EPR: Sustainable solution to Electronic waste

by

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Introduction

A couple of decades back, the amount of waste generated was considered small and hence ignored. With massive industrialisation and urbanisation, the quantity of waste has increased manifold. As the garbage pile gets higher and the amount of toxins in this waste increases, it is no longer feasible to ignore or sidestep this problem.

Like the rest of the world, India is also going through a phase of accelerated industrial activities, the process having got a boost in the last decade resulting in significant increase in the quantities of waste generated in the country. The last decade has also witnessed a revolution in the Information Technology industry, which has led to various new kinds of waste and new materials being added to the waste stream. Electronic and electrical waste (E-waste) is one such waste, which is growing in volumes and is a result of rapid urbanisation and changing lifestyles of citizens. Along with the traditional approaches, India needs to integrate newer principles to tackle this toxic pile.

Extended Producer Responsibility (EPR) is an emerging principle for a new generation of pollution prevention policies that focus on product systems instead of production facilities. EPR imposes accountability over the entire life cycle of products and packaging introduced in the market. It means that the responsibility of producers for their products is extended to the post-consumer stage and a company must be concerned not only with making the product and how it functions, but also with what will become of the product at the end of its useful life.

EPR extends the traditional environmental responsibilities that producers and distributors have previously been assigned (i.e. worker safety, prevention and treatment of environmental releases from production, financial and legal responsibility for the sound management of production wastes) to include management at the post-consumer stage. The firms, which manufacture, import and/or sell products and packaging, are required to be financially or physically responsible for such products after their useful life. They must either take back spent products and manage them through reuse, recycling or in energy production, or delegate this responsibility to a third party, a so-called *Producer Responsibility Organisation* (PRO), which is paid by the producer for spent-product management. In this way, EPR shifts responsibility for waste from government to private industry, making it mandatory for producers, importers and/or sellers to internalise waste management costs in their product prices.

Conceptually, EPR is form of leasing - where the producer never terminates ownership. Many companies such as Xerox advocate leasing of their products (in USA) because it gives the producer control over the entire life cycle of the product and allows them to repair and re-use components. However, this is not feasible for all product categories, specifically in case of products with a very short life, and so other policy tools are used.

EPR is an important approach to reconcile environmental protection and economic growth. The responsible management of products and processes from an environmental point of view can stimulate greater awareness throughout the company, improve corporate credibility and reputation, enhance business development opportunities and facilitate dialogue and partnership with key stakeholders.

Objective behind EPR

The aim of EPR is to encourage producers to prevent pollution and reduce resource and energy use in each stage of the product life cycle through changes in product design and process technology. In its widest sense, Producer Responsibility is the principle that producers bear a degree of responsibility for all the environmental impacts of their products. This includes upstream impacts arising from the choice of materials and the manufacturing process to the downstream impacts from the use and disposal of products. Thus, responsibility for product is broadened beyond the emissions and effluents generated by the extraction or manufacturing processes to include the management of the product once it is discarded. EPR is based on the premise that the primary responsibility for waste generated during the production process (including extraction of raw materials) and after the product is discarded, is that of the producer of the product.

The long-term purpose of EPR is to encourage development of more environmentally friendly product - products that require fewer resources, contain fewer harmful substances and are easier to reuse/recycle.. The ultimate goal is sustainable development through environmentally responsible product development and product recovery. EPR can lead to the following:

- Overall waste prevention;
- The use of non-toxic materials and processes;
- The development of closed material cycles;
- The development of more durable products;
- The development of more reusable and recyclable products;
- Increased reuse, recycling and recovery;
- The transfer of waste management costs for used products onto producers consistent with the Polluters Pay Principle.

Most of the above objectives can be factored into product design, which is the most crucial step in determining the nature and quantity of resource use and pollution emissions throughout the products' life cycles. The goal of EPR is to bring about better and cleaner product design, not to simply set up a recycling system. Years of environmental regulations have focused on controlling pollution from each individual facility with no regard to pollution arising at other stages of product life cycle. The consumers also have responsibility but in the end only the producer has ultimate choice over materials and product design. Most consumers would, in fact, welcome more reusable and repairable products but such products are less and less available.

Increasing the life of products through better design is pollution prevention. Doubling the utilisation (or, product-life) of goods cuts by half the need for raw materials and energy production, and halves the amount of post-consumer waste, without a reduction in wealth or welfare. It reduces mining waste and environmental damage in extractive industries, waste in manufacturing, distribution, recycling and waste disposal by 50 per cent. This is achievable largely with existing technology and at the same or lower price to the consumer.

Producer Responsibility Organisations

EPR provides the leverage to move towards a sustainable model of material use by changing the way the products are designed. Requiring producers to pay or be responsible for waste management would give them an incentive to make less wasteful and more economically recyclable products. This can be most effective when individual producers are required to take back and recycle their own products. But this is not practical and may not be economically viable for all the producers. For this reason, EPR policies usually permit producers to form 'Producers Responsibility Orgainisation (PROs)' which enables them to fulfill their responsibility collectively.

The Duales System Deutschland (DSD) in Germany, VALPAK in United Kingdom, El-Kretsen AB in Sweden and the Rechargeable Battery Recycling Corporation (RBRC) in United States are examples of such organisations, which are emerging in many countries along with the rapid spread of EPR programmes.

The beginning

EPR was first initiated in Germany under its Packaging Ordinance of 1991. The country was then faced with a severe landfill shortage, with packaging waste amounting to about 30 per cent by weight and 50 per cent by volume of the nation's total municipal waste stream. Under this Ordinance, the so called Dual System (DSD - Duales System Deutschland AG) was established, where the producers of all kinds of packaged products were required to take back their packaging and be responsible for handling its packaging waste. DSD charged for its green dot label to producers, who then printed green dots on plastics, metals and composites, which were collected in yellow bins or bags located at households.

In Germany, since its packaging ordinance in 1991, 30 million metric tons of packaging wastes have been recovered, amounting to 5.6 million metric tons in 1998. Between 1991 and 1998, the per capita consumption of packaging was reduced from 94.7 kg to 82 kg, a reduction of 13.4 per cent. Since then, the German EPR concept has subsequently spread to other European countries in many different forms.

In 1994, the European Commission developed a Packaging Waste Directive aimed to reduce packaging waste generation by 50 per cent throughout Europe by 2001, and recently passed legislation that will force electronic manufacturers to pay for the recycling and disposal of their products. Most members of the EU countries have now adopted this system. The system has also spread to North America and Asia, including Japan, which passed the EPR legislation for packaging in 1995.

The term 'Extended Producer Responsibility (EPR)' was coined early in this decade by Thomas Lindhqvist, a Swedish Professor of Environmental Economics who defined EPR as the extension of the responsibility of producers for the environmental impacts of their products to the entire product life cycle, and especially for their take-back, recycling, and disposal.

Thomas Lindhquist, sometimes referred to as the father of EPR, has identified five basic types of producer responsibility:

Liability - Producer is responsible for environmental damage caused by the product in question.

Economic responsibility - Producer covers all or part of costs for collection, recycling or final disposal of products .

Physical responsibility - Producer is involved in physical management of the products or of the effect of the products. This can range from merely developing the necessary technology to managing the total 'take back' system for collecting or disposing of products they manufacture.

Ownership- Producer assumes both physical and economic responsibility.

Informative responsibility - Producer is responsible for providing information on the product or its effects at various stages of its life-cycle

Although some of the applications of EPR may be new, the idea is not. After all, deposit refund systems on refillable glass bottles are some of the earliest forms of EPR. The extension of producer responsibility throughout the product cycle has been enacted or is under serious consideration in Austria, Germany, Belgium, France, the Netherlands, Sweden, Japan, Taiwan, Korea, UK and Canada, as well as in numerous sub-national governments. The range of products and waste streams targeted under these emerging EPR policies include packaging, paper goods, consumer electronic, office machinery, cars, tyres, furniture, electrical appliances, buildings and construction materials, batteries and household hazardous wastes. Clearly, the epicentre of the movement to increase the environmental responsibility of producers remains in Northern Europe.

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Policy tools for EPR

There is a range of policy instruments that can be used to encourage the producers to accept greater responsibility.

Policies that embody the principle of EPR can be classified as below:

1. **Regulatory instruments** that embody EPR can include:

- ***Mandatory take-back*** - Policies that require the producer to take back the product after its useful life is over are the most apparent form of extending the producer's responsibility into the post-consumer phase of a product's life cycle. The take back concept was started in Germany in their Packaging Ordinance and now is used in various products including batteries, cars, computers, etc. in many countries across the globe.

- ***Minimum recycled content standards*** - The policies with this, set a target of a minimum amount of recycled content per product. Targets for recycling are found in most currently operating EPR programmes and very prominently in Waste Electrical and Electronic Equipment (WEEE) programmes in European nations. This can be very important when the objectives are to increase reuse and recycling rates or reduce the amount of waste going for final disposal.

- ***Secondary material utilisation rate requirements -*** The secondary utilisation rates specify the amount of secondary materials mandatory to be used in the given product. This instrument can promote recycling and reuse of secondary materials, which will help in reducing the mining of virgin materials and thereby prevent exhaustion of the available resources.

- ***Energy efficiency standards*** - Introducing individual producer responsibility for energy consuming products can be used as a strategy to influence producers to develop products with less environmental impact. An extended individual producer responsibility would instruct producers to pay for the environmental damage caused by the products during their lifetime. This would mean that products with a high need for energy are imposed on a higher environmental fee than energy efficient products. Implementing an individual producer responsibility in full scale for energy consuming products, for instance, electrical products, cars and buildings, will create a market incentive for producers to create energy efficient products.

- ***Disposal bans and restrictions*** - Ban and restrictions on disposal of certain material can not only prevent hazardous wastes being dumped into landfills but can also encourage resource recovery. This will also reduce the landfill costs borne by the municipal bodies and benefit the countries that are feeling the space crunch.

- ***Material ban and restrictions*** - EPR programmes need to include material restrictions for highly problematic materials like heavy metals and carcinogenic materials. The precautionary principle should be applied to the decision-making process used to determine material ban. If a material has inherently harmful properties, and/or there is mounting scientific evidence of it, the material should be phased out and safer substitutes found. WEEE legislation in Europe, for example, restricts and bans uses of hazardous materials like lead, mercury, etc.

- ***Product bans and restrictions*** - This instrument looks at banning or putting restrictions on certain products, depending on the availability of alternatives, which contain hazardous or non-recyclable materials.

2. **Economic instruments** that embody EPR include:

- ***Advance disposal fees*** - An Advance Disposal Fee (ADF), in the context of EPR, would be a fee levied on certain products or product groups based on estimated costs of collection and treatment methods. Advance disposal fees are charged from either the consumer or the producers. These may be the fees paid by the producer into a government fund, which may or may not be earmarked for environmental programmes. ADF, when charged to consumers, might be a visible or invisible charge. An alternative that engages consumer participation and raises awareness by use of advance disposal fees is when the consumer is charged more than the required cost of disposal. The refund of that extra amount, in proper way, can act as an added incentive for the consumer to return the used product/waste to a specified location.

- ***Material taxes and removing subsidies for virgin materials*** - Imposition of material taxes can reduce the use of virgin, non-recyclable and toxic materials in favour of secondary (recycled) or less toxic materials. Provision for extra taxes on hazardous materials can also help in achieving this aim. This tax can be earmarked and used for the collection and treatment of the end of life products.

- ***Deposit/refund -*** Deposit refund schemes encourage reuse. They were standard practice, used most extensively on refillable glass bottles, before the age of disposable packaging and global trade. Denmark has legislated against the use of non-refillable beverage containers and implemented mandatory deposit schemes on refillable ones. It is illegal to sell beer, soft drinks and other beverages in cans. A deposit of 1-3 krone (17-51 US cents) per bottle has ensured 97 per cent of beer and soft drink packaging is reused or recycled.

- ***Environmentally preferable products procurement*** - Incentive in forms of tax relief or subsidy on environment-friendly materials and products can encourage the use of recyclable products and product innovations.

3. **Information instruments** that embody EPR:

The main objective in all the information instruments is to provide information to the consumers. Labeling for energy efficiency, Chloro Fluoro Carbon (CFC) use, etc can function as a good measure to show consumers the environmental and economic impact of the products they are purchasing. If a product contains the information about its durability, the consumer has the choice to make his /her purchase decision based on that. A consumer will, in most cases, prefer products which are long lasting leading to lower disposal rates, thus reducing the environmental burden. When consumers are provided with information regarding product/material hazard or the risk, they can match the risk and benefit of the product they choose with their own preference. Information can be provided through following instruments:

- ***Seal-of-approval types of environmental labeling***
- ***Environmental information labeling***
- ***Product environmental profiles for the whole life cycle of materials***
- ***Product hazard warnings***
- ***Product durability labeling***

Examples of EPR programmes around the world

Germany's Ordinance on the Avoidance of Packaging Waste (the 'Green Dot' programme), the first mandated EPR programme in the world, placed the financial responsibility for collecting and reducing packaging waste on manufacturers. Sweden, Norway, Taiwan and Switzerland adopted legislation that requires manufacturers of electronic and electrical goods to provide free end-of-life care for their products through licensed handlers. The Norwegian law allows consumers to take discarded white goods, personal computers, telephones, cables, electronic and industrial electrical materials free of charge to dealers of local authority collection points financed by certain 'recycling charge' on such products at the point of sale.

Netherlands has created Automobile Recycling Netherland (ARN), a group that organises material-recovery and recycling. The Dutch have also transformed their road tax into a vehicle ownership tax that people must pay until the car is officially recycled. United States implemented effective EPR programmes on a state level, through mandates imposed by state laws, regulations or policies. Some of the problems include, advanced disposal fees, deposit refund systems, such as bottle bills, and mandatory take back systems for rechargeable nickel-cadmium batteries. Japan implemented take back programmes requiring refrigerators, air conditioners, TVs and washing machines, but allows the companies to charge end user for the 'service'.

Through its leasing programme in the U.S., Xerox takes back at least 75 per cent of the equipment it sells and often accepts trade-ins on products that are not leased. This led the company to identify design options for increasing the economic values of end of life materials and parts. Xerox estimates that its efforts to design environment friendly products saved the company more than US $2 billion (96 billion Indian Rupees) in addition to keeping 1.2 billion pounds (by weight) of electronic waste out of landfills.

Although a variety of EPR systems are in operation, there are underlying commonalities. All are strategically focused on the post-consumer phase of products and imply that producers have physical and/or financial responsibility for product waste management. All approaches also set target quotas for waste reduction and recycling.

EPR in India

Though EPR has been used widely in various countries, especially in European countries, in India we are yet to explore its full potential. The only environmental legislation, which has component of EPR, is the Batteries (Management and Handling) Rules, 2001.

The rule assigns the responsibility of ensuring that the used batteries are collected back, to the manufacturer (includes manufacturer, importer, assembler and re-conditioner). The rule also makes it mandatory for the manufacturers to set up collection centres for collection of used batteries form consumers or dealers. They are also responsible for ensuring safe transportation, creating public awareness, and ensuring that the used batteries are sent to the registered recyclers.

Until recent times, in India milk and soft drinks (though soft drinks are still sold in glass bottles also, the plastic containers are fast replacing them on the shelf) were sold in returnable, refillable bottles where producers took back the empty containers. This is an example of producer responsibility extending beyond the sale point.

There is another instance of EPR proposed in the Indian legislation. The report submitted by the Committee on 'Plastic Waste Disposal' formed under the guidance of Shri Ranganath Misra contained elements of EPR. The Committee, constituted by Ministry of Environment and Forests in 2001, recommended a buy back policy in The Recycled Plastic Manufacture and Usage Rules, 1999. Under this, the plastic industry was to be made responsible for retrieving empty packaging material and have proper disposal system. The committee also proposed establishment of collection centres with 90 per cent recycling targets for Polyethylene terephthalate (PET) bottles. The recommendations are yet to be implemented.

WEEE-waste and the need for EPR

Electronics industry is the world's largest and fastest growing sector. The last decade has seen a tremendous growth in the field of information technology all over the world. As a consequence of this growth, combined with rapid product obsolescence, discarded

electronics or the 'e-waste' is now the most rapidly growing waste problem in the world. The current production of electronic products typically uses thousands of toxic chemicals, including solvents, gases, heavy metals and acids. It is a crisis not only of quantity but also a crisis born from toxic ingredients such as lead, mercury and cadmium, to name a few that poses both occupational and environmental health threats. The large quantities of e-waste being generated from homes as well as offices have spawned a new industry, the e-waste recycling, which is a lucrative business because these electronics consists of valuable metals including the gold and copper.

Years of irresponsible manufacturing and disposal of electronic and electrical equipment across the globe has resulted in major environmental problems. The processes used to manufacture electronics and electronic waste poses a significant threat to human and ecological health and worker safety due to both the volume of waste produced and the hazardous materials contained therein. E-waste has become one of the fastest growing and most toxic waste streams in the industrialised world.

The electronic waste broadly covers waste from all electronic and electrical appliances and comprise of items such as computers, mobile phones, iPods, refrigerators, washing machines, televisions and many other household consumer basic items. All such electronic and electric items on completion of their useful life are being discarded and contribute to the quantum of waste. With growing consumerism and increased growth rate, the generation of this waste has grown manifold and would continue to accelerate at a fast pace.

The main sources of electronic waste in India happens to be government, public and private sector discards, which accounts for almost 70 per cent of the total waste. The contribution of individual households is relatively small at about 15 per cent. Other sources are the computer manufacturers.

Another major source of e-waste is the imports of such material being brought in illegally. This adds to the volume of waste generate within the country. The accurate data on such imports is not available largely owing to the nature of trade. However, estimates suggest that the imports account for an almost equal amount to what is being generated in the country. Lack of stringent environmental regulations, weak enforcement mechanisms and the ill informed population, all contribute to the growing imports of e-waste in India.

In India, there is no law, which specifically deals with the issue of e-waste and lays down the process for collection and its disposal. The current National Rule on Hazardous Waste Substances covers the various aspects including the generation, storage, transportation and disposal of hazardous waste. This is more equipped to handle the issue of large industrial houses generating waste or traders of these hazardous waste as well as the facility mangers of such waste. However, this regulation completely falls short of addressing the issue of e-waste in totality.

In view of the magnitude of the problem and the situation that emerges from it, there is an urgent need to have a suitable legislation on recycling of electronic and electric waste. The legislation should address the problems of imports as well as domestic generation of waste.

Any solution to this issue needs to be seen in the broader context of sustainable development. Some of the basic principle of the environmental justice such as 'precautionary principle' and 'polluter pays' should be the overriding factors to design solutions.

Extended Producers Responsibility is perceived to be the most appropriate framework that attempts to amalgamate all the enlisted principles of environmental justice. This framework shifts the responsibility of safe disposal on to the producers. It not only looks at downstream solutions but also at upstream technology. It promotes sound environment management technology and also aims at better raw material and cleaner production technology. The EPR models being implemented in many developed countries need to be suitably altered to suit the localised conditions prevailing in this country.

European Union EPR directives for electronic products

The European Union has adopted two EPR directives: The Waste From Electrical and Electronic Equipment (WEEE) and the Restriction on Hazardous Substances (ROHS). A key achievement of the legislation was establishing *individual* responsibility for all products put on the market after 2005. Individual responsibility mandates that producers handle their own waste closing the feedback loop between front-end design decisions and end-of-life problems—thus promoting a greater incentive for greener design. The Directives cover a broad range of electronic products ranging from computers to hair dryers to refrigerators to electronic toys.

Key Components of Europe's EPR Directives:

Financing of electronic waste equipment: Consumers can return e-waste to collection points free of charge. Individual producers bear the costs of organising disposal, recycling and reuse of all products they put on the market after 2005. Producers can charge consumers an additional front-end fee that varies depending on the particular product.

Labeling: Producers must clearly label their products to allow for identification and to inform consumers that e-waste is banned from municipal waste and must be handled separately.

Product design: The WEEE Directive mandates that products must be designed for dismantling and recovery. By 2006, industry will have to recycle or reuse more than half of the old equipments on the market. The Directive specifies recycling rates that increase over time.

Ban on hazardous substances: The compromise reached provides that the use of substances such as lead, cadmium, mercury, hexavalent chromium and certain brominated flame-retardants to be phased out by July 1, 2006.

Collection and recovery of waste equipment: The member states had until 2005 to introduce take back systems and collection facilities for all electrical and electronic equipments. An initial collection target of 4 kilos per person per year has been set by the European Commission, a target that each Member State is expected to reach by December 31, 2006. While it falls on Member States to ensure that these targets are attained, it is the responsibility of producers to set up the take-back systems. New collection targets will subsequently be set by the Commission based on the results and experiences of take-back systems in Member States. The WEEE Directive is unclear on who should pay for collecting the waste from households and delivering it to central collection facilities. There is currently a debate between local authorities, industry and EU government officials on how to resolve this outstanding issue. Retailers are also concerned that they will likely have to play a role in collection. The Directive now states that customers can return old electronic products to retailers if they are the buying the same type of item.

The European Union Directive will create a uniform EPR system enabling industry to avoid meeting different requirements set in member countries (although individual countries under European law can appeal for more stringent requirements). Contrary to the electronic manufacturers in the United States, most of the major European electronic manufacturers supported the Directives. In fact, European environmental organisations and electronic manufacturers wrote a joint letter to the European Commission in support of the Directives.

Cases of EPR for electronic waste in some countries

EPR in Belgium

WEEE legislation is fully implemented in Belgium, and companies selling electric and electronic products in the Belgium market must be able to prove they are meeting their take-back obligations.

The manufacturers and importers of electrical and electronic equipment founded Recupel as a non-profit organisation with the support of the Belgian regional governments. The system, which came into force on July 1, 2001, is responsible for collection, sorting, processing and recycling of WEEE in Belgium. The system currently covers almost 75 per cent of Belgian territory, with 4 kg collected/inhabitant on an annual basis.

At the time of purchasing a new electrical or electronic appliance, the end user contributes a fixed amount to the costs, which is determined by the type of appliance and it corresponds to the actual cost of recycling. The costs range from 20 Euros (approx. 1100 Indian Rupees)

for cooling and freezing equipment to 9 Euros (approx. 500 Indian Rupees) for PCS to 0.1 Euro (approx. 6 Indian Rupees) for smaller goods.

Manufacturers and importers that belong to Recupel have to pay the recycling contribution to Recupel for each appliance put on the market.

In 2002, RECUPEL collected 35 875 tons of WEEE (3,5 kg per inhabitant) and achieved a global 80 per cent recycling rate. In 2003, RECUPEL collected 45.037 tons of WEEE (4.5 kg per inhabitant) and achieved a global 83 per cent recycling rate and 87 per cent recovery rate.

EPR in Netherlands

The Netherlands enacted EPR legislation requiring manufacturers and importers of large and small-scale electronic products to establish take back systems with retailers, local governments and repair shops serving as collection sites. In addition to producer responsibility, Dutch EPR programmes include recycling targets, which have been met or exceeded 86 per cent of refrigerators are recycled, 75 per cent of large home appliances, 78 per cent of televisions and 64 per cent of smaller appliances.

Manufacturers are allowed to charge consumers for end-of-life costs through invisible fees (included in the price of the product) and visible fees (advanced disposal fees). Up until 2005, manufacturers can share take back responsibilities with other businesses through collective recycling programmes often run by third party entities. After that point, individual manufacturers will have to set up brand specific take back programmes, which ultimately are more effective in influencing front end design decisions.

For white goods, 5 main producers' sector organisations have joined within NVMP (Netherlands Association for Disposal of 'Metalelectro' Products) while ICT-Milieu has been set up for the management of grey goods (IT equipment, paper printing equipment and telecommunication goods).

Both take, through official carriers, goods discarded by consumers from Regional Transfer Stations, retailers and repair companies to their recycling partners.

The charges for large household applicants range from 5-17 Euros (approx. 285- 1000 Indian Rupees)

EPR in Sweden

Back in 1997, Sweden experimented with EPR programmes for electronic waste through a take-back pilot project with cell phones. Manufacturers contracted a recycling centre to collect cell phones and disassemble and separate components for reuse, recycling and proper

disposal (such as printed circuit boards, plastics, metals and batteries). The programme proved so successful that manufacturers are still using it today.

Building on the success of the cell phone pilot project, in 2001, Sweden enacted the Ordinance on Producer Responsibility for Electrical and Electronic Products. This law requires manufacturers, importers and retailers to take back a wide range of electronic products free of charge to the consumer. Most manufacturers participate and pay into a collective recycling system operated by a third party non-profit organisation. Participation fees are based on the number and type of products put on the market. Collective financial responsibility gives less incentive for upstream design changes as brand name products are mixed together making it difficult to identify specific end-of-life problems.

El-Kretsen is a service-oriented company founded in 2001 and owned by 20 industrial organisations in Sweden. It was established to resolve the producer responsibility for electronic waste. El-Kretsen runs a nationwide system for the collecting and recycling of electrical and electronic products. The system is called Elretur and is run together with all the municipalities of Sweden. The system is very simple for households to use, as they can return their electrical waste at the same place where they dispose regular waste. It is also convenient for producers, who through El-Kretsen get access to a nationwide well-established collection system. El-Kretsen is financed through the fees its member pays. The fees are calculated from the volumes of sales.

The quantity of collected discarded electrical products was a record high in 2005. El-Kretsen collected 112 Million Kilos. If the number of fridges and freezers recycled by the municipalities between January and July is added, the figure is a total of 126 Million Kilos (Since August 2005, the responsibility for collecting and treating household fridges and freezers was shifted from the municipalities to El-Kretsen.), which equals approx.14 Kilos per person in Sweden.

EPR in Switzerland

In 1998, the Swiss Federal Council passed a directive that regulates the take-back and recycling of electrical and electronic appliances (ORDEA). The ORDEA conditions that defective or obsolete devices can no longer be disposed of with the usual domestic waste, but must be returned to retailers, importers and manufacturers or delivered to specialised disposal facilities or public collection points (obligation of return). Retailers, manufacturers and importers selling electronic or electrical appliances are obliged to accept old items back from their customers, for re-use, recycling or disposal in an environmentally tolerable way.

SWICO (Swiss Information and Communications Technology Industry Association) funds the collection and disposal of appliances by charging an advance recycling fee added to the purchase price of new appliances. The SWICO Recycling Guarantee has been in place since 1994. It guarantees that used equipment is taken back comprehensively from the following sectors: informatics; office electronics, consumer electronics, tele-communications, graphics

industry and dental industry. Used equipment can be handed free of charge for recycling. The recycling operations are financed by consumers, who pay an amount in the form of an advanced recycling fee (ARF) when they purchase new equipment. The contribution is specifically stated on the invoice or the purchase order at the time of purchasing the equipment, which range from 10-20 Euros (approx. 580-1100 Indian rupees) for TV sets to 1.37 Euros (approx. 78 Indian rupees) for portable equipments.

In 2005 some 42,000 tonnes of used equipment were professionally recycled. This means more than 75 per cent of the material was returned to the raw materials cycle.

EPR in Norway

The Ministry of the Environment in 1998 enacted Norwegian legislation on WEEE. The Norwegian legislation is said to have been a model for Directive 2002/96/EU WEEE, and goes beyond the EU-directive by opening up for all types of electronics and machinery, not only consumer electronics.

Under the Norwegian regulation, the distributor of EE Products (anyone who on a commercial basis sells new and/or used EE Products, both wholesale and retail), in addition to the municipalities, is obliged to accept returned EE Waste, which is consumer waste, free of charge, at his place of business. The distributor is also obliged to accept EE Waste, which is production waste free of charge against new purchases of an equivalent quantity of new products. The reception obligation is restricted to such EE Products as the distributor sells, plus EE products he has previously sold within the same product range. The reception obligation is not restricted to brand or manufacture. The distributor of EE Products shall ensure that EE waste is sorted, properly stored and forwarded to a collection-point where such is established in such a way that it is suited for further treatment in conformity with the rules or else to an approved treatment facility.

The manufacturer/importer of EE Products, in turn, is obliged to arrange for the collection, free of charge, of EE waste from distributors and municipalities in geographical areas of the country corresponding to those in which their EE products are sold, were sold or were supplied. They are also responsible for ensuring that materials and components of EE waste that is hazardous waste are sorted and disposed of in an approved treatment facility.

For white/brown goods, the consumers are charged visible advance recycling fees (ARF) which range from 0 charges for small products to 17 Euro (approx. 950 Indian rupees) for refrigerators.

EPR in Germany

There is an Act governing the sale, return and environmentally sound disposal of electrical and electronic equipment (Electrical and Electronic Equipment Act, or ElektroG) which

combines WEEE and ROHS (EU). Germany has adopted 10 categories with some exceptions like light bulbs.

EPR requires producers to finance a take-back system by registering with the Elektro-Altgeraete Register (EAR, or State clearinghouse) and paying an annual financial guarantee. The guarantee pays for collection and recycling of household goods to municipal collection points if the producer becomes insolvent after March 24, 2005.

It is important to understand that the Act distinguishes WEEE from households and businesses. Household users can return their goods free of charge to municipal collection points. Business users must arrange their own transport to the collection point.

EPR in Ireland

WEEE Ireland is a not-for-profit organisation, founded by producers of electrical and electronic appliances in order to comply with the legal obligations imposed by the WEEE Directive 2002/96/EC. The Irish government implemented the WEEE Directive 2002/96/EC in August 2005. From August 13, 2005, all producers and distributors (retailers) of EEE have to comply with the WEEE Regulations 2005.

Prior to the introduction of the WEEE Regulations 2005, much of the WEEE in Ireland was disposed of in the municipal waste stream directly to landfill. Since the introduction of the regulations, consumers can bring their unwanted electrical and electronic equipment to their local civic amenity centres or to retailers when they purchase new equipment for recycling. Half a million household appliances have been taken out of the waste stream and recycled since the implementation of the regulation, including 85,000 fridge freezers, 78,000 TVs, etc. A collection rate of 7kg/inhabitant has been achieved already and Ireland is on course to achieve double EU target of 4kg/inhabitant by end 2008.

WEEE Ireland organises for the treatment and recycling of waste electrical and electronic equipment from authorised collection points, on behalf of its producer members. WEEE Ireland has 360 members, which represents approximately 80 per cent of the total weight of EEE placed on the market. The bulk of material collected is processed and recycled in Ireland, except refrigeration units, which are processed in other European countries.

EPR in Korea

In Korea, continuous efforts have been made to promote recycling and reduce waste over a period of many years. Under the Producer Deposit System of 1992, producers of home appliances, tires, lubricants, batteries, paper goods and metal cans had to pay deposit to the government to receive refunds proportional to the amount of recycled products and product waste. This system, however, was limited in promoting recycling because it did not place enough recycling responsibility directly on the producers. EPR was first introduced as part of a government aim to establish an economic system of cyclical resources, where waste

generation is minimised through resource conservation and efficient resource use, and where the generated waste is recycled as much as possible.

According to the system, product manufacturers take the full responsibility for the recycling and disposal of their products. Products subject to EPR includes electronic appliances like televisions, refrigerators, washing machines, tires, lubricants, fluorescent lights, and packaging materials such as cans, glass bottles, and plastic bottles. As the system has taken a full effect as of 2003, the list of recyclable materials to be separately collected has further expanded to include PCs, plastic bags and wrappers, styrofoam materials and cellular phones.

In 2002, a pilot project for the EPR was launched for home appliances and fluorescent light bulbs. Three major manufacturers collected and recycled their products after the consumers used and discarded them. The results of the pilot project indicated that this measure not only promotes recycling, but also forces manufacturers to improve product design so that waste generation is minimised and recycling becomes easier. With its official launch in 2003, EPR was extended to include product packaging, batteries and tires, and the list of recyclable materials will be further expanded. The volume-based waste system is in place in Korea and most residents separate recyclable goods from garbage. Local governments also encourage separation of recyclable waste and are encouraged to set up waste storage containers and facilities.

EPR in Japan

Japan was one of the first countries to confront the overwhelming amount of hazardous electronic waste. With over 70 per cent of electronic goods produced by Japanese manufacturers, it has been a testing ground for EPR programmes.

In 1998, Japan enacted the Specified Home Appliance Recycling Law (SHARL), which requires producers to take back television sets, refrigerators, air conditioners and washing machines. The law requires recycling rates of between 50-60 per cent by weight, which could be fulfilled by reusing and recycling product components. Due to the levels of lead and other hazardous materials in cathode ray tubes and printed circuit boards, Japan also enacted the Waste Treatment Law, which requires 'environmentally sound' treatment of these product components. However, Japan relies heavily on incineration and advocates continued use based on cost comparisons to material recycling.

For computers and other large scale appliances not covered by SHARL, Japan enacted the Revised Law for Promotion of Effective Utilisation of Resources, which requires manufacturers of computers, copy machines and large electrical home appliances to design for disassembly, recycling and waste reduction and longevity of use (repair, reuse and recycling). Recent revisions of the law mandate producer take back for business computers and appliances. Manufacturers can charge consumers for end-of-life waste management costs (collection, take back and treatment).

Under SHARL, the consumer pays a collection/recycling fee when s/he leaves the product at the collection point or retailers. S/he also hands over a recycling ticket bought from the post office or the retailer. The ticket is a receipt for the collection fee. If the consumer buys a new appliance at a retailer, s/he can return the old product. Even if an exchange is not made, however, the consumer must still buy a recycling ticket beforehand and show that ticket to the retailer when returning the discarded product in the future. Retailers take back discarded appliances and pass them on to manufacturers along with the recycling ticket. Manufacturers recycle unwanted goods. They receive the recycling fee each month.

The retailer and the manufacturer have the discretion to decide the amount of the recycling fee. The standard fees are Air conditioners: $23 – $30, Refrigerators: $30 – $38, Televisions: $18 – $24, Washing machines: $16 – $22. For PCs, there are 2 recycling financing schemes that depend on the date of buying. If pre- Oct. 1, 2003: there are end-of-life fees from $27-$37 dollars (approx. 1200- 1700 Indian rupees). Post- 1 Oct. 2003, the fee is included in the PC's price and is called front-end financing mechanism

Most of the Japanese EPR laws require physical take back for specified electronic goods allowing financial costs to be passed onto consumers. In contrast to European manufacturers who have relied more on collective recycling systems shared by many producers, individual Japanese manufacturers develop and manage their own recycling programmes for their brand name products. As such, Japanese manufacturers have created stronger feedback loops between upstream and downstream actors.

EPR in Taiwan

Taiwan's take-back system for computers, TVs, refrigerators, washing machines and air conditioners has been in effect since March 1998. The system requires retailers to accept used electronics from customers, and will cover equipment regardless of when it was sold.

Conclusion

There are number of environmental concerns which arise from the production and disposal of electronic and electrical equipments. The environmental impact of their production is often high. Also, because of the increasing volumes and varied nature of WEEE, it is difficult to dispose of. It is either discarded in landfill sites, which have limited space available in the long term, or recycled in crude manner. WEEE contains significant amounts of toxic constituents, which may present hazards to public health and the environment.

In order to address these problems, EPR emerges to be a useful policy tool. Application of this tool will not only help in managing this growing waste, but will also encourage the manufacturers or producer to redesign their products. EPR is a tool to ensure responsibility is placed on the party with the greatest ability to reduce the environmental and human health impacts of products: the brand owner/manufacturer. During the design stage, brand

owners/manufacturers are in the position to select safe materials, minimise toxic waste throughout the life cycle, increase the useful life of the product and facilitate disassembly and reuse of the product at the end of its life.

EPR is also a tool to moderate resource consumption. Consumer products are typically designed for one time use, to be thrown out by consumers at the end of life and disposed of in landfills and incinerators. This has led to unsustainable consumption patterns that are depleting the world's stock of raw materials at a rate faster than nature can sustain. EPR encourages producers to create products that last longer and manage materials so they are continually reused and recycled in a closed loop system.

EPR is an instrument to achieve better product design. Many of the materials used in products are harmful to human health. As a result, harmful pollutants are dispersed from products during production, use and disposal. Society, as a whole, pays for the added costs of these impacts, whether it is in higher healthcare bills or increased waste management expenses. When producers pay for managing product waste at end of life, they have an incentive to design products that are less toxic, less over-packaged, longer lasting and designed for reuse and recycling.

The disposal of WEEE also represents the loss of large amounts of valuable resources, in particular metals and plastics. If these were to be recycled it would not only divert the waste from disposal but would also reduce the need to use virgin raw materials.

Also, since the producers have a better knowledge of the structure and content of the complex EEE products, they can use their expertise while managing the products in the post-consumer stage and can perform waste management/recycling more cost efficiently and environmentally effectively.

Though there are some voluntary EPR programmes in some countries, it is seen that Government-enforced targets and deadlines for the phase out of hazardous materials and the collection, reuse and recycling of designated products are achieving more positive changes in the way products are currently designed with minimal impact on the profitability of affected industries. Thus EPR will lead to product innovation, cost savings, reduced environmental liabilities and increased customer satisfaction

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