



A Hybrid Law Model for the Management of Waste Electrical and Electronic Equipment: A Case of the New Draft Law in Thailand

Panate Manomaivibool^{1,*}, Sujitra Vassanadumrongdee²

¹ Institute for the Study of Natural Resources and Environmental Management, Mae Fah Luang University, 2nd Fl. Building E2, 333 Moo 1, Thasud, Muang, Chiangrai, 57100, Thailand

² Environmental Research Institute, Chulalongkorn University, Institute Building 2, Phayathai Rd., Wangmai, Pathumwan, Bangkok, 10330, Thailand

*Corresponding author: Email: panate.man@mfu.ac.th

Article History

Submitted: 24 November 2015/ Accepted: 27 January 2016/ Published online: 25 February 2016

Abstract

Waste electrical and electronic equipment (WEEE) has been high on the environmental policy agenda of many countries due to its rapidly increasing volume and concerns over its toxicity and the critical metals it holds. To date, 59 countries have passed laws for WEEE management (excluding State level legislation in the USA and Canada). Most of these laws are based on the principle of extended producer responsibility (EPR) but their treatment of allocation of responsibility and system operation differ considerably.

This study reviews the implementation models of EPR which are classified into two broad groups: producer compliance schemes and governmental funds. The advantages and disadvantages of each model are analyzed and a synthesis proposed for Thailand in the form of a step-wise hybrid model, considering local conditions. A new draft law, the Act on the Management of Waste Electrical and Electronic Equipment and Other End-of-Life Products, differs from earlier drafts solely based on the governmental-fund model. Under the proposed system, producers of designated products would have an opportunity to develop their compliance plans individually or collectively. This would allow them to channel their experiences of working with EPR in other countries to the implementation of Thai WEEE management schemes. The compliance plans have to outline how they intend to support the free take-back obligations stipulated in the draft law. Collection targets can be added to improve system performance in the later years. Unlike a typical producer-led system, the government retains the power to levy product fees into the National Environmental Fund. This ensures the leverage in the case that the producer's plans fail to function in a developing country context. Revenues would then be earmarked to support investments and campaigns to achieve the objectives of this law.

Keywords: Advanced recycling fee; Electronic waste; Extended producer responsibility; Product take back

Introduction

Waste electrical and electronic equipment (WEEE) has emerged as a high priority on the environmental policy agenda of many countries due to its rapidly increasing volume and concerns over its toxicity and the critical metals contained in the waste. While highly recyclable, improper handling of WEEE can release various types of heavy metals such as lead, cadmium, mercury and other hazardous substances, posing serious impacts on the ecological system. There is also a concern over the threats to public health as many of these substances are proven carcinogens and can be accumulated in the liver, kidney, gallbladder and thyroid gland causing congenital handicap and impairing neurological system and brain.

Many countries, developed and developing alike, have issued laws and regulations restricting the use of certain hazardous substances (RoHS) in electrical and electronic products as well as establishing a management system for environmentally sound recycling of WEEE. When this research was conducted, 59 countries had passed WEEE recycling laws. In addition, although there has yet been a law promulgated at the federal level, the majority of states and provinces in the USA and Canada have enacted their own laws. Most of these laws are based on the principle of extended producer responsibility (EPR) but their details on responsibility allocation and system operation vary considerably across jurisdictions.

For example, producers in Japan are required to set up a system to recycle large home appliances taken back by retailers. However, the Japanese law allows producers to charge consumers for their recycling services. On the other hand, the goal of EPR in the EU WEEE Directive is to establish take-back systems that are free for consumers to return WEEE. Producers are asked to cover at least a significant part (if not all) of costs through producer responsibility organizations or compliance schemes. While the locus of EPR in Taiwan is also on financial res-

ponsibility, this is enforced through a governmental fund in which all producers are required to join the program.

There have been several attempts to develop a legal framework for the management of WEEE in Thailand. Earlier studies have been sponsored by the Pollution Control Department (PCD) and the Department of Industrial Works (DIW) during the early 2000s. Under the National Integrated Strategy for the Management of Waste Electrical and Electronic Equipment (henceforth the Thai WEEE Strategy), approved by the Cabinet on 24 July 2007, ten priority product groups were announced: 1) cathode-ray tubes (CRT) and flat-panel displays (FPD), 2) digital cameras and camcorders, 3) portable media players, 4) printers and facsimiles, 5) mobile and cordless phones, 6) desktop and notebook computers, 7) unit-type air conditioners, 8) refrigerators and freezers, 9) fluorescent lamps, and 10) dry-cell batteries.

A major follow-up study was carried out during 2007-2011. At that time the Fiscal Policy Office had tabled a draft Act on Fiscal Measures for Environment as a framework law to allow related agencies to adopt economic instruments for pollution prevention and control by enacting subordinate laws. Several subordinate laws were drafted including a (draft) Royal Decree on Criteria, Methods, Conditions and Management of Revenue from Product Fees, a (draft) Ministerial Regulation on WEEE and a (draft) Notification of the Ministry of Natural Resources and Environment on the List of Electrical and Electronic Equipment under Product Fee Scheme. This project, however, was abortive when the Ministry of Finance stopped sponsoring the multi-purpose framework law around the year 2012 (for more details, see [1]).

This paper recounts the development of a new legal framework for the management of WEEE in Thailand, based on a study commissioned by PCD [2] to rework the institutional design of an EPR system aligned with the Thai context. The overall design of the draft has changed from a governmental-fund model as appeared in earlier

drafts, to a hybrid model that synthesizes the two approaches to EPR discussed in the next section. The new law, if enacted, would allow the government to introduce policy instruments in a stepwise fashion, beginning with producer compliance schemes. The third section describes the methods and materials of the study. The fourth section summarizes key findings and outlines the new draft. The paper concludes with a discussion of the ongoing process of law promulgation.

Models of Extended Producer Responsibility

EPR is a concept that has concrete impacts on waste management policies and practices, initially inside, and gradually outside the Organisation for Economic Co-operation and Development (OECD). Lindhqvist offers the following definition of EPR: “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” [3]. In this way EPR redefines the problem of solid waste and the locus of waste prevention. Waste is no longer just an engineering problem which seeks after an end-of-pipe solution to treat waste as it is. It is instead a systemic problem predetermined when a product was designed without sufficient consideration to its environmental impacts when the product becomes obsolete. Therefore, the principle suggests that producers and/or consumers can take various forms of responsibility in solving the problem. Tojo describes four types of responsibilities: liability, physical, financial, and informative responsibilities [4].

Table 1 outlines diversity in actual EPR programs in operation as reviewed in our previous work. It can be seen that the principle and responsibilities can be translated in various ways. Due to space limitations, this work focuses mainly on organizational aspects of the EPR programs,

which were regarded as most critical for institutional design. EPR can provide a rationale for the government to use economic instruments on new targets upstream in the product life cycle in order to build a fund to manage the end-of-life problem. This would result in a governmental-fund model. However, producers might be asked collectively or individually to organize a system to take back and recycle their end-of-life products. This would result in a producer-compliance-scheme model

1) Governmental Funds

Economists have long discussed the efficiency and impacts of a system which earmarks revenues from taxes and fees from upstream economic activities to subsidize downstream activities such as waste collection, treatment and disposal. Fullerton and Wolverton published a seminal paper on this two-part instrument [6]. A deposit-refund system (DRS) is one and the most straightforward way to implement this. One of the oldest examples was the DRS for end-of-life vehicles in Sweden under the 1975 Car Scraping Law [7]. The system can be less rigid with different payers and recipients of the money. For example, producers might be required to pay material-based taxes, with revenues channeled to recyclers. Nevertheless, institutionally the two-part instrument needs to be supported by a kind of governmental fund.

EPR as a policy principle can support adoption of such a economic instrument. The financial responsibility is a basis of levying taxes or fees on producers and the objective to make end-of-life improvements that justify downstream subsidies. Going down this path, producer responsibilities *per se* are limited beyond the questions of the product scope and who is going to be classified as the producers of the said product. Their responsibilities would be measured through tax or fee rates. Great attention is, however, called for the design of the governmental fund to administer the money. Although it would assume a

certain degree of governmental control, there are diverging views on whether the funds should be seen as another pocket of the government or the industries' money "deposited" with the government for specific purposes. The answer to this

question will guide the composition of the fund committee and the nature and level of possible subsidies. Regardless of this, the issue of transparency will be heightened and payment of subsidies will be subject to regulation.

Table 1 Implementation aspects, options, and examples from existing WEEE programs [5].

Aspects	Options	Examples
Organization	Governmental Fund	Taiwan, California
	PRO / Compliance schemes	Germany, Italy, Japan ¹ , Korea, Switzerland, Sweden, Netherlands
	Clearinghouse	Germany, Italy, Maine
	Individual producer	Japan ²
Financial Mechanism	Pay as you go	Taiwan, California, Switzerland, Sweden, Netherlands, Germany, Italy, Korea
	Upfront full unit cost	Japan ²
	Return share	Maine
	End users pay	Japan ¹
Collection Service provider	Local governments	Sweden, Germany, Italy, Maine
	Designated collectors	Taiwan, California, Switzerland, Netherlands, Korea
	Retailers	Japan ¹
	Postal office	Japan ²
Collection	End users pay	Japan ¹
Cost to consumer	Free take back	EU, Switzerland, Taiwan, California, Korea, Maine, Japan ²
Target	Collection and recycling	EU (kg/capita, weight-based %)
	Collection only	Korea (% of new product shipments)
	Recycling only	Japan (weight-based %)
	No binding target	Taiwan, California, Switzerland, Maine

2) Producer Compliance Schemes

The producer-compliance-scheme model is arguably a more distinctive form of EPR. It is less grounded in the economic literature and more in industrial ecology, where relationships among industrial actors are sought to operationalize the tenets of ecological modernization [8]. In contrast to a governmental-fund model, the financial responsibilities of producers are often broadly defined, and the options for financial mechanisms open. The focuses of legal development are on physical and informative responsibilities.

The onus of institutional design under this model is on the physical arrangements. New responsibilities such as take-back obligations, recycling targets, etc. would be ascribed to actors in the product chain in order to transform the system. In addition to traditional collection of waste serviced by municipalities, retailers and producers are often requested to develop reverse logistics for special waste products. Consumers are in some cases no longer allowed to dispose of such products via the municipal waste system. Reporting obligations then follow for the authorities to check whether the relevant

actors have been assuming their new roles and responsibilities properly. The heavily debated issue of individual versus collective responsibility in EPR literature [9] is highly relevant in this model. However, in practice, collective compliance through a producer responsibility organization (PRO) or other kinds of compliance schemes is a standard because it is not possible to mandate an individual program for all producers in a consumer product market. So, the real issues at hand are whether, and to what extent, individuality should be encouraged in the law.

Materials and methods

This study consisted of extensive documentary research about the international experiences and Thai conditions. International experiences in WEEE management were first compiled through www.sagisepr.com, a website monitoring the development and implementation of EPR laws worldwide for packaging, WEEE and batteries. Then, 12 case studies were conducted in order to understand the two models and their variances. Table 2 shows the cases and their categories. For each case an English version of the original laws and regulations, policy documents and related academic papers were reviewed. To allow comparison, all cases are

described in nine aspects: (1) objectives, (2) scope, (3) place on the market obligations, (4) collection, (5) recycling, (6) financing, (7) supervision, control and law enforcement, (8) special authorities, and (9) penalty. Some findings will be presented here; for readers interested in the review, see [2].

The analysis of Thai conditions was based on reviews of the situation in Thailand and related domestic laws and regulations. The former included technological change, new types of EEE and hazardous material profiles, and updates of WEEE inventory, treatment technologies, standards and costs. Although there was no specific law for WEEE management in Thailand, the issues came into contact with laws and regulations in four main areas: the national environmental quality laws governing pollution prevention and control and the management of the National Environmental Fund; public health laws governing collection and disposal of household waste; factory laws governing recycling plants; and the Hazardous Substances Act governing the import, use, transport and disposal of listed substances and articles, including WEEE. Therefore, it is important to understand whether the new law would overlap or overrule existing laws and, if possible, how to create synergies among different regimes.

Table 2 Selected case studies and their associated EPR model.

Case Studies	Model
1. European Union	Producer compliance scheme
2. Japan	Producer compliance scheme
3. The Republic of Korea	Producer compliance scheme
4. Taiwan	Governmental fund
5. United State of America (California State)	Governmental fund
6. United State of America (Minnesota State)	Producer compliance scheme
7. Canada (Alberta)	Governmental fund
8. Canada (Ontario)	Producer compliance scheme
9. Australia	Producer compliance scheme
10. The Republic of India	Producer compliance scheme
11. People's Republic of China	Governmental fund
12. Socialist Republic of Vietnam	Producer compliance scheme

The documentary research was supplemented by in-depth and focus-group interviews with stakeholders and experts. Nine in-depth interviews were arranged with major manufacturers, importers, retailers, and recyclers between February and May 2014. The interviews were semi-structured and face-to-face. The interviewees received a set of main questions before the session and a summative transcript was reconstructed from the notes, in some cases with follow-up questions via email. The questions mainly focused on the market situation in Thailand, trends for eco-products, company environmental policies and practices, in particular for take-back and recycling, aftersales services, EPR and WEEE policies, and policy preferences.

Six focus-group sessions were organized in 2014. The first was held on 7 May with 46 participants from the private sector, governmental agencies, NGOs and research institutions. The discussion revolved around three themes: international policies and approaches, product priority, treatment technologies, future policy, and the impacts of and on the informal sector. The second session on 3 June featured the presentation of a broad legal framework. A group of 57 participants had a similar composition to the previous event, with the addition of representatives from the new media. The discussion focused on the title and scope of the proposed law, the composition of the future committee, and the timeline for legal development. Subsequently, three regional workshops were held between 1 and 15 August in Ayutthaya, Bangkok, and Nakhon Ratchasima, with a combined total of 158 participants, to elicit feedback on the draft law. The involvement of local government in these workshops provided insightful feedback on practical issues. A revised draft was presented and discussed in the final seminar on 11 September for further comments and suggestions.

Results

1) Advantages and disadvantages of the two approaches in the Thai context

The review of international experiences found that the majority of WEEE laws (76%) can be categorized as using a model of producer compliance schemes. The governmental-fund model was evident in another 12% of the cases, with the other 12% using mixed approaches such as having an EPR scheme but allowing producers to be exempted by paying product fees to the government, or else having fees as a penalty to be levied when targets were not met. The popularity of the producer compliance schemes hints at policy convergence driven by lesson-learning, but also a strong lobby from multinational corporates (MNCs) that operate in many markets and support harmonization of WEEE regulations and requirements. The impacts of such lobbying was evident in the cases of India and Vietnam where the EU Directives served as a model. In India the trade association proposed an EPR draft to the government while in Vietnam a group of manufacturers succeeded in dissuading the government from the governmental-fund model. The key advantage of the producer compliance schemes in this sense is that it allows producers to use their experience and knowledge in other systems to prepare compliance plans, organize take back activities, contract transporters and recyclers, and provide information campaigns. This also means the programme would rely much less on the organizational capacity of the authorities in the day-to-day operation of the system.

However, simply holding producers responsible for end-of-life management is not sufficient to create an effective system. The provision of a free take-back obligation that is common in OECD countries might not provide sufficient incentive in developing markets in which people can easily sell their WEEE to junk shops. The review shows that the rules in India had failed to make any significant impact on flows of WEEE. A new study [10] still found that

most WEEE ended up in the informal sector, confirming findings of a previous study [11]. A similar concern can be raised for the EPR law in Vietnam. The cases of North America and South Korea highlight the importance of establishing collection targets to create leverage in the system. However, stakeholders in Thailand cannot agree on what would constitute a realistic yet challenging target under prevailing market conditions, making target setting a highly contentious issue in any discussion.

On the other hand, existing governmental funds seem to offer an advantage in consolidating the downstream sector. Taiwan is probably the most advanced system in this respect, but the impact of the new Chinese fund is also evident. Such funds allow governments to stimulate new investments and the authorized treatment facilities to be competitive. However, the administrative burdens on the authorities in promulgating subordinate laws, rules and regulations and related costs cannot be overlooked. The failed case of the now defunct DRS in South Korea should also not be forgotten. The experience provides two additional lessons that the level of economic incentives must be sufficient to produce desired results, and that the fund should not be strictly earmarked for too specific purposes. This means a proposal for an effective governmental fund can be politically sensitive, which did not sound very well under the political climate of 2014.

2) Overall structure and design of the hybrid law model

Based on analysis and feedback from the consultations with focus groups and related authorities, a new draft law was proposed: the Act on the Management of Waste Electrical and Electronic Equipment and Other End-of-Life Products. The draft Act consists of the following chapters:

- Principles and Rationale
- Keywords and Definitions
- Chapter 1: The National Board on End-of-Life Product Management

- Chapter 2: Product Control
 - Part 1: Defining Regulated Products
 - Part 2: Control of Producers and Distributors
- Chapter 3: End-of-Life Product Management
 - Part 1: Discarding, Taking Back, Collection and Transportation
 - Part 2: Recycling, Treatment and Disposal
- Chapter 4: Target Setting
- Chapter 5: Revenue Management and Fund Subsidies
- Chapter 6: Monitoring and Controlling
- Chapter 7: Transitory Provisions

The draft differs from earlier drafts that were solely based on the governmental-fund model. Instead, the new draft proposes a committee, namely the National Board on End-of-Life Product Management, to advise the responsible Minister in a stepwise fashion: (1) which product needs legal backing for its end-of-life management under Thai conditions; (2) whether a producer's compliance plan is acceptable; (3) whether a collection target needs to be prescribed; or (4) whether a product fee should be levied on the said product. Section 13 sets three criteria for selecting regulated products: environmental hazardousness, recyclability and potential for product improvement. Since EEE technology changes rapidly, the draft Act stipulates a review cycle for the product list every three years.

The new proposal contains three main instruments. First, the compliance plan is a default mechanism. Based on the EPR principle, producers will undertake a leading role in developing a take-back system covering regulated products. The legislation begins with registration of producers which include importers in the definition. Under the draft Act, producers of regulated products shall prepare a compliance plan individually or collectively on the management of regulated end-of-life products, and submit the plan to the Board within 1 year after notification of the regulated product or product category is issued. The compliance plan shall contain at least the following

information: development of an information distribution channel; take-back or collection channels, taking into account the convenience of consumers; financial support to cover collection costs incurred by the take-back centres and distributors; financial support to cover cost of transportation of end-of-life products to authorized factories. The results of its implementation shall be reported to the Board annually.

Collection targets can be added to improve the system performance in the later years in order to allow the public to become aware of the system, and the authorities to assess the effectiveness of producer compliance schemes without targets. If needed, the Minister, on the advice of the Board, can introduce a minimum collection rate for a product group in the fifth year after the law enters into force. The collection rate can be calculated on the basis of the total weight of amount of end-of-life products collected in a given year, expressed as a percentage of the average weight or amount of products placed on the market in the two preceding years. Other criteria can be applied as deemed appropriate by the Board. Also, a minimum recycling rate can be imposed and the draft Act encourages producers to cooperate with recyclers to achieve the recycling rate.

A unique characteristic of this draft Act is the flexibility to switch the management program from producer compliance schemes to a governmental fund. Unlike a typical producer-led system, under this draft Act, the government retains the power to levy product fees into the National Environmental Fund. This ensures leverage in the case that the producer plans fail to function. Revenues will then be earmarked to support investments and campaigns to achieve the objectives of this law in the long run. The money shall be directed to a separate account under the Fund and shall be paid for the following operations: (1) supporting the expense of take-back centres and recycling factories; (2) supporting the operation of information centres as well as other organizations that

provide information and education on moderate consumption and resource recycling; (3) supporting research and development on technologies and projects related to resource recycling, waste treatment and disposal; and (4) remedying persons who are affected by pollution caused by the end-of-life products according to the qualification, criteria, procedures and conditions prescribed by the Board.

Besides producers, some vital responsibilities will be assigned to distributors. Distributors will undergo the registration process similar to producers but with assistance from local governments. The main role of distributors is to take back WEEE or other regulated products from consumers. The distributors shall accept the returned end-of-life products of equivalent type from buyers on a one-to-one basis free of charge and deliver the collected end-of-life products to the take-back centers or system established in accordance with the producer compliance plans. Moreover, for large retailers and shopping malls, there is an additional responsibility to provide a deposit area for small regulated items having dimensions not exceeding 25 cm, no matter whether or not the consumer purchases a new product at the store. This provision aims to enhance convenience for consumers to return obsolete products. As pointed out in Wagner, accessibility, including the availability of services at the destination, is an important aspect of consumer convenience [12]. However, unlike producers, consumers do not need to shoulder the take-back and recycling costs.

Conclusions

After several postponements, the draft Act was submitted to the Cabinet on May 19, 2015 and approved in principle. Since then, the draft Act has been under the review of the Office of the Council of State, the national legal advisory agency, which established an ad-hoc committee to review the draft Act proposed by PCD.

According to PCD, the ad-hoc committee is mostly concerned with the potential impact of the new laws on stakeholders and has attempted to roll back the roles and responsibilities of concerned parties such as producers and distributors. However, it is of concern that the revisions might significantly weaken the legal framework and lead to ineffective implementation. Following approval of a new draft by the Office of the Council of State, the final draft will be submitted to Parliament for final approval. Members of the current National Legislative Assembly (NLA) may have some comments and make further changes on the draft Act before giving a vote. Therefore, it is urgent that PCD and scholars should provide sufficient background information on the draft Act to NLA members in order to pass the law that meets the expectations and needs of policy makers and stakeholders.

Based on the past experience in 1992 that many environment-related laws were passed during the military-imposed government, it is highly expected that the current government and the special parliament body (NLA) will enact the Act. Many believe that laws which have a positive economic impact on the public, though positive impact to the environment, would not be easily passed by an elected government and members of parliament who are mostly concerned with their political votes. However, due to significant changes to the draft Act during the State of Council review process, it is suggested that PCD should organize stakeholder consultation meetings to review the draft Act before submitting it to the NLA. PCD should retain the EPR concept and ensure its essential principles are retained in the final draft. Otherwise, the final laws as enacted would be unable to achieve its overarching goal to develop an effective take-back system to reduce environmental impact caused by improper management of WEEE.

Acknowledgement

This work was conducted pursuant to the WEEE and Other Household Hazardous Waste Management Legislative Drafting Project commissioned by Pollution Control Department (PCD), Thailand. The opinions expressed are of the authors and do not necessarily reflect the position of PCD.

References

- [1] Vassanadumrongdee, S. and Manomaivibool, P. 2014. The challenge of promoting greater use of economic instruments in Thailand: lessons learned from the Draft Act on Economic Instruments for Environmental Management. *Applied Environmental Research*. 36: 39-51.
- [2] Pollution Control Department (PCD). 2014. Final report: Legislative drafting on the management of waste electrical and electronic equipment and other household hazardous wastes," (in Thai). Report prepared by Environmental Research Institute, Chulalongkorn University. Bangkok, Thailand: Pollution Control Department.
- [3] Lindhqvist, T. 2000. Extended producer responsibility in cleaner production: Policy principle to promote environmental improvements of product systems. Ph.D. Dissertation, IIIEE, Lund University, Lund, Sweden.
- [4] Tojo, N. 2004. Extended producer responsibility as a driver for design change – Utopia or reality? Ph.D. Dissertation, IIIEE, Lund University, Lund, Sweden.
- [5] Manomaivibool, P. and Vassanadumrongdee, S. 2011. Extended producer responsibility in Thailand: Prospect for policies on waste electrical and electronic equipment. *Journal of Industrial Ecology*. 15(2): 185-205.
- [6] Fullerton, D. and Wolverton, A. 2005. The two-part instrument in a second-best world. *Journal of Public Economics*. 89(9-10): 1961-1975.

- [7] Manomaivibool, P. 2008. Network management and environmental effectiveness: the management of end-of-life vehicles in the United Kingdom and in Sweden. *Journal of Cleaner Production*. 16(18): 2006-2017.
- [8] Mol, A.P.J. 1996. Ecological modernisation and institutional reflexivity: environmental reform in the late modern age. *Environmental Politics*. 5(2): 302-23.
- [9] Van Rossem, C. 2008. Individual producer responsibility in the WEEE Directive: From theory to practice? Ph.D. Dissertation, IIIIEE, Lund University, Lund, Sweden.
- [10] Mahesh, P. 2015. At the crossroads: Indian experience on e-waste management. *E-waste Asia Conference*, Bangkok.
- [11] Manomaivibool, P. 2009. Extended producer responsibility in a non-OECD context: The management of waste electrical and electronic equipment in India. *Resources, Conservation & Recycling*. 53(3): 136-144.
- [12] Wagner, T.P. 2013. Examining the concept of convenient collection: An application to extended producer responsibility and product stewardship frameworks. *Waste Management*. 33: 499-507.