Extended Producer Responsibility in a Non-OECD Context: The management of waste electrical and electronic equipment in India

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EXTENDED PRODUCER RESPONSIBILITY IN A NON-OECD CONTEXT:

THE MANAGEMENT OF WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT IN INDIA

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Migrant workers take apart electric devices in Guiyu, China.

Prologue by Greenpeace International

Greenpeace International commissioned this report to test how the principle of Extended Producer Responsibility (EPR) for waste from electronics equipment (e-waste), embodied in EU, Japanese, South Korean and other OECD (Organisation for Economic and Co-operation Development) legislation could be applied effectively in countries outside of the OECD.

Greenpeace believes that laws requiring producers to take responsibility for their products, once discarded by their customers, are urgently needed worldwide to tackle the global e-waste crisis. Although China has restricted hazardous substances in some electronic products and both China and Thailand have EU-type laws for Waste from Electrical and Electronic Equipment (WEEE) pending, they are the exceptions in the developing world.

There are plenty of reasons why non-OECD countries should introduce EPR laws to deal with e-waste and the sooner, the better.

Developing countries have growing amounts of their own domestic e-waste with virtually no formal infrastructure to deal with it. They also import used e-products from the rich world for re-use and repair, which end their lives as e-waste in places with no formal facilities for their recycling. In addition, many non-OECD countries, like India and China, accept legal and illegal imports of e-waste, often under the pretext of re-use, which are subsequently recycled in very primitive conditions.

E-waste from obsolete consumer products has to be detoxified to enable its safe recycling. Since it is the producers who chose what materials to use in the design of their products, only the producers can make the switch to safer materials. Making producers responsible for the waste generated by their products creates the incentive for their product designers to design out the costs of dealing with toxic waste.

The products of the same global electronics manufacturers are present throughout the developing world. In countries with EPR laws, like the EU, some US states and Japan, these same companies are financially responsible for dealing with the waste from their products, meeting collection and recycling targets and other obligations. Yet, in non-OECD, these same companies have no such responsibilities. Although several global mobile phone and PC companies are trying to redress these double standards by starting voluntary takeback and recycling programmes, they are hampered by numerous difficulties. For example, how can these companies guarantee “responsible recycling” in countries where the informal sector dominates the market? Moreover, their less responsible competitors are free to continue business as usual without the costs of treating the waste from their discarded products.

This is where governments have to step in. EPR laws for e-waste implemented globally would level the playing field for the electronics sector – which after all is a global industry. As priority, governments should not only copy the EU Directives, but learn from their shortfalls and pass stronger regulations.

Many developing countries host production facilities where workers are exposed to the same harmful substances that are later found in the products. There is increasing evidence of even wider worker and community exposure to the toxic chemicals in e-waste when it comes to be recycled. Greenpeace has documented the toxic hotspots from e-waste recycling in the backyards and workshops of India and China[1]. A recent study simulating the type of primitive recycling operations prevalent in these countries found alarming levels of chlorinated and brominated dioxins in air emissions and ash during the burning of PVC cables and circuit boards[2]. This all points to the need for governments to go beyond the current EU list of restricted substances (RoHS Directive) and include PVC (vinyl – a major source of chlorinated dioxins and furan when burnt) and all brominated flame retardants – not just those already banned by RoHS.

Non-OECD countries that allow the import of e-waste for recycling should immediately close their borders to this trade, as it will continue to feed the informal recycling sector and hamper the introduction of EPR programmes. Thus, not only must OECD countries stop exports of collected e-waste, the Southern countries - the destinations for this waste - must also stop its import. Toxic waste, like e-waste, must be treated as close as possible to the place it is generated.

Just as an EPR legislative package must include administrative instruments like RoHS Plus, so non-OECD governments[3] must also include a ban on imports of e-waste and impose strict controls on import for re-use.

Using India as a case study, this investigation acknowledges that although there are serious challenges to introducing EPR legislation, there are also unique opportunities. The authors conclude that there are no insurmountable obstacles to the implementation of EPR legislation in India. This analysis of the Indian situation can act as an example and encouragement for other non-OECD countries.

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1 Brigden, K., Labunska, I., Santillo, D., and Allsopp, M. (2005). Recycling of Electronic Wastes in China and India: Workplace and Environmental Contamination. [Online]. Available: http://www.greenpeace.org/international/press/reports/recyclingelectronicwasteindiachinafull
2 Gullet, B. K., Linak, W. P., Touati, A., Wasson, S. J., Gatica, S., King, C. J. (2007). Characterization of air emissions and residual ash from open burning of electronic wastes during simulated rudimentary recycling operations, Journal of Material Cycles and Waste Management, 9(1): 69-79.
3 Some non-OECD governments have already banned toxic waste imports as part of ratifying the Basel Ban amendment.

Preface

This report, commissioned by Greenpeace International, presents a four-month research on the possibility of implementing the principle of Extended Producer Responsibility (EPR) for waste electrical and electronic equipment (WEEE) in non-OECD countries. The research, conducted between February and May 2007, selected India as our case country to investigate. The majority of the work – data collection and compilation of report – has been performed by Panate Manomaivibool.

The authors would like to thank Greenpeace International and Greenpeace India for engaging the IIIEE in the topical task of examining the possibility of applying EPR in non-OECD countries. The processes of reviewing experiences and arguments, interacting with stakeholders and observing the reality in India have been both rewarding and challenging and enriched us with a deeper understanding of the principle and of non-OECD countries. Special thanks to Ramapati Kumar, Greenpeace India, who coordinated activities in India.

The empirical materials regarding the E-waste management in India constitute an integral part of this report. The authors would like to express our gratitude to the stakeholders in India for their time and invaluable inputs. We would also thank conference participants of the 7th Asian Pacific Roundtable for Sustainable Consumption and Production for exchanging ideas. Our gratitude is also directed to alumni of the International Institute for Industrial Environmental Economics (IIIEE) in India for their kind help in verifying our understandings and findings.

Several reviewers have taken the time to read earlier draft versions of the report and their input is much appreciated and has improved the quality of the report significantly. We would especially like to thank external reviewers: David Rochat, India e-Waste Project Coordinator; Swiss Federal Laboratories for Material Testing and Research (EMPA); Jim Puckett, Basel Action Network (BAN); Gregory J. Tyson, Associate Consultant, UNEP/Wuppertal Institute Collaborating Centre on Sustainable Consumption and Production (CSCP); Viktor Sundberg, Vice President Environmental and European Affairs, Electrolux Household Products Europe, and Kieren Mayers, UK and Ireland Reverse Logistics Manager, Geodis UK Ltd. for their useful comments. The full responsibility for the report remains, however, with the authors.

Remains of an Apple computer in a Chinese scrap yard (Guiyu).

List of Acronyms

ATF	Authorised treatment facility
B2B	Business-to-business
B2C	Business-to-consumer
CFCs	Chlorofluorocarbons
CPR	Collective producer responsibility
CRT	Cathode ray tube
DfD	Design for disassembly
DfE	Design for environment/Eco-design
DfR	Design for recycling
DVD	Digital versatile disc
EEE	Electrical and electronic equipment
ELV	End-of-life vehicle
EMS	Environmental management system
Eol	End-of-life
EPR	Extended producer responsibility
EU	European Union
ICT	Information and communication technologies
IPR	Individual producer responsibility
MNC	Multinational corporation
MSW	Municipal solid waste
OECD	Organisation for Economic Co-operation and Development
PBDEs	Polybrominated diphenyl ethers
PRO	Producer responsibility organisation
PSS	Product-service system
PVC	Polyvinyl chloride
PWB	Print-wired board
RoHS	Restriction of the use of certain hazardous substances
SMEs	Small- and medium-sized enterprises
VOCs	Volatile organic compounds
WEEE	Waste electrical and electronic equipment/E-waste

Executive Summary

This report, commissioned by Greenpeace International, investigates the possibility of implementing the principle of Extended Producer Responsibility (EPR) for waste electrical and electronic equipment (WEEE) in one of the non-OECD countries – India. Its aims are two-fold. Firstly, in Part 2, it clarifies the principle to facilitate its informed and complete implementation. Secondly, in Part 3, it checks the suitability of implementing EPR in the current Indian context.

A policy principle with two families of objectives

EPR is a policy principle meaning that it aspires to certain goals and guides the selection and setting of policy instruments towards them. There are two families of EPR objectives (Section 2.1). The first is design improvements of products and product systems. In other words, an effective EPR programme must systematically provide incentives to the manufacturers of targeted products to invest in design for environment (DfE). All things being equal, the closer an EPR programme comes to Individual Producer Responsibility (IPR) - where an individual producer bears the responsibilities related to the environmental performance of his/her products and product systems - the more effective it will be.

The second is high utilisation of product and material quality through effective collection, treatment, and re-use or recycling in an environmentally friendly and socially desirable manner. The end-of-life management has been the weakest link in the production responsibility chain and is an important stage where producers' responsibility is extended in existing EPR programmes. To be able to contribute to sustainable development, a downstream network under an EPR programme must not only be economically viable but also environmentally friendly and socially desirable. As will be shown in Part 3, this latter point is particularly crucial in non-OECD countries where currently most WEEE is handled by groups of disadvantaged populations in the so-called 'informal sector' using rudimentary methods with little or no protection against health and environmental hazards.

Products are not homogeneous

Products under an EPR programme are not homogeneous, at least in the transitional period. A four-cell typology in Section 2.3 shows that different types of products have different emphasis in the programme. An effective EPR programme must: (1) differentiate between new and historical products; (2) prevent the occurrence of new, orphan products and free- riders in general; (3) provide incentives for DfE in new product development; (4) ensure high utilisation of product and material quality through effective collection, treatment, and re-use or recycling of all products, and (5) have an acceptable method of distributing the costs relating to historical products. This is based on the fact that only new products can be redesigned and that the problem of new, orphan products – e.g. due to bankruptcy of an otherwise identifiable producer after he/she puts products on the market– can be prevented in an ex ante fashion with the front-end financial guarantees.

A man stands next to a large heap of e-waste scattered on the side of the road in Guiyu, China.

Different types of responsibility and several ways to implement IPR

There are four types of responsibility: physical responsibility, financial responsibility, liability, and informative responsibility. As shown in Section 2.3, some types of responsibility in certain activities can be advantageously allocated to other actors, besides the producers. Examples are: a retailer's physical obligation to provide a convenient take-back service to final consumers; municipalities' physical involvement in collection, and monitoring and enforcement by the trade association, competent authority, or third parties.

The analysis of types of responsibility also reveals that there is more than one way to implement IPR. IPR is possible even when the producers do not bear all types of responsibilities in all activities. Appendix I compiles such examples of IPR. Specifically, Section 2.4 argues that IPR can exist within a Producer Responsibility Organisation (PRO) which is a crucial component of most, if not all, existing EPR programmes. Successful marriage between IPR mechanisms and a collective body is a prerequisite of the programme's effectiveness. Here, there will be incentives for design improvements, while the programme can still benefit from a PRO by helping small- and medium-sized producers to fulfil their responsibility; by lowering transaction costs and by peer monitoring of potential free-riders.

EPR is implemented through a combination of policy instruments and is translated into laws

EPR is implemented through a package of policy instruments – administrative, economic and informative instruments. Policy instruments are not inherently EPR and can also be employed in a non-EPR programme. However, when used in an EPR programme, their performance must be judged on how these policy instruments and their combination would contribute to the achievement of the two EPR objective families. Section 2.5 discusses the effects of such reinterpretation on four administrative instruments – substance restrictions, re-use and recycling targets, environmentally sound treatment standards, and treatment and disposal restrictions. It also illustrates the use of one informative instrument – labelling – together with a brief, general discussion of economic instruments. When employed in an EPR programme, the merit of these instruments should be judged on their contribution to the upstream and downstream objectives.

Section 2.6 is dedicated to the translation of EPR into laws. It argues that the development of an EPR programme can capitalise on existing administrative fragmentation – regulating production and waste management normally fall under the remit of different authorities – by harmonising the emerging global standards in the area of substance restrictions under the product standards system, while leaving more time to develop the WEEE legislation. This fragmentation can also allow legislators to combine the strengths of comprehensive and selective approaches by having a comprehensive scope for upstream activities and a selective one for downstream activities. This section also discusses possibility and risk relating to the distinction between B2B and B2C products. In addition, it stresses the need for a level playing field between compliance schemes – small and large compliance schemes must be treated equally; being a member of a collective compliance scheme should not exempt producers from paying a financial guarantee for future WEEE – and for the provisions for non-compliance. In addition, Appendix III provides a cross-country comparison of the WEEE management system in selected OECD and non-OECD countries.

Missing components in the current Indian situation

Section 3.1 describes the situation at present in India without an EPR programme. Distinctive features of this situation are the existence of so-called 'no-name'-branded products, lucrative re-use markets for certain product groups, considerable inflow of imported used products, and the informal recycling sector. On the other hand, three necessary components of EPR programmes – (1) a formal sector comprising authorised treatment facilities (ATFs); (2) monitoring and reporting infrastructure, and (3) additional financial flow(s) from the (identifiable) producers to the formal downstream operators – are missing. The rest of Part 3 develops into a scenario where these three basic requirements of any EPR programme are established in India.

The opportunities if an EPR programme were to be established in India now

Section 3.2 lists six opportunities if EPR were to be implemented in India now. First, India currently has a relatively small stock of domestic historical products due to low penetration rate in the past. The fact that the market is far from saturation, and the penetration rates are continuously increasing, means that distributing the cost of historical waste onto new products sold would not lead to dramatic price increases. However, this also means that the cost of policy inaction would increase rapidly over time.

Second, the big share of corporate users for certain product categories, such as information and communication technologies, can act as a buffer to smooth out the transition period. Obsolete products from these sources are, in general, of higher quality (in terms of homogeneity and value) and quantity than those from private households. In addition, facing internal and external stimuli, corporate users can be made to commit to delivering their obsolete products to a cleaner channel without direct economic compensation. However, there is a risk of overestimating the amount of B2B share, due to a hidden flow of obsolete B2B products to the B2C sector.

Third, recycling systems of an EPR programme can be built upon existing lucrative downstream businesses in India through the formalisation of the informal sector. Some low-risk operations, such as collection, can be left to the informal sector, while others such as manual disassembly will benefit from the improvements of working standards to protect the environment and workers' health.

Fourth, having a separate system to take care of WEEE would lift the burden from municipalities who otherwise have to handle it as a part of municipal solid waste (MSW). In addition, with spare capacity, they can play the role of service providers in the system.

Fifth, some existing business practices and initiatives in India are in tandem with EPR. Two such practices are mentioned in this report: retailers' trade-in practices and producers' voluntary free take-back schemes. Their relationship with an EPR programme can be two-fold. On the one hand, the programme can be partly developed on them. On the other hand, the programme can further their scope and environmental benefits.

Sixth, India can capitalise on experiences from existing EPR programmes and the like abroad. India is then placed in an advantageous setting where not only does she have an opportunity to apply the principle in a way that is suited to her context, but also to leap-frog ahead with superior application that avoids past pitfalls apparent in existing programmes. Multinational corporations (MNCs) might also transfer their global experiences in terms of technologies and know-how to India. In addition, it is particularly advantageous for India to harmonise with some international standards such as the RoHS-like product standards and the legal transboundary movement of used products.

Challenges also exist but they are manageable and should be managed

Despite the merits of the principle and aforementioned opportunities, some stakeholders are concerned that the Indian specificity would render EPR inappropriate and non-functional. Section 3.3 addresses six issues, one of which – effects on the re-use market – does not constitute a real challenge in itself, as an EPR programme designed to capture WEEE would hardly be able to compete head on with the re-use market. The other five challenges are, on the other hand, real.

First, the formal recycling sector comprising authorised treatment facilities (ATFs) has still to be established in India with a collection network able to divert WEEE to the sector. In addition, authorisation infrastructures in India, be they regulatory framework, financial or human resources, must be strengthened in order to support the incorporation of prospective facilities into the system, whilst at the same time maintaining rigorous standards of authorisation. This is a challenging but not impossible task, and many countries, OECD and non-OECD, have demonstrated good examples of resources mobilization, standard setting and authorisation.

Second, a more fierce challenge, is the competition from the informal sector for WEEE, unless the whole informal sector can be formalised. Informal recyclers are able to pay more for end users' WEEE because they avoid the costs of proper handling of WEEE. Therefore, not only would the shortage of supplies render ATFs economically non-viable, but the uncontrolled handling of WEEE in the informal sector, such as acid bathing and open burning, would also endanger the health of workers in the informal sector and surrounding communities, as well as damage the environment. This implies the need for (1) additional financial flow to ATFs – in terms of recycling subsidies sourced from producers and proportional to the amount of WEEE collected by respective ATFs – enabling them to offer competitive buying prices for WEEE to end users, and (2) for auditing and certification mechanisms to ensure that the right amounts of subsidies go into the right hands.

Third, though India is party to the Basel Convention, it has been documented that WEEE is imported under the guise of re-usable EEE. This illegally imported WEEE helps to sustain the informal sector, and hence the second challenge. Additional finance in an EPR programme – needed to address the second challenge – might attract illegally imported WEEE into the system and jeopardise its viability unless the auditing and certification mechanisms were able to block their entry. To prevent this from happening, measures are needed to stop this illegal traffic. One solution is to give customs teeth to stop the shipments by having clear guidelines which distinguish used EEE for re-use, from WEEE for recycling and disposal. Another is to have a blanket ban on all imports of used EEE to the country, irrespective of the purposes.

Fourth, from an EPR perspective, the biggest challenge is the existence of no-name-branded products – born-to-be-orphan products. This is because it ensures that the problem of orphan products can never be resolved. However, a close investigation reveals that these no-name-branded products are normally comprised of products from two sources – the grey markets and small assembling shops. The former is a consequence of ill-conceived tax structure and hence can and should be rectified accordingly. The latter can be incorporated into an EPR programme, at least indirectly without having to scrap this 'low-risk entrepreneurship learning space'.

Fifth, small- and medium-sized manufacturers (SMEs) are in general poorly equipped to compete on the basis of DfE. Therefore, it is advisable to have supportive measures to increase the penetration rate of DfE among SMEs. Examples of such measures are research and development, information sharing programmes and workshops, and benchmarking.

In conclusion

EPR has the potential not only to ensure the management of WEEE in an environmentally sound manner, but also to address the root cause of the problem, i.e. the design of products and product systems. To make this happen, a programme should be designed to be as close to IPR as possible, through the allocation of different types of responsibilities in different activities and the selection and setting of the policy mix. The report also shows unique opportunities for implementing EPR in the current Indian context which should be exploited. In addition, on an individual basis, all the challenges are very manageable. And most challenges are symptoms of deviant behaviours in the market – whether they be illegal imports, polluting recycling, or grey markets – which should be corrected at any rate, whether or not an EPR programme is established. This reflects the fact that EPR is a principle developed on the assumption of a well-functioning market economy where transactions are based on legal contracts, and any deviation from this ideal which might jeopardise its function should be seen as a weakness that needs to be rectified, not as an excuse to postpone the action.

The report ends with a discussion on the role of the government in developing an effective EPR programme in Section 4.2 and 4.3, and Appendix IV which contains a checklist for policy makers adapted from previous works on the management of WEEE in non-OECD countries. It argues that government intervention is important, even in the cases of voluntary programmes, and that anticipatory behaviours responding to 'regulatory threat' can play a crucial positive role if the government sends a clear and consistent signal. However, there is also a risk of too much intervention, especially when this prevents alternative IPR solutions from being developed by the industry. Fortunately, intervention can also come in various forms, with different degrees of government involvement depending on the situation. The important things are that policy makers: (1) fully understand and recognise the objectives of EPR; (2) select and combine policy instruments accordingly; and(3) set the parameters at an appropriate level.

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1. Introduction

'there is no system to ensure environmentally sound management of WEEE in India'

Waste electrical and electronic equipment (WEEE, also known as e-waste) is a growing concern of Indian society and policy makers. The penetration rate and variety of many appliances used in India have been increasing in the last few years. In addition, a considerable amount of used electrical and electronic equipment (EEE) has been imported both legally and illegally to India. This will translate into a growing amount of WEEE in the future. Currently, waste from these high-tech and complex products is handled in the so-called 'informal' recycling sector. The rudimentary and uncontrolled methods employed in this informal sector, such as open burning of cables containing PVC and treatment of wastes in acid baths to recover gold and other valuable metals, not only cause environmental risks and negative externalities, but also directly jeopardise the health of people in the sector and surrounding communities (see Box 1). In addition, WEEE not captured by this sector is mixed with other municipal solid waste (MSW) and freely disposed of. In short, there is no system to ensure environmentally sound management of WEEE in India.

Box 1 – Backyard recycling, hazards and inefficiency

Post-consumer WEEE recycling in non-OECD countries is, by and large, handled in so-called 'backyard recycling'. Informal recyclers are after precious metals such as gold, silver and copper in WEEE. They apply rudimentary methods and tools to separate these metals from complex components and subassemblies of WEEE. Among the most risky operations are: heating to de-solder circuit boards over an open flame; treatment of printed wiring boards (PWBS) in acid baths to recover gold and other valuable metals; open burning of PVC-coated wires and cables to recover copper; destructive methods to separate materials in cathode ray tubes (CRTs), and open burning of residues to recover metals. In addition, waste from the operations is directly dumped on nearby soils and in water bodies.

Several studies have documented pollution related to backyard recycling. The most infamous case is the town of Guiyu, Guangdong, China. A series of investigations in Guiyu between 2003 and 2005 shows: (1) elevated concentrations of polybrominated diphenyl ethers (PBDEs) in soil and sediment samples, with substance profiles similar to various technical formulations of flame retardant products (Wang, Cai, Jiang, Leuang, Wong, and Wong 2005, 810); (2) contamination of soils with carcinogenic, mutagenic, teratogenic and bioaccumulating polycyclic aromatic hydrocarbons (PAHs), especially soils from sites used for the open burning of wastes(Yu, Gao, Wu, Zhang, Cheung, and Wong 2006, 1503); (3) high concentrations of heavy metals such as cadmium, copper, lead and zinc in sediment samples from the Lianjiang river, consistently above the Interim Sediment Quality Guidelines set for Canadian standards (Wong, Wu, Duzgoren-Aydin, Aydin, and Wong 2007, 437); and, (4) concentrations of some heavy metals associated with fine particulates (PM2.5) in air samples ranging from 4 to 33 times higher than those recorded in other Asian cities (Deng, Louie, Liu, Bi, Fu, and Wong 2006, 6950). These findings convey a similar picture of environmental contamination around electronic waste recycling facilities to that reported in the study of such facilities in both China and India conducted by Brigden, Labunska, Santillo and Allsopp (2005). More recently, an experiment simulating open burning of PWBs and PVC-coated wires reported high concentrations of heavy metals, dioxins and furans (both chlorinated and brominated) in fly ash and high leaching capacity of metals from the residual ash (Gullet, Linak, Touati, Wasson, Gatica, and King 2007).

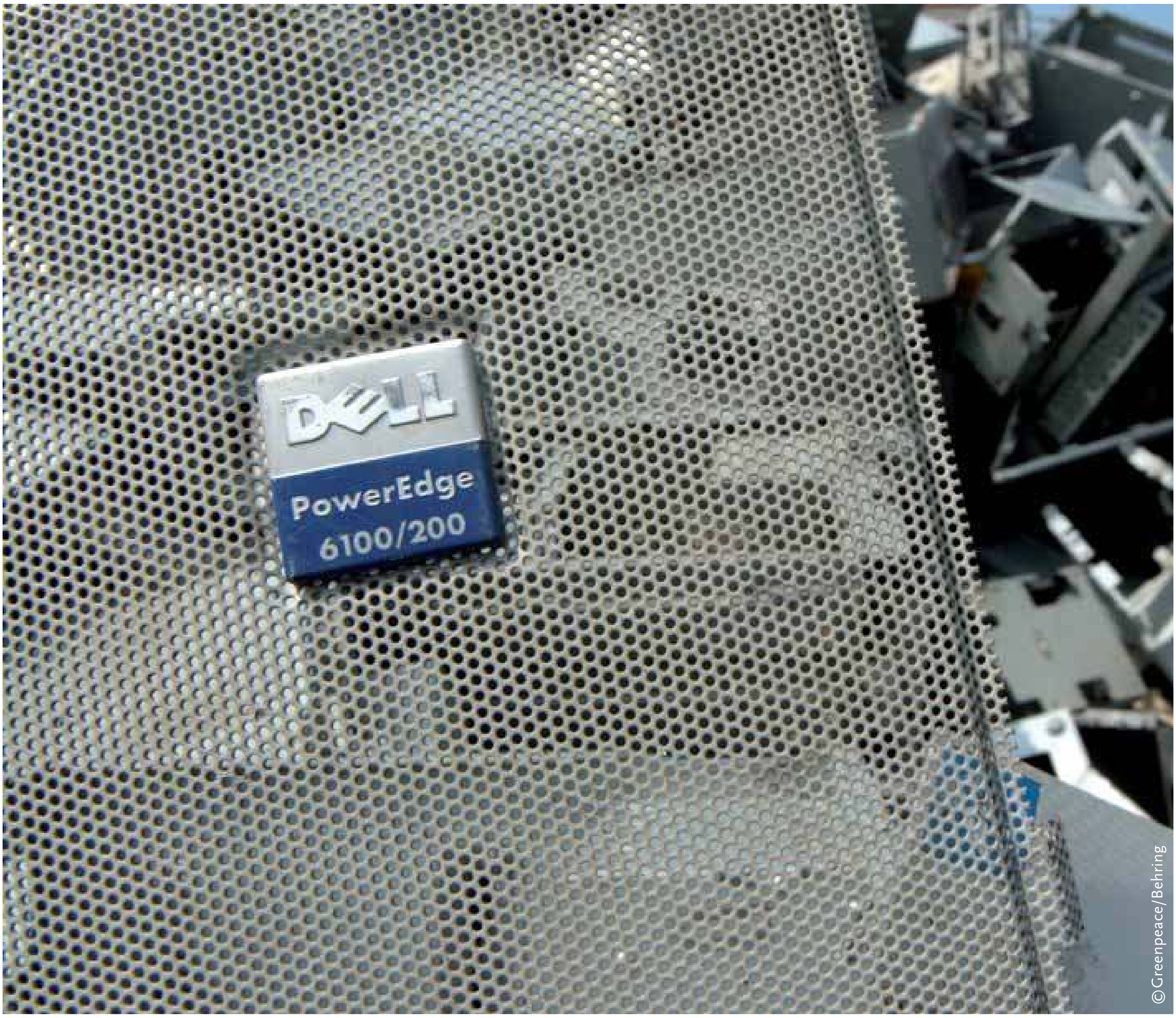
The working conditions in the sector are detrimental, with very limited, if any, protection for health and safety of workers and surrounding communities. Bi, Thomas, Jones, Qu, Sheng, Martin, and Fu (2007) found high concentrations of PBDEs in the blood samples of residents in Guiyu, including the highest concentration of the commonly used brominated flame retardant BDE-209 so far reported in humans. Concerns have also been raised about high levels of lead in the blood of children from Guiyu, (Yu et al. 2006, 1501) and the potential for damage to their IQ and developing central nervous systems as a result.

Neither does the backyard recycling fare well in terms of resource conservation. A recent study (cited in Rochat 2007) estimates the overall efficiency of a wet chemical process to recover gold from PWBs in India at a maximum of 20%. This compares to 95% in a state-of-the-art facility in the EU that can recover not only gold but also 16 other precious metals with lower total emissions.

India is not the only country facing the WEEE problem. Many OECD countries began encountering this problem a few years earlier. To various degrees, these countries embraced the principle of Extended Producer Responsibility (EPR) and its refined version, Individual Producer Responsibility (IPR), at the core of their strategy to redress the situation. At present, a few non-OECD countries are in the process of applying this principle to their national situation.

Set in this context, this report aims to facilitate the implementation of EPR in non-OECD countries by clarifying the principle (Part 2) and discussing its implications on these countries using India as a case study (Part 3). It tries to navigate the policy development processes through three types of failures: uninformed, incomplete, and inappropriate policy development (Dolowitz, and Marsh 2000, 17) [4]. In policy analysis literature, this kind of policy development is referred to as "policy transfer".

The report is based on research conducted between February and May 2007. The research began with an extensive literature review on (1) EPR in general and in relation to WEEE; (2) international and Indian experiences in the management of WEEE, and (3) solid waste management in non-OECD countries with a focus on the informal sector. The literature on the Indian situation was then preliminarily checked through a small survey with alumni of the International Institute for Industrial and Environmental Economics (IIIEE) who are now living in India. The primary data was collected during a visit to India between 13 and 22 April via observation and interviews with key informants. Findings and ideas were also reflected with participants of the 7th Asian Pacific Roundtable for Sustainable Consumption and Production, held between 25 and 27 April in Hanoi, Vietnam. Although the report is based on research in India, the main findings, summarised in Part 4, should, to an extent, be applicable to other non-OECD countries. This report, however, does not go into the details of implementing an EPR programme, which it sees proper to leave for policy makers and stakeholders in the country.



A scrap yard in Guiyu, China: remains of electronic equipment with Dell logo.

4 In this report, however, general terms such as policy development or policy implementation will be used to reach broader audiences.

2. Extended producer responsibility

'why producers? because most of the environmental impacts are (pre)determined when they design the products'

The term 'Extended Producer Responsibility' (förlängt producentansvar) was officially introduced in a report to the Swedish Ministry of the Environment, *Models for Extended Producer Responsibility* (Lindhqvist, and Lidgren 1990). Subsequently, the concept was revised and defined as an environmental principle, giving it a legal nuance in the sense that it "binds acts of international organisations, state practice, and soft law commitments" (Sands 2003: 231). Lindhqvist (2000, 154) defines EPR as follows:

> *"a policy principle to promote total life cycle environmental improvements of product systems by extending the responsibilities of the manufacturer of the product to various parts of the entire life cycle of the product, and especially to the take-back, recycling and final disposal of the product. A policy principle is the basis for selecting the mix of policy instruments that are to be used in the particular case. Extended Producer Responsibility (EPR) is implemented through administrative, economic and informative policy instruments."*

This definition reflects three cornerstones of EPR, namely the 'pollution prevention approach', 'life cycle thinking' and 'polluter pays' principles. In addition, it is broader than the definition used by the OECD (2001, 9) – "an environmental policy approach in which a producer's responsibility [financial and/or physical] for a product is extended to the post-consumer stage of a product's life cycle" – in the sense that the extended responsibilities of a producer are not only limited to the end-of-life stage but also to other stages of the product life cycle where the conventional responsibilities are deemed insufficient to guarantee optimal environmental protection. To date, EPR has been applied in OECD countries and has focused mainly on the end-of-life stage, "the 'weakest link' in the production responsibility chain" (Kroepelien 2000, 166).

It must be stressed that EPR is not a policy instrument and its application can be implemented through a package of policy instruments. Some authors treat EPR as merely shorthand for either a take-back mandate or a kind of economic instrument (Gottberg, Morris, Pollard, Mark-Herbert, and Cook 2006; Sachs 2006). In this manner, they fail to capture the totality of a programme and to appreciate the policy mix in an EPR programme under consideration. For example, they admit the effects of the EU[5] RoHS Directive's substances ban (an administrative policy instrument) on the product design but do not count it as a part of an EU EPR policy package. In this paper, EPR is treated as a policy principle and policy makers are free to choose any policy instruments, or their mix, to accommodate particular contexts and to implement the spirit of EPR.

Chinese workers sort chunks of plastic from old computers into piles.

2.1 Objectives: why producers?

There are two families of objectives in an EPR programme: (1) design improvements of products and their systems, and (2) high utilisation of product and material quality through effective collection, treatment, and re-use or recycling [in an environmentally friendly and socially desirable manner] (van Rossem, and Lindhqvist 2005, 2). The phase added at the end of the second family of EPR objectives will play a crucial role in Part 3, when the principle is discussed in the context of non-OECD countries where, before the establishment of any EPR programme, downstream activities are handled by groups of disadvantaged populations such as rural-urban immigrants in the so-called 'informal' sector.

The first family is a distinctive feature of the principle. Looking through the lens of life cycle thinking, EPR redefines products and their design as a vessel and a root cause of environmental problems, respectively (Heiskanen 2002, 431; Lindhqvist 2000, 3). The very reason that responsibilities are placed on manufacturers is because most of the environmental impacts are (pre)determined when they design the products, as graphically shown in Figure 1. Thus, an effective EPR programme must provide incentives for manufacturers to embrace Design for Environment (DfE) – "the development of products by applying environmental criteria aimed at the reduction of the environmental impacts along the stages of the product life cycle" (Bakker 1995). Design improvements can be further divided into two categories, product design improvements and product system design improvements. Examples of product design improvements are the selection of low-impact materials or substitution of components; the reduction of the product's size and weight; the reduction of energy consumption during the use stage; Design for Disassembly (DfD); Design for Recycling (DfR), and the increase in a product's life span through upgrading, etc. (Gottberg et al. 2006; Mathieux, Rabitzer, Ferrendier, Simon, and Froelich 2001). On the other hand, a product system is concerned with all other factors, besides the product per se, that enable the functionality throughout the life cycle (Lindhqvist 2000, 5). Examples of product system improvements include development in recycling technologies, reverse logistics, and marketing strategies, such as product leasing.

5 The correct term is 'EC' for the European Community. In this report, however, the term 'EU' for the European Union is used throughout as it is more familiar to general audiences.

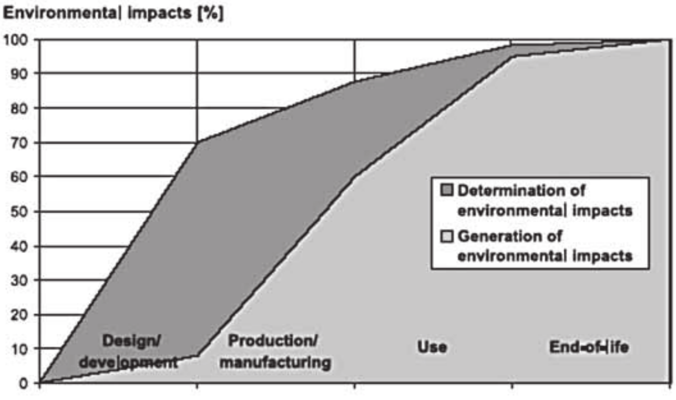


Figure 1 – *Generalised representation of the (pre)determination and the generation of environmental impacts of a product's life cycle (Rebitzer 2002). Note: this only shows a broad impression of the issue. The actual division of impacts along life cycle phases does vary across products, e.g. that of a refrigerator will be heavy during the use phase, while that for an x-ray machine will be dominated by the impacts in the production.*

There are at least two factors influencing the strength of the design incentive: excludability and immediacy. First, a manufacturer is likely to invest in DfE, if he/she is able to compete more favourably and exclude competitors from enjoying the benefits of the investment. All things being equal, the closer an EPR programme comes to Individual Producer Responsibility (IPR) - where an individual producer bears responsibilities for his/her own products - the more effective it will be. Second, regarding the process of discounting the future, the more immediate the benefit, the stronger the incentive for DfE. This is especially true in dynamic markets such as that of EEE where the life span of a product might be longer than that of its manufacturer. In addition, as manufacturers are economic actors, financial incentives are likely to carry more weight than other types of incentives.
It must be stressed that this first family of EPR objectives is fully applicable only to new products not yet on the market, which can be re-designed (van Rossem, Tojo, and Lindhqvist 2006a, 7).
The second family of EPR objectives can be further divided into three categories: collection, treatment, and re-use and recycling. First, an effective EPR programme must be able to separate discarded products and incorporate them into the system. Second, the collected WEEE must be treated in an environmentally sound manner. Third, its material and calorific values should be optimally extracted through re-use, material recycling and energy recovery, i.e. in accordance with the so-called 'waste management hierarchy'. This family of objectives is equally applicable to both new products and historical products, i.e. products put on the market before the introduction of an EPR programme.

Although this conventional waste management objective could be achieved through other non-EPR approaches, there are several advantages in placing responsibilities on a producer. Firstly, placing clear responsibilities on one actor would avoid the situation where everyone's responsibility becomes no one's responsibility (Lindhqvist, and Lifset 1997). Secondly, it is prudent to source finance from actors at the point of retail sale for final consumption where there is both the ability and willingness to pay. In other words, this so-called 'front-end financial mechanism' has an edge over the end-user-pays mechanism in that it is less likely to give rise to illegal dumping (Calcott and Walls 2005, 288) – a problem which grew after the implementation of Specific Home Appliance Recycling (SHAR) in Japan (Tojo 2004, 191). In addition, where the rear-end mechanism is used to settle financing for complex products with a relatively long lifespan like EEE, there needs to be a complementary mechanism to allocate the costs of orphan products whose producer disappears from the market before they reach the end-of-life (Eol) stage. Thirdly, if a producer knows that they have to be responsible for managing their products at the end of their life, they would have an incentive to incorporate the end-of-life considerations in their design. Unlike the first two points, which are indifferent on the division of responsibilities among producers, and between them and consumers, this consideration points towards IPR (see Section 2.4). Where EPR is introduced in a way that all producers are equally affected - irrespective of the design of their products, and producers can shift most of the costs to the consumers- the financial incentives for design improvement, if any, would be minimal (see Gottberg et al. 2006, 45). All these highlight the importance of competition. Fourthly, assigning responsibilities to a producer, even for historical products, would eventually lead him/her either to physically involve themselves in end-of-life management or enter into a dialogue with downstream actors. This would provide a producer with learning opportunities regarding design for end-of-life (van Rossem, Tojo, and Lindhqvist 2006a, 7). Good examples are the ECRIS project, which conducted an experiment on the dismantling of end-of-life vehicles and the remanufacturing of automotive parts which was later transformed into the Expert Centre specialising in the issues (see Manomaivibool 2007; Hartman, Hernborg, and Malmsten 2000), and the two WEEE Consortia in Japan (see Tojo 2004).

2.2 Types of Products

Products that fall under an EPR programme can be classified into four groups. Table 1 shows the four groups on the basis of two criteria: the ability to identify its producer and the time when the product is put on the market. The identification of the producer matters whenever his/her responsibility is required in a respective EPR programme. For example, regarding financial responsibility, the time of identification is at the point-of-sale in a programme with a front-end mechanism, while it is at the end of the product's life in a rear-end programme. The second criterion means the effective date specified by an EPR programme that enables a distinction to be made between new and historical products. In the case of the EU WEEE Directive, the date was 13 August 2005. This typology captures other common terms. New products are those in groups A and B. Historical products are those in groups C and

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Panasonic logo on e-waste in a scrap yard in Guiyu, China.

D. Orphan products—the products whose responsible producer cannot be identified and hence a free rider—are those in groups B and D. Moreover, the typology helps in clarifying the relation of each group of products to the EPR objectives.

		The Producer of a product	
		Identifiable	Non-identifiable
Put on the market	After the introduction of EPR	A	B
	Before the introduction of EPR	C	D

Table 1 – *Types of products*

Products in group A are the prime and most straightforward targets of an EPR programme, because their producer is identifiable and they have not yet been put on the market. Therefore, it is possible to create a mechanism(s) giving the producer incentives to re-design them. In other words, both families of EPR objectives apply to this group with a priority on incentive for DfE.

Products in group B are also the targets of an EPR programme but rather problematic ones. Though they are new products, and it is possible to aim at both objective families, the fact that their responsible party would not be identifiable renders this irrelevant. Hence, the first priority regarding this group of products is to reduce or, if possible, eliminate them; i.e. ideally all new products should be in group A. For instance, the EU WEEE Directive requires a financial guarantee from the producer when a product is put on the market thus avoiding the risk of future orphans would he/she later disappear from the market. In the countries where there is a systematic channel selling so-called 'no-name-branded products' (these products can be called 'born-to-be orphan') this problem would be more complicated as the producers are not identifiable from the very beginning (see Section 3.3.4). To circumvent this difficulty, a solution can be obliging distributors to only sell products from identifiable (registered) producers.

Products in groups C and D — historical products — are an unavoidable extra of any EPR programme for durable products. As mentioned above, only the second family of EPR objectives is relevant here. So, the system for historical products can solely pursue the goal of cost-effectiveness of the downstream activities, as historical products cannot be re-designed. For example, the costs of sorting historical products by brand might not justify the practice as there is no further upstream benefit. Moreover, the proportion of historical, orphan products (group D) could be considerable. This is one of the reasons why a Dutch Producer Responsibility Organisation (PRO), ICT Milieu, abandoned the practice (Institute for Prospective Technological Studies 2006, 48). It must be noted that the problem of historical, orphan products (group D) cannot be resolved in an ex ante fashion like that of group B, as the products had already been placed on the markets and their producers had subsequently disappeared before the establishment of any financial mechanisms. In this regard, an important issue is to find a way of distributing the handling costs of historical products (if any) among existing actors. Normally, the principle of 'ability to pay' applies so that the costs are distributed to identifiable producers, who are currently selling products with a similar function, on the basis of their present market share. From a broader perspective, a crucial issue is how to discontinue the growth of historical products by distinguishing them from new products. This can be achieved through, for example, the use of simple or more advanced product tags such as bar codes and radio-frequency identification (Saar, and Thomas 2003) and sorting. In cases of simple visual labelling, it is advisable for each EPR programme to have a distinct symbol to avoid inter-programme fraud.

In summary, an effective EPR programme must: (1) differentiate between new and historical products; (2) prevent the occurrence of new, orphan products and free-riders in general; (3) provide incentives for DfE in new product development; (4) ensure high utilisation of product and material quality through effective collection, treatment, and re-use or recycling of all products, and 5) have an acceptable method of distributing the costs relating to historical products.

2.3 Types of Responsibility

The extension of responsibilities to manufacturers varies between EPR programmes, both in terms of types of responsibility, as well as activities to be undertaken. Figure 2 provides a classical typology of responsibilities, introduced by Lindhqvist in 1992.

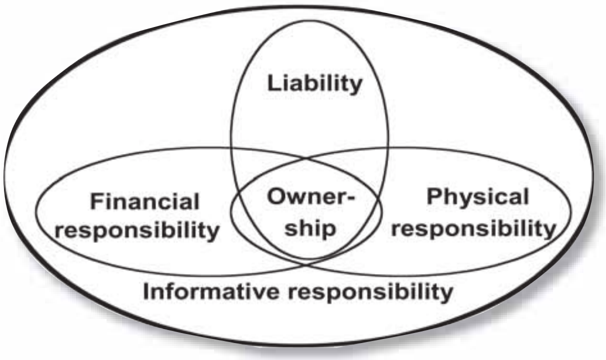

Figure 2 – *Model for Extended Producer Responsibility (Lindhqvist, 1992)*

Definitions of these four types of responsibility are given below: (Lindhqvist 2000, 38-9):

"**Liability** refers to a responsibility for proven environmental damages caused by the product in question. The extent of the liability is determined by legislation and may embrace different parts of the life-cycle of the product, including usage and final disposal.

Economic (Financial) responsibility means that the producer will cover all or part of the costs for e.g. the collection, recycling or final disposal of the products he is manufacturing. These costs could be paid for directly by the producer or by a special fee.

Physical responsibility is used to characterise the systems where the manufacturer is involved in the actual physical management of the products or of the effects of the products. ...

Informative responsibility signifies several different possibilities to extend responsibility for the products by requiring the producers to supply information on the environmental properties of the products he is manufacturing (e.g. to recyclers)."

Retaining *ownership* of his/her products throughout their life cycle, as in a product-service system (PSS), is the ultimate means for a producer to fulfil his/her full responsibilities.

'retaining ownership *of his products throughout their life cycle is the ultimate means for a producer to fulfil his full responsibilities'*

Table 2 further identifies elements of responsibilities as far as the end-of-life management is concerned. In principle, the more responsibility a producer assumes, the stronger the EPR mechanisms. In designing a programme, however, it might not be necessary for a producer to be responsible for every aspect or be involved in every activity in order to achieve the aforementioned objectives. For example, in many programmes, retailers, due to their widespread networks and convenience for consumers, are obliged to take obsolete products from consumers (Element 1) on various bases — e.g. on a one-to-one basis, on a basis of types of products sold – and to provide information to make customers aware of the service (Element 3); in certain cases, they bear the collection costs (Element 2) as well. In many cases, separating physical responsibility from financial responsibility for collection proves to be an effective way of achieving high collection rates. One example is Electronics Recycling Alberta, where municipalities get compensation for collection from the programme on a tonnage basis. However, the involvement of municipalities is contentious as municipal collection is partly subsidised by taxpayers' money. The availability of such a subsidy can discourage a producer from developing their own collection network, i.e. from implementing IPR. Monitoring and enforcement (Element 7) is another activity where separation of responsibility can be desirable. Self-regulation is often praised but on its own it hardly provides sufficient credibility to the system. In most cases, collective bodies such as Producer Responsibility Organisations (PROs) and industry associations play a leading role in this element (see also Section 2.4.2). Where the issue of credibility is decisive, as in Taiwan in 1997, a third party independent from the industry might be introduced to perform such a role (Lee, Chang, and Tsai 1998, 131).

Type of responsibility	Activities			
		Collection	Recovery	Monitoring & Enforcement
	Physical management	Element 1	Element 4	Element 7
	Financial mechanism	Element 2	Element 5	
	Information management	Element 3	Element 6	

Table 2 – *Types of responsibility by downstream activities (Tojo 2004, 178)*

2.4 IPR and PRO: desirability and necessity

This section discusses the seemingly contradictory pillars of EPR: a desirable IPR and a necessary PRO. On the one hand, although superior in principle, IPR is normally criticised as not practical. On the other hand, while collective producer responsibility (CPR) falls short of providing incentives for design improvements, commentators argue that it is unavoidable by pointing to the omnipresence of its organisational manifestations, PROs, in all industry-managed EPR programmes. Based on the types of responsibilities and products, this section shows that the matter is more like a continuum between individual and collective responsibility, rather than a black and white demarcation. Moreover, components of IPR can and should be incorporated into an EPR programme with a PRO. In other words, there is no need to sacrifice the higher objectives of IPR for the sake of practicality.

2.4.1 Individual producer responsibility (IPR)

IPR exists where an individual producer is responsible for proper management of his/her own products. IPR is desirable, at least for new products, because the responsibility of each producer would relate to the characteristics of their products and product systems. Knowing this fact, a rational producer would try to optimise their products and product systems to maximise their profit. However, it is believed that implementing IPR is difficult, if not impossible, owing to practical considerations such as duplicated systems and high transaction costs, uncertainty in ex ante estimation of the EoI costs for complex products, and a need for a supplemental system to address the problems of orphan products and historical products etc. (Tojo 2004, 52). Nevertheless, this criticism is based on a false assumption that there is only one form of IPR where each producer bears all types of responsibilities, i.e. "individual producer" would appear in Elements 1-6 in Table 2. For example, based on Table 2, this extreme form is but one out of a mathematically possible 63 combinations (!)[6] where at least one single producer bears a responsibility for one element individually. In other words, apart from the two extreme forms, we are dealing with different degrees of IPR (or CPR). Appendix I provides examples of IPR in practice. In this sense, Tojo (2004) lays down the following definitions:

> "… a *producer bears an individual financial responsibility* when *he/she initially pays* for the end-of-life management of *his/her own products*. When a group of producers pay for the end-of-life management of their products regardless of brands, their *financial responsibility is collective.* (274)
>
> … a producer bears an *individual physical responsibility* when 1) the *distinction* of the products are made at minimum by *brand* and 2) the producer has the *control over the fate of their discarded products* with some degree of involvement in the organisation of the downstream operation … A *collective physical responsibility* is taken when 1) products of similar kind are physically handled together regardless of the brand and 2) the handling is rest in the hands of a third party, such as PRO. (276)
>
> … producers have *individual informative responsibility* with regard to the collection and provision of information concerning their *products and product systems*, such as the location of hazardous substances, types of materials used, the routes through which the components and materials reach their production sites and the like. … Meanwhile, various information, such as the operation of an EPR programme, location of collection points, the results of the programme and the like, can be useful when aggregated in a coordinated manner. (276)"

2.4.2 Producer responsibility organisation (PRO)

A PRO is usually a not-for-profit organisation established by a group of producers to exercise their designated responsibility. There are several reasons that make (a) PRO(s) crucial in an EPR programme. In the first place, some producers might not have enough capacity or would be put at a disadvantage, e.g. in negotiating a contract with recyclers and carrying out their own responsibility through their own individual systems. Of concern here are small- and medium-sized manufactu-

6 Readers should be aware that Table 2 does by no means show an exhaustible list of activities. Here, it is used to illustrate that there is more than one way to implement IPR.

rers and importers (SMEs). Secondly, there is an economy of scale in some activities such as collection. However, a fragmented view on downstream activities must come with a caution: costs minimisation in one activity might raise the costs and compromise the effectiveness of other activities. For example, single collection of mixed waste with a compactor is economical in terms of collection but hardly advisable when brand sorting and recovery come into the picture. Thirdly, a PRO can facilitate monitoring and enforcement and lower the transaction costs in the system. For example, BPS, a PRO of Swedish car producers, certified a number of dismantlers with whom its members chose to make a contract to exercise the physical responsibility on their behalf. In addition, the action on the part of an industrial association through a PRO might alleviate the problem of free- riders. Comparing authority, a PRO which is normally an offspring of the producers' trade association has more knowledge of the markets. In addition, because one of the PRO's goals is to protect the interest of (identifiable) producers, it has an incentive to help the regulator to identify non-compliers, i.e. free riders, through peer monitoring.

Although these reasons imply the necessity of a PRO in an EPR programme, they do not warrant its monopoly. A monopoly by a PRO might lead to unnecessary high prices of services due to a lack of competition to keep down the prices. Large compliance schemes can give economy of scale, but if they are too large, or even monopolies, this can offset such a benefit. For example, Bohr (2006, 133) attributes the higher treatment price in Switzerland than those in adjacent Germany to the monopoly of the Swiss system.

A migrant worker throws stacks of computer motherboards in Guiyu, China.

In addition, the mere existence of a PRO, even a monopolistic one, does not necessarily mean a full degree of CPR, i.e. "all producers collectively" appears in Elements 1-6 in Table 2. For example, in a system with one monopolistic PRO which charges each producer differently based on his/her product characteristics, i.e. employing *differentiated fees*, there would still be an incentive for design improvements at which IPR aims. Alternatively, a fee and refund at flat rates could be used and a producer is entitled to get the refund from the PRO for the amount he/she has managed individually. This latter arrangement would induce a producer to try to optimise their product systems to beat the average cost (equal to the refund) and benefit from the difference. Regardless of the arrangement, the main message is that an effective EPR programme must create a competitive atmosphere where each producer is encouraged to translate their environmental performance into business competitiveness and this is a challenging but possible task even within a monopolistic PRO.

2.5 Policy Instruments

As already stressed, EPR is a policy principle. It helps a policymaker to make an informed choice of a policy mix from a repertoire of policy instruments to reach the objectives. This policy mix must also be adapted to the products and local contexts. Although the truism that there is no one best way does apply here, there are some general patterns that can be meaningfully outlined. Table 3 gives an inexhaustible list of policy instruments normally employed in EPR programmes. Five of them (bold in Table 3) are discussed in detail below. It is worth noting that these instruments are not inherently EPR-oriented and can be used in non-EPR programmes as well. Here, their use and potential are reinterpreted under an EPR paradigm, i.e. how these policy instruments and their combination would contribute to the achievement of the two EPR objective families. The discussion of economic instruments is intentionally avoided because there exists a sizable body of knowledge about the issue (see Bohr 2006; Calcott, and Walls 2005; Eichner, and Runkel 2005; Krozer, and Doelman 2003; Fullerton, and Wu 1998). In general, most studies find that a combination of a front-end tax and a subsidy for recycling is an effective way to provide economic incentives for design improvements while guaranteeing high utilisation of product and material quality. This confirms the point in Section 2.1 that the immediate effects from the tax on upstream, and incentives from the subsidy for downstream activities, are crucial. Another lesson is a finding of Calcott and Walls (2005, 301) that the producers should lose unclaimed deposits. If they could retrieve unclaimed deposits, the producers would have an incentive to minimise the collection effort, which in turn, jeopardises the achievement of the second family of EPR objectives.

Administrative instruments	Collection and/or take-back of discarded products, **substance restrictions***, achievement of collection, **re-use (refill) and recycling targets**, utilisation mandates**, **environmentally sound treatment standards, treatment and disposal restrictions***, minimum recycled material content standards, product standard.
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/labelling 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.

Table 3 – *Examples of EPR-based policy instruments*

* Some exclude substance and landfill bans from EPR-based policy instruments.

** Utilisation mandates refer to the situation where producers should achieve certain re-use and /or recycling targets, but do not have to use them within their own activities.

Source: adapted from Lifset (1992), OECD (2001), Stevens (2004), Walls (2004).

Substance restrictions in an EPR programme are an administrative instrument. From a design perspective, they force manufacturers to remove toxics from their design. From the downstream perspective, they ensure less-hazardous inputs and hence safer treatment and recovery processes. Prominent examples of this instrument are the EU RoHS Directive restricting the use of six substances: lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB), and polybrominated diphenyl ethers (PBDE), and the phase-out of CFCs in cooling appliances. Previous studies all agree on the effectiveness of the Directive in stimulating (re)design of EEE even outside the EU (Gottberg et al. 2006, 48; Røine, and Lee 2006, 231; Sachs 2006, 93; Yu, Welford, and Hill 2006). Similarly, Laner and Rechberger (2007, 14) find the use of VOCs as a refrigerant and as a blowing agent after the phase-out of CFCs, has significantly reduced the environmental impacts of material recycling of cooling appliances. Due to globalisation of trade, a few countries such as Japan have emulated the EU RoHS Directive but in a weaker form as a marking/labelling requirement, which will be explained below.

Re-use and recycling targets are a kind of administrative instrument prescribing the minimum level of re-use and recycling of collected WEEE. Ideally, there should be differentiation between closed-loop (re)utilisation in forms of component/product re-use and material recycling targets, and downcycling in the form of utilisation mandates e.g. the reapplication of plastic recyclates in non-electronics sectors. Though the targets mainly focus on the second objective family, from an EPR perspective, their effectiveness should also be judged from the signal they give to the designers, e.g. in the selection of materials. Hitherto the targets in the EU, Japanese and Korean systems are all weight-based and make no distinction between closed-loop and downcycling. Recently, some authors who focus on the environmental and/or economic impacts of treatment practices suggest a concept of material-based targets (Laner and Rechberger 2007, 16; Huisman, Stevels, Marinelli, and Magalini 2006). Here, targets would be put on specific materials, not the products. For example, Article 7 of the EU WEEE Directive might be rewritten in the following manner: “the rate of material x recovery shall be increased to a minimum of X% by its average presence in an appliance.” The main advantage of the material-based targets is their ability to optimise existing treatment practices by targeting materials with high toxicity and/or economic value. The drawbacks, which are twofold, lie in the signals they send to the designers and material producers. Firstly, unlike the weight-based targets which provide an incentive for designers to increase the recyclability of their products, the material-based targets are muted on this issue. They can even give adverse incentives to the designers to choose materials with lower targets due to their high costs and/or low returns in recycling such as plastics, which in turn, would result in a decrease in the recyclability of the products. Secondly, the dynamics in the weight-based regime — which gives an incentive to different material producers to increase the recyclability of their materials, e.g. increasing homogeneity, and/or investing in research and development of their treatment practices to make their materials attractive to product designers — would lose in the material-based regime, which implicitly assumes a status-quo in material and treatment technologies. Having said all this, the recurring theme of the limits to the (re)design of historical products also applies here. The aforementioned incentives of weight-based targets in the case of historical products are very limited. Hence, flexibility should be allowed in the weight-based regime to accommodate the treatment of some historical products whose features can be problematic for recycling. For example, a study in Austria (Laner and Rechberger 2007) shows that CFCs in old models of cooling appliances are more effectively captured and controlled in a treatment system with combined thermal and material recovery than in a treatment system maximising material recovery, though the former might not meet the recycling target of the EU WEEE Directive.

In the systems with an authorisation procedure there are **environmentally sound treatment standard**s that WEEE-related enterprises need to comply with. The standards can be either emission standards, i.e. emission limit values, or production/specification standards (Faure, and Skogh 2003, 190-2). The latter can be further classified into two groups. The first are those standards prescribing specific treatments for certain components and/or materials. The second are technical requirements of the storage and treatment sites. Examples are Annexes II and III of the EU WEEE Directive, respectively (reproduced in Appendix II of this report). Regardless of the types of standards, their effectiveness is heavily dependent on the ability of respective authorities to monitor and enforce them. One way to ease monitoring and enforcement is to encourage treatment plants to have an environmental management system (EMS).

Part of treatment standards are **treatment and disposal restrictions** such as those against landfill of waste containing hazardous substances, burning of PVC, etc. The main rationale for such restrictions is to control, if not prohibit, any operations deemed to pose high risks to public health and the environment. The restrictions also force producers and material producers to develop alternative and safer treatment and disposal methods for their products and materials. In an age of globalisation, for these national restrictions and standards to be meaningful, a framework to control transboundary movement of WEEE is necessary. In this sense, the existing global platform of the Basel Convention contributes to a national EPR programme in two major ways. Firstly, in the country where WEEE is generated, it serves as a barrier in an EPR programme preventing producers from opting for “cheap and easy (but undesirable) solutions” to alleviate their responsibility over collected WEEE, which in turn, would water down its incentives for design improvements. Secondly, in the prospective recipient country, it safeguards the programme against the inflow of foreign WEEE and misuse of the programme’s resources. The latter implication is of vital importance in countries prone to illegal imports of WEEE, like India, and will be discussed at length in Section 3.3.3. One limitation of administrative instruments is a lack of built-in dynamics. The instruments do not encourage actors to go beyond the requirements. However, there are several (mutually-supporting, not competing) ways of overcoming this limitation. One way is to set higher targets/standards for latter periods, as in the case of the EU ELV Directive which has a recovery target of 85% for 2006 and 95% for 2015 (Article 7). Another is to have a clause regarding a periodic review and adaptation to scientific and technical progress as in most EU Directives. More dynamic, economic instruments can also be used in tandem with targets/standards to foster improvements beyond the statutory requirements. This last point highlights a need for a combination of policy instruments – a policy mix.

Labelling plays a crucial enabling role in an EPR programme. It can serve various functions. Firstly, it specifies the time the products are put on the market. This is the most important, as an effective EPR programme needs to distinguish between new and historical products. Secondly, a label can be used to inform the users about their role in separate collection of WEEE. The crossed-out wheeled bin symbol in Annex IV of the EU WEEE Directive fulfils both functions, as the label appears only on new products. Thirdly, to further facilitate IPR, the responsible producer of new products should be identifiable as specified in Article 11.2 of the EU WEEE Directive. Beyond these enabling roles, this informative instrument can also stimulate design improvements and high utilisation of product and material quality (Schischke, Griese, Mueller, and Stobbe 2005). For example, the Japan RoHS instead of banning outright the use of six substances as in the EU RoHS, requires producers to label the contents on the equipment casing, containers and catalogues, when the presence of these substances exceeds specified limits. This is more lenient, but as far as the image of the producers is concerned, can eventually lead to similar design improvements providing that there is a demand for environmentally friendly products among consumers. The same is true with the use of the 'environment-friendly use period' in Article 11 of the China RoHS, and design for reliability and robustness. Substance and sorting marking can also facilitate downstream activities (Shimamura, Takahashi, Ueno, and Ishii 2005). The Eol management can be further facilitated if the producers are obliged to provide re-use and treatment information to re-use centres and treatment and recycling facilities, i.e. the information provision instrument.

2.6 Translation into Laws

There are several issues in the translation of the principle into legislation. Five will be discussed in this section: the legal and administrative structure, the definition of a producer, the scope, the division of so-called B2B and B2C, and provisions for non-compliance.

2.6.1 Administrative fragmentation of life cycle phases

EPR is based on life cycle thinking, and ideally existing institutions should take environmental considerations into account in a holistic fashion Heiskanen, E. 2002; Weale 1992). In practice, the institutions for production and Eol management are separated. This is reflected in legal structure, in which there exists one set of regulations governing manufacturing, and another for solid waste management. Administratively, the former falls under the remit of the Minister of Trade and Industry, while the Minister of Environment or of Public Health and local governments are responsible for the latter. Therefore, in such a setting, a full translation of EPR into laws requires coordination between these authorities at the very least. In addition, EPR laws might be based upon existing legislation (in most of the cases on the Waste Management/Disposal Act and the like), some of which need to be modified accordingly to accommodate the reallocation of responsibilities. However, there is an upside to this administrative fragmentation, as it allows a government to treat and prioritise manufacturing issues and solid waste management issues on an individual basis. For example, while it is time-consuming to formulate a new law governing the Eol management of a waste stream, the process of adopting product standards based on existing laws by a trade and industry authority can be much faster. In fact, this is the approach used by some countries, such as Thailand, to harmonise quickly with the RoHS-like regulations of their trading partners while leaving more time to develop the legal framework for the domestic Eol management of WEEE.

2.6.2 Definition of producer

In theory, EPR targets the manufacturer of a product placed on the market. The real supply chain can, however, be much less straightforward and in many cases it is not the manufacturer who puts a product on the market. Although the details and wording are different, all EPR laws have a definition of a producer covering manufacturers and importers of products placed on the domestic market for the first time. The EU Directives also take into account novel sale methods, such as that via internet sales. The final brand on the product immediately prior to its retail sale, is a key criterion for identifying the responsible producer. In some cases, as in Japan and the United States, the definition is extended to cover those who refurbish and eventually resell the products in their second life. This might, however, lead to complexity in registration and monitoring where refurbishing is undertaken in small shops, which is the case in India. There is also the possibility of double accounting, i.e. the refurbished products can be charged twice in the system – once when they are new products and again at their second life. Alternatively, in China - under the draft Ordinance on the Management of Waste Electric and Electronic Equipment Reclamation and Disposal (henceforth, the China WEEE) - this fraction of re-used products would be treated separately. The implication of this inclusion/exclusion of the re-use market will be discussed further in Section 3.3.6.

2.6.3 Scope of legislation

In its totality, EEE comprises a long list of equipment dependent on electric currents or electromagnetic fields, and the list can be extended to include equipment for the generation, transfer and measurement of such currents and fields. This equipment can be very different when it comes to product characteristics, some of which are critical to the Eol operation (see e.g. Darby, and Obara 2005). In general, there are two approaches for defining the scope of EPR programmes for EEE, each with its own advantages and disadvantages. The first one can be called a comprehensive approach, as adopted in the EU, Switzerland and Norway. Here, a broad definition of EEE is given and all equipment with abovementioned characteristics is covered. In addition, the EU Directives also introduce a system of product categories dividing EEE into ten categories according to their major characteristics, e.g. size, function, main application, etc. The second is a selective approach where a few categories of EEE are selected based on certain criteria. Non-European systems follow this approach, and among the first targeted EEE are video display devices, refrigerators and freezers, unit-type air conditioners, washing machines, and personal computers and laptops. In these systems, it is generally possible to add more EEE into the scope through secondary laws such as a decree or a ministerial order. The difference between the two approaches can be summarised as follows: with the selective approach, the main issue is which products fall inside the scope while with the comprehensive approach it is which products fall outside the scope, i.e. not classified as EEE by definition.
The advantage of the comprehensive approach is its holism, which guarantees the applicability to all EEE. In addition, from the consumers' perspective, it can lead to a convenient collection system (this would, however, be compromised if there is a grey area of what is not EEE by definition). Nevertheless, this approach does have a drawback in terms of administrative complexity, as having many products with very different characteristics requires a high level of flexibility and variation within the system. Moreover, there is larger room for cross-subsidisation among different product categories.
The strengths and weaknesses of the selective approach are the opposite. As manageability is often one of the selection criteria (this is explicitly stated in the Japanese SHAR Law), the major advantage of the approach is the ease of administration, possibly with incremental improvement and expansion over time. Its main disadvantage is

'the system can be comprehensive when it comes to production requirements, and selective in the products its EoI component will handle'

higher 'cost of policy inaction' (Bakkes, Bräuer, Brink, Görlach, Kuik, and Medhurst 2007) as the regulatory stimulus for the products outside the scope is, at best, weak. For example, the elimination and/or substitution of hazardous substances in selected products might fail to transfer to similar applications in other products. This is one of the reasons why some established systems, such as those in Korea and California, are moving towards the comprehensive approach. Fortunately, even for a newly established system, a hybrid approach - which retains the advantages of both - is possible, especially if we appreciate the aforementioned institutional fragmentation. As the advantages of the comprehensive approach are in the manufacturing phase, while those of the selective approach are in EoI management, the system can be comprehensive when it comes to production requirements, and selective in the products its EoI component will handle.

When considering scope, most systems cover all components, subassemblies and consumables of respective EEE, but exempt equipment which is designed specifically as a part of another product, e.g. EEE in vehicles, and those for military and some specific purposes.

Women workers 'bake' motherboards from e-waste, breathing toxic fumes, in Nanyang, China.

2.6.4 B2B vs B2C

There is also the issue of the division between B2B – those dedicatedly used by institutional users in a large volume – and B2C – those used by private households and the like – products. The EU WEEE Directive and the Japan Law for computers explicitly make such a division and allows the producers and the users of B2B products to conclude agreements about financing methods to deviate from those stipulated in the Directive. This provision enhances the flexibility of the system to better suit the B2B stream which has different quality and quantity characteristics from that of private households. Nevertheless, such a provision can only come after a careful investigation of the flow of B2B products. If there is an extensive flow of used B2B products to the B2C sector, where those articles would eventually become waste, the provision could turn out to be a way of avoiding producer responsibility (there is not yet a system which classifies B2B users who resell used products as a producer). For example, there will be no guarantee for EoI management of these products, thus leading to the problem of orphan products. An alternative approach is to treat all consumption equally, as in the Californian laws. Moreover, in practice, it might not be so straightforward to distinguish B2B and B2C products, as experienced in the implementation of the EU WEEE Directive in the Member States.

2.6.5 A level playing field between compliance schemes

In the transition period, it is likely that most producers would face uncertainty in which directions to take to comply with the EPR requirements, and would thus tend to pool resources to share the risks. Although a correctly formulated regulation should take this into account, it must not prematurely rule out the possibility of IPR. Currently, many EU Member States' national legislation has delved deep into how to design their system in a way that accommodates the evolution of (one) large collective compliance scheme(s) and "penalises" a producer, or a group of producers, who develops competing compliance schemes (van Rossem, Tojo, and Lindhqvist 2006b). For example, a large collective compliance scheme might be exempted from providing financial guarantees and does not have to prove the financial "sustainability" of the collective system. When keeping the objectives of EPR in mind, it is important that collective compliance scheme is not a way of avoiding the provision of sufficient guarantees for future WEEE. Moreover, collective compliance schemes should function in a way that enables the producers to shift from one scheme to another in order to create dynamics and competition in the system.

2.6.6 Provisions for non-compliance and reporting obligations

Last but not least, punitive measures must be in place to discourage non-compliance. Provisions for fines and penalties are, however, only half the story as they only specify the penalty for non-compliance but not the probability of being caught. To be effective, the system also needs to have a working monitoring and enforcement process in place. Reporting obligations can reinforce monitoring and enforcement. At the very least, a working EPR programme needs information on: (1) producers (through registration, for example); (2) the quantity of new products each producer puts on the market; (3) authorised treatment facilities (ATFs) in the system (through authorisation, for example); (4) the quantity of waste which enters the system, and (5) the quantity of waste going to different treatment and recovery channels. All this information has to be updated frequently. Many programmes also specify how long the records have to be maintained. The Taiwanese system, with detailed auditing procedures, seems to be the most extensive in these areas.

3. Indian specificity

Successful policy implementation has to be sensitive to the situation in the country concerned. Unless a policy is tuned to match the social, technological, economic and political contexts, it is likely to result in inappropriate implementation (Dolowitz, and Marsh 2000, 17; Evans 2004, 43-4). This also applies to EPR. In addition, the discussion in Part 2 shows that the exact allocation of different types of responsibilities, and the mix of policy instruments, are largely dependent on local conditions. The following three sections in this part discuss the Indian specificity and its relevance to EPR in terms of opportunities and challenges.

3.1 Current Situation in India

Figure 3 summarises the Indian situation in a simplified form. The system is divided into three segments. The first segment is the market place for EEE. There are two types of new products: branded products, whose producer is identifiable, and no-name-branded products, whose producer is not identifiable, i.e. the born-to-be orphan products. Second-hand products are sold in the re-use market and are dependent partly on the downstream operation for spare parts retrieved from WEEE. The relationship between new branded, no-name-branded, and re-used products is that of price competition. The two latter types are, in general, cheaper and of lower quality, and occupy a niche market for a certain sector of the population. Recently, as the prices of new branded products have dropped continuously, the market share of the other two types of products has shrunk.

The second segment is consumption and post-consumer WEEE generation. Domestic users of EEE play a two-fold role both as a consumer of EEE and as a generator of WEEE. Some discarded but functional products will be resold in the re-use market. There are two types of consumers: corporate users and private households. From the available literature, corporate users either donate their obsolete EEE, or auction it in bulk (Swiss Federal Laboratories for Material Testing and Research 2007). Households normally trade in their functional, high-value but obsolete items, like televisions, when they buy new products (see Section 3.2.5). Discarded products with no trade-in value are sold to kabadiwalas (rag pickers), or simply disposed of along with other MSW (the open-end arrow from the circle "WEEE") (EMPA 2007). Besides domestic generation, WEEE is also illegally imported into the country.

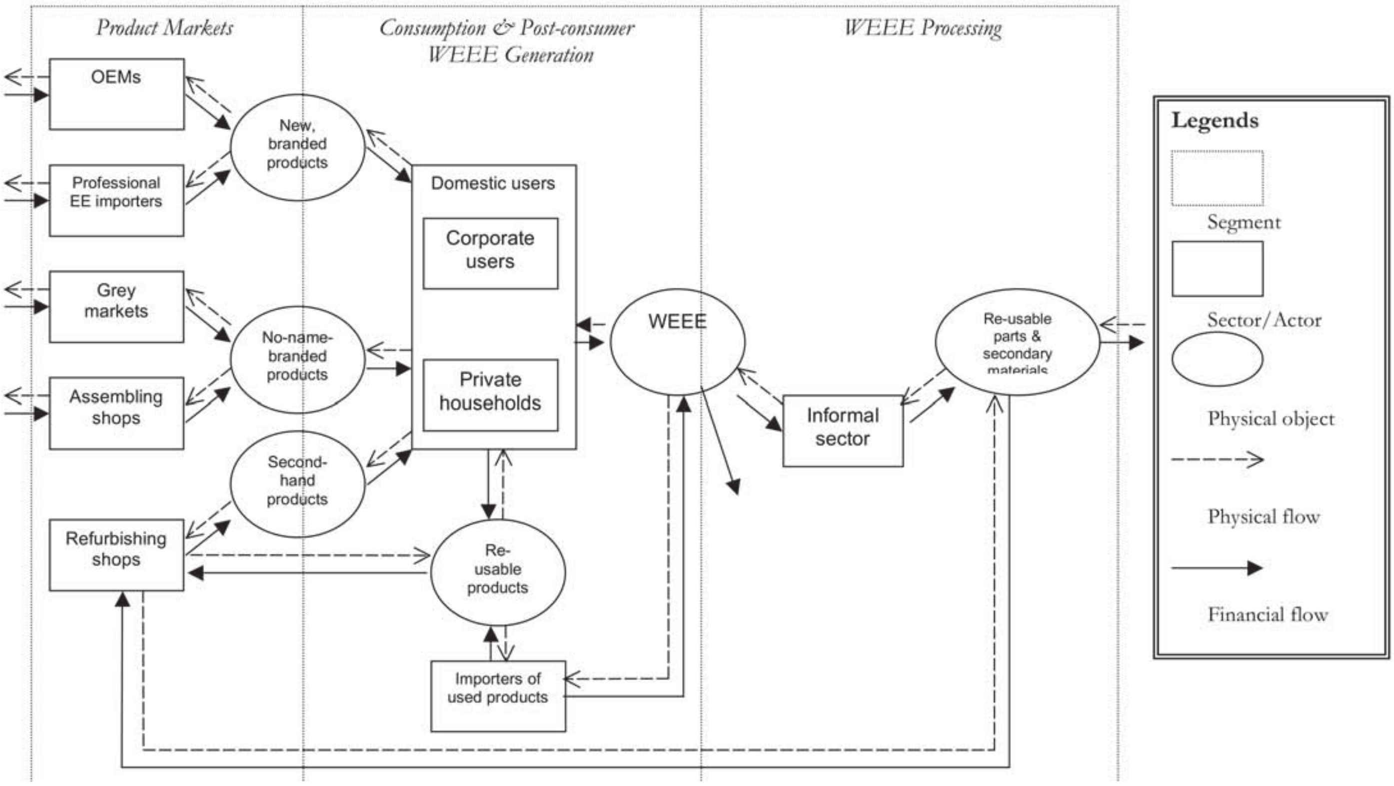

Figure 3 – *The Indian situation in a simplified form.*

The third segment is WEEE processing. As they currently handle the majority of WEEE, only the informal recyclers are shown, despite the existence of two authorised WEEE recycling plants in India. WEEE entering the informal sector is traded through several actors in their hidden, but vertically well-organised, networks – i.e. they have established fairly stable partnerships with actors one-tier up and down the supply chain. These actors in the Eol chain then extract re-usable components and valuable materials from WEEE according to their specialities. Re-usable components are resold in the re-use market, while valuable materials are sent to the secondary material markets, outside the system boundary of this analysis.
To keep the figure simple, residue/waste from downstream activities is not shown. However, readers must be aware that downstream activities are not waste-free and, as will be discussed in Section 3.2.4, the informal sector is responsible for causing pollution both on-site and in surrounding areas through residue from the uncontrolled operation. In addition, this diagram excludes pre-consumer waste from production – industrial WEEE – as the fraction comes under a separate system and would be fairly easy to incorporate into an EPR programme afterwards.

Figure 4 Illustrates a scenario where an EPR programme with minimum requirements is added to the Indian situation. There are three necessary components that any EPR programme must have: (1) a formal sector comprising authorised treatment facilities (ATFs); (2) monitoring and reporting infrastructure, and (3) additional financial flow(s) from the (identifiable) producers to the formal downstream operators. The necessity of the additional financial mechanism is obvious for WEEE with negative values, but its necessity for all WEEE in the Indian context will be discussed in full in Section 3.3.2. The analysis of opportunities and challenges in the following two sections, is based on the understanding of the relationship between different components in this scenario.

Waste recycling in Delhi: a boy winces at the smoke rising from the computer motherboards being melted over open fires.

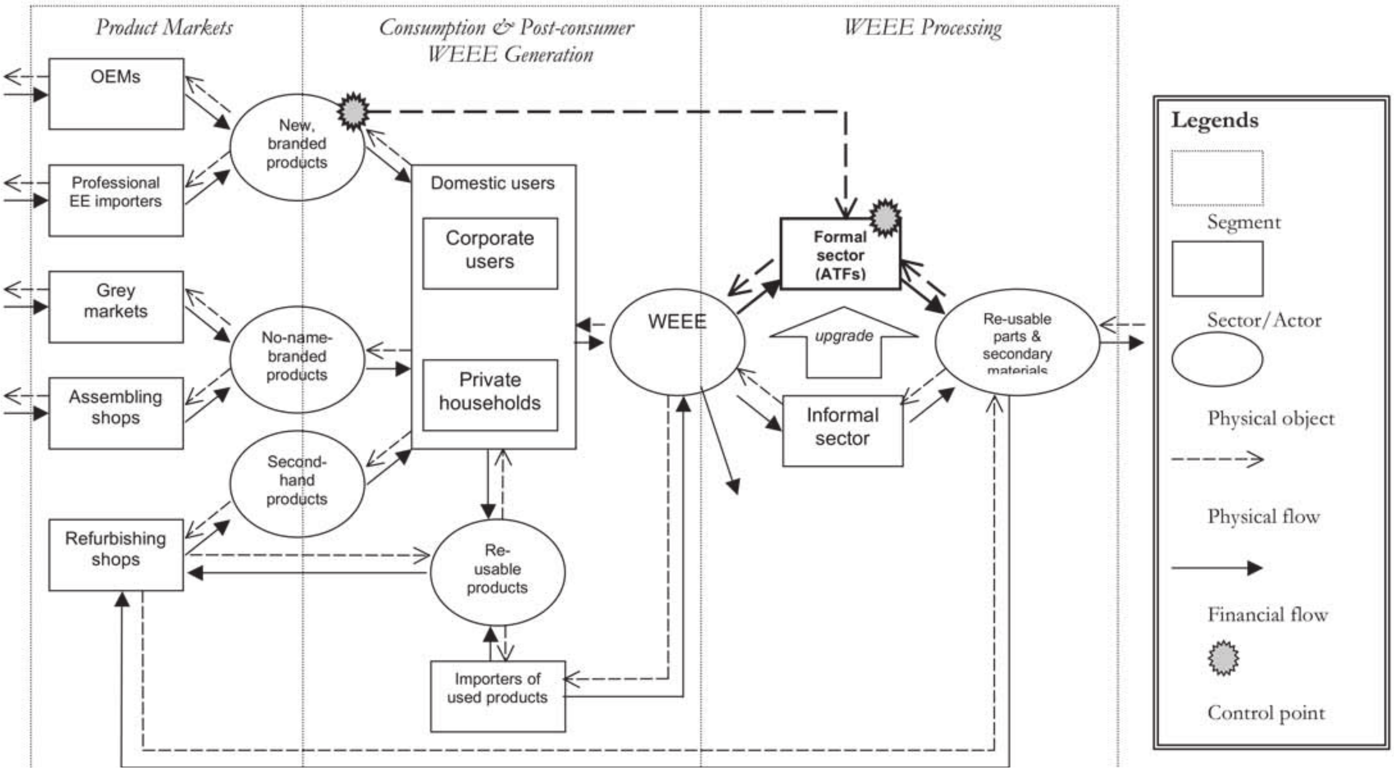

Figure 4 – *A system with an EPR programme with minimum requirements.*

'a continuous increase in the penetration rate in India hints at increasing costs of policy inaction'

3.2 Opportunities

This section lists six opportunities in the current Indian situation for the establishment of an EPR programme with minimum requirements.

3.2.1 Relatively small stock of domestic historical products

Historical products are an addition to an EPR programme. Within this fraction of the waste stream, there is an unpreventable problem of historical, orphan products (cell D in Table 1) which might unfairly burden existing identifiable producers. In India, however, due to a low penetration rate in the past, this fraction has not been as big as that in OECD countries, and the market is far from saturation. The Central Pollution Control Board (Press Information Bureau 2007) estimates that the domestic generation of four waste products – televisions, refrigerators, air conditioners, and computers – amounted to 146 000 tonnes in 2005. This is equal to 0.1 kg per capita, compared with 17-20 kg per capita in the EU (IPTS 2006, 1; please note that the scope of the estimation in Europe is broader in terms of product categories). Meanwhile, the amount of EEE placed on the Indian market has increased every year. Together, this means that even if all historical products were (or were treated as) orphan and their EoI costs were borne by new products, the ratio would be substantially less than 1:1. Metaphorically, even in the worst case of all historical products being orphan, it would resemble a pension system in which a bigger and growing labour force works to support a handful of pensioners.

On the other hand, a continuous increase in the penetration rate in India hints at increasing costs of policy inaction. Until now, the problem of domestic WEEE in India has been relatively small but it is expected to grow rapidly. The same study by the Pollution Control Board (referred to in Goel 2006) forecasts an 11-fold increase in the amount of domestic WEEE to 1 600 000 tonnes by 2012. In the Indian context, where the use of the end-user-pays mechanism is dubious (see Section 3.3.2), this implies a need to have a system capable of securing the finance for the future EoI management of the new products.

3.2.2 Big share of corporate users

For *certain product groups*, corporate users have the lion's share of the consumption in India. For example, they have accounted for more than three-quarters of the computer shipments by unit (MAIT 2007). On a practical level, the waste generated by corporate users is easier to manage as it comes in bulk and has a rather high value. In addition, big corporate users have their image to protect and most have an environmental policy. This in turn makes it relatively easy to get them to cooperate in a take-back programme, when compared with other dissipative sources. The Electronics City Industries Association in Bangalore (e-Waste Agency 2006), representing large consumers of ICT products, has developed a code of conduct for e-waste management under the concept of a 'Clean e-Waste Channel.' One of the notable elements of the code is Preamble 5 stating that "The members should not focus on profitability through disposal of e-waste" (e-Waste Agency 2006). B2B e-waste has the potential to smooth out the transitional period where normally the set-up of the collection and treatment networks, together with the need to secure the sufficient and constant supply of WEEE into the system, are key challenges. Specifically for the Indian case, this might lessen the challenge of competition from the informal systems (see Section 3.3.2). However, the sales information needs to be treated with care when it is translated into EoI information.

E-waste transported on a tricycle in Seelampur, Delhi.

'a national EPR programme would provide a foundation to level the playing field'

The amount of WEEE from corporate users can be overestimated. Interviews and a survey have revealed that not all corporate EEE becomes B2B WEEE, as some functional equipment is sold for nominal prices to the employees, where it ultimately becomes B2C WEEE.

3.2.3 Lucrative downstream businesses

Downstream activities in India, despite being carried out in the informal sector, have established very lucrative businesses involving a number of actors. High-value used appliances such as computers, televisions, refrigerators, air conditioners, washing machines, and mobile phones are collected by, among others, kabadiwalas (rag pickers) who go door-to-door and later pass on collected items to known WEEE dealers/middlemen. Unless they are resold as second-hand products, collected items are manually disassembled to an extent never experienced in OECD countries. Depending on the disassemblers' resources and demand for different spare parts, certain components are separated and stored for re-use. Others are sent to informal recyclers to recover saleable materials, including plastics and glass. Recovered materials are then supplied to huge, domestic markets for secondary materials through waste dealers/middlemen, who also deal with materials recovered from other waste streams.

The existence of these actors in the informal sector provides a unique opportunity for an EPR programme to exploit. However, the backyard recyclers whose methods are considered to be too risky, dirty and inefficient, would not be in line with an EPR programme (see Box 1 and Section 3.3.2). Collection can be performed economically in India without significant environmental impacts. Due to its heterogeneous and complex composition, which renders automatic disassembly difficult, disassembly of WEEE is largely undertaken manually (Li, Shrivastava, Gao, and Zhang 2004, 34; Cui, and Forssberg 2003, 245). Workers in the informal sector are already skilled in this operation. Therefore, it is beneficial to integrate existing collectors and skilled disassemblers into an EPR programme - it is preferable for the latter to be employed in authorised treatment facilities (ATFs, see Section 3.3.1). Not only would this already skilled workforce smooth the start-up of the EPR programme, but the integration into the formal sector would also provide the workers with better and more secure working conditions and fringe benefits. However, previous attempts such as a GTZ-sponsored initiative, *E-Waste Recyclers in Delhi – Way Ahead*, have proved that this upgrade is not an easy task (Mahesh 2007). In some cases, small actors and workers are locked in a one-way dependent relationship with the so-called 'waste mafias' in the chain. The area where integration would be contentious, is in material recycling which should be handed over to ATFs with controlled processes.

3.2.4 Lessen the burden on municipalities

Unless there was separate collection and treatment of WEEE, the rapid increase in EEE consumption in India would eventually translate into growing amounts of MSW which would over burden the limited capacity of the municipalities and the taxpayers. Although in the current situation (Figure 3), most WEEE would first be diverted from the MSW stream into the informal sector, low-value items and the residuals, (which are usually highly toxic owing to uncontrolled and inefficient processes), would be dumped on-site and in neighbouring areas. To collect and treat these residuals and clean the sites would be expensive. On the other hand, an EPR programme for EEE implies a separation of WEEE from other MSW and dedicated physical and financial infrastructures for WEEE. In addition, where municipalities have spare capacity, they might be physically involved in the collection of WEEE and be reimbursed for their efforts through the EPR programme.

3.2.5 Existing business practices and initiatives

Currently there are two business practices upon which a national EPR programme can be built: producers' voluntary take-back and retailers' trade-in schemes. Voluntary take-back is a marketing strategy driven mainly by environmental concerns, as take-back schemes, in general, incur additional costs (Hazra, and Mehta 2007). Big Indian manufacturers are currently under pressure from local civil society to take responsibility for the entire life cycle of their products. In response, they have promised to comply with RoHS in India and to incorporate a free take-back scheme into their businesses, despite the absence of a national programme. In the same way, multinational corporations (MNCs) are facing the demand from the international civil society to be globally consistent in their EPR policies (see Greenpeace 2007) so as to avoid double standards. Some of them have already promised to introduce RoHS-compliant products to the Indian market in the near future, regardless of local legal requirements.

Furthermore, most retailers in India offer a trade-in option for their customers. Here, a retailer offers discounts for a used product of equivalent function from customers buying a new product. This has been a marketing strategy driven mainly by economic factors. As Okada (2001) mentions, trade-in is one way to stimulate consumers' replacement decision. From our market walk, retailers determine discounts based on the remaining value of the traded-in products, and the discount of a used product is fixed regardless of the value of a new product (with some deviations). This valuation practice means that retailers expect to earn a fixed amount of money from traded-in products at a later stage, and the discounts do not merely reflect a margin between wholesale and retail prices.

Both types of schemes can be improved further under an EPR programme. So far, the producers' take-back schemes have scored poorly in terms of collection. As will be seen in Section 3.3.2, in the Indian context, free-of-charge take-back does not give enough incentive to users to hand over their WEEE to the schemes. And the take-back schemes are worthless unless they can collect WEEE. On the other hand, it would seem unfair to further ask the forerunners who initiated the schemes to incur additional costs while there is no system to force other producers to do the same. A national EPR programme would provide a foundation to level the playing field. Regarding retailers' trade-in schemes, an EPR programme might enable them to cover low- or negative-value used products. Currently, the scope of the schemes is limited to functional and high-value used products. Retailers simply offer discounts to customers without taking back their used products with nominal values and/or low demand in the re-use markets, such as food mixers. In a mandatory programme, all WEEE would be included. In addition to these benefits, the establishment of a formal treatment sector in an

EPR programme would ensure that WEEE collected through these channels would be handled in an environmentally sound manner.

3.2.6 Harmonisation and learning lessons

Besides the domestic situation, the time is also right for India to capitalise on and harmonise with the experiences and examples abroad. It is true that to have an effective system adapted to the Indian context, studies and a process of trial and error are needed. But it is also true that many countries have gone through these painstaking processes. Most OECD and some non-OECD countries have a system for WEEE in place (but not all are based on EPR) while others are in the process of developing one (see Appendix III). India can, instead of starting from scratch on her own, benefit from them, e.g. by emulating good practice and not repeating the mistakes. In addition, when faced with similar responsibility in India, global players, i.e. MNCs, might facilitate the transfer of technologies and know-how they have developed elsewhere, to India (Lin, Yan, and Davis 2002, 564).

There are two areas particularly advantageous for India to support the harmonisation of international standards and practices: the RoHS-like product standards and the transboundary movement of used products. Hitherto the EU RoHS Directive has prompted other countries to adopt similar standards restricting the use of six substances in new products. This is the move that India should follow, not because of the export argument, but rather the opposite. The Indian hardware sector is currently underdeveloped and India is not a big exporter with only 14% of its production being exported (Information, Planning & Analysis Group of Department of Information Technology 2006a). Thus the direct impact of foreign product standards on Indian manufacturers is not that high. In addition, exporters have to comply with these foreign standards anyway, regardless of domestic standards. (This partly explains why the China RoHS does not include the production of products destined for export (Article 2).) The real rationale for harmonisation is, however, to prevent the import of non-RoHS-compliant products, components and sub-assemblies. Although it is likely that the production of these products will eventually end (as more and more countries adopt RoHS-like standards), in the transition period, its legacy in the global market would result in non-compliant products seeking unprotected markets. The threats of an inflow of imported non-RoHS-compliant products are twofold. Firstly, the EoI management of these products will be comparatively costlier and inherently less clean than those which are RoHS-compliant. Secondly, these dumped products could damage the development of domestic EEE production if they are under-priced due to the low demand in the global market (Goel 2007).

Another area to harmonise is the legal transboundary movement of used products (illegal movement will be discussed separately in Section 3.3.3). Due to global trade, one way producers in countries with EPR programmes circumvent their responsibility is to legally ship used products to countries with no such system, e.g. India, for re-use. Tojo (2004, 288) suggests that the establishment of EPR programmes in the importing countries, where the importers of these used products are considered as producers, could be a solution. In this case, it is even imaginable that, if there are financial guarantees in the exporting country as in the EU, these guarantees should be transferred to the EPR system in the importing country and used for the EoI management of the products, instead of just ending up in the hands of the producers in the exporting country.

3.3 Challenges

This section lists six challenges in the current Indian situation to the establishment of an EPR programme with minimum requirements.

3.3.1 Lack of formal recycling infrastructure

The first challenge in developing an EPR programme in India is a lack of ATFs and a collection infrastructure to channel WEEE to controlled facilities. Currently, there are only two facilities authorised to recycle WEEE and a handful of enterprises authorised to dismantle WEEE. However, this problem is not limited to India. Many countries have shown ways of overcoming it with various degrees of governmental intervention. At one extreme, there is public ownership, where the government owns and operates ATFs as in Taiwan. Alternatively, the government might provide financial incentives, such as recycling subsidies in California or favourable loans in China, to induce the establishment of private ATFs. At the other end of spectrum, the government simply sets a clear legal framework together with collection and re-use and recycling targets, and leaves it to producers to develop the necessary facilities to meet the targets, as in the EU, Japan, and South Korea. ATFs can be developed either after or before the establishment of an EPR programme. An advantage of the former is that resources can be mobilised through recycling fees on new products under the programme. The challenge is the timeliness of the project. Taiwan experienced a shortage in treatment capacity in the beginning, and had to store collected WEEE for a few years owing to the delay in constructing and authorising recycling plants (Shih 2001, 59). On the other hand, the risk of constructing ATFs before the programme is running, is that there might not be a sufficient supply of WEEE to support continuous running of ATFs. This is especially the case when there is fierce competition for WEEE from the informal sector (see Section 3.3.2). For example, several plants in China have stood idle or are not fully operational due to a lack of supply and a delay in a promulgation of the China WEEE (Liu, Tanaka, and Matsui 2006, 100; He, Li, Ma, Wang, Huang, Xu, and Huang 2006, 510-1; Hicks, Dietmar, and Eugster 2005, 467).

The authorisation process itself is equally important. The process must be rigorous, transparent but not cumbersome. To make the authorisation process meaningful, the government needs to be competent and have sufficient resources, which unfortunately is not always the case. During interviews, some stakeholders expressed concern over a lack of specific standards for WEEE treatment in India and a lack of resources on the part of the Pollution Control Boards. Currently WEEE recycling plants in India have to apply for permits under the existing Hazardous Waste (Management and Handling) Rules, 1989 (as amended in 2003), which are not tailored to WEEE. In addition, although there is a legal clause in the Rules that the authorisation process has to be completed within 90 days (Article 5(4A)), the process can be overly lengthy and demanding in practice (Parthasarathy, and Shankar 2007). If we view the authorisation as an exchange transaction between the government and enterprises (Nelson, and de Bruijn 2005), for WEEE recycling in India the benefits of authorisation are limited while the costs are rather high. Therefore, it is unsurprising that the majority of Indian recyclers remain in the informal sector.

As a remedy, India can use Annex II and III of the EU WEEE Directive as a starting point and make an amendment to the Rules, until separate legislation for WEEE is passed. Regarding resources, the Taiwanese system - with very elaborate auditing and certification

Women in Bangalore, working in a ISO-14001 certified ATF.

procedures - illustrates how authorisation can be strengthened using the money from the Resource Recycling Management Fund (Article 17.4) derived from producers. Alternatively, authorisation might be treated as a minimum requirement and environmental self-regulation encouraged among ATFs by providing favourable conditions. For example, to be a member of the BPS' (a PRO of Swedish car producers) network, ATFs had to implement EMS in line with the ISO 14001 standard (Manomaivibool 2007, 60).

3.3.2 Competition from the informal sector

Unless the whole informal sector was upgraded and authorised, informal recyclers would compete with ATFs for WEEE. Here, it is advantageous to make at least a conceptual distinction between competition for WEEE and for re-usable products. Here, only the former is of concern (the latter will be discussed in Section 3.3.6). Without any interventions, informal actors would have an edge over their formal counterparts in terms of their non-compliance with environmentally sound production/specification standards, absence of related costs and tax payment. As far as material recovery is concerned, recovered materials will, at the end of the day, be sold in the secondary material markets at similar prices, regardless of where they originate. Therefore, unless ATFs are able to earn higher net profits from processing WEEE, by using more efficient technologies than the informal recyclers with rudimentary methods (for example, see Rochat 2007 on the superiority of a state-of-the-art facility in extracting precious metals from printed-wiring boards), the informal sector would have more money to offer users for their discarded WEEE. With the presence of informal competitors in India, the formal system would score poorly in terms of collection. And any WEEE management system would not be viable without the ability to collect WEEE – the problem highlighted in Chinese pilot projects. An Indian ATF has complained about this problem, stating that while

'without any interventions, informal actors would have an edge over their formal counterparts'

the amount of domestic WEEE has increased continuously, (never mind the illegally imported WEEE), it has been struggling to find materials to fully operate its five-tonne-per-day facility (Parthasarathy, and Shankar 2007). Currently, the plant relies on WEEE collected through producers' service centres, which have to be disposed of in a sound manner due to the producers' environmental policies. This is also a reason why foreign companies are deterred from investing in the Indian WEEE (Mahesh 2007; Parthasarathy, and Shankar 2007; Rochat 2007).

All these are reasons why an additional financial flow is still necessary, even for those products for which EoI management is profitable in India. Under an EPR programme, this additional finance in terms of recycling subsidies, would be sourced from the (identifiable) producers. Here, the use of front-end mechanisms is even more preferable because an end-user-pays approach would further weaken the formal sector's collection potential. In the programme, only an ATF with official certification confirming the amount of WEEE it physically handles, would be eligible to receive the subsidies proportional to the amount of WEEE it processes. This would bridge the gap between their purchasing power and that of the informal recyclers. Here, auditing and certification mechanisms are needed to ensure that the right amounts of subsidies go into the right hands. The exact arrangement and setting of the financial mechanism(s) from producers to ATFs, and then consumers, is beyond the scope of this study, however. Currently, Toxics Link, GTZ-ASEM, and EMPA are developing an EPR model for WEEE in India under Indo-German-Swiss cooperation (Toxics Link 2007a; Chaturvedi 2007; Rochat 2007). It is expected that the financial element of this EPR model will, at least, (1) address this issue of competition from the informal sector and (2) provide incentives for producers to make design improvements in new products (Rochat 2007).

3.3.3 Illegally imported WEEE

Illegally imported WEEE[7], presents two major challenges. Firstly, it keeps the informal businesses viable. Though there is no official data on the amount of illegally imported WEEE, previous studies refer to it as the biggest source of computer scrap supplying India's informal sector (Mundada, Kumar, and Shekdar 2004, 267; Toxics Link 2003, 14). This is why the size of the informal sector in India is bigger than it would otherwise be if it only handled domestic WEEE. Unless measures are taken against this practice, illegally imported WEEE will sustain a sizeable informal sector, which in turn, perpetuates its competition with the formal sector for domestic WEEE. Worse still, illegally imported WEEE can even disrupt measures to correct that competition – representing the second challenge. If the formal sector has an additional financial mechanism to attract domestic WEEE away from the informal sector, it is likely that it will attract illegally imported WEEE as well. In other words, illegally imported WEEE is like orphan products and free-riders and unfairly burdens the WEEE management system - at least in terms of sorting, monitoring and auditing.

A rigorous enforcement of the Basel Convention can stop this illegal transboundary movement of WEEE. The Supreme Court of India ruled on 14 October 2003 that WEEE shall not be imported into India, as she is a party to the Basel Convention (though India

7 This is conceptually distinct from legal transboundary movement of used products discussed in Section 3.2; importers of illegally imported WEEE are by definition non-identifiable and hence not affected by any harmonisation measures.

'this distinction between re-usable and waste EEE has become a loophole in the system'

has not yet ratified the Ban Amendment). However, putting the Supreme Court's order into practice is not straightforward. Currently, this rule does not apply to the import of used products for direct re-use. This distinction between re-usable and waste EEE has become a loophole in the system as it has not been clearly defined in India. Most exporters/importers declare their shipment as "re-usable" irrespective of the condition of the imported products. Therefore, clear guidelines and criteria for customs to implement this distinction are needed.

In this respect, it is particularly useful to look at practices abroad in order to make an international synergy on this global issue. The work of Mobile Phone Partnership Initiative (MPPI) on the transboundary movement of collected mobile phones under the Basel Convention provides a good basis. A decision tree procedure is comprised of a series of questions to determine a category, and rules are applied under the Convention to a particular shipment of collected, used mobile phones (see Box 2). This is in line with a three-step approach laid down by port authorities in the EU in the guidelines on shipments of WEEE. According to the guidelines, used EEE not deemed to be WEEE should have: (1) functionality tested and hazardous substances evaluated; (2) records containing the details, and (3) proper packaging. It is clear in the guideline that a visual inspection alone is unlikely to be sufficient to fulfil the first step. Generally speaking, obsolete items which should be allowed to move under normal commercial rules, are those which have been tested and considered as used EEE that can be re-used *without* further repair or refurbishment and those destined for repair or refurbishment *under warranty* by the producer. However, a grey area of used EEE which might possibly be re-used after repair or refurbishment in the importing country, still exists. This is a contentious issue in functionality testing. To circumvent the testing, the Thai government employs a much cruder approach by setting arbitrary maximum ages of used products allowed to be imported into the kingdom – two years and five years after the year of production for 28 appliances and for copy machines, respectively. At any rate, the burden of proof of compliance should rest on exporters/importers. India, as an importing country, can also benefit from strict enforcement in exporting countries via cooperation and harmonisation of criteria and procedures.

Box 2 – The Basel Convention and MPPI's decision tree procedure

In Annexes VIII (List A) and IX (List B) of the Basel Convention, there are two entries relating to used EEE and WEEE. Articles in the entry A1180 in Annex VIII are considered as hazardous and subject to Basel control mechanisms unless they can be demonstrated that they are not hazardous according to Annex III.

A1180 – Waste electrical and electronic assemblies or scrap containing components such as accumulators and other batteries included on list A, mercury-switches, glass from cathode-ray tubes and other activated glass and PCB-capacitors, or contaminated with Annex I constituents (e.g., cadmium, mercury, lead, polychlorinated biphenyl) to an extent that they possess any of the characteristics contained in Annex III (note the related entry on list B B1110)
Articles in the entry B1110 in Annex IX, on the other hand, are not wastes covered by the Convention unless they contain Annex I material to an extent causing them to exhibit an Annex III characteristic.

B1110 – Electrical and electronic assemblies:

- Electronic assemblies consisting only of metals or alloys
- Waste electrical and electronic assemblies or scrap (including printed circuit boards) not containing components such as accumulators and other batteries included on list A, mercury-switches, glass from cathode-ray tubes and other activated glass and PCB-capacitors, or not contaminated with Annex I constituents (e.g., cadmium, mercury, lead, polychlorinated biphenyl) or from which these have been removed, to an extent that they do not possess any of the characteristics contained in Annex III (note the related entry on list A A1180)
- Electrical and electronic assemblies (including printed circuit boards, electronic components and wires) destined for direct re-use, and not for recycling or final disposal

To facilitate the interpretation of the Basel text, MPPI has developed a decision tree procedure, as shown in Figure A.

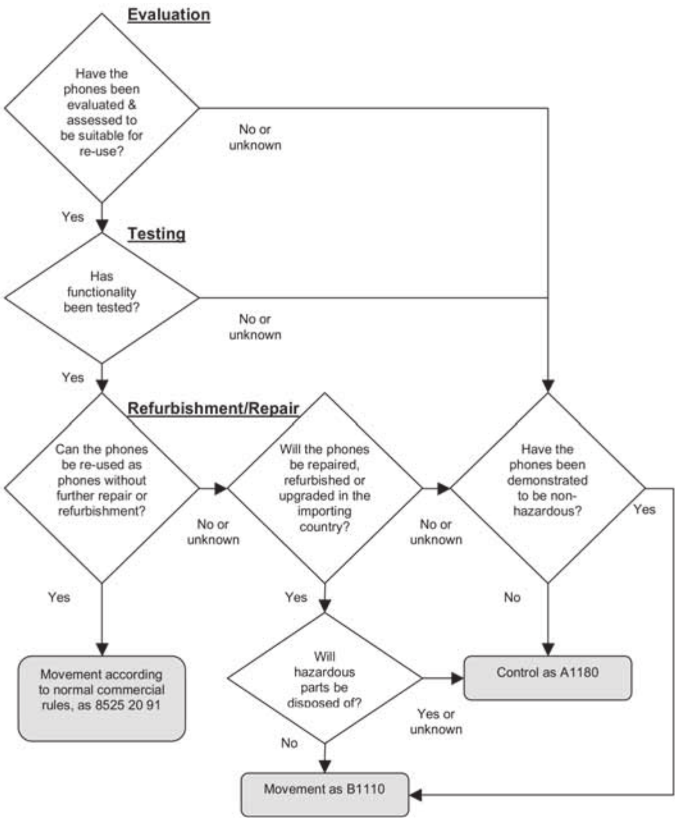

Figure A – *Decision tree for transboundary movements of collected used and end-of-life mobile phones (MPPI 2006, 18)*

- This entry does not include scrap assemblies from electric power generation.
- PCBs are at a concentration level of 50 mg/kg or more.
- This entry does not include scrap from electrical power generation.
- Re-use can include repair, refurbishment or upgrading, but not major reassembly.
- In some countries these materials destined for direct re-use are not considered wastes.

'the problem of no-name-branded products is more manageable than first appears'

Another option to get around this issue is to abandon this distinction and have a blanket ban on all imports of used products. Those who support this approach argue that the costs of the legal loopholes outweigh the benefits of used products that actually go to re-use and donation (Mahesh 2007). It is worth noting that the MPPI and EU guidelines respect import restrictions in importing countries.

3.3.4 Identification of producers

The biggest challenge to the prospect of an EPR programme in India lies not in the downstream, but in the upstream segment. Most, if not all, stakeholders express their concern that EPR would not be applicable in India where a large share of the market comprises "no-name-branded products" (Goel 2007; Hazra, and Mehta 2007; Jain 2007; Khanna 2007). As Table 1 shows, the challenge is real if these no-name-branded products are new, orphan products (cell B). Here, they are the ultimate form of these born-to-be orphan products as not only the producers disappear from the market (e.g. bankruptcy or withdrawal from the market), but also the whole transaction between the producers and consumers is not identifiable. In other words, the front-end mechanism is completely out of the question. Under an EPR programme, when these products reach the Eol stage, they will unfairly burden the formal system. Where the programme sources finance from identifiable producers, they also have to shoulder the costs of these free-riders' products. In addition, because one possible consequence of costs internalisation in an EPR programme is an increase in the prices of new branded products (cell A in Table 1), this might worsen the price competitiveness of the branded products on the market[8]. Consequently, the market share of the no-name-branded products might increase. The bigger market share would translate into a bigger share of orphan WEEE, which in turn, increases the EPR costs of identifiable producers and the prices of their products even further, and so the vicious circle continues. As mentioned in Section 2.2, for the smooth operation of an EPR programme, this group of no-name-branded products must be eliminated or reduced. This requires a good understanding of its nature and sources.

Having said all this, a closer investigation reveals that the problem of no-name-branded products is more manageable than first appears. From the interviews and market walk, the no-name-branded products are not one homogenous group of products, but comprise at least two types of products: products in the grey markets and assembled products. The extent of the problems of the two types also varies across products. Firstly, some products are sold in the grey market. The transaction is illegal and the operators in the grey market do not pay any duties and/or taxes. This fact translates into their price competitiveness. Though no official data exists, industrial associations believe that the grey market currently has the lion's share in certain products such as radios and DVD players (estimated at 70% and 60% by units sold, respectively) and a smaller share in the case of televisions (20%) (Goel 2007; Khanna 2007; see also IPAG of DoIT 2006a, 67). This problem of grey markets is, however, solvable. Stakeholders agree that this market anomaly is the result of the tax structure. In India, the production and sale of certain products faces high and complex tariffs. For example, the value-added and sales taxes can be as high as 35% (Khanna 2007). This drives some economic actors to operate in the grey market where no taxes are imposed. At the same time, this tax structure discourages foreign direct investments and other spin-off benefits (see the vivid story of Dell in Prasad, and Gupta 2007, 65-8). Therefore, the ultimate way of redressing the problem is to reform the tax structure. Such reform in the mobile phone sector provides a good example (IPAG of DoIT 2006a, 69). This particular case saw a dramatic drop in the share of the grey market from 75% to 10% (IPAG of DoIT 2006a, 66). The arguments for the need for revenue requirements, accessibility of the poor to justify high taxes and the existence of the grey market, are ill-conceived. An analysis by IPAG of DoIT (2006a, 66) shows that the government could actually collect less revenue in the 14%-duty scenario than in the 5%-duty one. In addition, despite their lower prices, products sold in the grey market are in general of inferior quality and expose consumers to fraud. Therefore, the government should protect consumers' rights. The accessibility of the poor to technology should be promoted through other more direct means, such as welfare programmes (which possibly source money from increased revenues in the low-tax scenario).

Secondly, there are assembled products, which are specific to computers. In places such as Nehru Place, Delhi, small-time shops assemble components into computers. Although most of them do put their brand on the assembled PCs, it might be difficult to target them in an EPR programme. Thus, they are practically non-identifiable. However, some of these shops do pay taxes, though possibly not in full, as some shops offer products at a discounted price without a receipt, and aspire to become a big, recognisable and hence identifiable actor. This partly explains why they have their brand, and offer after-sale services. Unlike the grey market, this sub-segment of the informal sector provides a "low-risk entrepreneurship learning space" (Nelson, and de Bruijn 2005, 582) for small entrepreneurs and it is possible to address the problem of their identity under specific arrangements of an EPR programme without scrapping the assembling sector. This possibility lies in the fact that components of assembled products are branded and their producer is identifiable. In this case, the comprehensive scope of an EPR programme would cover not only EEE as such, but also all components and subassemblies, and using the Californian definition of a final consumer – a person who purchases a new or refurbished covered electronic device in a transaction that is a retail sale, or in a transaction to which a user tax applies – would effectively make the transaction between component producers and assemblers correspond to an EPR front-end financial mechanism. For example, a big manufacturer, X, who sells a monitor to a computer assembler, Y, would be considered a producer in an EPR programme and might be obliged to provide a financial guarantee. (In cases where assemblers source supplies from the grey market, the problem of the grey market has to be corrected.) One can even imagine a selective approach in choosing EPR products and a comprehensive approach in defining the products. For example, an EPR programme might include only computers (selective) but have the definition of a "computer" that includes its components and subassemblies sold to final consumers. The disadvantage of this hybrid scope is a disparity and a loophole when certain components and subassemblies are used in other non-EPR targeted products.

8 The argument of an increase in product price must not be carried too far, however. It is common for the estimated EPR costs to be much higher than the actual costs due to political reasons. For example Gottberg *et al.* (2006, 53) report the estimated compliance costs in the lighting sector in two European countries with no EPR programme in place at 60% of the product price while the Swedish companies under an EPR programme report the actual costs between 0.5% and 3% -- factor of 120 and 20 lower.

3.3.5 Small- and medium-sized enterprises

An effective EPR programme changes the market structure to favour those manufacturers who are able to develop environmentally superior products and product systems. Surveys repeatedly show legislation, including laws embracing EPR, as one of the strongest stimuli for DfE (Schischke, Mueller, and Reichl 2006; Veshagh, and Li 2006; van Hemel, and Cramer 2002). However, not all manufacturers are equally well-equipped to face this levelling of the playing field. Of special concern are small- and medium-sized enterprises (SMEs). In their proposal for a WEEE take-back scheme in China, Lin *et al*. (2002, 575) foresee that:

> "The economic opportunities proffered by the implementation of the proposed take-back scheme are more likely to inure to the larger, economically and technologically better endowed foreign-invested facilities than either TVEs [Township and Village Enterprises] or the domestic computer production facilities."

It is generally recognised that DfE is rarely a management issue in SMEs and they lack resources, systematic approaches, and suitable tools to practise DfE (Schischke *et al*. 2006, 235; Woolman, and Veshagh 2006, 281; van Hemel, and Cramer 2002, 439). In addition, case studies of DfE in SMEs are limited and the experiences of large manufacturers might not be transferable to SMEs (Schischke, Mueller, and Reichl 2006, 235). Therefore, it is advisable to have supportive measures to increase the penetration rate of DfE among SMEs. Examples of such measures are research and development e.g. in tools adapted to SMEs' needs (e.g. Lindahl 1999), in cleaner products (e.g. the Danish Environmental Protection Agency's 'Cleaner Products Support Programme', see Greenpeace 2005, 13-14), information sharing programmes and workshops (e.g. Schischke, Mueller, and Reichl 2006), and benchmarking programmes (e.g. Altham 2007).

The other issue regarding SMEs is their relationship with a PRO. As mentioned in Section 2.4.2, with their limited capacity SMEs might be better off joining a PRO to enjoy an economy of scale, for example. On the other hand, PROs or the trade associations, upon which they are based, are normally established and/or operated by bigger players. So, there is a need to have a measure to ensure that bigger players would not use their advantageous position within a PRO at the expense of SMEs. One way is to have (a) representative(s) from SMEs on the board of a PRO.

3.3.6 Effects on the re-use market?

India has a very lucrative re-use market for used products. Repair, recondition, and component re-use are widely practised in Indian refurbishing shops. This is partly due to the cheap labour that makes minute disassembly possible. Re-use in general, is environmentally superior to material recycling as the material and energy values embodied in products and components when they are shaped or moulded, for example, are retained. However, there is a concern that the establishment of an EPR programme would lead to the collapse

Taking a break in a workshop-living quarters, surrounded by heaps of electronic scrap (Delhi, India).

of this re-use market. This fear is based on the fact that the re-use objectives in existing foreign EPR programmes are rather limited, and the majority of collected WEEE is sent directly to material recovery processes, one step lower in the waste management hierarchy.

However, the threat of an EPR programme to the re-use market has been taken too far. Figure 4 graphically shows that an EPR programme, represented by the box of formal recyclers and the re-use market, is after WEEE and re-usable products, respectively. The economic values of these two types of discarded products are significantly different. In the Indian context, where users require compensation for the perceived remaining value of used products, the system designed to collect WEEE would not be able to compete head on with the re-use system. For example, Lu, Wernick, Hsiao, Yu, Yang, and Ma (2006, 17) report that the average price offered in the second-hand market for notebooks is 44 times higher than the collection subsidy of the Taiwan WEEE system. The same is true in India. An enterprise in the re-use business claims to have a much higher purchasing power than an ATF and does not experience any difficulty in finding its supply, in contrast with an ATF (Syed, Shetty, and Manoharan 2007; Parthasarathy, and Shankar 2007). In addition, the re-use market might benefit from the increased prices of new branded products as the latter bear additional EPR costs. Unlike the case of no-name-branded products, however, here the front-end mechanism can break through the vicious circle. Unless producers get the unclaimed deposit (see Section 2.5), there will be money left in the system when the re-used products finally reach their end of life. In this sense, re-used products would be covered under the physical elements of EPR when they become WEEE but not be subject to the front-end mechanism, i.e. no deposit on the transaction of second-hand products. Deposits already collected when the re-used product was first put on the market as a new branded product, and charging the re-use transaction, would be double accounting. A real challenge in practice is thus how to collect re-used products at the end of their life, and incorporate residuals from re-use processes into the system, i.e. the issue discussed at length in Section 3.3.2. However, the situation would be different if re-used products were the legacy of illegally imported or new, no-name-branded products. In these two cases, corrective measures to redress the two problems such as those mentioned in Section 3.3.3 and 3.3.4 are needed before any meaningful discussion can be had regarding the re-use market.

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4. Conclusion and discussion

'there is no insurmountable obstacle to its implementation in the country'

4.1 Possibilities for implementing EPR in India

India is now facing a growing problem of WEEE. EPR has the potential not only to ensure the management of WEEE in an environmentally sound manner, but also to address the root cause of the problem, i.e. the design of products and product systems. Nevertheless, some stakeholders have expressed their concern that EPR, which originated and has been implemented largely in OECD countries, would not be suited to the Indian specificity (Goel 2007; Hazra, and Mehta 2007; Jain 2007; Khanna 2007; Kumar 2007; Satpathy 2007).

However, taking them individually, all the challenges from this specificity are very manageable, as shown in Section 3.3. India is not the only country facing these challenges, and others have already demonstrated possible remedies. Moreover, most challenges are symptoms of deviant behaviours in the market economy – whether they be illegal imports, polluting recycling, or grey markets – which should be corrected at any rate, whether or not an EPR programme is established. This reflects the fact that EPR is a principle developed on the assumption of a well-functioning market economy, where transactions are based on legal contracts and any deviation from this ideal which might jeopardise its function should be seen as a weakness that needs to be rectified, not as an excuse to postpone the action. In addition, as Section 3.2 has shown, it would be beneficial if India were to develop an EPR programme for EEE immediately.

Therefore, if policy makers and stakeholders in India want to address the WEEE problem and see EPR as a way forward, there is no insurmountable obstacle to its implementation in the country. The last two sections of this report will be dedicated to a discussion around the role of the government in developing an effective EPR programme.

4.2 The Role of the Government

Even though many governments around the globe have already enacted legislation to regulate the management of WEEE - or are awaiting forthcoming legislation - the issue of *mandatory and voluntary* EPR programmes is still worth revisiting to establish a rationale for government intervention by showing that one can reinforce the other. It is true that EPR is a market-based principle and draws invaluable lessons from existing voluntary practices in the business world. However, the government intervention can provide a springboard and give leverage to the strategic transformation. In fact, some so-called 'voluntary' programmes are a response to pre-empt legislation rather than a pure business initiative. This implies the possibility of various degrees of intervention. Regardless of the form of intervention, to provide any leverage an intervention must be designed to reward the good, e.g. innovators, and punish the bad, e.g. free-riders. In addition, it is important that a government sends a clear and consistent signal to the targeted industries once it determines to intervene, in order to trigger positive anticipatory behaviours.

There are a few examples where a producer initiates his/her own EPR programme, especially where he/she is responsible for the management of own products at the end of their life, such as those mentioned in Section 3.2.5. However, despite the inspiration and the promising business and environmental benefits they give, these voluntary business practices are exceptions rather than the rule. Consequently, in most cases environmental benefits are treated as positive externalities and are under-provisioned. Thus, a levelling of the playing field is needed. In addition, a closer investigation shows that some practices such as leasing would not entail the promised environmental benefits unless: (1) the manufacturer of products leased them directly, and had interest in their design improvements; (2) the products at the end of their life were returned to them for extracting embodied values; and (3) the waste management hierarchy was followed (Mont, Dalhammar, and Jacobsson 2006, 1510). In other words, there is a strong case for government intervention to stimulate and steer business practices in an environmentally beneficial direction.

Approaching the issue from another direction reflects a similar need for intervention. A study on dissemination of DfE in Europe shows that "regulations are the main driver for eco-design activities" (Mont, and Lindhqvist 2003, 906). The conclusion and implementation of the most successful covenants, a flagship of the voluntary approach, would not be possible without a so-called 'regulatory threat'. Tojo (2004, ix) even concludes that the anticipation of upcoming legislations can be just as powerful as actual mandatory requirements in stimulating design improvements. However, whether the anticipatory behaviour would be beneficial depends on what is anticipated. Unless a government clearly and consistently signals its determination and objectives, some industries might try to sway the agenda and others might adopt a 'wait-and-see' strategy (Crotty, and Smith 2006, 105), instead of engaging in fruitful design improvements.

One lesson that policy makers can take from this discussion is that the intervention can come in various forms with different degrees of governmental involvement. For example, the Norwegian packaging industry concluded a covenant with the government to avoid a regulatory proposal for a perceived costly packaging tax (Røine, and Lee 2006, 225). At the other extreme, in Taiwan, the government eventually took over the control from joint recycling, clearance and disposal organisations (PROs) and has operated the Resource Recycling Management Fund to increase the credibility of the system. The nature of a trade association is an outstanding factor here. The existence of a strong and responsive trade association is a necessary condition to make a voluntary initiative, such as a covenant, sufficient. Such a collective body is able to develop industrial solutions, gain commitment from its members and hence circumvent the problem of free-riders to an extent; and win confidence from regulators and the public at large. In an absence of this condition, the government might consider more direct forms of intervention. However, there is also a risk of too much involvement, especially when the government moves towards the extreme by taking over the administration and does not allow producers to develop alternative solutions. As Section 2.4 shows, this restrictive and anti-competitive nature can kill the incentive for design improvements of IPR.

Children extract copper from discarded computer parts in New Delhi.

'the closer to IPR, the stronger the incentives for design improvements in the programme'

4.3 Developing an effective EPR Programme

There are several things that policy makers should consider when they want to develop an effective EPR programme. To help them, van Rossem and Lindhqvist (2005) and Clean Production Action (2003) have compiled lists of questions which serve as self-evaluation tools. These checklists are very useful and are reiterated with some additions from this research in Appendix IV for policy makers in non-OECD countries. Here, the discussion takes another form and is developed under Hall's (1993) policy change framework as EPR represents a change in public policy (Manomaivibool 2007).

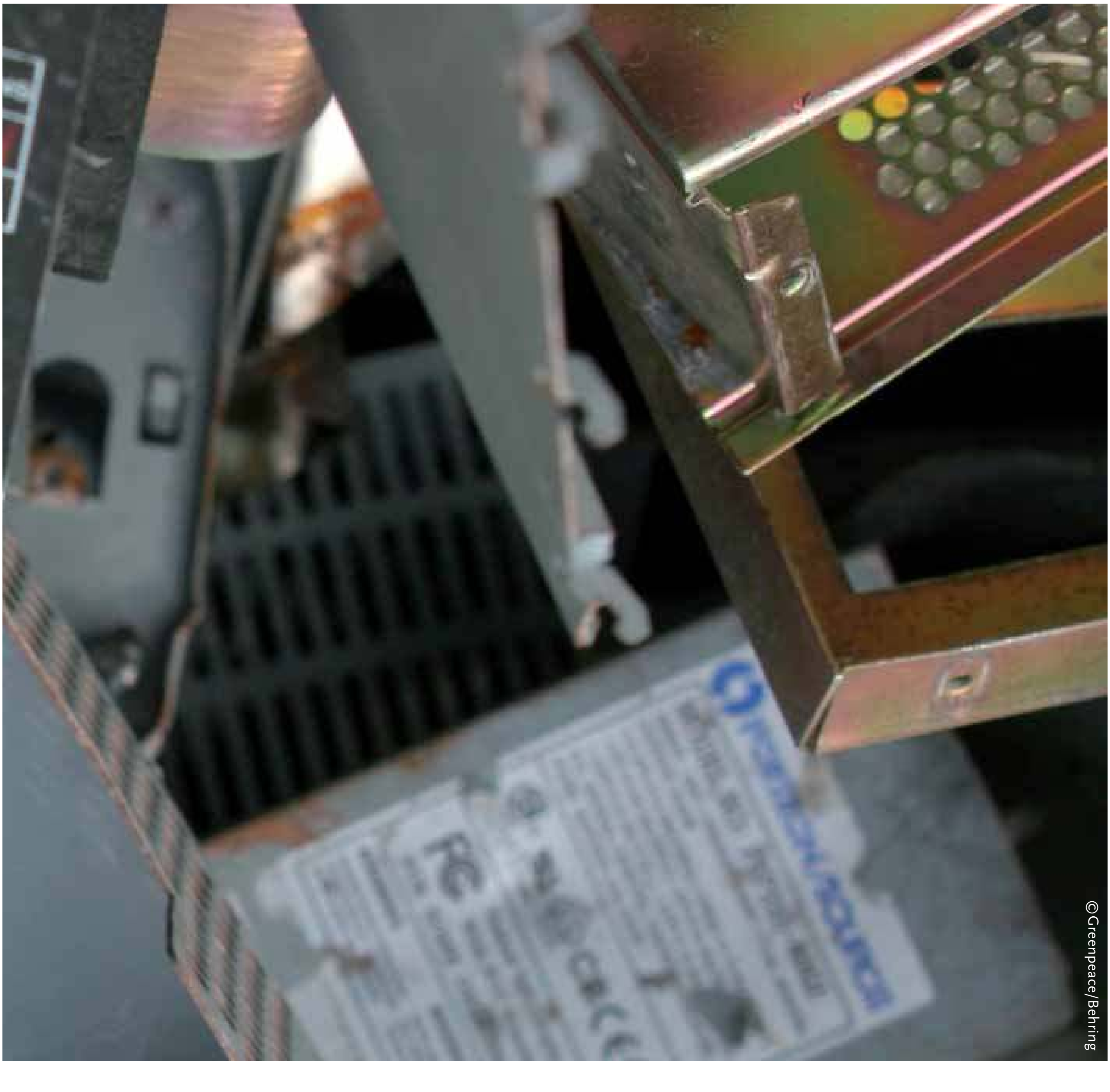
Hall (1993) suggests that conceptually there are three levels of policy change[9]. The most fundamental and abstract level is a change in the 'policy paradigm' – "a framework of ideas and standards that specifies not only the goals of policy and the kind of instruments that can be used to attain them, but also the very nature of the problems they are meant to be addressing" (Hall 1993, 279). The principle of EPR itself is at this level. As shown in the beginning of Part 2, EPR redefines the root cause of the WEEE problem and specifies design improvements (the first family of objectives) as higher policy objectives, on top of traditional MSWM goals, i.e. high utilisation of product and material quality through effective collection, treatment, and re-use or recycling in an environmentally friendly and socially desirable manner (the second family). Therefore, fundamentally a WEEE management programme cannot be labelled EPR unless it also aims to stimulate design improvements. Policy makers should also keep in mind that, all things being equal, the closer to IPR, the stronger the incentives for design improvements in the programme. Ideally, this should be explicitly spelled out in legislation or an agreement governing the programme. An example is Article 8 of the WEEE Directive, where different financial mechanisms for new and historical WEEE is explicitly mentioned and individual financial responsibility is mandated for new WEEE. This provision has not been well followed by many of the Member States in EU, however.

Policy instruments are on the second level. It is advantageous if the policy makers are clear on the first level as a policy paradigm will describe how policy instruments should be used to achieve policy objectives. In general, Porter and van der Linde (1995, 99-100) identify six characteristics of 'correctly formulated [environmental] regulation' as follows: (1) signal likely resource inefficiencies and potential technological improvements; (2) focus on information gathering; (3) reduce uncertainty as to whether investment to address environmental impacts will be valuable; (4) create pressure that stimulates innovation and progress; (5) eliminate the possibility of free-riding; and (6) focus on the long term.

9 Hall's (1993) jargons of first- (fine-tuning), second- (changes in policy instruments), and third-order (changes in policy paradigm) changes are, however, not used here to avoid confusion to wider readers, not familiar with the literature.

The example of a front-end financial mechanism is employed here as an illustrative case. A caution must be put forward, however, that a complete assessment of policy instruments must consider a whole package of a policy mix because policy instruments do interact, both in synergetic and counterproductive manners. As shown in Section 2.1, there are some inherent advantages to a front-end financial mechanism over an end-user-pays or rear-end mechanism. However, not all front-end arrangements are conducive to EPR objectives, notably design improvements (which are, in the main, only applicable to new products). Only when the front-end fees on new products are linked to the characteristics and Eol management of these products, e.g. cost internalisation, differentiated fees, or flat fees with some sort of rebate mechanisms, do they give incentives to producers. On the other hand, front-end fees used solely for the management of historical products would hardly contain such incentives. Similarly, front-end fees that were collected by the treasury as general revenue and not re-channelled to the Eol management of the products would not be able to live up to the second family of EPR objectives. (The worst in the class would, of course, be a combination of the two – front-end fees which were not proportional to the products' environmental performance and not re-channelled to their Eol management).

At the most concrete level is the precise setting of chosen instruments. To be effective, policy makers must fine-tune the parameters of policy instruments, be they scope, target, standard, timeframe, etc. to suit the situation at hand. For example, too low a recovery target would not carry much weight to induce further improvements. On the other hand, too high a target can backfire as policy makers might be forced to make an unscheduled adjustment due to practicalities, which in turn would damage the reputation of policy makers and the programme. Although fine-tuning is a trial-and-error process, there is a rule of thumb that parameters should be challenging but achievable considering the resources of targeted parties.



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CONT
O K
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ASM: 25F8392
LEVEL 3
EC: C41504
CONTROL NO: RAL0003
DATE CODE: 9432
RATING INPUT: 200-240 V~,
50/60 Hz, 2A
OUTPUT: +12.0 V═══, 2.10A
+ 5.1 V═══, 2.10A
+ 5.1 V═══, 15.00A
− 5.0 V═══, 1.70A
−12.0 V═══, 0.20A
−12.0 V═══, 0.45A
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Appendix

Appendix I Evidence of implementation of individual responsibility[10]

Although individual producer responsibility is often perceived as being harder to implement, whether within collective systems or for brand-specific or limited brand producer systems, practical implementation of EPR programmes around the world has successfully embedded various elements of individual responsibility. In this section, the various patterns identified are presented and categorised based on: 1) when and how the discarded products are distinguished from the rest, and 2) how the producers involve themselves in the downstream operation.

Distinction when collecting from end-users

Table A summarises cases where the brands of the products are already distinguished when products are collected from/handed in by consumers.

Products (countries)	The manner of collection and distinction	Arrangement with recovery facilities	Manner of payment by consumers
Copying machines (JP)	Taken back by the producer or a service company	Recovered in the company's own facility	Cost internalisation
Computers used in offices (NL,CH, JP), large professional EEE (SE)	Taken back by the producer/contracted party	Producers make direct contracts with recyclers. In the case of CH, recyclers must have licence from the PRO	Internalised in the price of new products (NL, SE), flat visible advance disposal fees (CH), end-user pays (JP)
ICT equipment (SE, NO)	Taken back from offices by an intermediary company Establishment of separate collection points for households by an intermediary company	An intermediary company takes care of recovery at the request of the producers	Cost internalisation
Computers from households (JP)	Sent back to the producer via postal service	Recovered in the company's own facility	Historical products: end-user pays, new products: individual visible advance disposal fee
Cars (SE, sold after 1998)	End-users bring the cars to dismantlers contracted by the respective producers	Producers make direct contracts with recyclers. An insurance company has contracts with recyclers for some importers	Internalised in the price of new products
Large home appliances (JP)	Collection by retailers. End-users purchase recycling tickets issued by the respective brands	Recovered in the company's own facility, or producers make direct contract with other producers and recyclers	End-user pays
Batteries for business users (NL)	Collected from end-users at specific dealers	The Producer makes direct contracts with a recycler	Cost internalisation For large quantity, end-user pays

CH: Switzerland
JP: Japan
NL: the Netherlands
NO: Norway
SE: Sweden

Table A – *Examples of individual responsibility (1): brand name distinction at end-users.*

10. Appendix II is excerpted from Tojo (2004, 265-70).

This is the case when the users of many of the products are businesses, but measures also exist to collect products of specific brands from households. Some of the products (large professional EEE, copying machines) have high end-values while others do not. The manner in which products of specific brands are collected varies, with different degrees of involvement by end-users. In general, products are picked up from business-users while the involvement of end-users increases in the case of WEEE from households. The manner of payment by consumers varies, including cost internalisation, flat visible advance disposal fees, individual visible advance disposal fees and end-user pays. Likewise, individual manufacturers have varying degrees of involvement in the organisation of the collection and recovery operation. Some domestic manufacturers establish their own recovery plants, while others have contracts with recyclers. As well as the arrangement with the recovery facilities, collection from end-users is organised either by the producers themselves, or out-sourced to a third party. However, what is common is that all the producers have control over the management of their products.

Distinction at intermediary collection points

The products can also be sorted by brand once they are collected from consumers and aggregated at intermediary collection points. Intermediary collection points include retailers, regional aggregation stations, municipal collection points, collection facilities of actors contracted by producers, and the like. Examples are summarised in Table B.

Despite the rather negative perception of some of the interviewees who run collective systems, sorting at intermediary collection points has been operated in various ways. One solution is the establishment of separate collection points by a group of companies who wish to have a separate system, as found in the case of ICT equipment manufacturers in Sweden and Norway, and manufacturers of large home appliances in Japan. This enables companies to enjoy economies of scale with regard to transport and management of collection points, while giving them greater potential to control their own products. Meanwhile, special arrangements can be made with retailers. As found in the case where the brands of discarded products are distinguished when collected from end-users, the degree of involvement of individual producers in organising the collection and recovery operation varies. Often the operation is outsourced to third parties. However, producers have control over the fate of their products. The manner of payment by consumers differs from one case to another.

Products (countries)	The manner of distinction	Arrangement with recovery facilities	Manner of payment by consumers
Coffee machines (CH)	Separated from the rest of WEEE by retailers, arranged by the PRO	Recovered in the company's own facility	Flat visible advance disposal fees
ICT equipment (SE, NO)	Sorting at the separate collection points by an intermediary company upon request	An intermediary company takes care of recovery at the request of the producers	Cost internalisation
Large home appliances (JP)	Retailers, municipalities and designated legal entities bring the discarded products into two regional aggregation stations depending on the brands	Recovered in the company's own facility or producers make direct contract with other producers and recyclers	End-user pays

CH: Switzerland
JP: Japan
NO: Norway
SE: Sweden

Table B – *Examples of individual physical and financial responsibility (2): brand name distinction at intermediary collection points.*

Distinction at recovery facilities

Table C summarises cases where the brand names of discarded products collected and transported together to recovery facilities, are distinguished at the plants.

In the examples, the physical management of products is performed collectively, at least under the current operation, and all discarded products go through the same recovery process. However, the brand names – and in the case of Japanese manufacturers the models of the products as well – are distinguished before the recovery operation. The involvement of producers in collection and recovery activities decreases, especially in the case of the ICT producers in the Netherlands and Switzerland. However, they have a mechanism for identifying and recording the products that reach the recovery plants.

In the systems presented, the degree of design for end-of-life has not been reflected in the amount paid by the producers, but they illustrate the possibility of distinguishing between the brands and models of products at recycling facilities.

Products (countries)	The manner of distinction	Arrangement with recovery facilities	Manner of payment by consumers
ICT equipment (NL until the end of 2002)	The brand names and the weight of the respective products were recorded	PRO makes the overall arrangement. The recycling facility sent an invoice to the respective producers in accordance with the total amount of discarded products recycled	Cost internalisation
Large home appliances (JP)	The manifest attached to each product distinguishes the brand name and the model of the respective products	Recovered in the company's own facility or producers make direct contract with other producers and recyclers	End-user pays
ICT equipment (CH)	Periodic samplings take place to find out the average amount of products taken back manufactured by the respective brands	PRO makes the overall arrangement. Producers pay the PRO in proportion to the amount of their products	Visible flat advance disposal fee

CH: Switzerland
JP: Japan
NL: the Netherlands

Table C – *Examples of individual physical and financial responsibility (3): brand name distinction at recovery facilities.*

Man in Chennai, working in a ISO-14001 certified ATF.

Appendix II Treatment Standards in the EU WEEE Directive[11]

Selective treatment for materials and components of waste electrical and electronic equipment with Article 6(1)

1. As a minimum, the following substances, preparations and components have to be removed from any separately collected WEEE:
- polychlorinated biphenyls (PCB) containing capacitors in accordance with Council Directive 96/59/EC of 16 September 1996 on the disposal of polychlorinated biphenyls and polychlorinated terphenyls (PCB/PCT)(1),
- mercury containing components, such as switches or backlighting lamps,
- batteries,
- printed circuit boards of mobile phones generally, and of other devices if the surface of the printed circuit board is greater than 10 square centimetres,
- toner cartridges, liquid and pasty, as well as colour toner,
- plastic containing brominated flame retardants,
- asbestos waste and components which contain asbestos,
- cathode ray tubes,
- chlorofluorocarbons (CFC), hydrochlorofluorocarbons (HCFC) or hydrofluorocarbons (HFC), hydrocarbons (HC),
- gas discharge lamps,
- liquid crystal displays (together with their casing where appropriate) of a surface greater than 100 square centimetres and all those back-lighted with gas discharge lamps,
- external electric cables,
- components containing refractory ceramic fibres as described in Commission Directive 97/69/EC of 5 December 1997 adapting to technical progress Council Directive 67/548/EEC relating to the classification, packaging and labelling of dangerous substances(2),
- components containing radioactive substances with the exception of components that are below the exemption thresholds set in Article 3 of and Annex I to Council Directive 96/29/Euratom of 13 May 1996 laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionising radiation(3),
- electrolyte capacitors containing substances of concern (height 25 mm, diameter 25 mm or proportionately similar volume)

These substances, preparations and components shall be disposed of or recovered in compliance with Article 4 of Council Directive 75/442/EEC.

2. The following components of WEEE that is separately collected have to be treated as indicated:
- cathode ray tubes: The fluorescent coating has to be removed,
- equipment containing gases that are ozone depleting or have a global warming potential (GWP) above 15, such as those contained in foams and refrigeration circuits: the gases must be properly extracted and properly treated. Ozone-depleting gases must be treated in accordance with Regulation (EC) No 2037/2000 of the European Parliament and of the Council of 29 June 2000 on substances that deplete the ozone layer(4).
- gas discharge lamps: The mercury shall be removed.

3. Taking into account environmental considerations and the desirability of re-use and recycling, paragraphs 1 and 2 shall be applied in such a way that environmentally-sound re-use and recycling of components or whole appliances is not hindered. ...

Technical requirements in accordance with Article 6(3)

1. Sites for storage (including temporary storage) of WEEE prior to their treatment (without prejudice to the requirements of Council Directive 1999/31/EC):
- impermeable surfaces for appropriate areas with the provision of spillage collection facilities and, where appropriate, decanters and cleanser-degreasers,
- weatherproof covering for appropriate areas.

2. Sites for treatment of WEEE:
- balances to measure the weight of the treated waste,
- impermeable surfaces and waterproof covering for appropriate areas with the provision of spillage collection facilities and, where appropriate, decanters and cleanser-degreasers,
- appropriate storage for disassembled spare parts,
- appropriate containers for storage of batteries, PCBs/PCTs containing capacitors and other hazardous waste such as radioactive waste,
- equipment for the treatment of water in compliance with health and environmental regulations.

11. Derived from Annex II and III of the EU WEEE Directive.

Appendix III A Cross Country Comparison

	India	The European Union*	Switzerland	Maine, the United States
Legal framework	n.a.	Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (EU WEEE) (2002)**	Ordinance on the Return, the Taking Back and the Disposal of Electrical and Electronic Appliances (ORDEA) (1998)	An Act to Protect Public Health and the Environment by Providing for a System of Shared Responsibility for the Safe Collection and Recycling of Electronic Waste (2004)
RoHS-like product standards	n.a.	Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EU RoHS) (2002, in effect July 2006)	Ordinance on Reduction of Risk in the Management of Specific Particularly Hazardous Substances (2005, in effect May 18)	An Act to Reduce Contamination of Breast Milk and the Environment from the Release of Brominated Chemicals in Consumer Products (2004, in effect January 2006; only for brominated flame retardants)
Scope	n.a.	EU WEEE: all electrical and electronic equipment which is grouped into 10 product categories*** EU RoHS: 8 product categories of the EU WEEE and electric light bulbs and luminaries in households***	Electrically powered consumer electronics equipment; office, information and communication technology equipment; household appliances; lighting fixtures; lamps (excepting incandescent lamps); tools (excepting large-scale stationary industrial tools); sports and leisure appliances; and toys (as well as components of these)	Computer central processing units and video display devices
PRO	n.a.	At least one per Member State in most of the Member States	SWICO (grey and brown goods) and SENS (white goods)	Mainly an IPR programme allowing for collective solutions
Provision for separate collection	n.a.	Yes	Yes	Yes
Dis of new from historical products	n.a.	Yes, 13 August 2005	No	No, but having a brand-based programme and requiring identifying labels on all products put on the market after 1 January 2005
Physical collection	Informal sector	Varies among MS but mainly municipalities and retailers	Dedicated collection points, retailers and manufacturers/ importers	Municipality
Financial mechanism	n.a.	Collective on the market share for historical waste, individual for waste from new products The transposition did deviate, however; some Member States allow producers to use 'visible fees'	Collective on market share through the recycling fee on new appliances	Consolidation facilities charge producers recycling costs individually; costs of orphan products shared among producers on a pro rata share
Recovery & Recycling targets	n.a.	Yes	No	No
Authorisation & treatment standards	Yes (but only 2 facilities obtain the recycling permit)	Yes	Yes	Yes
Monitoring & enforcement	n.a.	Depending on the Member States, mostly environmental or trade authority	National and cantonal authorities, Technical control bodies of PROs	Bureau of Remediation & Waste Management, the Department of Environmental Protection, the State of Maine

* The EU now has 27 Member States: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and the United Kingdom. Here only the EU-wide policy frameworks, the EU WEEE and RoHS Directives, are referred to. The transposition of the two directives in the EU Member States does vary, however (see Huisman, Stvels, Marinelli, and Magalini 2006; IPTS 2006; van Rossem, Tojo, and Lindhqvist 2006; Mayers 2005).

** In practice, the effective date of the EU WEEE Directive depends on the EU Member States' transposition which was due on 13 August 2004. However, most Member States could not meet this timeframe.

*** The 10 product categories are: (1) large household appliances, (2) small household appliances, (3) IT and telecommunications equipment, (4) consumer equipment, (5) lighting equipment, (6) electrical and electronic tools (with the exception of large-scale stationary industrial tools), toys, leisure and sports equipment, (8) medical devices (with the exception of all implanted and infected products), (9) monitoring and control instruments, and (10) automatic dispensers. The two categories not covered in the EU RoHS Directive are (8) and (9).

	Japan	China	South Korea	Taiwan	Thailand
Legal framework	Specific Household Appliances Recycling (SHAR) Law (1998, in effect 2001) Law on the Promotion of Effective Utilization of Resources (Japan Law) (the 2000 amendments)	NDRC's draft of Ordinance on the Management of Waste Electric and Electronic Equipments Reclamation and Disposal (China WEEE) (first to the public 2004)	Act on the Promotion of Saving and Recycling of Resources (the 2003 amendments) MoE's draft Act for Resources Recycling of Electrical/Electronic Products and Automobiles (first to the WTO 2006, expect to be effective 2008)	Waste Disposal Act and relating regulations (the 1998 amendments)	PCD's draft of the Promotion of the Management of Hazardous Waste from Used Products Act (Thai WEEE) (first to the public 2005)
RoHS-like product standards	A part of the Enforcement Order of the Law on the Promotion of Effective Utilization of Resources (Japan RoHS) (the 2006 amendments)	Measures for Administration of the Pollution Control of Electronic Information Products (China RoHS) (2006, effective March 2007)	MoE's draft Act for Resources Recycling of Electrical/Electronic Products and Automobiles (first to the WTO 2006, expect to be effective 2008)	n.a.	TISI standards (Thai RoHS) (first consultation 2007, expect to be effective 2008)
Scope	SHAR Law: TVs, washing machines, refrigerators, air conditioners Japan Law: computers Japan RoHS: TVs, washing machines, refrigerators, air conditioners, computers, microwave ovens, cloth driers	China WEEE: TVs, refrigerators, washing machines, air conditioners, computers China RoHS: all electronic information products	TV, washing machines, refrigerators, air conditioners, computers (2003) mobile phones, audio equipment, fax machines, printers, copiers (2004, 2005)	Heaters/air conditioners, refrigerators, TVs, washing machines, computers, fluorescent lamps, printers	n.a.
PRO	2 Consortia	n.a. (China WEEE: a governmental special fund)	MoE performs clearing house allocating annual responsibility Recycling business mutual aid associations	Resource Recycling Management Fund and is managed by the Taiwan EPA	n.a. (Thai WEEE: a governmental special fund)
Provision for separate collection	Yes	n.a.	Yes	Yes	n.a.
Distinction of new from historical products	Possible with Japan RoHS's marks, but not on all products	Possible with China RoHS's marks, but not on all products	No	No	n.a.
Physical collection	Retailers, with some back-up of municipalities and designated legal entities	Informal sector	Retailers and municipalities	Dedicated collection points	Informal sector
Financial mechanism	Return-share, but no cost differentiation by brand so far Under SHAR Law, end users buy/pay recycling tickets Cost internalisation for new computers under Japan Law	n.a.	Individual responsibility allocated on market share	Individual recycling, clearance and disposal fee allocated on market share	n.a. (Thai WEEE: product fee)
Recovery & Recycling targets	Yes	n.a.	Yes	No	n.a.
Authorisation & treatment standards	Yes	n.a.	Yes	Yes	Yes
Monitoring & enforcement	The Ministry of Economy, Trade and Industry (METI), Ministry of Environment Association for Electric Home Appliances	China RoHS: State Administration of Quality Supervision, Inspection and Quarantine (SAQSIQ)	Ministry of Environment (MoE)	Taiwan Environment Protection Administration (EPA)	Pollution Control Department (PCD) and the Department of Industrial Works (DIW)

Appendix IV A Checklist for Policy Makers

The following checklist is developed from previous works of van Rossem and Lindhqvist (2005) and Clean Production Action (2003). It is a question-based, self-evaluation tool enabling policy makers to identify, from an EPR perspective, strengths and potentials for improvements and further development of a WEEE management programme when they are designing or operating one. The questions in Section 2 and 3 are formulated so that the answer 'yes' to any question means the programme performs well in that respect and 'no' the opposite. However, many issues can be less clear-cut; the column 'Note' can be used to provide further information. It comprises three main sections: questions checking on the non-OECD context, general EPR questions, and specific questions regarding WEEE.

No.	Question	Yes	No	Note
	Section 1: Non-OECD Context			
01	Are the majority of [product x, e.g. TV] sold through legal, identifiable transactions?		To Q 08	
02	Is the share of the grey market for [product x] considerable (e.g. above y %)? (If yes, why do the grey markets exist – look at the tax structure.)			
03	Is the share of the assembled products for [product x] considerable (e.g. above y %)?			
04	Do assembled shops of [product x] mainly use branded subassemblies and components? (If yes, consider a comprehensive scope covering the sale of such subassemblies and components, see Q 05.)		To Q 06	
05	Are such subassemblies and components used in other products which do not fall under the programme?			
06	Are such subassemblies and components re-used? (If yes and the programme has full guarantees when new products are put on the market, there should be money left in the programme similar to the case of re-used products.)			
07	Are there any other kinds of no-name-branded products?			
08	Is there an import of used products?			
09	Does the country allow the import of used products for re-use? (If no, a blanket ban can be an option, i.e. customs would then stop all imports of used products.)		To Q 11	
10	Is there a clear, simple and workable rule for customs to differentiate 're-usable' products from waste? (If no, specifying a maximum in terms of numbers of years seems to be user-friendly for customs.)			
11	Do municipalities have sufficient resources to fulfil their obligations in collection and/or treatment, especially when there is no separate system for the targeted products? (If no, there is a case for having an EPR programme.)			

12 Are there informal recyclers using uncontrolled, risky methods such as acid bathing and open burning to retrieve materials from waste?		To Q 14	
13 Are workers in the informal recycling sector from disadvantaged populations? (If yes, consider upgrade and re-housing measures for them.)			
14 Are there business practices that an EPR programme can further, such as producers' voluntary take-back initiatives, retailers' trade-in schemes?			
Section 2: EPR Programme in general			
15 Are the two families of EPR objectives clearly spelled out in the legislation (or agreement in the case of voluntary agreements) governing the programme?			
16 If there is a voluntary agreement: - is it enforceable? - oes it have specific targets and deadlines? - is it accessible to the public? - is it monitored and are results reported regularly? - does it have corrective mechanisms in case of non-compliance ?			
17 Is the term "producer" clearly and sufficiently defined?			
18 Are roles of the government, municipalities, retailers, consumers and other actors clearly defined?			
19 Is there a distinction between new and historical products in the legislation (or agreement in the case of voluntary agreements) governing the programme?			
20 Are there specific instruments, such as labelling, to enable such distinction in practice?			
21 Will the individual producer directly benefit, either at the time of payment or retrospectively, when costs have been determined following the discarded product's end-of-life treatment, from product design improvements?			
22 Will individual producers directly benefit, e.g. by fully realising the financial benefits for such system improvements, from system design improvements?			
23 If the front-end fees on new products are used to finance the system, will they provide (1) sufficient guarantee for future end-of-life (Eol) management of these new products and (2) sufficient funds for the Eol management of historical products?			
24 If the rear-end fees are charged to producers, are there other complementary measures to address the problem of orphan products whose producers are not identifiable when they reach the Eol stage?			

25	If the end-users have to pay fees, are there any mechanisms to prevent illegal dumping and ensure that waste would be delivered to the system?			
26	In any case, are the collected fees only used for specific purposes?			
27	Does the system include measures to secure goal achievement for collection targets, such as penalties in the case of non-compliance?			
28	Are there tangible incentives in the form of direct or future financial benefits for striving towards higher collection results?			
29	Are there environmentally sound treatment standards?			
30	Is there a provision for producers to provide information for authorised treatment facilities (ATFs)?			
31	Does the system provide measures to ensure compliance with the law and other regulations for treating discarded products during collection, sorting, dismantling and treatment?			
32	Does the system provide incentives to promote Best Environmental Practice for treatment of discarded products during collection, sorting, dismantling and treatment?			
33	Is re-use and recycling clearly defined and measured?			
34	Are there measures to secure goal achievement for stated re-use and/or recycling targets, e.g. penalties unless the targets are met?			
35	Are there incentives for striving for high re-use and/or recycling levels?			
36	Does a Producer Responsibility Organisation (PRO) represent the interest of producers?			
37	Can individual compliance schemes compete with collective compliance schemes on an equal basis?			
38	Are there timetables for review and update targets and standards to give dynamics to these administrative instruments?			
39	Is there competition within a programme to keep the prices of services down?			
40	Are there measures to encourage small- and medium-sized producers (SMEs) to adopt design for environment (DfE)?			

Section 3: EPR programme for electrical and electronic products			
41 Are there product standards restricting the use of certain hazardous substances with a comprehensive scope, at least equal to those in the EU RoHS Directive?			
42 If the scope of the programme, especially for the EoI management, is comprehensive, are there mechanisms to prevent cross-subsidisation between product categories such as having different accounts for different categories?			
43 Is the market of [product x] far from reaching the point of saturation? (If yes, the ratio of historical vs new products is substantially less than 1:1)			
44 Do corporate users, i.e. B2B products, have a big share of certain product categories? (If the share is big enough, this might justify the distinction between B2B and B2C.)			
45 Do the majority of B2B products stay in the sector when they become obsolete? (If yes, this must be taken into consideration with Q 44 regarding the distinction between B2B and B2C.)			