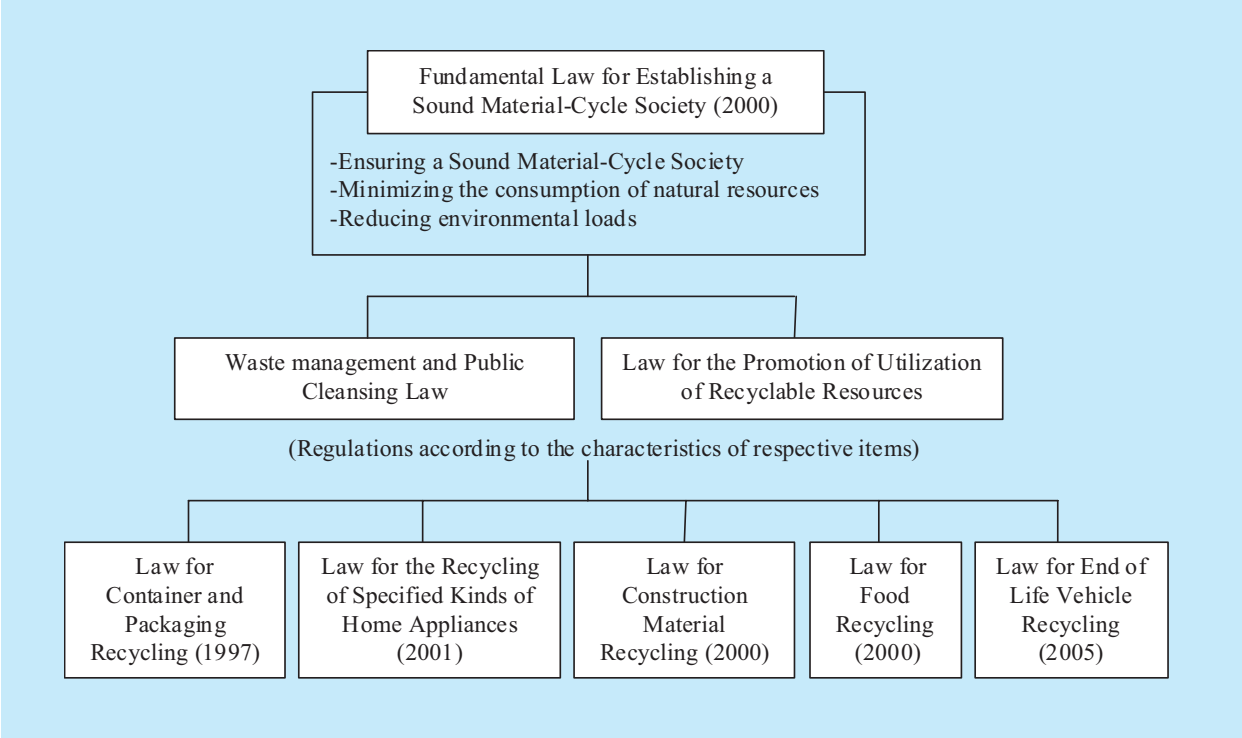

Figure 2-1: EPR-based laws in Japan

Table 2-1 shows the diversity of manufacturers' responsibility and cost sharing under three of the five recycling laws[3]. The Law for Container and Packaging Recycling (LCPR) and the Law for the Recycling of Specified Kinds of Home Appliances (LRHA) both stipulate that manufacturers are to be the main actor to recycle the items covered.

Meanwhile, the Law for End-of-Life Vehicle Recycling (LELR) calls on manufacturers to take responsibility for collecting and recycling three items – chlorofluorocarbons (CFCs), air bags, and shredder residues.

[3] As for the construction material recycling and food recycling, waste generator's responsibility was emphasized.

Table 2-1: Manufacturers' responsibility and cost sharing under three recycling laws

Feature of Law	Law for Container and Packaging Recycling (LCPR)	Law for the Recycling of Specified Kinds of Home Appliances (LRHA)	Law for End-of-Life Vehicle Recycling (LELR)
Manufacturers' responsibility	Recycling	Recycling	Collection and recycling (CFCs, air bags,Shredder residues)
Cost sharing	Manufacturers	Consumers (waste generators)	Vehicle owners

In regards to cost sharing, there are different stipulations in the respective laws. In the case of LCPR, manufacturers are required to pay the recycling costs. Under this law, Japan's Containers and Packaging Recycling Association (CPRA) carries out recycling through contracts with municipalities. Recyclers are decided through public bidding undertaken by CPRA. In contrast, under the LRHA, consumers are required to pay the recycling costs when they dispose of used home appliances (refer to next section). LELR requires vehicle owners to pay recycling fees when they purchase a new vehicle. Recycling fees are collectively managed by a fund management corporation in order to avoid the lack of financial resources when the manufacturing companies would be bankrupted or dissolved.

The recycling performance of manufacturers has been gradually increasing since the enactment of the respective laws[4]. Thus, the laws can be evaluated as successful in terms of extending the role of manufacturers in recycling.

However, these laws share a common problem that was not considered at the time of their enactment – how to account for recyclables that are exported. For instance, the number of waste polyethylene terephthalate (PET) bottles recycled by CPRA has been decreasing since 2004, owing to the sharply growing export of PET flakes to China. Furthermore, used PET bottles are starting to be traded as valuables. This highlights the issue that CPRA requires manufacturers to pay more than the costs actually incurred for recycling. This is because the amount of PET bottles exported is regarded as recycled under the current system.

Similar situations have arisen with appliances and vehicles. Only about half of used home appliances are recycled by manufactures, while about one-third are estimated to be exported as second-hand goods to developing countries, where they are often treated improperly.[5] For example, the process of recovering precious metals from printed circuit boards taken from imported e-waste leads to air and water pollution in China and other developing countries[6]. As for end-of-life vehicles, after the enactment of LELR, more than one million vehicles were statistically

[4] Refer to the following site for details (http://www.env.go.jp/recycle/recycling/index.html).

[5] The rest are likely kept by households or dismantled by un-credited recyclers.

[6] Refer to the BAN and SVTC (2002) for the realities of improper recycling.

estimated to be exported as secondary goods.

Curbing improper recycling in countries that import Japan's recyclables is regarded as a policy challenge. Thus, it is necessary to re-design legislation to reflect the transboundary movement of resources that are currently causing environmental and health problems but could be put to good use in developing countries.

EPR and E-waste management

Policy backgrounds and outline of legislations

At present, Japan deals with e-waste through two pieces of legislation. The first is the Law for the Promotion of Effective Utilization of Resources (LPUR), which enhances measures for recycling goods and reducing waste generation. The other is the Law for the Recycling of Specified Kinds of Home Appliances (LRHA), which imposes certain responsibilities related to the recycling of used home appliances on manufacturers and consumers. LPUR covers personal computers and small batteries designated as recyclable products, while LRHA deals with four classes of items: television sets, refrigerators, washing machines and air conditioners. For these four items, the recycling fees are charged at the time of disposal.

Both laws were enacted to address the increasing scarcity of waste disposal sites and increased costs for waste disposal. The significant difference between LPUR and LRHA is that the former encourages voluntary efforts by manufacturers, while the latter imposes compulsory obligations on manufacturers.
Increased awareness of the imminent necessity to recycle used home appliances in Japan influenced the enactment of LRHA, as well as the Law for End-of-Life Vehicle Recycling (LELR). In the 1990s, municipalities and the Ministry of Welfare (MoW) started demanding that used home appliances should be designated as "tekisei-shori-konnanbutsu" (AEHA 1998). To handle them properly, municipalities needed additional treatment facilities and semi-skilled workers, which led to an increase in treatment costs. To reduce these costs, municipalities simply disposed of the used home appliances in landfills. However, this action only caused the landfill situation to worsen.

In 1990, a case of illegal dumping of hazardous industrial waste came to light in Teshima, Kagawa prefecture. About 500,000 tons of hazardous industrial waste, including shredder dust, used oil, and waste plastics were not properly treated. The improper treatment of shredder dust was particularly troubling since it contains considerable amounts of lead. Used home appliances account for 20 to 40 percent of shredder dust generation, but only 30 percent of them were being properly recycled (MOE 1997).

Used computers

Recycling of used computers does not fall under the LRHA and is therefore not regulated as a compulsory legal requirement under the law. However, since April 2001, computers discarded by businesses must be collected and recycled pursuant to the LPUR.

Computer manufacturers have been voluntarily taking part in collection and recycling since October 2003. For used computers purchased after October 2003, consumers must pay an explicit recycling cost that is included in the

purchase price (internalization). For computers purchased before October 2003, consumers must pay for the recycling fee upon disposal, just as for used home appliances. Consumers can dispose of computers either via the manufacturer or a post office. For the efficient utilization of resources, the following recycling rates[7] per item are recommended by LPUR: 50% for desktop computers, 20% for notebook computers, 55% for cathode ray tube (CRT) monitors, and 55% for liquid crystal displays. However, any provisions on mandatory collection targets are not made in the LPUR.

Moreover, unlike LRHA, LPUR does not stipulate any compulsory responsibility for retailers, which are regarded as one of the main actors in used appliance recycling under LRHA. This difference is a reflection of the difference in purchasing patterns between computers and home appliances. First, consumers generally take newly-purchased computers home themselves. It is quite rare for retailers to deliver computers to the purchasers' home. Second, consumers do not commonly dispose of their old computers at the same time that they purchase a new one due to the need for data migration and other factors. Therefore, consumers are not likely to present their used computers at the time of purchasing a new one.

Used home appliances

As the authors have confirmed, LRHA adopts the principle of EPR. Specifically, LRHA provides a legal framework for assigning responsibilities to manufacturers, retailers and consumers in the flow of used home appliances originating from consumers. As shown in Figure 2-2, manufacturers are responsible for physically recycling used home appliances disposed of by consumers.

Upon the request of consumers, retailers are obliged to take back used home appliances. When discarding used home appliances, consumers are responsible for the cost of transportation, as well as e-waste recycling. Recycling fees range from 2,400 yen (washing machines) to 3,600 yen (refrigerators)[8]. Transportation costs are paid separately. Retailers then must transport the used home appliances to collection sites[9], which are designated by the manufacturers.

Manufacturers are required to either establish their own recycling facilities or commission commercial recycling companies to fulfill their recycling obligations. They are additionally required to achieve compulsory recycling rates to ensure effective utilization of resources. These rates are: 55% for television sets, 50% for refrigerators and washing machines and 60% for air conditioners[10].

[7] Recycling rate of used computers = (recycled amounts as parts or recyclable resources)/(total recycled amounts)×100.

[8] Revision of recycling costs was made in October 2008. There was no change in the recycling fee for TV sets (over 16 inches), washing machines, and refrigerators (over 171 liters).In the meantime, 1,700 yen for TV sets (under 15 inches), 3,600 yen for refrigerators (under 170 liters), 2,500 yen for air conditioners are to be paid for consumers to discharge.

[9] In many cases, transport company offices or existing disposal company yards are used.

[10] Increase of recycling rates is expected in 2009. The rates being discussed are 70% for air conditioners, 60% for refrigerators, and 65% for washing machines.

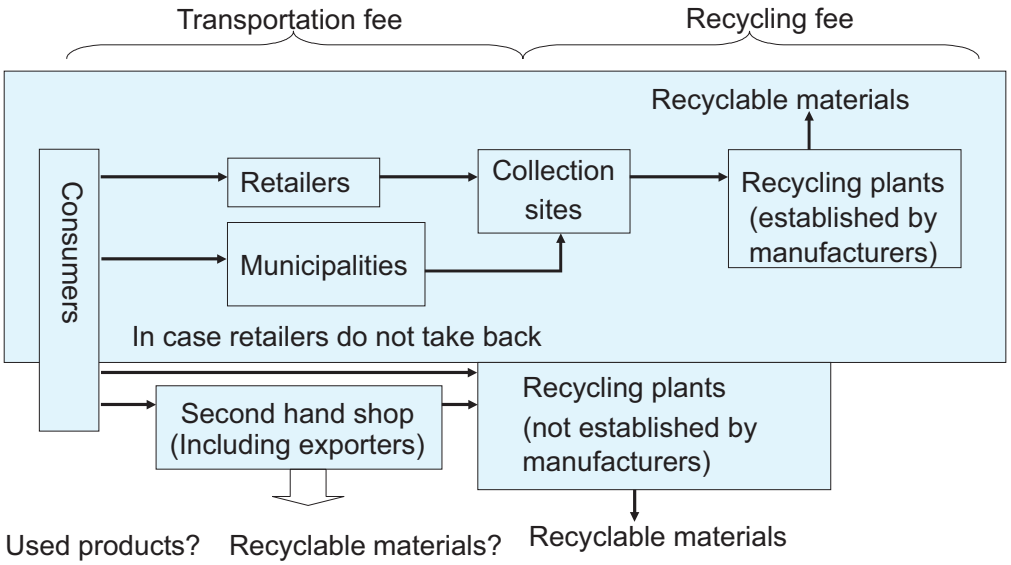

Figure 2-2: Flow of used home appliances and the role of associated actors under Japan's LRHA (Source: Compiled by the authors)

Municipal authorities are no longer obliged by LRHA to collect used home appliances. However, they can still collect and treat used home appliances, including those that have been dumped illegally in their area of jurisdiction. In cases where consumers discharge used home appliances to municipalities, municipalities receive the fees for transportation and recycling from consumers, and they must deliver the used home appliances to designated collection sites.

One weakness of LRHA is that it regulates only a part of the total process, indicated by the box shown in figure 2-2. The processes described outside the box are not managed under the current law. At present, this uncontrolled route constitutes a "hidden flow."

Performances and policy challenges

As mentioned in the above section manufacturers are required under LRHA to construct a recycling infrastructure for used home appliances. However, the specific method is not provided by LRHA. The responses of manufacturers can be broadly divided into two groups, which have different viewpoints about how to reduce general costs, including collection and recycling of used home appliances (Hada 2003).[11]

The first group (Group A) attempted to keep recycling costs down by fulfilling its legal

[11] The reason Japan came to have two types of recycling infrastructure is because competition was promoted between manufacturers, while the violation of anti-trust legislation was avoided. In case a manufacturers or importer does not join either group, they can commission their legal obligation to the Association for Electric Home Appliance (AEHA).

obligations by contracting with 30 existing recycling plants. These can be classified into three main types: industrial waste treatment companies; existing local scrappers; and companies belonging to a Marisoru Network, a national organization of industrial waste treatment companies. Using existing facilities allows for a flexible response to fluctuations in volume, which is important when collection of used home appliances falls short of expectations.

In contrast, the second group (Group B) built 16 recycling plants and attempted to reduce total costs by adopting efficient logistics systems. Although the initial investments were burdensome, this group is able to make adjustments to match operating conditions at recycling plants. Each of these groups provided 190 national collection sites. However, unlike Group A, which utilizes the existing collection warehouses, Group B generally uses transport company warehouses as collection sites.

Because each group's collection sites are managed separately, retailers may not necessarily choose their nearest collection site if costs are lower elsewhere. This creates a heavy financial burden on retailers since they are in position to ask consumers to pay transportation costs. Competition between retailers over sales of new products forces them to lower prices as much as possible, which may preclude them from covering the costs of transportation to collection sites.

A five-year post-implementation review of LRHA is currently underway. A joint committee of the Ministry of Environment (MOE) and the Ministry of Economy, Trade and Industry (METI) is currently reviewing matters that require comprehensive measures. The issues being discussed are: strengthening the measures for illegal dumping, promoting DfE, driving 3R (Reduce, Reuse, Recycle) activities, setting proper recycling fees and recycling rates, covering more items, cutting down the costs for collection in isolated island communities, raising consumer awareness, and reviewing the approach taken with commercial recycling companies.

Furthermore, related to the broader issue of hidden flow, illegal dumping and the export of e-waste (often under the pretext that e-waste qualifies as second-hand goods) are the main points in question. In particular, it is important to research and discuss EPR-based domestic regulations in light of the active transboundary movement of e-waste.

Korea
Current situation of EPR policy

The EPR policy in Korea began in 1992 with the enactment of the Law for Promotion of Resources Saving and Reutilization (LRSR), which emphasized the legal role of manufacturers in the recycling process. The law created the Producer Deposit Refund (PDR) system, which functions on the basis of a deposit-refund principle to promote recycling (refer to section 3.2 for more details).

The law was enacted at a time when local authorities were to be given greater autonomy, which gave rise to concerns that environmental damage caused by municipal development policies would expand across the nation, that the central government's coordinating role in

waste management would diminish, and that interregional disputes over waste disposal would intensify. Thus, another aim of LRSR was to ensure that local authorities were all guided by one national law. An expansion and improvement of waste disposal facilities carried out to mitigate discord among localities brought about substantial increases in the waste management budget (Rhee and Jeong 2003).

Under the PDR system, the list of items covered has been revised a number of times. In 1992, there were 17 items in seven categories under the Waste Management Law, but in 1993 these were reduced to 13 items in five categories. In December 1996, PET bottles for detergent and refrigerators were newly added, finally resulting in 12 items in six categories[12].

In January 2003, the Producer Responsibility (PR) system was launched under an amendment to LRSR. This system was strongly influenced by the OECD manual on EPR. In Korea, EPR was viewed as a system to promote a "resource-circulating society" through 3R by environmentally-friendly performance in designing, manufacturing, distribution and disposal of products, to be carried out by manufacturers (MOE 2003).

Unlike PDR system, which suggests imposing only economic responsibilities on manufacturers, Korea's PR system calls on manufacturers to take direct responsibility for meeting Mandatory Recycling Targets (MRTs). These set minimum volumes that must be recycled, determined in relation with the annual shipping (importing) volume on manufacturers. Also, while the PDR system imposes economic responsibilities based on the assumption that 100% of packaging and products shipped (imported) will be collected, the PR system does not impose explicit economic responsibilities.

Figure 2-3 shows how the PR system works. First, on an annual basis, the Ministry of Environment (MOE) announces the item-specific MRTs, which are set in consideration of the previous year's recycling performance, recycling capacity, amount recovered, and other factors. Each manufacturer can then fulfill their legal obligation in one of three ways. The first way is to construct their own recycling plant and do their own recycling. The second way is to outsource the job to commercial recycling companies. The third way is to join the Producer Responsibility Organization (PRO), pay the required fees, and have them do the recycling. PRO is a third party organization that allows manufacturers to collectively manage items covered, which enhances efficiencies in collection and recycling. In the event that a manufacturer does not fulfill the MRTs, they are obliged to pay a recycling fine. Surcharges are levied in proportion to the amount of the unperformed recycling targets.

Korea's Environment and Resource Corporation (ENVICO) is responsible for running the PR system, such as keeping records on product shipments for each manufacturer, investigating the state of recycling performance, and levying recycling charges. As of 2005, the PR system covers

12 Products requiring waste deposits include: packaging (paper cartons, metal cans, glass bottles, PET bottles), pharmaceutical preparations, batteries (mercury, silver oxide), tires, lubricants, and consumer appliances/ electronics (TVs, refrigerators, washing machines, air conditioners).

four types of packaging and five categories of products for a total of 18 items[13]. Printers, copy machines, and facsimiles were added in 2006 after a pilot period.

[13] Packaging items are paper cartons, metal cans, glass bottles, and plastic packaging; products are consumer appliances, batteries, tires, lubricants, and fluorescent lights.

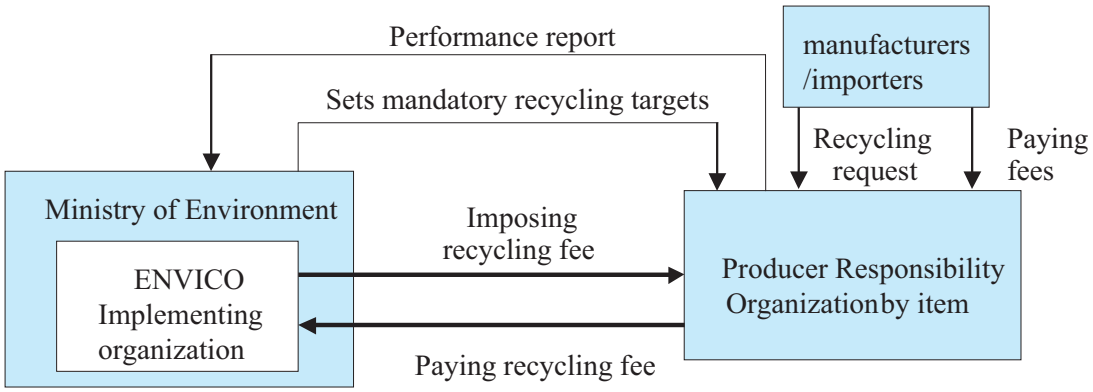

Figure 2-3: Flow chart of PR system in Korea (in the case of recycling through PRO)

Table 2-2 shows that, in most cases, manufacturers of both packaging and products are meeting or exceeding their MRTs, which implies that the PR system is achieving its intended purpose. For packaging, the MRTs and manufacturers' performances have been steadily increasing for every type except metal cans, and in 2005, the performance of manufactures surpassed the MRT for all categories of packaging. Similar success is being seen with products, especially consumer appliances. However, nickel batteries and lubricants have shown performances lower than the MRTs since 2003 (ENVICO 2006).

In 2008, the Law on Resource Circulation of Used Electrical and Electronic Equipment and Used Cars (LREC) was enacted. The law introduced new provisions regarding the efficient use of used consumer appliances and used cars, which were previously regulated separately under the revised LRSR and Car Management Law respectively. Under LREC, new limitations were placed on the use of hazardous substances such as lead and cadmium. Additionally, additional responsibilities were imposed on manufactures to provide information on their recycling practices with commercial recycling companies when requested.

Table 2-2: Mandatory recycling targets and manufacturers' performances under the PR system in Korea (Unit: thousand tons)

		Packaging				Products				
Year		Paper cartons	Glass bottles	Metal cans	Plastic packaging	Tires	Lubricants	Batteries	Consumer appliances	Fluorescent lights
2002	MRT	—	—	—	—	—	—	—	—	—
	Perf.	9	272	152	150	166	146	0.244	43	—
2003	MRT	16	314	184	128	184	141	0.151	46	—
	Perf.	15	295	161	172	195	151	0.135	58	—
2004	MRT	20	315	149	189	195	162	0.214	56	2
	Perf.	19	324	131	226	193	160	0.206	66	2
2005	MRT	20	328	142	219	197	163	0.3	73	3
	Perf.	21	363	144	260	208	147	0.173	80	3

Note: MRT: mandatory recycling target
Perf.: performances by manufacturers
Source: ENVICO (2006)

EPR and E-waste management

Policy backgrounds and outline of legislations

As mentioned above, e-waste (consumer appliances) has been managed as one category under the Law for Promotion of Resources Saving and Reutilization (LRSR) since 1992. LRSR aimed to conserve resources and preserve the environment by promoting recycling to address the rapid increase of waste.

As stated earlier, revisions to the LRSR in 2003 relating to the Producer Responsibility (PR) system were heavily influenced by the OECD's Government Manual on the implementation of EPR (OECD 2001). Subsequently, the PR system emphasized the role of manufacturers in e-waste recycling.

The legal structure and regulations of the Law on Resource Circulation of Used Electrical and Electronic Equipment and Used Cars (LREC) were patterned after EU regulations, such as Integrated Product Policy (IPP) and WEEE directive.

Performances and policy challenges

The PDR system (1992-2002)

Under the Producer Deposit Refund (PDR) system, the MOE requires manufacturers to pay advance deposits to cover recycling costs. Deposits were returned if e-waste was properly collected and

recycled by manufacturers. The deposit rate rose from 30 won/kg in 1992 to 38 won/kg in 1996 for more recycling by manufacturers.

The PDR system can be divided into two periods: before and after 1996, the year in which the deposit rate was increased. In the first period (1992 to 1996), manufacturers contracted out their e-waste recycling to commercial recycling companies to secure the return of their deposits. In the latter period (1997 to 2002), manufacturers chose to construct several recycling plants on a regional basis for e-waste recycling.

Total deposits and refund rates are shown in table 2-3. The increase in deposits since 1997 was caused by the increase of deposit rates the previous year, as well as the addition of refrigerators. The build-up of recycling plants[14], helped steadily increase the refund rate to nearly 9% in 1999. However, from a policy perspective, a refund rate of less than 10% is still considered to be quite low.

[14] Three main manufacturers (Samsung, Hyundai, Daewoo) agreed to build recycling plants on a regional basis to cover the whole country. Due to different understandings of e-waste recycling, construction of e-waste recycling plants was carried out separately under the PDR system.

Table 2-3: Changes in deposits and refund rates under the PDR system in Korea

	1993	1994	1995	1996	1997	1998	1999
Deposits (million won)	3,491	5,015	4,977	6,356	14,476	14,097	8,356
Refund rate (%)	0.03	0.6	3.04	5.56	8.3	7.3	8.7

Source: Environment White Paper (1993–2000).
Note: 100 won = 7.0 yen = 0.1 U.S. dollars (Dec.28, 2008).

The PDR system had two main policy challenges. The first was the lack of economic incentives for manufacturers. The deposit rate was far lower than the actual cost of recycling. As such, it made more economic sense for manufacturers to pay the deposit rather than to recycle e-waste. The actual cost was 169.1 and 160.1 won/kg for television sets and refrigerators, respectively, which is approximately more than four times higher than the deposit rate (KORECO 1990).

The second challenge related to the improper recycling of e-waste is via the municipality route where there was a strong possibility of improper treatment, thus causing environment impacts (Kim 1998). Because the discharge fee was low (3,000 to 10,000 won), there was a strong incentive for consumers to take municipality as a discharge route.

The PR system (2003-Present)

Prior to launching the PR system, a two-year pilot program was launched to lay the foundations for the PR system. This followed a voluntary

agreement that entered into effect on June 2000 by MOE and three major manufacturers – Samsung, LG and Daewoo. During this period, manufacturers were required to construct nationwide recycling infrastructure rather than making deposits.

The actual recycling was carried out by the Association of Electronics Environment (AEE) by proxy. With a few years' gap between each, the manufacturers constructed three recycling plants, starting with Samsung's Asan Recycling Plant (1988), and followed by LG's Chilseo Recycling Plant (2001) and finally the Metropolitan Recycling Plant (2003). These plants successfully increased the recycling capacity of manufacturers. They mainly recycled refrigerators and washing machines.

Commercial recycling companies that contract with AEE are paid by the volume recycled. In 2006, there were 28 such companies (six for television sets and monitors, 10 for computers, seven for CRTs and five for mobile phones).

However, only about 40 percent (98 out of 232) of the municipalities actively cooperate with manufacturers. This is largely due to the poor financial situation of municipalities. While recycling costs are imposed on manufacturers, municipalities are required to pay the costs of transportation to the manufacturers' recycling facilities.

The collection and recycling performance of manufacturers under the PR system is shown in Table 2-4. Used home appliances of high quality are inclined to be traded at positive prices in the second-hand market, rather than taken back for free by manufacturers. In addition, air conditioners show relatively low performances by manufacturers, probably because recyclers outside of the system collect them to recover the copper.

Table 2-4: The MRT and manufacturers' performances under the PR system in Korea (thousand units)

Product	2003		2004		2005		2006	
	MRT	Perf.	MRT	Perf.	MRT	Perf.	MRT	Perf.
Refrigerators	276	434	400	477	513	542	654	672
Washing machines	309	421	309	411	468	547	463	402
Air conditioners	9	14	10	20	32	28	33	30
TV sets	283	370	313	326	319	391	366	466
Total	877	1,239	1,032	1,234	1,332	1,508	1,516	1,570

Note: MRT: mandatory recycling target
Perf: performances
Source: AEE (2007)

Despite the general increase in collection by manufacturers, there were still several policy challenges. First, manufacturers are required to collect CFCs, but environment-friendly treatment after collection is not mandated. At present, the Asan recycling plant is the only one that destroys CFCs contained in refrigerator insulation. Most CFCs collected are reused without their harmful characteristics being nullified.

Second, the PR system primarily focuses on increasing the amount of recycling and guaranteeing proper treatment, rather than on promoting Design for Environment (DfE). In the manufacturer-built plants, fulfilling mandatory recycling targets takes a higher priority than DfE. Know-how obtained in the recycling process is hard to incorporate in new product design if it is not economically-profitable.

Finally, from the perspective of e-waste flow control, it is worth paying attention to the export of e-waste. E-waste, including mobile phones and CRTs, are actively exported to East Asian countries. According to the Korea Custom and Trade Institute (KCTI), 305,460 television sets, 184,906 main units of pc, and 951,077 CRTs of pc were exported in 2005 alone. The absence of a monitoring system to ensure that these items are properly treated in importing countries is an urgent problem.

Taiwan
Current situation of EPR policy

Taiwan introduced a recycling system in 1998 to promote recycling of "difficult-to-process, hazardous materials, and valuable items for recovery and reuse". This system obliges manufacturers, as well as importers, to pay recycling fees to the Environmental Protection Administration's (EPAs) Recycling Fund Management Committee (RFMC) to promote recycling.

Under the RFMC system, manufacturers have no responsibility to collect and recycle the items. Instead, they bear the full responsibility of paying fees into the Recycling Fund. These fees are then used as a source of revenue for the RFMC to provide subsidies to those who participate in collection and recycling efforts, such as consumers, retailers, and collection sites/recycling plants. This provides an incentive for collectors and recyclers to participate in the system.

The system does not oblige collectors and recyclers to participate. They have a choice of whether or not to comply with government recycling standards that must be met to qualify for the subsidy. Failure to conform to the system is not illegal; it merely means that the party gains nothing from the fees that they pay into the Recycling Fund. Actually, considerable collectors and recyclers tend to do their business outside of the RFMC system.

Recycling fees paid by manufacturers are determined by a rates committee, which is composed of members from government, academia, consumer groups, manufacturers, and other sectors. Annual revisions of the fees are made in consideration of the funds that are required for recycling (collection costs, the costs of recycling at recycling plants, and management cost for the committee) and current prices for recyclable materials.

Since 1998, targeted items have continued to increase. Currently, 33 items in 14 categories have been selected. Items include five types of home appliances, computers and some peripheral equipment, containers (made from several kinds of materials), automobiles, motorcycles, dry-cell batteries, tires, lubricants, lead-acid-batteries, and fluorescent lamps.

Table 2-5 shows that recycling of most items within the RFMC system has been uneven from year to year. This fluctuation has been influenced by differences in annual recycling fees and subsidies and varying levels of participation by collectors and recyclers. To some extent, the volume has been influenced by the demand for used goods and recyclables from foreign countries.

Table 2-5: Recycling amount of items under RFMC System in Taiwan (1998~2007)

	General containers (kg)	Insecticides containers (kg)	Automobiles (unit)	Motorcycles (unit)	Tires (kg)
1998	126,668,008	620,043	52,031	134,607	56,630,061
1999	187,263,919	665,239	102,257	431,504	94,647,603
2000	225,947,110	737,707	137,668	366,034	100,282,527
2001	245,298,818	886,051	221,718	308,633	119,034,446
2002	280,959,152	960,952	198,024	344,570	103,747,228
2003	356,909,132	1,004,430	142,549	182,994	120,541,496
2004	351,862,052	1,123,285	155,026	260,741	107,190,754
2005	336,195,604	887,779	186,819	306,329	103,053,525
2006	158,659,062	334,668	221,137	356,577	103,494,760
2007	167,612,856	272,385	223,637	310,483	107,420,781

	Dry-cell batteries (kg)	Lead-acid batteries (kg)	Lubricants (l)	Household appliances (unit)	IT objects (unit)	Fluorescent lights (kg)
1998	13,514	26,285,710	8,008,169	416,413	138,528	—
1999	256,684	30,334,316	13,023,086	1,155,270	485,975	—
2000	632,099	31,688,269	11,996,340	985,548	946,518	—
2001	585,808	36,580,896	12,328,261	1,848,757	1,247,946	—
2002	922,632	32,855,862	9,413,072	1,300,235	1,701,337	523,500
2003	1,016,562	41,778,207	9,008,457	1,283,213	1,819,883	7,891,706
2004	1,363,568	37,738,839	13,324,648	1,285,343	1,930,054	4,363,711
2005	2,177,218	38,390,203	14,437,080	1,463,998	2,006,916	4,675,873
2006	4,289,493	44,602,881	16,676,364	1,465,409	2,137,526	4,736,784
2007	2,387,866	35,278,505	22,381,083	1,637,341	2,294,095	4,557,818

Source: Environmental Protection Administration Executive Yuan, R.O.C. (Taiwan)
Homepage of Recycle Fund Management Board
(http://recycle.epa.gov.tw/EPA/result/QP08-T2206_86-96.xls)

EPR and E-waste management

Policy backgrounds and outline of legislations

In Taiwan, mixed metal scrappers, known as fei-wujin, have traditionally treated e-waste. However, their methods of extracting metals, such as burning non-metal parts or refining metal with chemicals, had high environmental impacts, including air pollution caused by burning in fields, polluting water and soil with heavy metals, and illegal dumping of unwanted parts (EPA 1985). As a countermeasure, the Environment Protection Administration (EPA) in 1984 organized mixed metal scrappers together in two districts in an attempt to effectively monitor their recycling practices. However, this measure was not successful. In 1986, polluted water containing heavy metals that had originated in the monitored districts ended up in neighboring sea areas, affecting nearby oyster farms.

In this context, the EPA sought to reduce environmental pollution by introducing a government-led recycling scheme. As explained in the above section, the RFMC system was introduced in 1998. Similar to that of Korea, it regulated 11 product categories. For e-waste, categories include home appliances and IT equipment, which contain five items, respectively[15].

[15] In Taiwan, the category of "home appliances" and "IT objects" correspond to e-waste. The category of "home appliances" includes TVs, refrigerators, washing machines, air conditioners, and electric fans. "Computers and some peripheral equipment" include notebook computers, frames, motherboards, drivers, printers, adapters and keyboards.

RFMC system

Figure 2-4 shows how the RFMC system works. Under the RFMC system, only manufacturers bear economic responsibility for e-waste recycling. This responsibility comes in the form of fees paid to the RFMC, and not for the collecting or recycling of e-waste. Subsidies are paid out of the Recycling Fund to organizations participating in the collection and recycling of e-waste, which include consumers, retailers, collection firms and commercial recycling companies.

The amount of the fees and subsidies are determined by the Fee Rate Reviewing Committee (FRRC), which is composed of representatives of government, academia, consumer groups, manufacturers and other sectors. Fees and subsidies are revised on an annual basis in consideration of the funds required for recycling (collection costs and costs of recycling at recycling plants), current prices for recyclable materials, and other factors. The amount that a manufacture must pay is determined by the annual fee decided by the FRRC, multiplied by the amount of sales of the previous year.

Under the system, retailers, municipalities, collection firms, or other parties collect each item from consumers. Items are then taken to collectors that are assigned by RFMC. In turn, collectors hand the items to recyclers that are also assigned by RFMC.

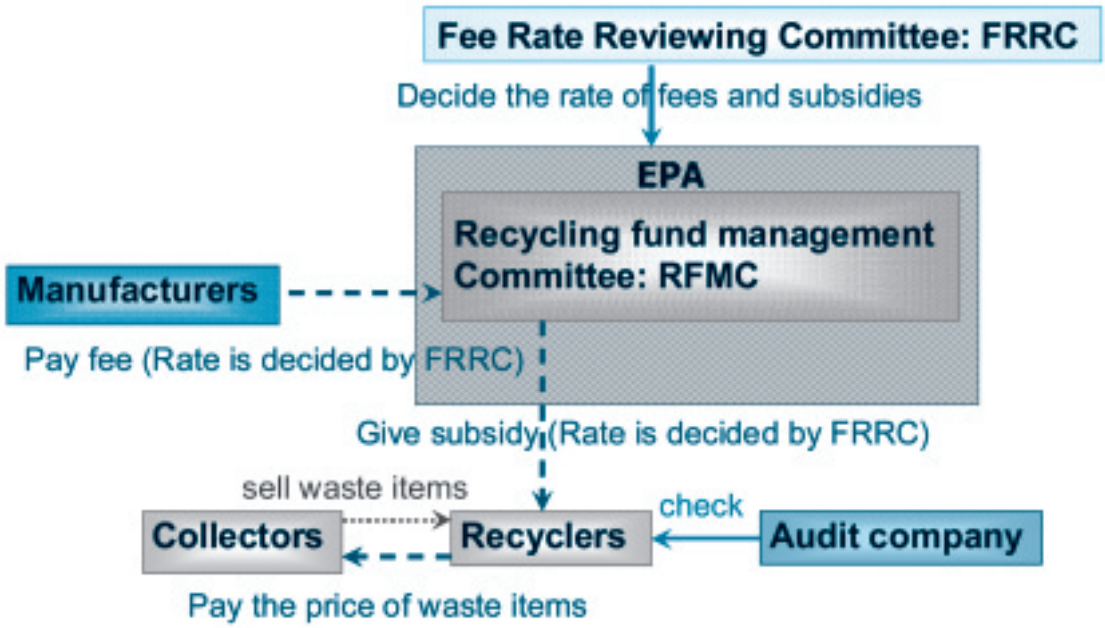

Figure 2-4: Flow chart of RFMC system in Taiwan

Taiwan's e-waste recycling scheme can be summarized as having three main features. First, the RFMC system emphasizes the economic responsibility of manufacturers. The second feature is the economic incentive (subsidies) used to induce commercial recycling companies to participate in the scheme. The third is that the proper treatment of e-waste is thoroughly guaranteed, which creates a huge monitoring cost.

Performances and policy challenges

Under the RFMC system, four types of used home appliances (television sets, refrigerators, washing machines and air conditioners) and used personal computers have been selected as one category in the system (Chang and Shaw 2000).

E-waste flow in Taiwan is shown in Figure 2-5.

Consumers can freely choose their preferred route for disposal of e-waste. Since e-waste has a high value, collectors typically sell the items to recyclers. Collection firms obtain revenue (sales and subsidies) by selling e-waste, which is generally collected from various routes such as retailers, municipalities and collectors. Recycling plants then buy e-waste from collection sites[16] and recycle them to obtain subsidies from the RFMC. After recycling, subsidies are paid by the RFMC when the unit counts are confirmed to be in agreement. However, only entities that are monitored by public auditing institute are able to claim a return for collection and recycling. Recyclers that do not participate in the scheme are not penalized, but are rather not able to claim subsidies.

[16] Unlike in Japan, the collection sites are managed by the specific collection firms rather than the manufacturers. Manufacturers are not required to organize collection sites in Taiwan.

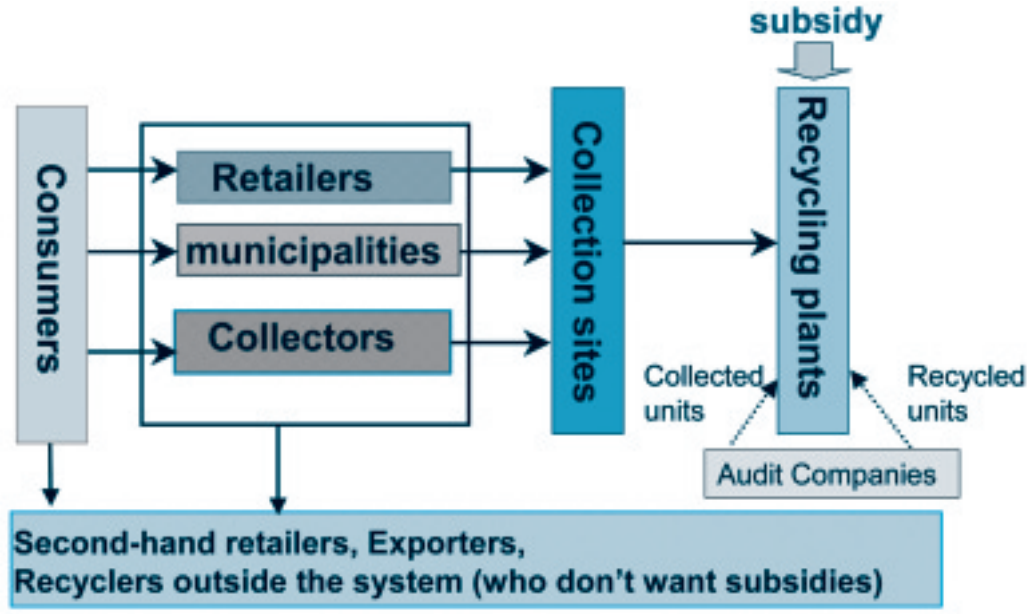

Figure 2-5: General flow of E-waste under the RFMC system in Taiwan
(Source: Compiled by the authors)

One reason manufacturers are thought not to be assigned responsibility during collection and recycling stages is that the home appliance manufacturing sector in Taiwan is made up of numerous small and medium-sized manufacturers. There are no leading companies; thus, no single manufacturer is able to act as a driving force. In addition, recyclers are not compelled to perform all recycling within the RFMC scheme. Recyclers can choose whether or not to participate in the RFMC. This system is inadequate in managing improper processing and encouraging proper processing methods throughout the country (Murakami 2005).

In 2009, fifteen recycling plants (fourteen companies) were recycling waste home appliances within the RFMC system. Two plants managed by one company were established by relatively major manufacturers with joint investment, while other recycling plants were established by existing recyclers and/or retailers. These recyclers purchased used home appliances from 128 collection firms at a national level. In the case of IT equipment, 19 recycling plants (18 companies) can collect from 132 collection firms. Out of those 19, 15 recycle home appliances as well as IT equipment.

Table 2-6: Number of recycling plants and collection firms for used home appliances and IT equipment in Taiwan

		2005	2006	2007	2008	2009
Home Appliances	Collection firms	N/A	87	116	127	128
	Recycling plants	7	9	14	13	15
IT equipment	Collection firms	N/A	89	118	132	132
	Recycling plants	N/A	11	17	16	19

Source: EPA Web site

There are currently two challenges for policymakers. The first is that the economic incentive for recyclers to join the RFMC system is insufficient. Because the decision of whether or not to join the system can be made entirely at the discretion of the commercial recycling companies, such decisions are typically based only on economic concerns. This has resulted in a considerable number of commercial recycling companies not joining the RFMC system. This is problematic, as there is no monitoring of recycling undertaken outside of the RFMC system, despite the fact that the RFMC system was developed to promote proper treatment.

The second problem is that the RFMC has only a weak influence on DfE. Under the current system, manufacturers are fulfilling their responsibilities through the Recycling Fund configured by the Taiwan EPA. Fluctuations in the fees do not provide sufficient incentives for manufacturers to actively take part in DfE activities (Murakami-Suzuki 2007).

Conclusion

In this paper, the authors gave a general description of current EPR policies in Japan, Korea and Taiwan before identifying realities and clarified problematic issues on e-waste recycling in the respective countries. Several implications acquired by the author's analysis were as follows.

First, the authors have confirmed that the three countries have constructed their respective recycling structure on the basis of EPR, but the details of each system significantly differ according to the policy challenges that each country considered imminent. In Japan, the basic framework law and respective laws to deal with the characteristics of individual items were enacted to provide for efficient use of recyclable waste. In contrast, in Korea and Taiwan, initial legislation was fundamentally based on the deposit refund principle of the 1990s. However, Korean policymakers followed the lead of the EU by initiating a separate initiative to manage recyclable waste by standardizing packaging and products.

Second, through the analysis of e-waste management in three countries, it becomes evident that each e-waste management system in respective countries has significant weak points, perhaps reflecting that each country was quickly striving to solve imminent problems. This implies that countries that are considering developing new e-waste management systems should thoroughly consider policy implications before implementing recycling structures. For example, deciding who will play the leading role within an electronic waste collection and recycling system is an essential issue to be solved. Countries must choose between a manufacturer-centered recycling system and a commercial recycling company-centered recycling system. Naturally, this decision should be approached from both physical and economic perspectives.

Third, the authors were able to confirm that e-waste regulations in the three countries stipulate an economic responsibility for collection and recycling. However, regulations on physical responsibility show different patterns. Japan is the only country to explicitly stipulate payment by consumers for e-waste collection and recycling costs. However, for used computers purchased after October 2003, consumers do not have to pay explicit recycling fees. The different structure in recycling fees in Japan comes from the understanding that home appliances and computers have different purchase and discharge patterns.

In contrast, Korea and Taiwan both placed the economic responsibility for e-waste on manufacturers, but did not specifically stipulate who should physically treat e-waste. Japan and Korea have the common feature that physical responsibilities are fulfilled by manufacturers (although, the range of responsibilities differs). This resulted in a similar phenomenon, in which manufacturers set up new recycling plants to fulfill their legal obligations. Although manufacturers in Taiwan operate two recycling plants, the manufacture has limited power to control the flow of waste items. The responsibility of producers is defined in connection with the manufacturers' economic responsibilities.

Finally, as a general proposition, it is uncertain if regulations adopted by one country will bring the same outcomes in other countries. This can be understood intuitively that different countries have different legislative backgrounds and perceptions about current situations, which are the most significant factors for constructing sustainable recycling system. This is also applicable to e-waste.

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3. Resource Efficiency, Integrated Product Policy and Extended Producer Responsibility: European Experiences

Greg Tyson

Introduction

A significant and emerging trend in European environmental policy in recent years has been a shift in focus away from point sources of pollution toward product- and consumption-related issues. This shift has occurred within the context of general success of traditional policy approaches to point sources of pollution that nonetheless have failed to address growing consumption-related problems. Such problems include a continuing intensification of non-point source discharges of toxic substances, continuing resource consumption and material flows, and wastes in society.

Many policy makers in EU member states have recognized that addressing these challenges will require new approaches that engage consumers as well as producers within new production-consumption frameworks. One such approach is Extended Producer Responsibility (EPR), which requires producers to assume life-cycle responsibility for products they produce and sell.

In a number of EU countries, legislation based around the principle of EPR has set the stage for an expanded role for the EU in the field of product-related environmental policy. A key initiative that to date lacks a specific legislative foundation is the EU Integrated Product Policy Initiative, which aims to understand product-related environmental problems and develop innovative solutions to production and consumption related challenges in consideration of life-cycle wide impacts.

In addition, as the complexity of addressing such challenges, as well as the global nature of production and consumption, become more clear, policy makers in the EU are beginning to focus their attention on international-level approaches to sustainable consumption and production. Two such initiatives of note include the United Nations "Marrakech Process" on Sustainable Consumption and Production and the EU Strategy on Sustainable Consumption and Production.

Recognizing the differences between the

European and Asian contexts, this chapter aims to summarize selected European EPR cases, integrated product policies, and sustainable consumption and production initiatives, with the objective of drawing some general insights that may inform a discussion on facilitating an increase in movements of both pre- and post-consumer resources and materials in Asia.

Challenges in products and product systems

For many decades, public authorities have been engaged in managing municipal waste with a primary focus on reducing health risks due to unsanitary disposal practices. Over time and with the emergence of modern consumer economies, the scale and complexity of products and materials entering the waste stream has grown in lockstep with economic and population growth. In many countries, this has led to significant difficulties for public authorities in securing sufficient disposal capacity. The difficulties have taken the form of public opposition to the construction of new waste disposal facilities near populated areas and are coupled with increasing expectations for improved environmental performance – twin challenges that led to what eventually amounted to a waste disposal crisis in some countries.

Furthermore, as a consequence of the environmental movement of the 1970s and afterward, attention to conserving natural resources through recycling efforts increased.. Given their traditional role as waste managers, public authorities appeared to be logical service providers to collect and recycle end-of-life products. Generally speaking, few products at that time were developed with environmental considerations in mind, and this was equally the case with respect to end-of-life management concerns. Publicly-operated recycling initiatives faced a number of challenges, particularly with developing reliable markets for collected materials. Another significant complicating factor was the unreliability of end-markets for many collected materials. While these two factors imposed significant challenges for the prospects of closing material cycles and reducing resource consumption, public authorities could do little about either.

The focus on product- and consumption-oriented policy that is seen today in leading jurisdictions evolved in part from the recognition of the limitations of traditional approaches to environmental protection, which was largely directed at large industrial emitters. These early efforts did not really aim to address systemic issues in production that led to polluting by-products and wastes, but were rather aimed at encouraging technical 'end-of-pipe' measures to treat emissions. However, end-of-pipe solutions proved costly and often served to merely shift environmental impacts from one medium to another (e.g. contaminants removed from water get disposed in landfill) or disperse pollution over ever greater distances.

Given the inherent cost and limitation of many end-of-pipe pollution control technologies, many leading businesses began to shift the focus toward preventing the generation of wastes and polluting substances through a variety of environmental management strategies. The success of initial corporate initiatives led policymakers in both Europe and

America to undertake programs aimed at both reforming relevant policy frameworks (e.g. industrial permitting) and supporting business stakeholders, especially small and medium sized firms, to implement preventive environmental management systems within their operations. Successful early examples of such business support initiatives include the Ecological Project for Integrated Environmental Technology (ECOPROFIT) program in Austria, the Effizienz-Agentur initiative in the German state of North Rheine-Westphalia and the Production Integrated Environmental Protection (PIUS) initiative at the national level in Germany.

This movement toward preventive approaches in manufacturing and production became known under several different terminologies in different regions, including pollution prevention, green manufacturing, clean production and cleaner production. Regardless of terminology, the central defining characteristic of these approaches was the recognition that problems could be most effectively addressed by taking systematic preventive measures rather than treating pollution after it had been created. Such measures could include intensive management of energy and other inputs, substituting toxic process inputs for less or non-toxic inputs, and internal material recycling initiatives.

A large body of literature has been developed that documents the success of these approaches across a broad scope of industrial sectors, company sizes and regions of the world. Many firms found that systematically examining and monitoring their operations with the objective of preventing environmental and health problems also led to significant new efficiencies and cost savings in production processes, as well as lower regulatory compliance costs. Consequently, what began as an environmental protection and compliance exercise ended up increasing both production quality and corporate profitability.

The success in addressing point source pollution at production facilities did not extend to the broader production and consumption system in society. While environmental challenges in production facilities remain even today, particularly in some newly-industrializing regions, by the 1990s evidence began to emerge that for many toxic and polluting substances, industrial discharges were decreasing significantly. Lindhqvist (2000) discussed a research project undertaken by the Swedish government's Ecocycle Commission in the mid 1990s which estimated the origin of various pollutants in the environment. The study found that for chromium, toxic metal, industrial discharges in Sweden had steadily increased from the early days of industrialization. This proceeded until the advent of government imposed emission limits in the 1970s, after which industrial discharges of chromium declined steadily to very low levels. Over the same time period, chromium discharges from the use and disposal of products grew steadily to a point that, by the 1990's, it was these diffuse product-related discharges, not industrial processes, that were the largest source of chromium entering the environment. Extrapolating from evidence such as this Swedish study, it became increasingly apparent that measures focusing on production facilities and point sources of pollution alone were insufficient to satisfactorily resolve many environmental challenges.

Despite the increasing analytical tools and information arising from product life-cycle studies that indicate that a growing share of environmental impacts arise from activities outside of production facilities, existing environmental management efforts on the part of policy makers and firms continues to focus largely on this life-cycle stage in the production system. While cleaner production and preventive environmental management practices in production facilities are both successful and in many cases profitable, major opportunities for environmental improvements are being missed in other life-cycle stages, specifically in the resource extraction and use/end-of-life stages.

The following figure illustrates a generalized picture of the current focus of environmental management efforts in relation to the life-cycle of a product. A majority of government and business efforts are aimed at managing impacts at production facilities, while significant impact areas in resource extraction and in product use and disposal are managed under ad hoc or sporadic efforts.

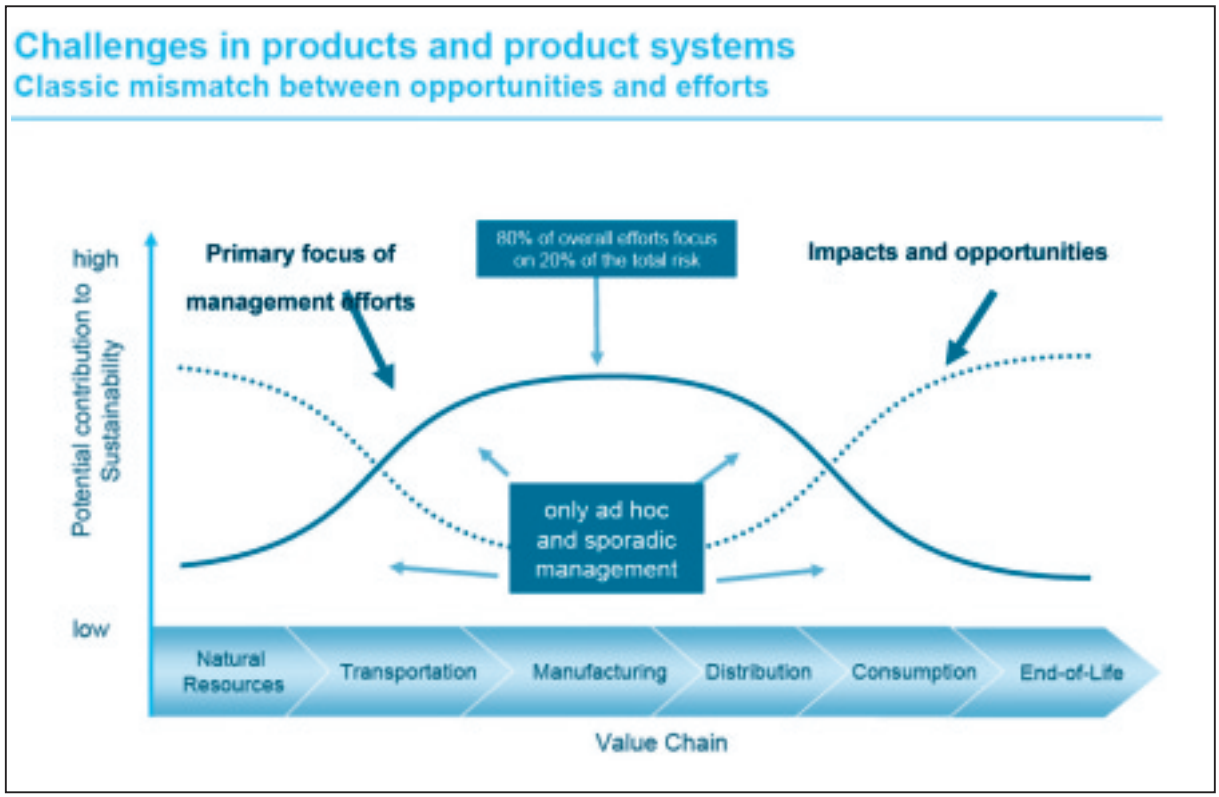

Figure 3-1: Classic mismatch between opportunities and efforts

Source: The UNEP/Wuppertal Institute Collaborating Centre on Sustainable Consumption and Production (CSCP)

What is now needed is to extend the innovative prevention-based logic of cleaner production and pollution prevention that has been so successfully applied at the firm level to society' s broader production-consumption systems. However, this is a considerably more complex process than addressing impacts at discreet production facilities. Product supply chains are long, complex and global in nature, and gaining a meaningful understanding of life-cycle impacts from any particular product is a complicated process. Developing effective and efficient policy responses to improve the life-cycle performance of even a narrow grouping of product types is a uniquely challenging task. These complications are further compounded by the fact that different life-cycle stages – from raw material extraction to manufacturing, assembly, use, reuse and end-of-life management or disposal – can occur across vast distances and in different countries.

International Developments toward sustainable consumption

In the decade following the 1992 UN Conference on Environment and Development, held in Rio de Janeiro, new analytical tools added new dimensions and perspectives to understanding the nature of environmental issues. These include: life cycle assessment; material flow accounting and product material intensity indicators; and the 'factor four' and 'factor ten' concepts of resource productivity. Given the increasingly global nature of production and consumption, it became increasingly clear that there were significant impacts only indirectly related to production facilities and located across vast distances. What emerged was a greater understanding of the complexity of production and consumption dynamics, as well as recognition by industry and policy leaders that a broader perspective in dealing with environmental issues was needed.

The need for a new focus on broader life-cycle issues in production and consumption was one outcome of the 2002 Johannesburg UN Earth Summit, the first major international forum that formally advocated for sustainable consumption as a critical aspect of sustainability. Under the leadership of the United Nations Environment Program (UNEP) and the United Nations Department for Economic and Social Affairs (UN-DESA), a major international project – the Marrakech Process – was launched following the Summit. Drawing its name from the location of the inaugural meeting, the process aims to develop a plan to "accelerate the shift towards sustainable consumption and production (SCP), to promote social and economic development within the carrying capacity of ecosystems by de-linking economic growth from environmental degradation" (UNEP). The final proposal for the ten-year framework will be presented to the UN Commission on Sustainable Development in 2010/11.

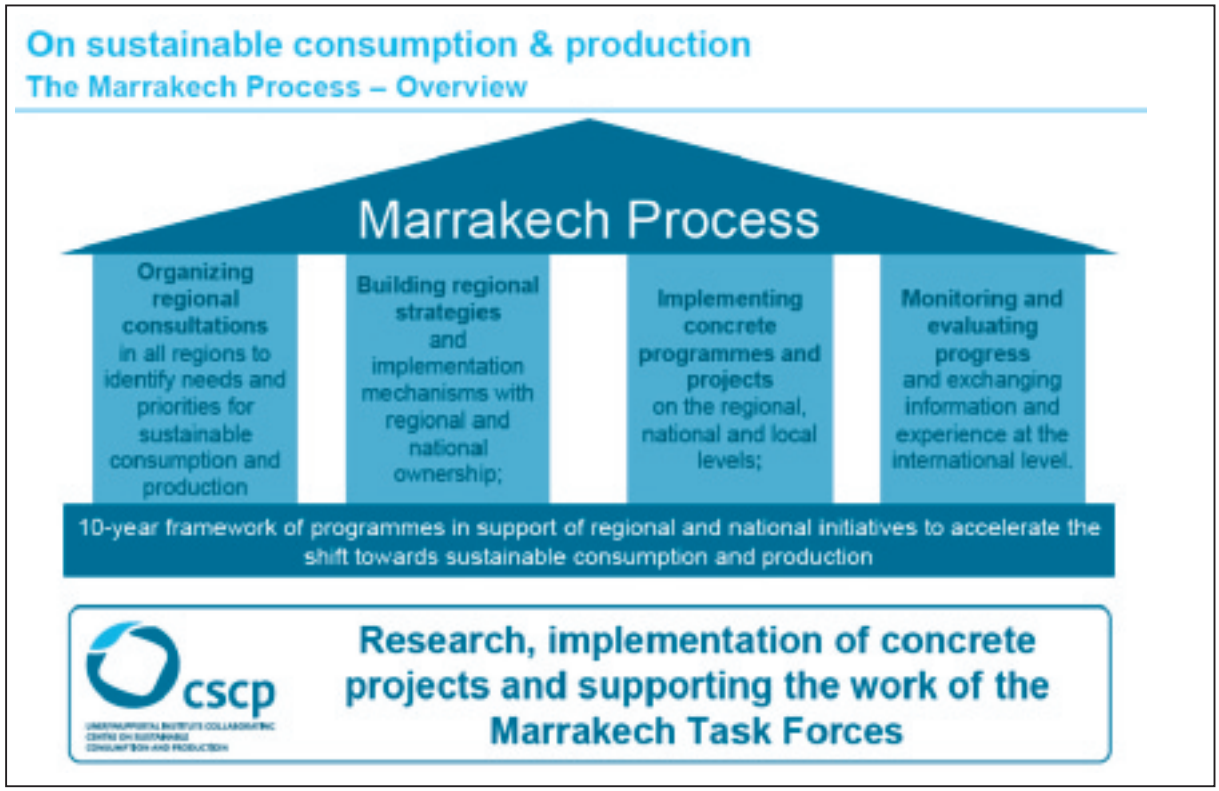

Figure 3-2: The Marrrakech Process-Overivew

Source: The UNEP/Wuppertal Institute Collaborating Centre on Sustainable Consumption and Production (CSCP)

With the objective of developing a Global Framework for Action on SCP, national governments, private companies, development agencies and civil society groups began a process to develop a ten year framework of SCP programs. There are four parallel phases: regional consultations and strategies; implementation of concrete demonstration projects; evaluating progress and exchanging knowledge and information at the international level.

Within the process, a number of Task Forces led by national governments are developing and testing SCP tools and sharing knowledge. These Task Forces focus on such themes as: Cooperation with Africa, Education for Sustainable Consumption; Sustainable Buildings & Construction; Sustainable Lifestyles; Sustainable Products; Sustainable Public Procurement; and Sustainable Tourism.

EU Integrated Product Policy Initiative

In response to a recognized need for new approaches to environment and sustainability challenges, the European Commission initiated work on its Integrated Product Policy (IPP) initiative in the late 1990s. The initiative aimed to optimize and harmonize existing policy tools and to develop a host of new measures to foster life-cycle improvements in products (European

Commission, IPP). Although this was among the first initiatives to strive to comprehensively address life-cycle impacts, there was already a clear recognition within the Commission that product- and consumption-related impacts should not be merely reduced in ways that result in greater impacts in other stages of the product life cycle.

Ideally, the vision for IPP was to extend the health, efficiency and competitiveness benefits previously achieved through cleaner production initiatives in production processes to the broader production-consumption system, both within Europe and at the international level (European Commission 1998).

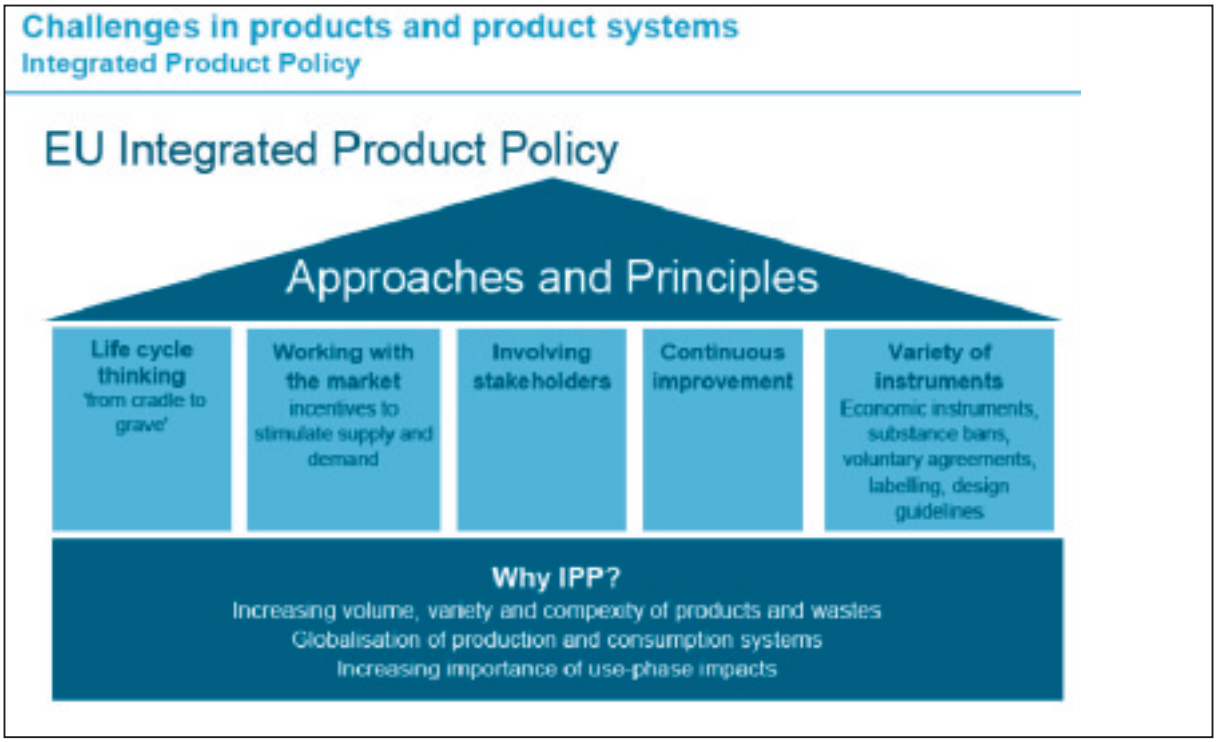

Figure 3-3: EU Integrated Product Policy

Source: The UNEP/Wuppertal Institute Collaborating Centre on Sustainable Consumption and Production (CSCP)

A 2001 European Commission Green Paper on IPP set the stage for a debate among stakeholders and policy-makers on the future role and implementation of the IPP initiative in the European Union (European Commission 2001). The Green Paper proposed a broad range of policy instruments to implement the IPP vision, including working with markets via state aid, applying differentiated taxation, applying producer responsibility concepts, stimulating demand for environmentally-friendly products such as via public procurement policies, and strengthening internal capacity for green design and production.

Following a considerable amount of work and consultation, the Commission published its proposed approach in 2003 within its IPP Communication. In part due to an enhanced understanding of the immense complexity and breadth of products in the modern marketplace, the ambitions of the 2001 Green Paper were not fully realized in the Communication. The Communication instead affirmed a commitment to proceed on the basis of five key principles: (1) consider life-cycle thinking; (2) work with markets through incentives; (3) closely involve stakeholders; (4) aim for continuous improvement; and (5) apply a host of complementary instruments and tools (European Commission. 2003a).

Given the complex and global nature of production and consumption, the vision of the IPP project has been difficult for the Commission to realize in practice. To date, practical outputs have consisted of ongoing stakeholder consultations, IPP pilot projects on mobile telephones and tropical wood garden chairs, and significant support to research initiatives, such as large-scale life cycle assessment models and studies. The challenge of addressing such a wide range of impacts across diverse geographical regions will require the initiative to promote new roles and functions for government, industry and consumers not seen to date in the lexicon of environmental policy.

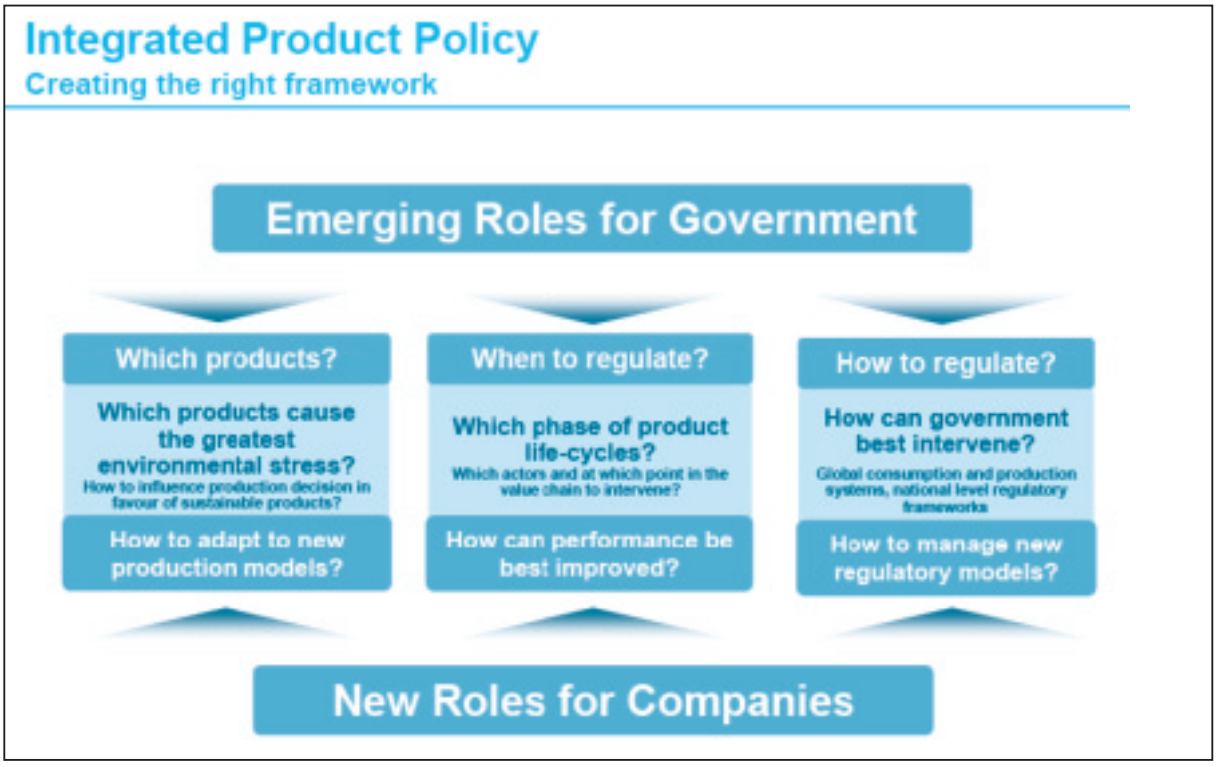

Figure 3-4: Creating the right framework for Integrated Product Policy

Source: The UNEP/Wuppertal Institute Collaborating Centre on Sustainable Consumption and Production (CSCP)

While the ambitions of the IPP project have not yet been fully realized, the initiative has supported research that has provided an important understanding of production and consumption dynamics and their relation to the environments within which these dynamics take place. A major need identified by Commission's 2003 IPP Communication was to identify products that impose the greatest environmental burden to enable the Commission to prioritize action on IPP.[17] To accomplish this aim, a three-phase project was initiated following the 2003 Communication. The first phase of the project – the Environment Impact of Products (EIPRO) study – was led by the European Commission' s Directorate General for the Environment Institute for Prospective Technological Studies, with support from a host of European research institutions. These included the Dutch TNO-CML Centre for Chain Analysis, which acted as project manager, the Flemish Institute for Technological Research (VITO) in Belgium, and the Danish Technical University (DTU). Impact areas that were studied included global warming impacts, acidification, photochemical ozone formation and eutrophication in aquatic ecosystems.

Remarkably, the research project found that a large percentage of environmental impacts resulted from just three broadly defined areas of consumption demand:

- food and drink - 20 to 30 percent of impacts, meat being the largest factor
- transportation - 15 to 35 percent of impacts, depending on methodology and impact area, but less for eutrophication and photochemical oxidation (private automobiles are by far the largest contributor, representing the source of some four-fifths of transport impacts)
- housing - 20 to 35 percent of total impacts (space heating, hot water and electrical appliances among the greatest source of impacts).

Together, these three fields of demand were found to represent some 70 to 80 percent of impacts and 60 percent of consumption expenditure among European consumers. All other consumption combined represents a maximum 20 to 30 percent of impacts in most impact categories, with clothing being the greatest (between 2 and 10 percent). These results are even more remarkable given that the findings are based on concurring results of several studies within the overall project, each applying differing approaches and methodologies.

17 See EIRPRO Study http://ec.europa.eu/environment/ipp/pdf/eipro_summary.pdf

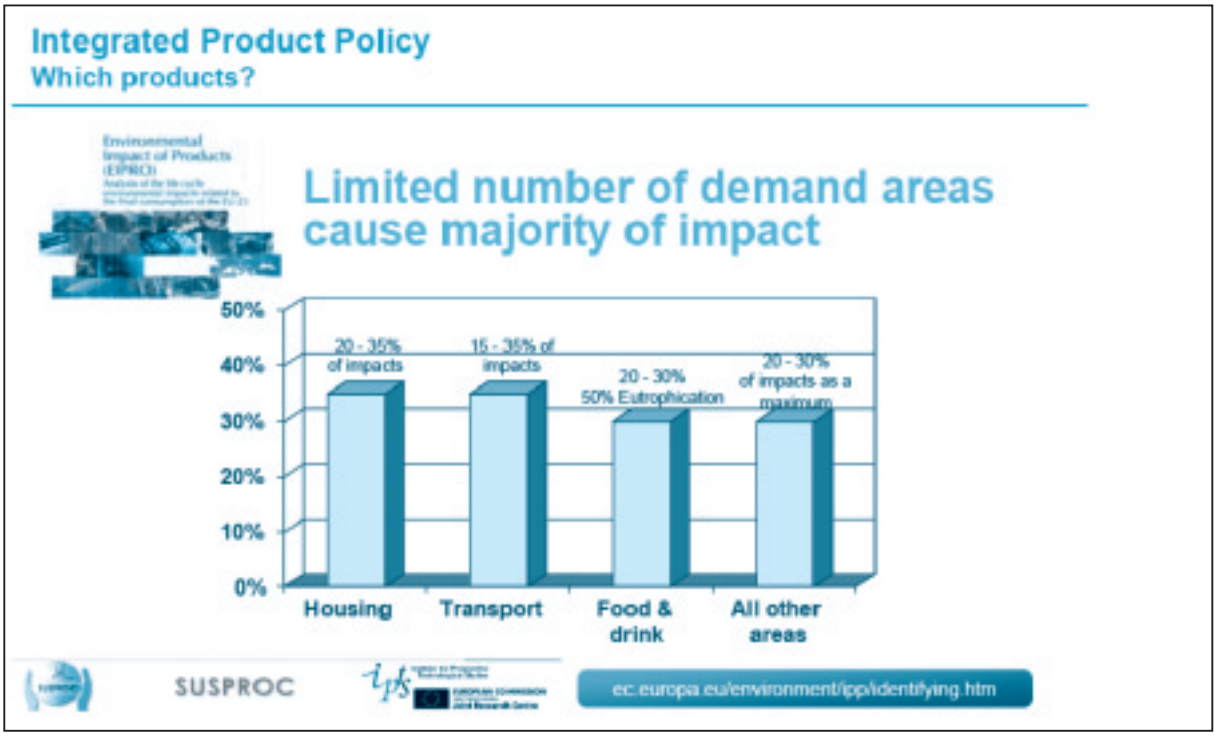

Figure 3-5: Which products to be focused by integrated product policy?
Source: The UNEP/Wuppertal Institute Collaborating Centre on Sustainable Consumption and Production (CSCP)

Phase II of the initiative – the Environmental Improvement of Products (IMPRO) – was launched in 2008. Specific projects are examining the technical potential for life-cycle improvements in private automobiles, residential buildings and meat and dairy products. Based on the results of Phase II, the third phase of the project will seek to identify policy instruments and measures likely to be successful in addressing the identified challenges. This phase started in 2009.

Much of the research conducted by the IPP project has formed a cornerstone of the European strategy on sustainable consumption and production (SCP), which aims to broaden the focus beyond that of the IPP initiative to include the role of consumers, as well as potentially engaging with trading partners outside the EU. In July 2008, the Commission proposed a series of measures and projects on SCP, which included initiatives on private consumption, green public procurement, energy efficiency, and ecodesign (European Commission 2008).

Extended Producer Responsibility in the EU

In response to significant increases in the quantities of waste being generated and intensifying expectations among public and government authorities for improved environmental management of wastes, attention has also begun to shift toward producers

taking a more active role in managing end-of-life products. This new Extended Producer Responsibility (EPR) policy approach aims to shift responsibility for product-related environmental impacts away from public authorities to producers, with a particular focus on the end-of-life phase of the product life-cycle.

An important aim of EPR policy is to achieve the often contradictory objectives of reducing burdens on public authorities and taxpayers, while at the same time improving waste management and recycling standards. Implicit in the EPR policy approach is to bring new financial and management resources from business to bear on waste management issues.

EPR-type legislation has been implemented in many European countries across a broad mix of product types, most notably for packaging, but also for household hazardous wastes, medications, various batteries and accumulators, end-of-life vehicles, and for electrical and electronic equipment.

A critical and defining feature of producer responsibility systems is the creation of market-based incentives to influence the design of products and product systems. Lindhqvist (2005) at the International Institute for Industrial Environmental Economics describes four key policy objectives of EPR systems that are often articulated explicitly or are implied within legislation (Lindhqvist and Rossem 2005). These are to establish:

(1) effective collection of end-of-life products from consumers;
(2) environmentally sound treatment, including dismantling and/or sorting to enhance reuse and recycling potentials;
(3) reuse and recycling such that collected materials can displace extraction of virgin materials from the environment; and
(4) ultimately design improvement for products and product systems through the provision of market-based incentive structures for producers that endure over time.

These four overarching objectives can be considered a valid framework within which EPR systems can be evaluated.

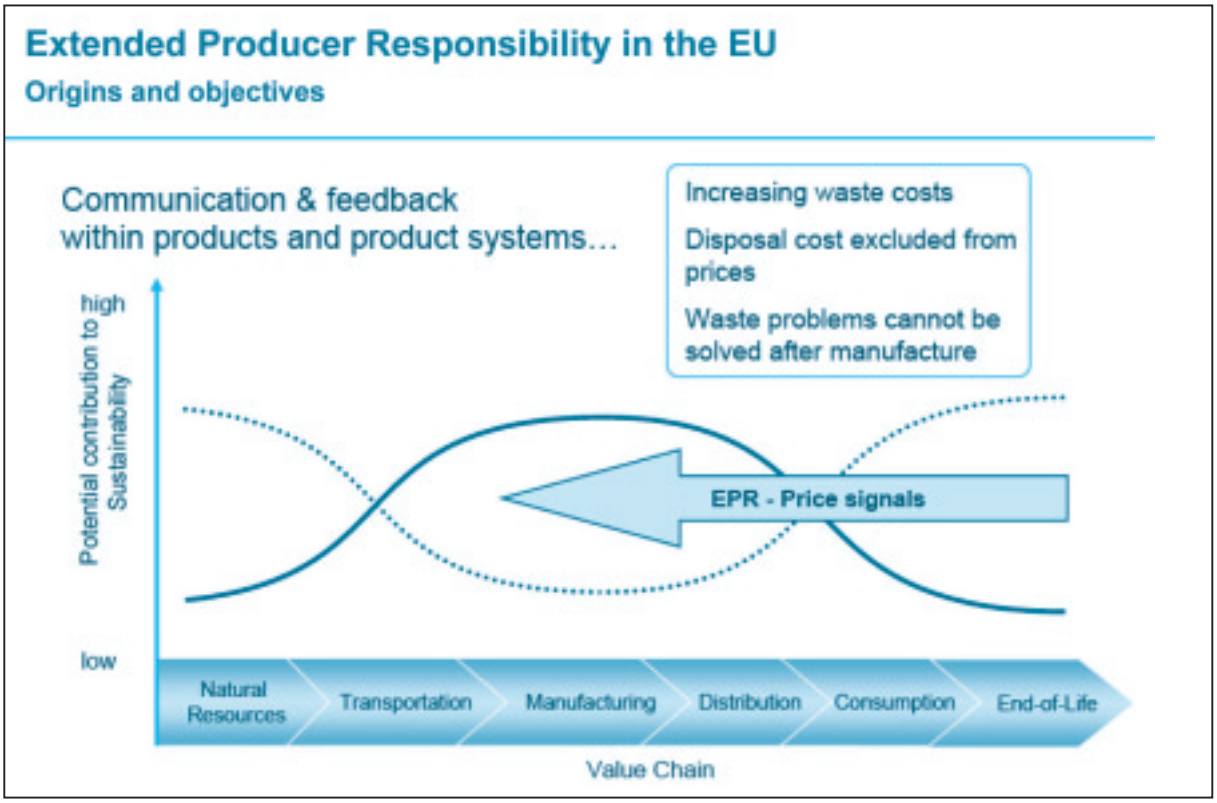

Figure 3-6: Origins and Objectives of Extended Producer Responsibility in the EU
Source: The UNEP/Wuppertal Institute Collaborating Centre on Sustainable Consumption and Production (CSCP)

International Material Flows and EPR: Two European Cases

The overarching theme of this publication is to scope the potential role of EPR policy within a context of international flows of materials and resources. In principle, there are potential benefits to be realized from an increase in movement of post-consumer materials for environmentally sound recycling operations, as opposed to requiring that end-of-life products be managed strictly within national boundaries.

Overall, there are many positive effects of the internationalization of material movements in terms of trade in goods and services. While many environmental challenges have emerged, economic theories concerning the division of labor and economic specialization suggest that increases in productivity seen on the production and distribution side can be expected for product end-of-life management activities, if implemented properly and with effective monitoring.

There are now mounting questions whether similar benefits from increased internationalization of material flows in new goods and services can be effectively extended to end-of-life management activities. EPR policy tools have been suggested to hold the potential to unlock such benefits. Could international

level cooperation and investment partnerships in end-of-life processing technology help address pressing waste challenges across the Asia region? Are there opportunities to improve not only economic efficiency of product end-of-life management but also provide improved environmental management and employment opportunities in resource recovery and recycling operations?

If an 'international' EPR system is to proceed, concerned governments must be able to avoid potential pitfalls and provide the best opportunity for realizing the system's potential advantages. The German Packaging Ordinance and the European Directive on Waste Electrical and Electronic Equipment can provide some useful observations to inform a proposal for an EPR system operating in an international context.

German Packaging Ordinance

Among the world's first and probably most well known EPR system emerged under the German Packaging Ordinance. As detailed in a case study by the Organization for Economic Cooperation and Development (OECD) on the implementation of the Ordinance, the Germany policy in the 1980s of incinerating municipal solid waste was facing increasing public opposition (OECD 1998). At the same time, waste volumes continued to grow to a point where the country was facing a waste disposal crisis.

To overcome these challenges, the German government adopted the Packaging Ordinance following consultations with industry and consumers. This imposed significant packaging take-back and recycling obligations on industry. Specifically, the Ordinance established a requirement for retailers, rather than producers, to either take back packaging from consumers at retail shops or participate within a national collective system for packaging collection and recycling.

Recognizing the significant challenges associated with collecting used packaging at retail shops, the retail, consumer goods and packaging industry established a voluntary organization – the 'Duales System Deutschland' (DSD) – to collectively carry out their joint packaging management responsibilities under the Ordinance

The DSD organization established a packaging recycling and collection system across all of Germany that operated in parallel to the municipal waste collection system, hence its name meaning the 'dual' system. Collection and processing from households and small businesses is physically undertaken by service providers operating under contract to the DSD.

This service for used packaging recycling is provided by the DSD without directly charging consumers. However, to finance their activities, the DSD charge license fees to producers that sell package goods (in practice packers and fillers) using the well known 'Green Dot' trademark as a means to prove that appropriate license fees have been paid.

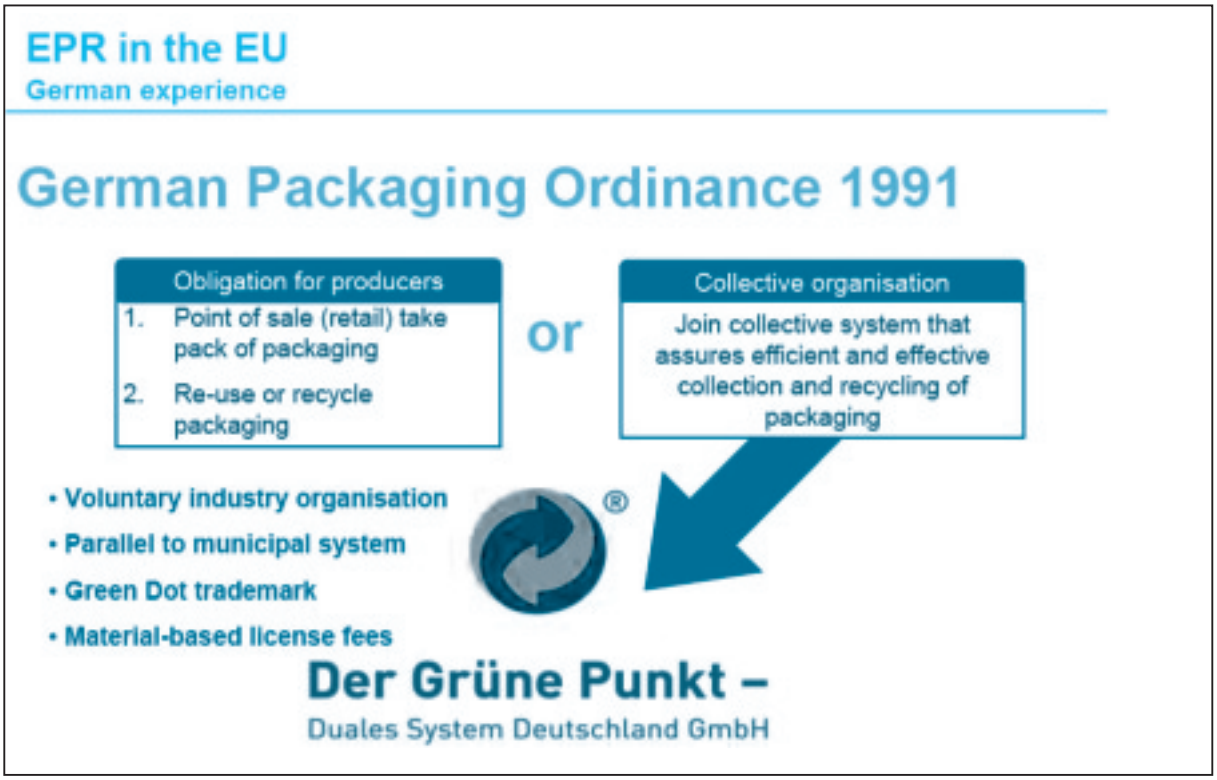

Figure 3-7: German Packaging Ordinance 1991

Source: The UNEP/Wuppertal Institute Collaborating Centre on Sustainable Consumption and Production (CSCP)

From an environmental perspective, the Packaging Ordinance has been largely successful. The German Federal Ministry responsible for environmental protection indicates that recycling of packaging increased from some 2.85 million tonnes in 1991 to 5.6 million tonnes in 2000, a significant increase (German Federal Ministry for the Environment 2008). By 2005, although recycling of packaging fell slightly to 5.15 million tonnes, it is remarkable that the overall increases in recycling corresponded with an actual reduction in sales packaging placed on the market despite sustained increases in retail sales to consumers. This strongly suggests that the application of EPR policy was successful in preventing the generation of packaging waste in Germany through redesign efforts on the part of producers.

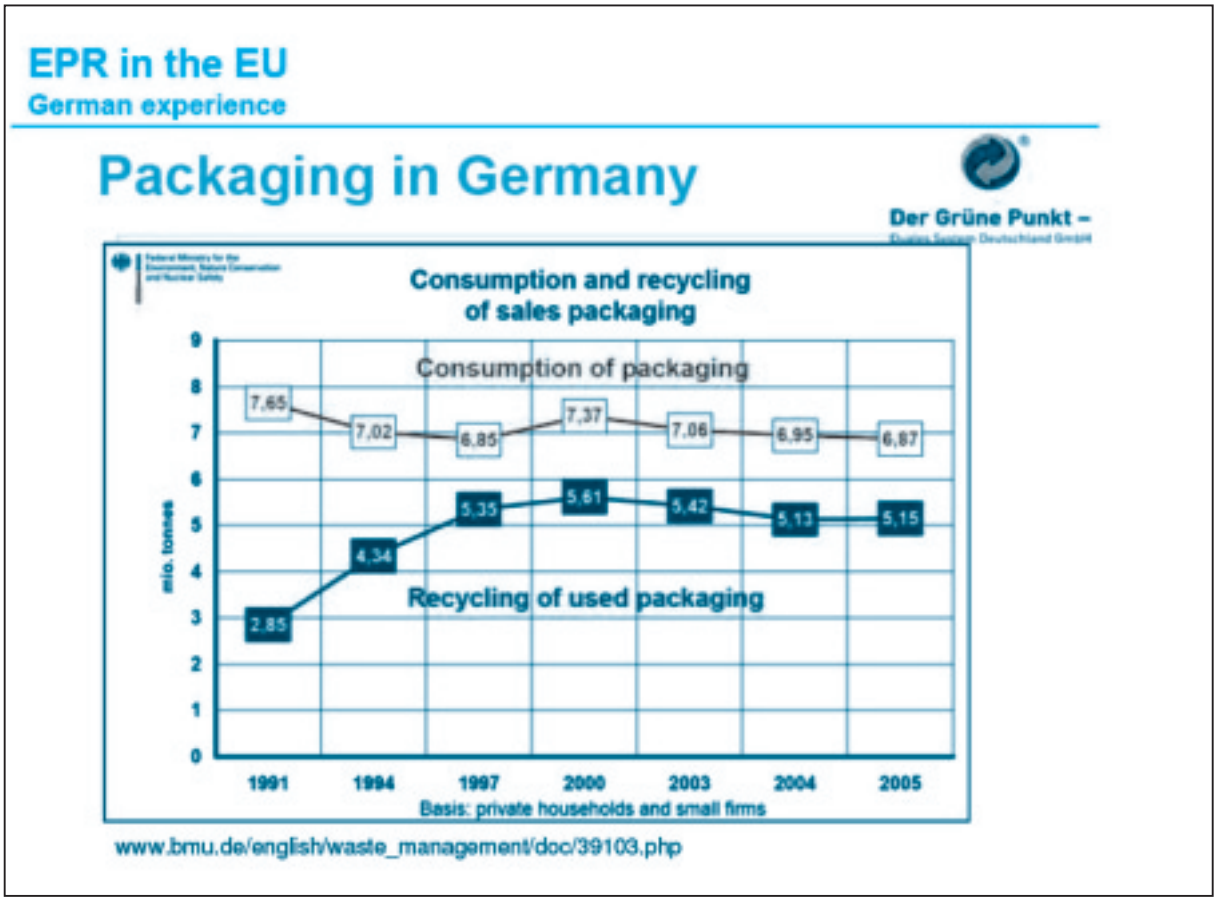

Figure 3-8: Consumption and Recycling of Packaging in Germany

Source: The UNEP/Wuppertal Institute Collaborating Centre on Sustainable Consumption and Production (CSCP)

Despite the success of the program, a number of factors led to some significant implementation challenges. The Ordinance imposed very ambitious targets for packaging collection and recycling and imposed a very short timeline for implementation by industry. In addition, while the recycling sector saw new investment and increased capacity (particularly in material sorting capabilities), this new capacity was insufficient to process all the materials generated in Germany given the unanticipated enthusiasm for packaging recycling shown by consumers.

This forced the DSD to export materials to neighboring countries for recycling. Large-scale packaging waste exports, along with various measures on packaging waste that were eventually adopted by other European countries, caused significant reductions in prices for post-consumer commodities in Europe to a point where prices became negative in some cases (e.g. DSD would pay processors to accept the materials). These price impacts caused significant problems for other countries, whose recycling systems had traditionally relied on a positive market price for materials collected for recycling. The European Commission recognized these "serious internal market problems" (European

Commission 1994) concerning post-consumer packaging recycling.

The problems reached a point that EU member states and many businesses sought to resolve them by introducing the European Directive on Packaging and Packaging Waste. The Directive aimed to harmonize national approaches across the EU so that such market disruptions could be overcome and avoided in the future.

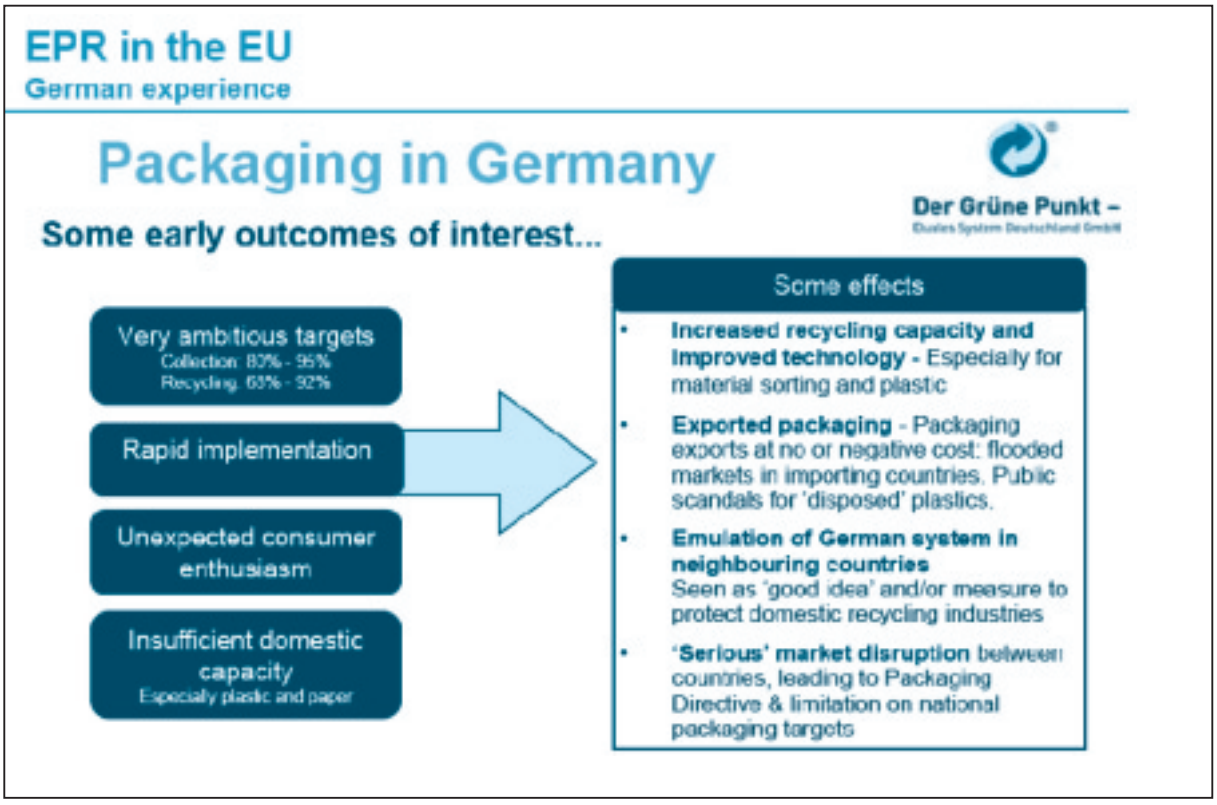

Figure 3-9: Some Early Outcomes of Packaging Ordinance in Germany

Source: The UNEP/Wuppertal Institute Collaborating Centre on Sustainable Consumption and Production (CSCP)

Directive on Waste Electrical and Electronic Equipment

A second relevant European example of an EPR system operating across national boundaries is the transposition and implementation of the country-level national measures under the Directive on Waste Electrical and Electronic Equipment (WEEE).

The objective of the Directive is to reduce the quantity of WEEE disposed by ensuring consumers are provided access to take-back and recycling facilities free of charge, as well as by providing producers with incentives to consider environmental and end-of-life aspects in the design of electrical and electronic equipment (European Commission 2003b). Because products covered under the Directive can be in the hands of consumers for an extended period of time, the

Directive also required that producers provide a financial guarantee that ensures the viability of WEEE recycling in the event that a producer becomes bankrupt or exits the marketplace in the future.

The Directive was implemented in tandem with a separate but related directive restricting the use of prescribed hazardous compounds. Together, the two directives have established what many have referred to as a de facto global standard for recyclability and elimination of toxics in electronic products.

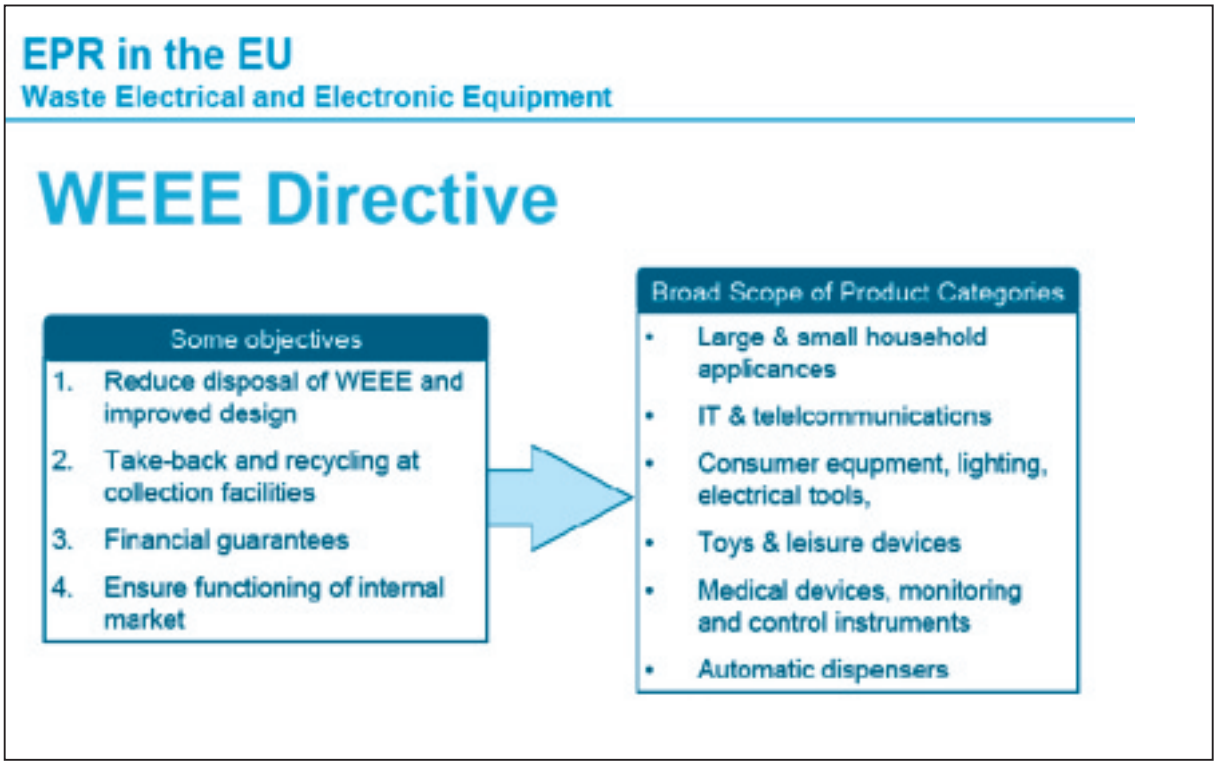

Figure 3-10: WEEE Directive

Source: The UNEP/Wuppertal Institute Collaborating Centre on Sustainable Consumption and Production (CSCP)

Though an association of some 42 compliance systems, producers developed a common data management and reporting system to demonstrate results to regulatory authorities and ensure environmentally sound treatment of collected WEEE. The data management software tool is referred to under the name "'WF_RepTool" and is operated under the WEEE Forum umbrella organization (WEEE Forum). It enables compliance schemes and WEEE recycling and treatment firms to track and determine the results of the collection and treatment systems across the chain of ownership among multiple material streams, collection systems and treatment firms Europe-wide.

The Directive does not apply directly to firms, but rather requires that EU member states translate

the Directive's requirements into national law, a process referred to as "transposition". While high-level requirements for collection, recycling and treatment of WEEE are defined, many details were left to member states to decide during the transposition process.

The different interpretations of the Directive' s requirements and differing environmental ambitions of member states resulted in some important legal and administrative differences in the transposition process. The effect of these different interpretations and approaches in the member states was analyzed in 2006 by Lindhqvist, Tojo and Van Rossem at the International Institute for Industrial Environmental Economics (IIIEE) at Lund University. In their study, entitled "Lost in Transposition? A study of the implementation of Individual Producer Responsibility in the WEEE Directive", they identified a number of key areas that presented substantial barriers to achieving the Directive's objectives (Lindhqvist et al. 2006).

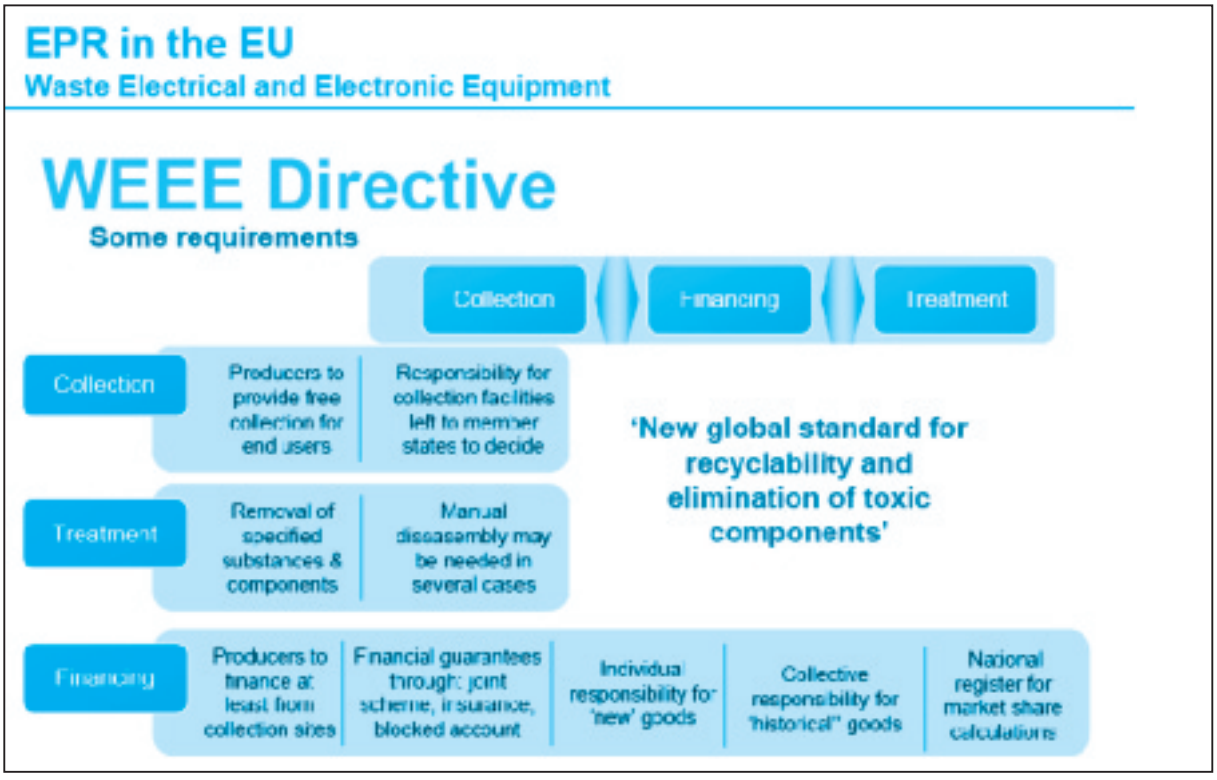

Figure 3-11: Some Requirements of WEEE Directive

Source: The UNEP/Wuppertal Institute Collaborating Centre on Sustainable Consumption and Production (CSCP)

One of the key problems identified in the IIIEE study is that member states have different provisions for collection facilities. Some states require producers to provide and pay for these facilities themselves, while others in effect allocated this important responsibility to municipal governments. This difference has had the practical effect of preventing individual firms from operating their own systems, since public authorities have been disinclined to make separate collection arrangements with multiple producer systems. Many people have characterized this as a significant obstacle in incentivizing innovation and ecodesign.

Other significant differences that were identified include legal and administrative mechanisms for producers to provide financial guarantees, as well as substantial differences in the interpretation of how to implement the Directive's requirement for "individual responsibility". These differences have had the effect of creating a substantially fractured market that decreases the likelihood of achieving the Directive's overall environmental ambition of waste prevention through improved environmental design.

These problems were significant enough that the European Commission announced its intention in 2006 to undertake a review process on the transposition of the Directive by member states. The review was completed in December 2008, and proposals were made to amend the Directive to address key challenges. Key proposed changes include harmonizing registration and reporting obligations for producers and to require inter-operability of national registers; introducing a mandate for a 65% recovery rate target in each member state and a combined recycling and re-use target to facilitate reuse; and setting minimum inspection and monitoring requirements, especially for waste shipments.

Discussion

While the European context is in many ways unique, and conditions in other regions can differ substantially, the brief discussion above was presented in order to highlight some key issues that may be relevant to a discussion on application of the EPR policy principle in the Asia region.

Figure 3-12: Key Learnings from Packaging Ordinance in Germany and WEEE Directive
Source: The UNEP/Wuppertal Institute Collaborating Centre on Sustainable Consumption and Production (CSCP)

When considering the implementation of the German Packaging Ordinance, the transboundary movement in secondary or recyclable materials can pose substantial challenges when overall conditions and markets for end-of-life materials differ. This is especially true when there is insufficient domestic capacity in the receiving country to process the imported materials, even where there is a sound tracking of materials from the country of origin through to the processing and recycling in the receiving country.

Expanding the amount of materials received for processing would seemingly increase opportunities for waste processors, while generating additional investment and expanded capacity in receiving countries. However, this is not necessarily the case. Where imported materials displace materials generated domestically in securing access to processing capacity, there is a very real risk of increased dumping or a reduction in recycling of domestic materials within the receiving country. This could be particularly problematic where large international firms negotiate preferential access to processing facilities in receiving countries, in effect squeezing out domestic sources of recyclable materials.

With regard to stimulating new technologies, the European experience has indeed shown a clear development of new technologies following the introduction of EPR legislation. However, the relative technological positions of the various EU

countries are fairly similar, and many countries are among the leading technological economies globally.

In Asia, however, there can be significant differences in technology development, both between different countries in the region and within countries (e.g. urban versus rural areas). In order for any EPR system to be effective internationally, significant attention will need to be given to ensuring that the overall management of materials results in improved environmental outcomes and that the system leads to an improved application of technology to manage end-of-life products in both exporting and importing countries.

It also clear from the European experience that organizing effective end-of-life management for complex and durable products, such as electronic and electrical equipment, is substantially more complicated than for simple short-lived products like packaging. Thus, a core issue that must be addressed in any international trade in complex end-of-life products is treatment standards and enforcement of those standards. It is clearly undesirable if the end-of-life management that occurs in a receiving country results in a lower standard of care than what would be expected in the exporting country.

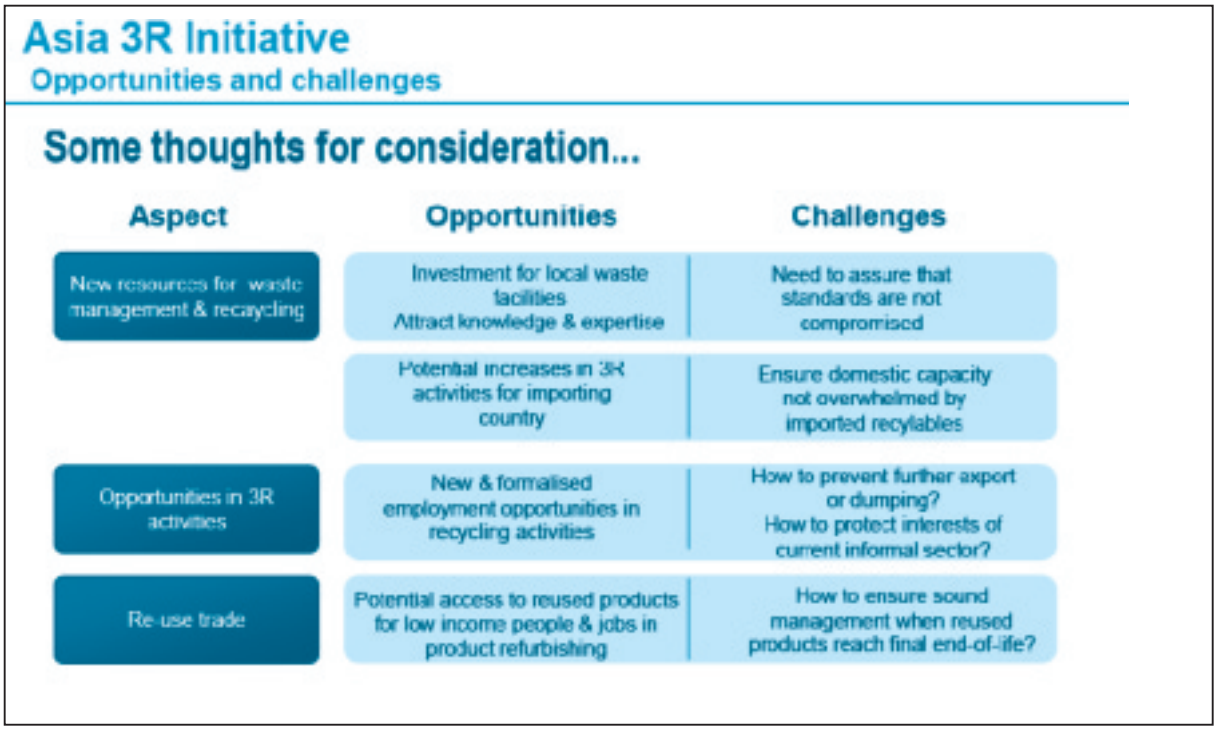

Figure 3-13: Opportunities and Challenges for Asia 3R Initiative

Source: The UNEP/Wuppertal Institute Collaborating Centre on Sustainable Consumption and Production (CSCP)

When considering international trade of goods for reuse (so-called "second-hand markets"), another relevant issue is how an EPR system that operates at an international level would manage the inevitable final end-of-life disposal of used products if they have traded hands a number of times across multiple borders. In such cases, it is difficult to identify a "producer". This is especially relevant to products with a longer life that tend to become discarded due to obsolescence in more technologically advanced countries, but retain productive value in other regions. Such products include mobile telephones, automobiles and industrial machinery.

Conclusion

This chapter has sought to provide an overview of the European Integrated Product Policy initiative, its relationship to resource efficiency efforts in Europe and to emerging global sustainable consumption and production policies. In the context of international material flows and EPR policies, the German Packaging Ordinance and the European Union Directive on Waste Electrical and Electronic Equipment were also profiled. In both these cases, the importance of harmonizing key aspects of EPR legislation was highlighted.

The chapter further emphasized the need to ensure sound environmental management across all phases of product life-cycles and that environmentally-sound life-cycle management should be the paramount objective within an EPR program, whether implemented at a national or international scale. Should an EPR system be undertaken in the Asia region, it is hoped that environmental, social and economic benefits can be realized for participating countries.

As with any economic trade agreement, an international application of the EPR principle poses both opportunities and risks for the countries involved. For potential importing countries, there are opportunities to secure new investments in recycling and processing capacity and to formalize the current informal workforce that is present in the recycling sector of several Asian countries. Taking these steps may offer potential for new investments and increased access to environmental technologies and economic development opportunities.

However, there will be a need to ensure that environment and social standards are not compromised and that environmental outcomes for materials processed in receiving countries are at least as sound as those in exporting countries. Furthermore, where there are significant differences in the cost of processing end-of-life materials between countries, steps will need to be taken to ensure that markets for recycled materials in lower-cost countries are not overwhelmed by imported materials. Moreover, where new recycling technologies are installed, the interests of participants within the current informal sector must be considered and disruptive workforce displacement must be avoided.

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4. The Emerging Need for Sharing Environmental Product Information and Reconsidering the Producers' Informative Responsibility[18]

Shiko Hayashi
Yasuhiko Hotta
Hideyuki Mori

Abstract

This chapter will briefly review how the EPR concept was originally designed and how it has been implemented in actual product policies. The original vision of the EPR concept and its implementation are analyzed from the standpoint of the regime assigning the producers' responsibility for their products including the post-consumer stage, with a focus on "producers' informative responsibility"[19].

The chapter will also emphasize the need for producers' informative responsibility, with reference to rising needs for environmentally sound management and resource recovery of waste electrical and electronic equipment. Such a responsibility requires producers to share information on what substances are contained in a product and how the product should be treated by various stakeholders through the entire product life-cycle, especially at the end-of-life stages. The chapter concludes with a suggestion that, in order to effectively utilize information about products' environmental properties, current EPR-based policies should expand their scope to mandate informative responsibility.

The original vision of EPR concept and its actual implementation

Original vision of the EPR concept

The term "Extended Producer Responsibility" (EPR) was first presented and defined by Thomas Lindhqvist in the early 1990's. EPR is a market-oriented environmental policy concept aimed at reducing the environmental burdens of a product through its life-cycle, especially at the end-of-life stage (Roine and Lee 2006). Under the

[18] This chapter is based on chapter 2 of the research report, "Research on management measures of hazardous and valuable substances contained in products toward sound international resource circulation (written in Japanese)", prepared by IGES in March 2009, under the research project funded by the Ministry of the Environment, Japan Grant-in-Aid for Scientific Research in 2008.

[19] Informative responsibility requires producers to supply information on the environmental properties of the products they are manufacturing (Lindhqvist, 2000).

concept, producers are assigned certain types and levels of responsibility for their products, and their responsibilities are extended to the post-consumer stages. Two major policy features include: 1) transferring the responsibility for managing end-of-life products from municipal governments to private producers; and 2) providing incentives to producers so they will incorporate environmental considerations into the design of products (OECD 2001).

Lindhqvist originally defined EPR as follows:

"Extended Producer Responsibility is an environmental protection strategy to reach an environmental objective of a decreased total environmental impact from a product, by making the manufacturer of the product responsible for the entire life-cycle of the product and especially for the take-back, recycling and final disposal of the product. The Extended Producer Responsibility is implemented through administrative, economic and informative instruments. The composition of these instruments determines the precise form of the Extended Producer Responsibility."
(Source: Lindhqvist (1992).)

According to the EPR principle introduced by Thomas Lindhqvist (2000), a product's ownership is categorized into various elements of responsibility: financial, physical, liability, and informative (Figure 4-1).

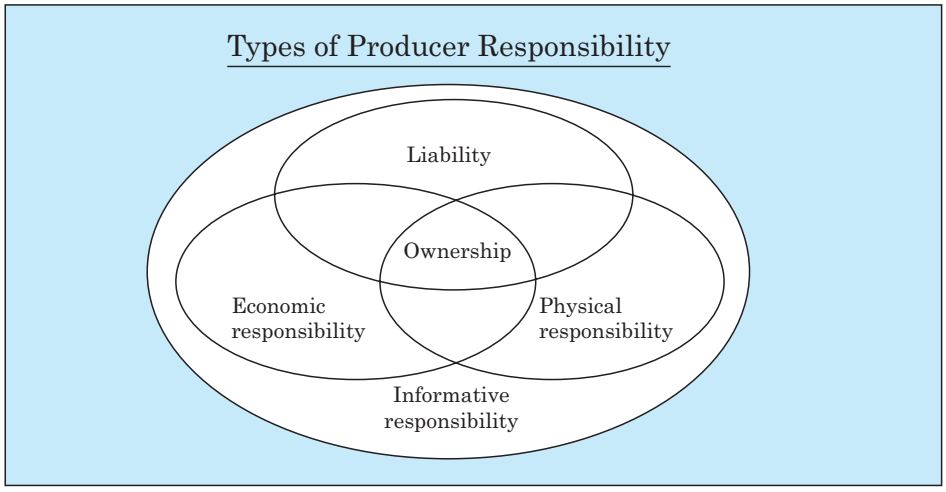

Figure 4-1: Types of producer responsibility under EPR concept
Source: Lindhqvist (2000).

Financial responsibility requires a producer to cover the costs incurred for managing their end-of-life products, including collection, recycling, and final disposal. Physical responsibility requires a producer to take back their end-of-life products and to properly treat and recycle those products in line with some established standards. Liability requires a producer to compensate for environmental damages caused by the product. Finally, informative responsibility requires producers to provide information on the environmental properties and composition of their products to consumers and recyclers. It is regarded as a basis for all other elements of producers' responsibility as shown in the Figure 4-1.

Implementation of EPR-based policies depends on a combination of different policy instruments (Table 4-1) and the level to which each instrument is legally binding. Each country introduces EPR-based legislation in a different manner; thus, EPR-based policies have been implemented differently among countries.

Table 4-1: Policy instruments for the EPR-based policy

Administrative instruments	Collection and/or take-back of discarded products, substance and landfill restrictions, achievement of collection, re-use(refill) and recycling targets, fulfillment of environmentally sound treatment standards, fulfillment of minimum recycled material content standards, product standard, utilization mandates
Economic instruments	Material/product taxes, subsidies, advance disposal fee systems, deposit-refund systems, upstream combined tax/subsidies, tradable recycling credits
Informative instruments	Reporting to authorities, marking/labeling of products and components, consultation with local governments about the collection network, information provision to consumers about producer responsibility/ source separation, information provision to recyclers about the structure and substances used in products

Source: Tojo. (2004).

Under the original EPR concept, these elements of responsibility are fully assigned to an individual producer, an arrangement usually referred to as "Individual Producer Responsibility" (IPR) (Lindhqvist 2000). Under an IPR arrangement, an individual manufacturer is responsible for the end-of-life management of their own products (Tojo 2004).

Such an arrangement provides an effective incentive for producers to improve their product designs to minimize costs at the end-of-life stages. In pursuit of cost-savings, producers will make their products more environmentally-benign by using fewer harmful substances and facilitating easier recycling or treatment at the end-of-life stage (Lifset and Lindhqvist 2008). This preventive approach lies at the core of the original EPR concept.

Under such circumstances, if a rational producer is given an incentive to disclose accurate and relevant environmental information about their products to recyclers, it will be possible to promote improvements in safety and efficiency of recycling processes and to realize cost savings

by an individual producer at the recycling and recovery stages (Toffel 2003).

However, in most cases where EPR legislation is in place, IPR arrangements are not practiced. Where they are in place at some extent, the regime is often not strong enough to give an individual producer enough economic incentive to improve their product designs. As a result, incentive mechanisms are falling short in promoting design for environment.

Actual implementation of the EPR concept

The "Guidance Manual for Governments" published by the Organization for Economic Cooperation and Development (OECD) in 2001 defines the EPR concept as

"an environmental policy approach in which a producer's responsibility, **physical and/ or financial, fully or partially**, for a product is extended to the post-consumer stage of a product's lifecycle" (OECD 2001 p.18).

While financial and physical responsibilities are stipulated as core elements, the provision of information (and liability) is regarded as a secondary responsibility assigned to producers.

In most countries where EPR-based legislation has been introduced, producers of similar product groups have established a producer responsibility organization (PRO), which typically organizes a national collection scheme for the end-of-life products concerned (OECD 1996) (Table 4-2). Under a PRO scheme, producers ensure the end-of-life management of their products regardless of brand, an arrangement usually referred to as Collective Producer Responsibility (CPR).

Table 4-2: Cross-country comparison of the EPR-based policies for WEEE

	Waste Electrical and Electronic Equipment (WEEE)					
	OECD	Europe				
		EU	Germany	U.K.	France	Switzerland
Legislation	Guidance Mannual for Governments	WEEE Directive	Electrical and Electronic Equipment Act (ElektroG)	The Waste Electrical and Electronic Equipment Regulations	Decret No 2005-829	Ordinance on the Return, the Take Back and the Disposal of Electrical and Electronic Equipment
(year of promulgation)	2001	2003	2005	2006	2005	1998
Existence of PRO	Third party organization which collectly manages the take-back of products on behalf of an individual producer	At least one PRO in a country	Elektro-Altgeraete-Register (EAR)	Producer Compliance Scheme	Eco-organismes	PROs (e.g. SWICO and SENS)
Physical responsibility	Responsibility of proper treatment of the end-of-life product	Separate collection (Article 5), Treatment (Article 6), and Recovery (Article 7)	Producer Obligation to Take Back WEEE (Article 10), Treatment (Article 11), and Recovery (Article 12)	Obligation to join a scheme (Article 10)	Separate collection (Article 10) and Treatment (Article 14)	Mandatory Take Back Obligation (Article 4) Mandatory Disposal Oblifation (Article 5)
Financial responsibility	Responsibility for paying all or part of the costs incurred for managing the end-of-life product	Financing in respect of WEEE from private households (Article 8)	Clearing House, Registration and Financing Guarantee (Article 6)	Financing (Article 8 and 9)	Financing the cost of collection (Article 8)	
Informative responsibility (the provision of information)	Not stipulated in the definition of EPR	Information for treatment facilities (Article 11)	Producers' Information and Reporting Obligations (Article 13)	Information on new types of EEE (Article 17)	Provision of product information to treatment facility (Article 7)	Not stipulated
Restriction of the use of certain hazardous chemicals in articles	—	RoHS Directive	Integrated in ElektroG	The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations	Integrated in Decret No 2005-829	the Ordinance on the Reduction of Risks from Chemicals
(year of promulgation)	—	2003	2005	2006	2005	2006

Waste Electrical and Electronic Equipment (WEEE)				End-of-Life Vehicle	Packaging
North America	Asia				
U.S. (California)	Japan	China	South Korea	Sweden	Germany
Electronic Waste Recycling Act of 2003	Electronic Home Applinace Recycling Law	Regulation on the Administration of the Recovery and Disposal of Waste Electrical and Electronic Products	The Act for Resource Recycling of Electrical/Electronic Products and Automobiles	Motor Vehicle Scrapping Act The Ordinance on Producer Responsibility for Cars	Ordinance on the Avoidance and Recovery of Packaging Wastes
2003	1998	2009	2007	1975 and 1997 respectively	1991
California Integrated Waste Management Board	PROs (Group A and B)	Establish a fund for managing WEEE and use a fund for costs of collection and waste treatement	Korea Environment & Resources Corporation (ENVICO)	BIL Automobile Producer Responsibility Sweden	Duales System Deutschland (DSD)
Recycling Covered Electronic Waste (SB20/SB50)	Obligation to Collect (Article 17)	Recovery and disposal of WEEE listed in the Catalogue (Article 3)	Recycling Requirements of Manufacturers and Importers (Article 15)	BIL certified dismantler collect and treat the end-of-life vehicles from the last owner with free of charge	Private collectors bring the EoL products to recycling companies on commissioned by DSD.
Funding system for the collection and recycling (Electronic Waste Recovery and Recycling Account)	Charges for Fees (Article 19)	Contribution to the Fund for the disposal of waste electric and electronic products (Article 7)	Collection of Recycling Charges for Electrical and Electronic Equipment (Article 18)	BIL paid treatment costs to dismantlers (BIL: Swedish Automobile Manufacturers and Wholesalers)	Producers pay license fees to DSD
Not stipulated	Not stipulated	Provision of Recycling Information（Article 10）	Provision of Recycling Information（Article 13）	Provision of Recycling Information (Section 10）	Not stipulated
Integrated in Electronic Waste Recycling Act of 2003	Law for Promotion of Effective Utilization of Resources（J-moss）	Administration on the Control of Pollution Caused by Electronic Information Product（China RoHS）	Integrated in the Act for Resource Recycling of Electrical and Electronic Equipment and Vehicles	—	—
2003	2006	2006	2007	—	—

Source: compiled by authors

Under a CPR scheme, the member companies of a PRO are often charged identical flat recycling fees per unit of weight. Therefore, the benefits of taking individual actions (e.g. redesigning products so that they are easier to recycle) are not directly returned to the company that made the effort, but are instead shared and diluted among a group of producers (Toffel 2003). As a result, each producer is given little incentive to improve their product designs (Lindhqvist and Lifset 2003). Thus, CPR regimes have not been fully effective in achieving the core intentions of EPR (Lifset and Lindhqvist 2008).

Comparing the two different arrangements, an IPR arrangement is more effective than a CPR arrangement in providing producers incentives for design improvements (Tojo 2004). Even though IPR arrangement puts into place, however, if the recycling fees are set at flat rate, the regime has not given strong incentive for an individual producer to promote the design improvements of their own products.

In addition, CPR regimes have given little incentive for an individual producer to collect and disseminate information that could help reduce the costs of end-of-life treatment. Therefore, producers rarely provide information under current EPR-based policies. This represents a failure to give individual producers strong incentives to make design changes, although this responsibility is clearly stipulated in the legislation of some countries (Table 4-2). As a result, information exchange between producers and recyclers has not been practiced.

Rising need for sharing information on product compositions

The latter half of the paper discusses the need for sharing information on product compositions focusing on waste electrical and electronic equipments (WEEE). In many countries, the EPR concept has been applied to WEEE with the aim of separating it from flows of municipal solid waste management. Because of their complex compositions, which include both hazardous substances and precious metals, information sharing is crucial to promote safe and efficient recycling of WEEE.

WEEE contains both hazardous and precious substances

Some WEEEs include highly toxic heavy metals, such as lead, mercury, cadmium, and brominated flame retardants (Table 4-3). If WEEEs are not properly treated, hazardous chemicals can be released into the environment and may impact human health. At the same time, many products, especially printed circuit boards, contain valuable metals and other materials which can be economically profitable to recycle. These metals include iron, aluminum, nickel, gold, silver, copper, and some rare metals (Table 4-4).

Table 4-3: Contents of hazardous chemicals contained in electrical and electronic products

Part	Chemicals
Batteries	cadmium, lead, lithium mercury
Printed circuit boards	antimony, beryllium, cadmium, chlorine and/or bromine, and lead
Cathode ray tube	antimony, barium oxide, cadmium sulfide, lead, phosphors
Liquid crystal displays	mercury in liquid crystal
Plastics	polyvinylchloride (PVC), brominated flame retardants (BFRs), cadmium,

Source: based on the work by Oyuna Tsydenova

Table 4-4: Contents of selected metals in the printed circuit boards of seven types of electronic products

Products	Valuable metals contained in products
TV (CRT monitor)	gold, silver, copper, platinum, antimony, nickel, yttrium, neodymium, iron, and aluminum
Washing machine Air conditioner Refrigerator	gold, silver, copper, platinum, antimony, iron, and aluminum
TV (LCD, plazma)	gold, silver, platinum, antimony, indium, yttrium, iron, aluminum

Source: Recycle One (2007)

Rising concerns for environmentally sound management of electrical and electronic wastes and resource recovery from waste electrical and electronic equipments

Concerns about improper treatment of WEEE are rising, especially in communities that handle the recycling and disposal of the equipment. In some developing countries, people in such communities undertake primitive recycling processes/techniques – e.g. open burning of plastics and wires and open melting of printed circuit boards in acid baths – with their bare hands with no or very little protective equipment or pollution control measures. As a result, these communities experience high levels of localized air and water pollution and soil contamination, which pose serious health risks for the communities (Wong et al. 2006). In addition, some heavy metals contained in the residues from the recycling processes are sent to municipal landfills. As a result, toxins such as lead, mercury and cadmium can leach into groundwater (Yang et al. 2008).

In response to these concerns, a number of developing countries began to develop policy initiatives similar to those of the European Union's Restriction on Hazardous Substances (RoHS) Directive and Waste Electrical and Electronic

Equipment (WEEE) Directive.

At the same time, policymakers still recognize the importance of recovering valuable metals from WEEE. The recent steep rise in resource prices has led to increased interest in recovering some precious metals, especially rare metals, from WEEE.

In addition, the Japanese government has initiated several model projects aimed at recovering rare metals from small electronic wastes, such as mobile phones, digital cameras, and portable music devices. Five municipalities – Akita, Fukuoka, Ibaraki, Tokyo, and Minamata-city – have already started model projects to collect small electronic equipment in order to recover rare metals. Also, Sony Corporation has started an experimental project to collect small electronic equipment in collaboration with Kitakyushu's municipal government in 2008.

Importance of information sharing

Sharing information on product composition (e.g. how much toxic substances and precious metals are contained in different parts of a product) between producers and recyclers can be a key tool in promoting environmentally sound management of WEEE and recovering valuable metals from those wastes. In turn, this can lead to higher recycling rates and higher quality of recycled materials (Bengtsson, 2009).

In fact, this is stipulated as an important feature in EPR-based legislation of some countries (Table 4-2). In the EU's WEEE Directive, the producer's informative responsibility is stipulated as follows:

"Information on component and material identification to be provided by producers is important to facilitate the management, and in particular the treatment and recovery/recycling, of WEEE."
Source: Directive 2002/96/EC of the European Parliament and of the Council, (22).

"Member States shall … ensure that producers provide reuse and treatment information for each type of new EEE put on the market … This information shall identify … the different EEE components and materials, as well as the location of dangerous substances and preparations in EEE."
(Source: Directive 2002/96/EC of the European Parliament and of the Council, article 11-1.)

In addition, several global forums have focused on the role of information sharing and identified a need for improvement. One example is the recent "Informal Workshop on Stakeholders' Information Needs on Chemicals in Articles/ Products" organized by UNEP and Sweden. In the workshop, participants recognized that information exchange is one key factor to enable stakeholders to avoid and/or properly manage hazardous chemicals and reduce risks to human health and the environment (UNEP 2009). Similarly, a recent study in Japan identified a clear need for improved availability of information on products' composition, including both valuable metals and hazardous chemicals. Studies in the EU and the US have made similar conclusions[20].

[20] Interview survey is conducted by IGES to various stakeholders, including recyclers, manufacturers, industrial association, municipalities, and researchers, under the research project funded by the Ministry of the Environment, Japan Grant-in-Aid for Scientific Research in 2008.

Producers' informative responsibility should be effectively utilized under the current EPR-based policy

This chapter briefly reviews how the EPR concept was originally designed and how the concept has actually been implemented in product policies, with a special focus on producers' informative responsibility. It is observed that incentives for product redesign have not been fully effective in policy implementation and that the provision of information has been limited. However, increasing calls for environmentally sound management of durable goods, such as WEEE, and efficient resource recovery from such wastes are putting pressure on producers to share information on substances contained in products, including both hazardous chemicals and precious metals. This is in line with the original intention of the EPR concept.

To make sure that adequate product information is made available to those who need it, we recommend that the current EPR-based policies should explicitly require and enforce the producers' provision of information. As argued above, this would promote both the environmentally sound management of WEEE and effective resource recovery.

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