Making Sense of Extended Producer Responsibility: Towards a framework for policy transfer

Manomaivibool, Panate

2009

Panate Manomaivibool

Making Sense of Extended Producer Responsibility

Towards a framework for policy transfer

Policy transfer of complex interventions often falls into the trap of uninformed, incomplete, and/or inappropriate transfer because the interventions are insufficiently identified with some of their perceived core components. This is no exception in the interspatial learning about extended producer responsibility (EPR) programmes. This thesis aims to transcend this shorthand approach to policy transfer. It combines the evaluations of EPR programmes for the management of end-of-life vehicles (ELV) and waste electrical and electronic equipment (WEEE) in the developed world with the analysis of the contexts in developing countries. The political areas include the United Kingdom, Sweden, Japan, South Korea, Taiwan, China, India, Argentina, and Thailand. The evaluation research applied theory-based evaluation (TBE) to archival and case data. The context studies used topical interviews and secondary data to conduct qualitative material flow analysis (MFA). The thesis maps out different variances of programmes and policy proposals, linking their mechanisms with policy outcomes, and then specifies key moderating and mediating factors in the actual contexts. In this way, it contributes to the prospect of policy development in developing countries by increasing the analytical tractability and checking the transferability of policy lessons.

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Licentiate Dissertation

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Panate
MANOMAIVIBOOL

Licentiate Dissertation
December 2009

The International Institute for Industrial Environmental Economics
Internationella miljöinstitutet

I drew the picture on the front cover towards the end of the thesis writing. My intention is to "transfer" one of my favourite pieces, Mucha's Zodiac, into the 12 Year Lunar Cycle (I was born in the year of rooster which is unsurprisingly on the top of the picture). This complex picture like an EPR programme can be broken down into its constituents – the dress is of course Thai, the face belongs to one of my favourite models, "Rose", but I (try my best to) keep the overall layout and the hair true to Mucha's style. I owe my best friend from high school, Charat Chaiwatcharaporn, for giving my work its colours.

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and
Associate Professor Naoko Tojo

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Acknowledgements

One purpose of this licentiate thesis is to give myself a chance to reflect on the first half of my PhD. When I take a look back at the journey, the loveliest and liveliest part consists of all the wonderful people I have been blessed to be in contact.

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In the past three years, I have been travelling to a number of international conferences and PhD courses. Honestly this has been more than I would wish for. But the experiences have always been rewarding. I would particularly like to express my gratitude towards the organisers of the 1st ICGSI in Chiang Mai, Thailand, that selected and submitted my paper to the Journal of Cleaner Production and the organisers of the 5th International Conference on East Asian Studies in Osaka, Japan, for inviting and providing me with financial means to attend the conference. The same was true from the scholarship from the Marie-Curie Actions which made my participation in the Postgraduate School of Industrial Ecology (PSIE) possible. I am also in debt to the organisers of the two 3R courses and high-quality training on LCA at Aalborg and DTU, and the eventful NVMP-StEP E-Waste Summer School in Eindhoven/Davos.

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I am certain that I will be even more thankful of you when I write my PhD dissertation!

A great adventure requires an equally great support and I have had that from IIIEE. Besides my supervisors, I should start my list with a walking WEEE encyclopaedia, Chris, whose passion in the topic is truly amazing. Luis and Kes – my officemates, Calle, Lotta, Berni, and the other (former) PhD students, thank you for your practical inputs to the PhD (aka Piled high and Deeper); it is good to have someone finishing and finally nailing it around me. Lars S, Kate, Yutao, Berni, Silvia, Alesia, Yuliya, Pao, and other irregular accomplices, there is nothing better than fika when the drowsiness hit me in the afternoon. Lotta and Mihai, thank you for your invitation and the retreats at your summer place(s—it has never been the same house, has it?). Kristina, Gerd, Sengul, Fredrik, and other administrative staff, thank you for the supports; my stay has been very smooth indeed.

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Panate Manomaivibool

Lund, December 2009

Executive summary

Background

Products have become a focus of environmental policies. *Extended producer responsibility (EPR)* is a policy principle aiming at environmental improvements in products and product systems that go well beyond the realm of production. The principle suggests that responsibilities in the product chain should be (re)allocated in a way that gives information and incentives for the integration of environmental considerations into the design of products and product systems. The role of producers is highlighted due to their influence over the design. In an EPR programme their responsibility is typically extended to the end-of-life management.

This thesis focuses on the applications of EPR in the management of two waste streams: *end-of-life vehicles (ELV)* and *waste electrical and electronic equipment (WEEE)*. The point of departure is the apparent potential for *policy transfer*. Many developed countries and areas have had EPR programmes up and running for several years while developing countries are now facing a challenging task to develop a system to ensure environmentally sound management of these complex waste products that are expected to exceed the limited capacity of the existing waste management system any time soon (if not already). Although developing countries should be able to learn from the experiences of the developed world, learning about complex interventions across different contexts is no ordinary task. A framework is needed (2) to increase the *analytical tractability* of policy lessons, and (2) to check the *transferability* of these lessons in a particular context.

Objective and Research Questions

This licentiate thesis and the four appended papers (Papers I – IV) prepare the ground for a PhD research which focuses on the development of product policies in developing countries. Together they explore the extent to which knowledge about EPR programmes in more developed countries can be used in the development of a programme in a developing country with the *objective* to structure policy lessons within a framework that can reduce the risk of uninformed, incomplete, and/or inappropriate policy transfers.

The framework for policy transfer is a product of combining two lines of research: programme evaluations and context studies. The *evaluation research* (Papers I and II) measures and explains the effectiveness of selected EPR

programmes in industrialised contexts by answering the following research questions:

> *RQ1: What are policy instruments and key components of the evaluated EPR programmes?*
>
> *RQ2: What are the outcomes of the evaluated programmes?*
>
> *RQ3: What are the key conditions under which the evaluated programmes deliver (or fail to deliver) desirable outcomes?*

The *context studies* (Papers III and IV) check the relevance of EPR in selected developing countries by pursuing the following questions:

> *RQ4: What are the main issues in the end-of-life management of durable, complex products in developing countries?*
>
> *RQ5: How can the EPR mechanisms address these issues in developing countries?*
>
> *RQ6: What are the conditions in developing countries that can affect the way EPR mechanisms work to achieve its objectives?*

Research Design and Analytical Frameworks

This research adhered to a *case study strategy*. The evaluation research followed a multiple-case design. Paper I consists of two cases, the management of ELV in the United Kingdom and in Sweden, and covers an implementation period of 16 years resulting in 32 observations. Paper II makes a cross sectional comparison of the management of WEEE in China, Japan, South Korea, and Taiwan. The context studies focused on the context of WEEE management in three non-OECD countries: India, Argentina, and Thailand. Although each of the context studies has a single-case design, a successive use of the same structure – qualitative material flow analysis (MFA) – allowed the findings from the first case in India, which is presented in detail in Paper III, to be compared with those from the later studies in Argentina, and Thailand. The comparison is presented in Paper IV.

Evaluation research belongs to a strand of evaluations called *theory-based evaluation (TBE)*. TBE is a practice that measures the merit of a policy or a programme with a set of suppositions explaining how the evaluand should operate – a programme theory. For this research, three modifications were

built into the general framework of TBE. First, a policy paradigm, EPR, set the boundary of the evaluations. Second, the results of TBE were validated with outcome proxies. Third, a step-wise procedure was employed in Paper II to keep both theory and implementation failures in check. The evaluations relied mainly on data from archives and previous studies.

The context studies explored the deep structures and key patterns in the production, product distribution, consumption and end-of-life management in a single context. The boundary of the analysis was defined by the *qualitative MFA framework*. The studies are based on documentary research and topical interviews. The analysis focused on possible interplays between contextual factors and three necessary elements of EPR – (1) a formal recycling sector consisting of authorised treatment facilities (ATFs); (2) a resource flow from the producers to the formal downstream sector; and, (3) monitoring and reporting mechanisms – to identify opportunities and challenges in achieving EPR objectives in the non-OECD contexts.

Main Findings

Main findings from the evaluation research and the context studies are grouped into four themes: the diffusion of EPR, variances of programmes, policy outcomes, and key contextual factors.

The Diffusion of EPR

The diffusion of EPR can be divided into two periods. In the first period EPR gave policy direction to the then new interventions in Europe and Northeast Asia at the end of the 1990s to the beginning of the 2000s. Following the applications in the first wave, EPR has been advocated as a solution for the management of WEEE in developing countries, which in turn, can potentially lead to a second wave of diffusion. However, in the process of interspatial learning, there has been a tendency to reduce EPR from a policy principle to one of its examples of operationalisation – notably the EU or Japanese model. This approach, which I called the "*shorthand approach to policy transfer*", is not at all healthy because it obscures rather than clarifies how the mechanisms in a programme interact with contextual factors to produce policy outcomes. Without such knowledge, policy transfer is susceptible to be uninformed, incomplete, and/or inappropriate.

Variances of EPR programmes

In contrast to the false presumption in the shorthand approach that there is *the* operational model of EPR, the cases in this collection show several

variances of programmes and policy proposals. These variances are grouped into two categories based on the degree of interventions from the government. In the first category, "*rowing*", we see examples of governments intervening directly (or planning to do so) and administering a centralised fund for the end-of-life management. In the second category, "*steering*", governments set binding conditions and/or nonbinding guidelines that targeted industries have to or should adhere to but leave the operational details to the industries. The typology reveals that the steering approach results in more variations and can lead to system innovations with more proactive solutions and involvements from the producers than the rowing approach.

Policy outcomes

EPR has *two sets of objectives*: upstream improvements in product and system design and downstream improvements in utilising end-of-life product and material quality in an environmentally sound and socially acceptable way. The evaluation shows that, in general, the downstream effects of the existing programmes are more evident than the upstream changes. This reflects the fact that most of the intervention mechanisms in the programmes have paid more attention to the management of historical products with a notable exception of the restrictions on the use of hazardous substances (RoHS). Resources have mainly been mobilised to improve the treatment and recycling of historical waste collected in the programmes.

Beyond this general trend, it should cause no surprise that different sets of policy instruments and system designs are not equal in achieving the twin objectives of EPR. Although not as evident as the downstream effects, some systems in the steering category demonstrate the ability of differentiated guarantees and brand identification to excite upstream changes. However, not all patterns of the differences in policy outcomes are expected. For example, monetary incentives in the system cannot give a satisfactory answer to the variations in collection rates across the programmes. This is surprising considering how much attention the mechanism has received in the current debate in developing countries but might be a timely reminder that we will not get a complete picture of the interventions unless their implementing contexts are taken into consideration.

Key considerations in actual contexts

This multiple-case research has an advantage of comparisons. Six contextual considerations are identified as being key moderators or mediators in an EPR programme through comparisons across product categories and across

economies with different levels of development: (1) the contextual studies articulate that unsaturated markets can enhance the potential of EPR because relatively less energy will have to be spent on managing the *historical stock of products*; (2) however, semi- or informal sections of the growing economies can make the *traceability of producers* next to elusive and heavily cripple EPR mechanisms; (3) in addition, a barrier can exist in the underdeveloped *municipal solid waste management systems* that do not have a strong culture for non-commercial source separation; (4) besides the level of development as such, the structure of the end-of-life value chain is also contingent on the *remaining values of obsolete products* and for some products there can be high competition for waste that can thwart the collection in an EPR programme; last but not least, (5) the *authorisation* and (6) the presence of *product registration and deregistration systems* are supporting mechanisms that are necessary for the effectiveness of a programme but often overlooked in the shorthand approach.

Concluding Remark

All in all the answers to the six research questions reflect a recurring theme that EPR programmes and contexts are complex constructs and we need a framework to decompose them and to articulate their constituents into comprehensible and transferrable policy lessons. The main *contribution* of this work is to be a first step towards such a framework by combining a strand of evaluation research, TBE, with a contextual analysis based on qualitative MFA. The *next step* is the improvements and implementation of this knowledge in an action research aiming for the better policy development in a developing country.

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List of Appended Publications

Paper I: 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, 2006-2017.

Paper II: Manomaivibool, P. (2008). Extended producer responsibility in East Asia: approaches and lessons learnt from the management of waste electrical and electronic equipment. In *Proceedings of 5th International Conference on East Asian Studies*, 21-22 September 2008, Osaka, Japan, p. 267-286. Osaka: Osaka University of economics and Law.

Paper III: 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, 136-144.

Paper IV: Manomaivibool, P., Lindhqvist, T., and Tojo, N. (2008). EPR in non-OECD context: an introduction to research projects on the management of WEEE. In *8th Asia Pacific Roundtable for Sustainable Consumption and Production*, 18-19 September 2008, Cebu, Philippines. Manila: Asia Pacific Roundtable for sustainable Consumption and Production.

Other Publications from the Author

Manomaivibool, P. (2009). Prospect of extended producer responsibility: Waste electrical and electronic equipment, Thai context and policy. Submitted in August 2009 to *Journal of Industrial Ecology*.

Manomaivibool, P. (2009). The making of Thai WEEE policy: What can be the role of EPR? In *2009 International Society for Industrial Ecology Conference*, 21-24 June 2009, Lisbon, Portugal.

Manomaivibool, P., Lindhqvist, T., and Tojo, N. (2009). *Extended Producer Responsibility in a non-OECD Context: The management of waste electrical and electronic equipment in Thailand*. Lund: IIIEE, Lund University, (available in English and Thai).

Lindhqvist, T., Manomaivibool, P., and Tojo, N. (2008). *La responsabilidad extendida del productor en el contexto latinoamericano: La gestión de residuos de aparatos eléctricos y electrónicos en Argentina* [Extended Producer Responsibility in the Latin American Context: the management of waste electrical and electronic equipment in Argentina]. Lund: IIIEE, Lund University, (available in English and Spanish).

Manomaivibool, P., Lindhqvist, T., and Tojo, N. (2007). *Extended Producer Responsibility in a non-OECD Context: The management of waste electrical and electronic equipment in India*. Lund: IIIEE, Lund University.

Manomaivibool, P. (2006). Network Management and Environmental Effectiveness: The management of end-of-life vehicles in the UK and in Sweden. In *Proceedings of 1st International Conference on Green and Sustainable Innovation*, 29 November - 1 December 2006, Chiang Mai, Thailand, p. 224-233. Chiang Mai: Chiang Mai University.

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Abbreviations

3Rs	Reduce, Reuse, and Recycling
ACF	Advocacy coalition framework
ATF	Authorised treatment facility
CoD	Certificate of destruction
CPR	Collective producer responsibility
DfD	Design for disassembly
DfE	Design for environment
DfR	Design for recycling
EEE	Electrical and electronic equipment
ELV	End-of-life vehicle
EMS	Environmental management system
EPR	Extended producer responsibility
ICT	Information and communication technology
IPP	Integrated Product Policy
IPR	Individual producer responsibility
MFA	Material flow analysis
MNC	Multinational corporation
NGO	Non-governmental organisation
OECD	Organisation for Economic Co-operation and Development
OEM	Original equipment manufacturer
PAYG	Pay-as-you-go
PRO	Producer responsibility organisation
PSS	Product-service system
RoHS	Restrictions on the use of hazardous substances
SHARL	Specific Household Appliances Recycling Law
TBE	Theory-based evaluation
WEEE	Waste electrical and electronic equipment

CHAPTER
ONE

1. Introduction

1.1 Background

Products are not only an integral part of the modern lifestyle, but also contribute significantly to environmental consequences. Throughout our life, each one of us consumes countless number of products. The Household Products Database of the National Library of Medicine, for example, contains over 9,000 consumer products with chemical ingredients that can pose health effects (US HHS 2009). When we take a life cycle perspective, besides the impacts during the use phase, the very demand for products can also be connected to upstream and downstream impacts from the processes such as extraction of materials, the manufacturing of products, transportation, and end-of-life management of waste products. A recent study shows that non-food products and packaging are associated with 37% of US greenhouse gas emission and if emissions related to imported goods are recalculated the share can even go up to 44% (Stolaroff 2009).

Products became a focus of environmental policies first among industrialised countries. Famously, the Commission of the European Communities (EC) presented the Green Paper on *Integrated Product Policy* (IPP) in February 2001. This can be perceived as an extension of earlier success of policy intervention in industrialised nations under the banners of pollution control and cleaner production in preventing and controlling upstream emissions. According to the Green Paper, "the [IPP] approach will primarily focus on **eco-design** of products and the creation of **information and incentives** for an efficient take-up and use of greener products" (EC Commission 2001, 3, bold original).

Extended producer responsibility (*EPR*) is an environmental policy principle. The principle suggests that product responsibility should be (re)allocated in a way that gives information and incentives for the integration of environmental considerations into the design of products. The role of producers is highlighted due to their influence over product design.

In typical EPR programmes, producer responsibility is extended to the *end-of-life management*. This stage is arguably "the 'weakest link' in the production responsibility chain" (Kroepelien 2000, 166). Traditionally local governments are responsible for the collection and disposal of post-consumer waste. But they have only limited means to influence the quantity and quality of waste products. As will be seen in following chapters, EPR programmes employ a range of policy instruments to require producers of targeted products to take back end-of-life products and/or to finance downstream activities.

Although early applications began with waste packaging and news print, this thesis focuses on EPR programmes for *waste from durable, complex products* such as end-of-life vehicles (ELV) and waste electrical and electronic equipment (WEEE). These waste streams often contain substances of environmental relevance. In addition, because their end-of-life handling is highly susceptible to risks and accidents, they often require dedicated (and costly) treatment systems in order to prepare materials for further recycling processes and safe disposal. Most, if not all, EPR programmes for these waste streams seek to improve the treatment conditions and promote recycling in addition to provide information and incentives for eco-design. As a matter of fact, the balance between integrated product and dedicated waste policies in an EPR programme can be heatedly debated (see Huisman et al. 2008; Sanders et al. 2007). This thesis, however, takes a stand that the two sets of objectives are not necessarily a trade-off because waste management is essentially part of a product system.

Developing countries face an even more challenging task to ensure environmentally sound management of the waste complex products. It is expected that the amount of waste from complex products in these countries is going to increase at an alarming rate following rapid uptakes of technologies. Inventory studies by and large support this expectation (Terazono 2007; Jain and Sareen 2006; Liu et al. 2006). However, while following closely the consumption patterns and lifestyle of the developed world, these countries are not necessarily able to build up their waste management infrastructure at the same speed. For example, the Pollution Control Department reports that in Thailand 62% of municipal solid waste in urban and just 6% in rural areas was collected and disposed at known disposal sites in 2006 (PCD 2008). In some countries informal recycling sectors fill the gap left by formal waste management systems. Their uncontrolled processes, however, can generate severe health hazards and environmental degradation as documented in Bi et al. (2007), Gullet et al.

(2007), Huo et al. (2007), Wong et al. (2007), Deng et al. (2006), Yu et al. (2006), Brigden et al. (2005), Wang et al. (2005), Toxics Link (2003), and BAN (2002). In addition, there is a concern that when stricter regulations are imposed in developed countries inferior products and hazardous waste might flow to less protected countries (PCD 2007) fuelling the internal stresses even further.

Against this pressing backdrop, several non-OECD governments start investigating the issues and exploring policy options. Featuring the policy discussion is the issue of *policy transfer*. Some authors advocate the transfer of EPR experiences in developed to developing countries (Nnorom and Osibanjo 2008; Pellow 2007; Toxics Link 2007; Mungcharoen and Varabuntoonvit 2006; Widmer et al. 2005; Lin et al. 2002). On the other hand, others cast doubts over the applicability or even the relevance of the OECD model(s) in developing country contexts (Williams et al. 2008).

1.2 Problem statement

An upsurge of interest in the application of EPR in non-OECD countries calls for a framework to facilitate the policy transfer. An EPR programme is a complex intervention aiming to illicit desirable changes in the life cycle of products such as product redesign and re-utilisation. Experiences in EPR programmes have to be translated into comprehensible and meaningful lessons. In addition, previous applications tend to exist mainly in OECD contexts and might not provide lessons that are directly transferable to non-OECD countries. Therefore, the framework should be able to perform two functions. First, it must increase the *analytical tractability* of EPR programmes. Preferably, programmes should be decomposed into generative mechanisms of changes, i.e. into policy lessons. Second, it should be able to check the *transferability* of the lessons in a particular context. This requires assumptions about background conditions underlying the working principle of mechanisms to be made explicit.

1.3 Objective and research questions

This licentiate thesis is situated within my PhD research focusing on the development of EPR policies in developing countries. In Sweden, a degree of licentiate can be obtained after the completion of part (worth at least 120 higher education credits) of a doctoral programme. In this case, the work includes the two articles published in scholarly journals and two papers

presented at international conferences, all appended to this thesis. More information about the four papers (henceforth Papers I-IV) can be found at the end of this chapter. Although not required at the International Institute for Industrial Environmental Economics (IIIEE), the licentiate examination conveniently provides a venue to get feedbacks from an external discussant on a *halfway review* and a *future outlook* of the PhD work which is expected to be completed in 2011.

The research presented in this thesis prepares the ground for the work on policy development. It explores the extent to which knowledge about EPR programmes in more developed countries can be used to develop a programme in a developing country with an *objective* to package it in a form that can reduce the risk of uninformed, incomplete, and/or inappropriate policy transfers.

To achieve this objective, I have pursued two lines of inquiries: evaluation research (Papers I and II) and context studies (Papers III and IV). The *evaluation research* examines policy lessons existing programmes can offer by answering the following research questions:

> *RQ1: What are policy instruments and key components of the evaluated EPR programmes?*
>
> *RQ2: What are the outcomes of the evaluated programmes?*
>
> *RQ3: What are the key conditions under which the evaluated programmes deliver (or fail to deliver) desirable outcomes?*

The evaluation research also constructs a framework to attribute policy outcomes to policy instruments and key components of a programme. The framework will be described in details in Section 3.2.1.

The *context studies* check the relevance of EPR with the ground reality of selected developing countries. It addressing the flowing research questions:

> *RQ4: What are the main issues in the end-of-life management of durable, complex products in developing countries?*
>
> *RQ5: How can the EPR mechanisms address these issues in developing countries?*
>
> *RQ6: What are the conditions in developing countries that can affect the way EPR mechanisms work to achieve its objectives?*

1.4 Scope and limitations

As mentioned above, this thesis consists of two lines of research: programme evaluations and context studies. EPR programmes are the object of the former while non-OECD contexts the latter. To define the boundary of the two terms is less straightforward than it might first appear. It is tempting to identify an *intervention programme* with a piece of legislation but two problems arise. First, this approach can lead to the exclusion of voluntary programmes without an explicit legal framework. Second and more relevant to this research is the fact that a programme might not be equal to one statutory instrument. For example, the ELV Directive, featuring Paper I, contains restrictions on the use of certain hazardous substances (so-called RoHS) while similar provisions are often introduced through separate instruments in the area of WEEE management, as can be seen in Paper II. To ensure comparability between the two areas, this thesis includes at least the framework on end-of-life management and RoHS provisions in an EPR programme.

The problem of *non-OECD contexts* is to define a boundary that is relevant to EPR. Because the policy principle tries to extend the responsibility of the producers of the regulated products to the end-of-life management, a proper scope should cover not only waste management systems, but also other segments along product systems. The boundary is thus set to cover from the point that products were shipped into a country to waste disposal. More upstream activities in a product life cycle such as extraction of virgin materials, or production abroad in the cases of imported goods are outside the boundary. Within the boundary, four aspects are investigated: actors, material flows, money flows, and institutions.

The key issue in the analysis both for the evaluation research and the context studies is *effectiveness*. In the first instance, the environmental effectiveness of existing programmes is evaluated using approaches and indicators introduced in Chapter 3. In the second instance, the contexts are assessed to see conditions that can affect the functionality of an effective EPR programme. Other criteria such as cost-effectiveness of recycling systems, fairness in the case of free riders, political acceptability for different policy options, though being discussed, are not the main focus of this research.

Geographically, the evaluation research consists of ELV programmes in the United Kingdom (UK) and Sweden (Paper I), and WEEE programmes in

Japan, South Korea, and Taiwan (Paper II). China, although included in Paper II, is more in line with an investigation of policy development in non-OECD countries in Paper IV because at the time of writing the country did not have yet a programme. The context studies focus on the WEEE policies and management in India, Argentina, and Thailand. This thesis gives more attention to the Indian case (Paper III) and only reports preliminary findings from the other two countries (Paper IV which also includes India).

1.5 Audiences and readership

This thesis intends to be self-reflexive on the past, the present, and the future of a PhD research work. It thus primarily serves as a communication tool between *the author, supervisors*, and *an external discussant*. The first three chapters of this thesis give the broader context of the research presented in the four appended papers. Chapter 4 summarises key themes that run through the papers. Chapter 5 concludes the thesis and proposes the future venues for the PhD, based on the reflection of the past, and is expected to be at the heart of the discussion.

Nonetheless, the thesis can also be of interest to a wider group of audiences. Policy actors and practitioners might find practical value from the findings of the research. The policy-oriented learning is particularly amendable to *EPR advocates* who share a set of policy core beliefs. Actors who are already convinced about the merit of the principle, may be more interested in how (also when and where) it can be applied or advanced. The validity and relevance of practical lessons can thus be found on this shared paradigm and interest. These readers might be particularly interested in the appended papers and Chapter 4. The learning across advocacy coalitions with those who do not share similar policy core beliefs is more difficult (Sabatier and Jenkins-Smith 1993) and this research tries less to convince or make a case for EPR to non-believers.

Researchers and practitioners in the field of evaluation can benefit from the development of the framework presented in Chapter 3. The framework is heavily influenced by and developed upon a platform of theory-based evaluation (TBE, Section 2.2 in Chapter 2). It shows how information about complex interventions can be decomposed and compared. It also defines a legitimate boundary of the evaluation and resolves the riddle of theory and implementation failures.

1.6 Structure of the thesis

This thesis consists of five chapters and four appended papers. The papers present original research. The chapters introduce the background of the research and a broad perspective over the findings of the four papers.

Chapter 1, Introduction, defines the topic of this thesis. It introduces the difficulty of the end-of-life management of complex products consumed in modern societies and an upsurge in the interest in extended producer responsibility (EPR) as a policy principle. Against this backdrop, the significance of appropriate policy learning across political settings – policy transfer – is highlighted and translated into research questions and research boundary. The chapter completes with a reading guideline.

Chapter 2, Theories & Concepts, outlines three bodies of theories and concepts central to this thesis: policy transfer, theory-based evaluation (TBE), and EPR. The terms are defined and their key issues are discussed in order to highlight their significance in this research which is an attempt to use TBE to improve the transfer of EPR policies.

Chapter 3, Research Design, starts with a short introduction of the standpoint this research advocated in the philosophy of sciences, namely, Critical Realism. Then, the design of evaluation research and context studies is described. The chapter also reflects on the advantages and disadvantages of the analytical frameworks with the benefit of hindsight. In the last two sections, it describes the research projects and the aspects of literature review and qualitative interviewing that are not fully captured in the methods and materials section of the appended papers.

Chapter 4, Main Findings, synthesises findings from the four papers. The synthesis is based on four common themes: the diffusion of EPR, the design of policies, policy outcomes, and the contexts of policies. The first section describes the process of policy transfer and the shortcomings of what I will call a "shorthand approach to policy transfer" that can lead to uninformed, incomplete, and/or incompatible transfers. The next three sections present policy lessons about the respective themes that can remedy the shortcomings and enhance the viability of policy transfer.

Chapter 5, Conclusions, concludes the thesis by revisiting the six research questions put forth in Chapter 1. The chapter also recounts the connection of this thesis and subsequent research that will contribute to my PhD work.

Paper I, an article published in a scholarly journal in the field of cleaner production, presented an evaluation of programmes for the management of ELV in the United Kingdom and in Sweden between 1991 and 2006. A special feature of this longitudinal study was a coupling of TBE with policy network analysis. This enabled the paper to shed some light on the interplay between policy processes and outcomes. The study included transposition of the ELV Directive (2000/53/EC) in the two Member States also.

Paper II, a paper presented at an international conference on East Asian studies, reviewed policies and programmes for the management of WEEE in Northeast Asia. Its point of departure was a seeming policy convergence on EPR in the region, despite an absence of a regional framework. TBE was done for the programmes in Japan, South Korea, and Taiwan. China had not had a WEEE programme yet and was dropped from the evaluation. This study demonstrated the power and limitations of a two-step, semantic approach to TBE. The paper also contained background information for the conference participants who were not familiar with the subject matter.

Paper III, an article published in a scholarly journal on resource management, was the "contrast of contexts" (Landman 2000, 18). It looked at the other end of the policy transfer, a potential recipient. It explored the context of a non-OECD country, India. A main objective of the study was to identify non-OECD specificities that can promote or hinder the application of EPR using the management of WEEE as a case study.

Paper IV, a paper presented at an international conference on sustainable consumption and production, continued the line of research presented in Paper III. In addition to the findings from India, it reported preliminary findings of subsequent context studies in Argentina and Thailand. The paper also discussed similarities and differences across the three cases. In addition, it reviewed policy development and proposals in the three countries at the time of writing.

CHAPTER
TWO

2. Theories and Concepts

This chapter introduces concepts that are central to the research: policy transfer, theory-based evaluation, and extended producer responsibility. Each section starts with a definition of the key concept and highlights its significance to the research. Then key issues around each are taken up. The chapter ends with a short summary that establishes the links between the three building blocks.

2.1 Policy transfer

2.1.1 Definition and significance

Policy transfer is an *interspatial policy learning* "in which knowledge about policies, administrative arrangements, institutions and ideas in one political setting (past or present) is used in the development of policies, administrative arrangements, institutions and ideas in another political setting" (Dolowitz and Marsh 2000, 5). The term thus excludes policy invention and learning from domestic antecedents.

A policy transfer study normally describes and explains policy changes and convergence with policy learning across political jurisdictions. It is comparable to the *diffusion models of policy innovation* (Berry and Berry 2007). Both posit that an innovation spreads through communication between actors in the social networks. Another closely related is lesson-drawing (Rose 1993). But policy transfer can have more nuances and includes also involuntary and irrational transfer. In this thesis, *lesson-drawing* is used to give a connotation of being voluntary and rational, while the other two terms, policy transfer and policy diffusion, are used interchangeably to give a more general and neutral portrayal.

Policy transfer sets a stage for this thesis. Motivated by an interest in making the transfer of EPR to non-OECD contexts more viable, this work is more

prescriptive than descriptive or explanatory. Nevertheless, such an aspiration still needs a good understanding about general processes and key issues in policy transfer.

2.1.2 Key issues

A general typology of policy transfer has a continuum with voluntary and coercive policy transfer at the two extremes and negotiated policy transfers in the middle (tilting towards the coercive end). In *voluntary policy transfer*, a government chooses to transfer a particular policy from another or others. This can be rational like in lesson-drawing or an effect of a less rational process such as normative isomorphism (DiMaggio and Powell 1983) or bandwagoning (Ikenberry 1990). Changes come as a condition of exchange in *negotiated policy transfer*. Examples are the implementation of the Structural Adjustment Programs (SAPs) in exchange for loans from the World Bank and the International Monetary Fund and the harmonisation and transposition of the EC Directives in exchange for a membership in the European Union. Despite transfer being obligatory, a government still has freedom to choose not to make the exchange. The freedom ceases to exist in *direct coercive policy transfer*. However, coercive policy transfer is less relevant nowadays than in the time of formal imperialism[1], though some of its legacies still live on.

Regardless of its types, policy transfer shares some common traits with other social learning. Hall (1993) identifies three key features of social learning: (1) policy changes are reactions to previous policies; (2) experts are key agents; (3) states are capable of acting autonomously from internal pressure in their immediate context. The rest of this section reviews the policy transfer literature under these three qualities.

Policy transfer is influenced by knowledge about previous policies elsewhere. Changes can be in policy parameters, policy instruments, or policy paradigms. It is not uncommon for a state to adjust parameters such as targets, tax and fee rates, or standard levels as a reaction to policies of trade partners or competitors. States can also learn alternative ways and instruments to achieve their objectives. At the most profound level,

[1] It can be argued that with a subtlety of imperialism which changes from military-based into economic-based, coercive policy transfer does not disappear but changes into negotiated policy transfer.

problems can be redefined leading to a new set of policy objectives. Although the research presented in this thesis is mainly on the level of policy instruments, it is embedded in a *paradigm shift* from waste to product policies under the influence of EPR.

Literature on social learning in general and policy transfer in particular is influenced more by elitism than pluralism. At the centre of learning are experts such as bureaucrats and policy advocates. Early work on policy transfer focuses on the role of individuals and personal interaction (see Rose 1993; Rose 1991; Bennett 1991). But recently the attention has shifted from a micro- to a meso-level analysis of *policy transfer networks* (Evans 2004). Therefore, meso-level concepts and theories such as epistemic community (Haas 1992), advocacy coalition framework (ACF) (Sabatier and Weible 2007; Sabatier and Jenkins-Smith 1993), and network management (Kickert et al. 1997) might be crucial for our understanding about drivers of international diffusion, choices of advocated policies, and transfer strategies, as demonstrated in Papers I and II.

Policy transfer indicates a distance between policy development and its immediate context. States has freedom and obligations beyond merely responding to internal stimuli in changing its policies. However, this does not mean *contextual conditions* can be overlooked. Theoretically, models that unify diffusion mechanisms with internal factors are better at explaining policy adoptions than either diffusion or internal-determinants models alone (Berry and Berry 2007).

Policy transfer can also be perceived as an explanatory factor of policy outcomes. Dolowitz and Marsh (2000), for example, distinguish three types of policy transfer that can lead to policy failure: *uninformed, incomplete, and inappropriate transfer*. Paying attention to contextual differences, as will be demonstrated in the context studies, can safeguard against inappropriate transfer. To avoid committing uninformed and/or incomplete transfer requires a good understanding of transferred policies for which I now turn to policy evaluation.

2.2 Theory-based evaluation

Policy evaluation can be a tool for evidence-based policy making in general and policy transfer in particular. A country can benefit considerably from an evaluation of a range of programmes abroad. Nevertheless, not all kinds of

evaluation are conducive for policy learning (Pawson 2002a). For example, a numerical meta-analysis would obscure rather than clarify the complexity of implementation and mistake correlation with causality. At the end of the day, it is not a programme but the interaction between the mechanisms it unleashes and its context that produce outcomes. Simply grouping programmes and tallying their outcomes to pick a winner gives little information about this interaction and might even increase the risk of policy failures. On the other hand, while constructivists can provide a rich description in their narrative reviews, they often fall short of offering anything close to transferable lessons. In contrast with the other two approaches, theory-based evaluation (TBE) can capture and give a structure to the complexity between context, mechanism, and outcome.

2.2.1 Definition and significance

TBE is a practice that measures the merit of a policy or a programme with a set of suppositions explaining how the evaluand should operate. In TBE, an evaluator does not only gauge outcomes of an intervention, but he/she also checks logical steps between an intervention and the outcomes. This set of suppositions/logical steps is what called a *programme theory*. The use of a programme theory as a standard of comparison enables the evaluation to answer a question: "why does a programme work (or fail to work)?" as shown in Table 2-1.

Table 2-1 A typology of results in TBE

		Has the expected outcome been observed?	
		Yes	No
Has the intervention executed as planned?	Yes	Successful theory, correctly executed**	Failed theory, correctly executed (Theory failure)
	No	Superfluous theory* with failed execution	Unproven theory with failed execution** (Implementation failure)

* For a theory about necessary conditions

** Together confirm a theory

TBE was first developed in the field of educational research (Weiss 1997; Fitz-Gibbon, and Morris 1996). Later, it found its application in evaluation

of public health, social, and environmental policies (Mickwitz and Birnbaum 2009; Tojo 2004; Mackenzie and Blamey 2005; Carvalho and White 2004; Birckmayer and Weiss 2000; Cole 1999; Connell et al. 1995). It is noticeable that in these fields scientific theories are relatively weak and evaluation of policies/practices can be seen as part of the theory development.

In this thesis, TBE serves as a building block in the analytical framework. This is based on the learning potential it offers for evidence-based policy making (Sanderson 2002). In addition, TBE is suitable for the evaluation of EPR programmes that have long-term goals that might not be immediately measureable (Tojo 2004; Weiss 1997; Fitz-Gibbon and Morris 1996). The next section presents some key issues for the application of TBE in this thesis.

2.2.2 Key issues

The concept "theory" is at the heart of TBE. The entire enterprise rests on a premise that every programme has its set of suppositions, although policy actors are rarely explicit about this. An evaluator thus harbours a considerable part of his/her energy in TBE in surfacing a programme theory. However, despite its central role, it might not be self-evident what is meant by saying a theory is used in an evaluation. As shown in Table 2-2, there are several kinds of programme-related theories and different sources use different terminologies. To avoid causing any further confusion, this thesis uses the terms in bold in the right column when referring to classes of theories in the left column. The term "programme theory" is reserved for a generic use.

A problem theory is a foundation underpinning other classes of programme theories. It is comparable to *policy paradigm* in policy analysis literature. Hall (1993, 279) gives a definition of policy paradigm as:

> *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.*

A problem theory holds a key to a constructivist charge that TBE is a way to force a certain discourse to our understanding of the world. This criticism is particularly adamant for an evaluation in the network setting where actors possess different and evolving views (Benjamin and Greene 2009). Although consensus-building, increasing participation of stakeholders, and using of

multiple theories can provide some safeguards against the criticism[2], they cannot completely make it withering away. At the most profound level, competing paradigms might be incommensurable (Kuhn 1970). An across-the-board example is the concept of "the good society". Although it underpins all interventions, the notion can yield various irreconcilable definitions (Shaw and Crompton 2003).

Table 2-2 Three classes of policy theories

Class of theories	Name
A (set of) proposition(s) explaining the determinants of the social/policy *problem* E.g. "the design of products and product systems is a root cause of waste problem"	**Problem theory** Other term*: aetiologic theory (Co), policy paradigm (H)
A (set of) proposition(s) explaining *mechanisms* of an intervention that trigger anticipated outcomes E.g. "Financial consequences influence end users' waste separation behaviour."	**Intervention theory** Other terms*: cause/effect theory (Co), programme theory (W, B&M), descriptive theory (Ch), middle-range theory (P&T), conceptual theory (B&S)
A (set of) proposition(s) linking programme *activities* to anticipated outcomes E.g. "A mandatory free take-back requirement will increase waste separation."	**Implementation theory** Other terms*: intervention theory (Co), implementation theory (W, B&M), prescriptive theory (Ch), action theory (B&S)

* B&M (Balmey and Mackenzie 2007), B&S (Bamberg and Schmidt 1998), Ch (Chen 1990), Co (Cole 1999), H (Hall 1993), P&T (Pawson and Tilley 1997), and W (Weiss 1995).

[2] These strategies can also counter one another, however. For example, it can be next to impossible to reach a consensus with a broad spectrum of stakeholders.

This thesis perceives the criticism as a call for a *legitimate boundary* of an evaluation. TBE is obviously a project of Critical Realism (see Section 3.1) and cannot (as well as should not) fully accommodate relativism. It is powerless in the face of multiple paradigms due to a lack of rational common ground to gauge the merits of competing policy paradigms. Nevertheless, it can handle and evaluate the effectiveness of intervention or implementation theories in addressing a defined problem and reaching the objectives within a single paradigm. Therefore, the evaluation research featuring in this thesis (Papers I and II) always starts with policy objectives derived from one problem theory – the EPR principle.

Besides establishing the conceptual consistency in and the boundary of the evaluation, the typology in Table 2-2 also sheds some light into the differences between two main approaches to TBE. The Aspen Institute's *Theory-of-Change* approach (Connell et al. 1995) is more amendable to the construction of an *implementation theory*. Here, an evaluator works closely with programme designers and practitioners to develop a theory explaining how programme activities would produce desirable outputs and outcomes. The issue of validity is resolved with a consensus-building process through which stakeholders develop a sense of ownership over the theory. The *realist evaluation* (Pawson 2002b; Pawson and Tilley 1997) is, on the other hand, more concerned with an *intervention theory*. A realist evaluator consulting scientific theories and hypotheses develops and owns a theory. The internal validity of the constructed theory stems from the rigour of our accumulated knowledge.

Despite their differences, the two approaches are more complementary than competing. As Balmey and Mackenzie (2007) point out, it is possible and might even be preferable that an evaluation uses both intervention and implementation theories so that it can truly attribute a success to a programme or (more importantly) to pin point whether a theory or its execution is to blame for a failure. A robust TBE should keep track of both *theory failures* and *implementation failures*. With only one class of programme theories, the evaluation is open to target shifting allowing one type of failure to be downplayed at the expense of the other (Dahler-Larsen 2001). The integration is one of the ambitions in the development of the analytical framework presented in Section 3.2.1.

2.3 Extended producer responsibility

2.3.1 Definition and significance

In this thesis, extended producer responsibility (EPR) is considered as an *environmental policy principle*. Lindhqvist (2000, 154) gives the following definition:

> *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.*

The term can also be described as an approach (OECD 2001), a strategy (Lindhqvist and Lidgren 1990), or a policy paradigm (Manomaivibool 2008), despite the absence of a legal nuance of the word principle. It is, however, not a policy instrument but rather serves as a basis and provides rationales for the selection of policy instruments (Lindhqvist 2000). As will be seen in the case studies, a wide range of policy instruments can be and have been employed in EPR programmes.

EPR is instrumental for the analytical framework of this thesis. Because most operational details of EPR will be taken up in Chapter 3 when discussing the development of the framework, this chapter focuses on key issues that build a case for EPR as a policy paradigm for the management of complex products.

2.3.2 Key issues

EPR emerged from the context of environmental policies in industrialised countries in the 1990s. After these countries had successfully controlled emissions from production facilities and other point sources, they turned their attention to pollution related to products including solid waste. Concepts such as waste management hierarchy, zero waste, 3Rs (Reduce, Reuse, and Recycling), and the likes, indicate a move away from a conventional arrangement of mixed waste collection and disposal. However, the governments did not have necessary leverages to bring about desirable changes under the framework of public health or solid waste management. While being responsible for solid waste management in this paradigm, municipalities had only limited control over waste generation and

compositions which were to a large extent influenced by replacement decisions, marketing, and product design.

Against this backdrop, EPR proposes a new lens to look at the problem and a new policy direction. Instead of treating it as waste management problems *per se*, the principle suggests that the root of the problem is "the design of products and product systems" (Lindhqvist 2000, 3). In this sense, EPR lays down a new problem theory and, hence, constitutes a new paradigm for waste policies.

The principle suggests that because they have control over the design of products and product systems, the producers should also shoulder the end-of-life responsibility. Four types of producers' responsibility, as shown in Figure 2-1, are identified and defined as follows: *liability* refers to the responsibility for proven environmental damages caused by the product; *economic/financial responsibility* means that all or a significant part of the costs in the management of the product are borne on the producer; *physical responsibility* refers to the physical management of the product and/or its effects; and, *informative responsibility* requires the producer to provide information on the environmental properties of the products he/she manufactures (Tojo 2004; Lindhqvist 2000).

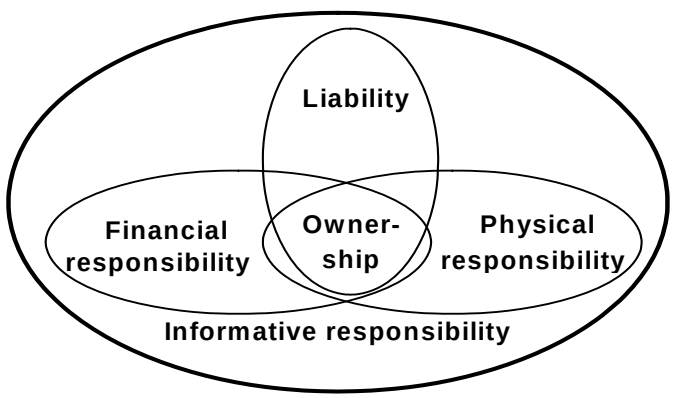

Figure 2-1 Model of extended producer responsibility
Source: (Lindhqvist 1992)

The (re)allocation of product responsibility is proposed in the light of two families of policy objectives: "(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 *design/upstream objectives* are a distinctive feature of EPR. Design improvements can be further divided into two categories, product design improvements and product system design improvements. Examples of product design improvements are dematerialisation, material substitutions, design for disassembly (DfD), design for recycling (DfR), and modular design, to name just a few. Product system improvements are concerned with all other factors, besides the product *per se*, that enable the functionality throughout the life cycle (Lindhqvist 2000). Examples of improvements in product systems are development in recycling technologies, reverse logistics, and product-service systems (PSS).

Two factors influence the strength of leverages for design improvements: excludability and immediacy. First, 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 the cases that products have a relatively long life span. In addition, producers are economic actors and might be more susceptible to financial incentives than other types of instruments.

The *waste management/downstream objectives* cover collection, treatment, and re-use and recycling. Although these are conventional waste management objectives, EPR has several advantages to other approaches in achieving them. 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 sales where there is both the ability and willingness to pay. In this way, EPR offers a government an attractive financial solution to the waste problems. Moreover, assigning responsibilities to producers can lead them to physically involve themselves in end-of-life management or enter into a dialogue with downstream actors, which in turn, can provide a producer with learning opportunities regarding design for end-of-life (van Rossem et al. 2006).

CHAPTER
THREE

3. Research Design

This chapter explains the design of research that constitutes this thesis. It starts with a brief discussion of a philosophical stand of the research which is influenced by the Critical Realism school of thought. Then the development and key features of the analytical framework behind the evaluation research and the context studies are described before the research projects are introduced. The chapter ends with a description of literature review and qualitative interview processes that have not fully captured in the appended papers. Other details of materials and methods can be found in the papers.

3.1 Research orientation

This research belongs to the *Critical Realism* school of thought. As such, it tries to "combine and reconcile ontological realism, epistemological relativism and judgemental rationality" (Bhaskar 1998, xi). While claiming that the external world and objects exist out there independently from the investigation, the intransitive aspect of being, it accepts that knowledge is transitive and thus relative. These combination rescues the research from the trap of judgemental relativism, which argues that all beliefs are equally valid. The intransitive reality provides a rational ground to judge the validity of statements and makes possible the inference to the best explanation (Wendt 1999).

The research posits a stratified structure of knowledge. Reality can be conceptualised into three domains: (1) the real where stable mechanisms and structures reside, (2) the actual where events occur, and (3) the empirical where we experience events. *Pure* or *theoretical explanations* give abstract knowledge about the real describing the deep structure, generative mechanisms and their tendencies (Lawson 1998). *Practical* or *applied explanations* account for the manner which mechanisms jointly articulate themselves and produce a particular concrete event we experience (Lawson 1998). Theoretical explanations are general and comparable to intervention

theories in TBE, while practical explanations are situational and comparable to implementation theories.

The two types of explanations are transfactual and contingent but not reducible (Outhwaite 1987). Explanations of events are not immediately generalisable as much as theoretical knowledge is not immediately predictive. Complex events such as EPR programmes and non-OECD contexts need to be described and resolved into its significant components before they can be explained using theories about mechanisms and structures. On the other hand, results of a programme evaluation or a context assessment have to go through a process of abstraction into transferrable lessons.

The design of the studies upon which this thesis is based follows this stratified structure. It borrows knowledge about generative mechanisms from literature in various fields. These theoretical explanations are then contextualised either in particular intervention programmes (in the evaluation research) or in a particular setting (in the context studies. The research tests their implications, identifies and investigates key conditions and interactions between the mechanisms and these conditions in the realm of the actual. Then it attempts to derive more abstract and generalisable lessons from the cases. The rest of this chapter presents the operational details of the evaluation research and context studies.

3.2 Analytical framework

3.2.1 Evaluation research

The evaluation research presented in Papers I and II follows a *multiple-case design* which helps increase the leverage of the research (Yin 2003; Dowding 2001). Paper I has two cases and covers 16 years resulting in 32 observations. Paper II makes a cross sectional comparison of four cases. Comparison is necessary to substantiate the kind of conclusions made in the qualitative studies.

TBE is a starting point of the evaluation research. The analytical framework is based on *three modifications* of general TBE. First, the boundary of the evaluations is defined with a policy paradigm, EPR. Second, there is a validation of TBE with outcome proxies. The last modification featuring Paper II is a step-wise procedure to check intervention and implementation theories.

As argued in Chapter 2, a legitimate boundary of TBE is an evaluation within a well defined policy paradigm/problem theory. In this thesis, EPR provides a problem theory and objectives for interventions.

The environmental effectiveness of an EPR programme is measured through the alignment of its implementation with a set of objectives. A list of upstream and downstream objectives are derived from van Rossem and Lindhqvist (2005, see Paper II). Then, information about policy instruments employed in each programme is compiled to reconstruct a model explaining how the programme has been implemented — an implementation theory. In a longitudinal study, Paper I, any change in policy instruments and their parameters that makes the implementation theory more logically relevant to the problem theory constitutes an increase in environmental effectiveness.

In the evaluation, a set of outcome proxies measuring the achievement of the objectives is also developed for the validation of TBE. For example, three downstream proxies are used for the management of end-of-life vehicles in Paper I: authorisation, collection, and recycling rates. Proxies in Paper II include evidences of product redesign, collection rate, recycling rate, and number of authorised treatment facilities.

The evaluation scheme used in Paper I, however, had two weaknesses. First, the way TBE was graphically reported (see Figure 3 in Paper I) limited the ability to draw specific policy lessons. Although it was convenient for a longitudinal comparison, the aggregated presentation obscured causal relationship between intervention mechanisms and outcomes. Second, the scheme did not have any procedure to distinguish theory and implementation failures. In addition, it was realised during the evaluation that the current state of knowledge in the field was still far from sufficient to create a quantitative model explaining the relationship between policy instruments and outcomes, not to mention the mediating effects of contextual factors.[3] To overcome the weaknesses and coping with the limitation, a two-step, semantic approach was developed.

The two-step procedure presented in Paper II better unbundles the implementation and intervention theories of a programme. The implementation theory is decomposed into its main components and their

[3] Such endeavours to quantitatively model a public intervention using theory-based evaluation have already emerged in some fields; see Bamberg and Schmidt (1998).

alignment with EPR objectives are predicted based on intervention theories. A poor alignment indicates implementation slippages. In the second step, which is validation, the congruence between predicted and actual effectiveness (measuring by proxies) marks the validity of intervention theories. Discrepancies in this step show deficiencies in intervention theories. The evaluation in Paper II proved the merits of the approach. The two-step, semantic approach was able to render implementation theories of complex interventions while reducing the loss of information compared with the approach in Paper I.

The approach could, nevertheless, be developed further. As one of the objectives of Paper II was to review the overall situation of WEEE management in Northeast Asia, it conflates state interventions and responses from industries when it describes a programme. However, a line could have been drawn between the two dimensions to further test intervention theories with questions such as what kind of responsibility organisations would be developed under set conditions of policies (see van Rossem 2008).

In addition, the framework should be made more sensitive to contextual conditions in the future. As it stands, the evaluation (both in Papers I and II) does not have a built-in option to vary how a mechanism might work under different contexts. In other words, it implicitly assumes that a programme with a certain set of components would always function in a certain way regardless of its context. Needless to say, this assumption is questionable. For example, an emissary group from the UK to Japan casts a doubt that:

> *It is difficult to conceive of the average British consumer being willing to pay £15 or so [as Japanese consumers] to have old appliances removed and recycled* (DTI 2005).

As a matter of fact, the deep-seated need for a better understanding of the moderating or mediating roles of implementing conditions is one of the drivers behind the context studies, to which I now turn.

3.2.2 Context studies

The contextual analysis presented in Papers III and IV is a successive use of an exploratory framework. The two papers are based on three studies with a single-case design. *Material flow analysis (MFA)*, as shown in Figure 3-1, provides a structure to the exploration in non-OECD contexts. The MFA framework ensures comparability across single-case studies.

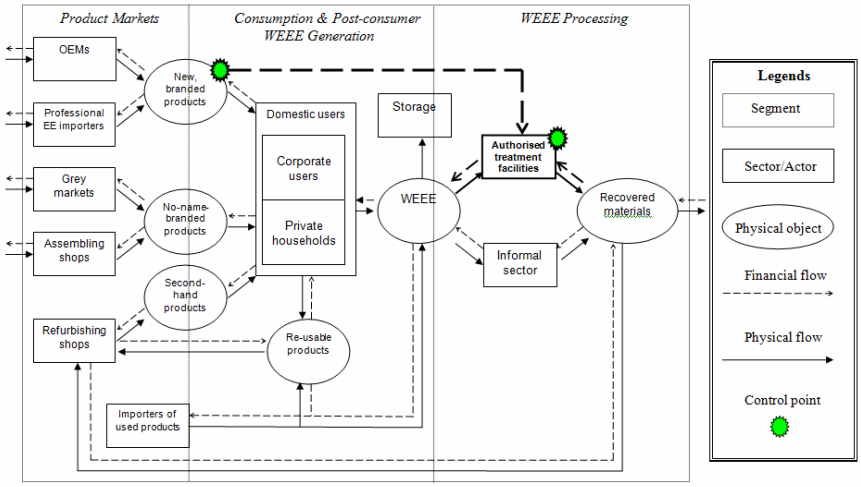

Figure 3-1 The system boundary of the contextual analysis

The framework is designed to be generic and comprehensive. It pays attention to sectors, actors, physical and financial flows along the life cycle of products which is divided into *three segments*. The first segment is the product shipments. Two types of distribution channels for new products are illustrated: accountable and unaccountable. The latter delivers products, whose producer is not identifiable. Second-hand products are sold in the re-use market and are dependent partly on the downstream operation for spare parts and reusable components.

The second segment is consumption and (post-consumer) waste generation. Some discarded but functional products will re-enter the market via re-use. Two types of consumers are depicted: institutional users and private households, because the nature of waste products from these sectors can be qualitatively different. In addition, some products might be retired from institutional users to private households. Besides domestic generation, there can be imports of used products and/or recyclable items into the system.

Finally, discarded products enter the waste management segment. The segment is divided into two sectors. The formal sector comprises of authorised treatment facilities who obtain a license to operate from the authorities. The informal sector, on the other hand, responds only to economic stimuli and does not comply with regulations or standards.

The framework produces structures and patterns in the production, product distribution, consumption and end-of-life management when applied to a particular case. The implications of these structures and patterns are obtained from a scenario with *three basic EPR elements*: (1) a physical flow of waste to a formal sector comprising authorised treatment facilities (ATFs); (2) a resource flow from the producers to the formal downstream sector; and, (3) monitoring and reporting infrastructure. These elements are shown with bold lines in Figure 3-1. Regardless of exact program configuration, the three elements are necessary for the functions of EPR programs. The first component ensures that downstream activities are carried out in an environmentally sound and socially acceptable way so that internalisation will adequately reflect true environmental consequences. The second element is the internalisation of end-of-life consequences to the producers. Preferably but not necessarily the resource flows from a producer should be proportional to the environmental consequences of his/her own products. Lastly, monitoring and reporting mechanisms are required to ensure that the other two elements are working as intended.

The analysis focuses on the interplays between contextual factors and these elements. The goal of the scenario analysis is to identify *opportunities* and *challenges* in achieving EPR objectives in a particular context: 1) to provide design incentives to producers of new products (cell A); 2) to prevent free-riders, especially born-to-be-orphan products (cell B); 3) to ensure environmentally sound treatment and high utilisation for all products; and, 4) to have an acceptable method of distributing the costs relating to historical products (cells C and D). These statements are derived from the two sets of EPR objectives based on the typology of products, shown in Table 3-1.

Table 3-1 A typology of products in an EPR programme

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

3.3 Research projects

The value of prescriptive policy transfer rests not only in the development of the analytical framework but also in being *action-oriented*. Table 3-2 lists research projects I have been involved up until September 2009. Projects with an asterisk mark are directly relevant to the research presented in this thesis.

These projects have added an important aspect of the action research to my research – the joint learning between the researcher and others (Ottosson 2003). This was particularly true for a series of projects commissioned by Greenpeace International that did not only broaden the geographic scope of the research, but also offer a unique opportunity to create dialogues with various groups of stakeholders in those countries. The research and the research team contributed to the communication within the NGO (between its local offices in developing countries and the international office), between the producers and the government.

For example, I was a speaker in a workshop held on 11 April 2008 in Bangalore, India, by the Manufacturers' Association for Information Technology (MAIT) and Greenpeace India. The purpose of the workshop was to sound out commitment and support of leading electronic brands in advancing an industry-led WEEE management model and negotiating with the government. Similarly but in a less formal way, I encouraged producers who were not manufacturers in Thailand and had not been consulted in the past public hearing to voice their concerns over the proposed policy to the Thai government. One way I facilitated the process is by continuously summarising key policy proposals in English and updates them. It was seen that some MNCs entered into a dialogue with responsible governmental agencies in the Ministry of Natural Resources and Environment and the Ministry of Industry for the first time during the project period.

It is not too far to say that the knowledge about network management presented in Paper I was put into practice in these projects. As mentioned in Chapter 2, policies are transferred via a network of actors. Social interactions can thus influence policy ideas. Some authors even suggest that network management strategies aiming at social aspects might be an effective way to breakthrough cognitive impasses in policy networks (Termeer and Koppenjan 1997).

Table 3-2 Commissioned and master-thesis projects related to the PhD research

Project	Duration	Short description
Commissioned projects		
Model Law on Producer Responsibility for WEEE in India*	Feb-Aug 07	The project was commissioned by Greenpeace International. The aim was to support its office in India in advocating EPR and investigating the local conditions. A report, (Manomaivibool et al. 2007), was a derivable of the project. A multi-stakeholder workshop was organised by the commissioning body to get feedbacks on the report on 21 August.
India scenario & stakeholders EPR analysis*	Dec 07-Aug 08	The project was commissioned by Greenpeace International. This spin-off project was to assist the office in India in negotaiting with industries and the government for a WEEE legal framework including a workshop between a trade association, producers, and NGOs on 11 April 2008 and follow-up feedbacks on draft laws and the then proposed guideline.
Argentina EPR Report*	Dec 07-Oct 08	The project was commissioned by Greenpeace International. The purpose was to replicate the earlier project in India in a Latin American context. I played a supportive role in the production of a report, (Lindhqvist et al. 2008). The project coincided with the development of draft legislation by a senator in Argentina.
Thailand scenario & stakeholders EPR analysis*	Dec 07-Nov 08	The project was commissioned by Greenpeace International. The purpose was to replicate the earlier project in India in the Thai context. I played a pivotal role in the production of a report, (Manomaivibool et al. 2009). The project coincided with the development of draft laws in Thailand.
The Study Project on Criteria and Fees of Thailand's WEEE Management	Feb 09-Feb 10	The project was commissioned by the Pollution Control Department. The on-going project will advise the fee-setting methodology and fee rates for targeted WEEE. It is based on economic and technical analyses of a future WEEE management system. The project also features a series of five public hearings.

Project	Duration	Short description
Master-thesis projects		
Network management and environmental effectiveness: The management of ELV in the UK and in Sweden*	Feb-Sept 06	This was the topic for my master thesis. It evaluated the ELV programmes in the UK and in Sweden. Paper I reports key findings from this project.
E-waste management in India: Stakeholders' perceptions and media attention*	Jan-June 08	This work, (Manda 2008), was inspired by the first Greenpeace project and coincided with the second project in India. The motivation was to examine opinions of various stakeholders in India and to measure the perceived salience of the issue in the society via media attention. My role as a supervisor in this project was mainly in guiding the research design and data collection and analysis based on topical knowledge about the Indian context.
Producer's role in managing used mobile phones: China case	Jan-June 09	This work, (Huang 2009), was initiated by a master student. She investigated the policies related to WEEE management and voluntary take-back schemes intiated by mobile-phone producers in China. My role as a supervisor in this project was mainly to suggest key issues for the research based on the findings of previous research.
Drivers and barriers of e-waste management: A case study of EPR	Jan-June 09	This work, (Carisma 2009), was initiated by a master student. He investigated various aspects of WEEE management in the Philippines. My role as a supervisor in this project was mainly to suggest key issues for the research based on the findings of previous research.
Proactive approaches towards producer responsibility regulation: The case of Nokia in Argentina	June-Sept 09	This work, (Maneschi 2009), was initiated by IIIEE and sponsored by Nokia to explore producer responsibility options under the proposed legislation and local conditions in Argentina. His research built upon the previous research in the country. My role as a supervisor was to suggest key issues and how to structure of the analysis.

3.4 Methods and materials

Research presented in this thesis employs various methods and materials. Because their details have already been described in the methods and materials section in respective appended papers, this section, instead of repeating the information, pays more attention to the literature review and reflections on qualitative interviews – the aspects not documented in the papers.

3.4.1 Literature review

Literature review is a backbone of this research. Not only is it used to identify scientific advancement and gaps in previous research, but it is also a source of intervention theories in the evaluation research and supplies the discussion in context studies. Thus, it is crucial that the literature review is comprehensive and structured.

The main focus of the literature review was on EPR and the management of complex products in theory and in practice. The end-of-life management had a special orientation on the contrast between developed and developing countries. A literature review protocol was developed in the course "Scientific Information Management" at Lund University in autumn 2007. The protocol helped systematising the activity.

The first step in the protocol was to review four scientific databases. Key information of the databases is outlined in Table 3-3. Then, different streams of keywords were deployed and combined using the BOOLEAN system as the followings:

1. Two groups of keywords, one on EPR: "producer responsibility" OR "product stewardship" – results A; and the other on WEEE: "WEEE" OR "electronic waste*" OR "e waste*" – results B, are used in two separate searches. The terms "take back" and "computer*" are left out from this step as they tend to give too many results;
2. The two searches are combined with AND and the terms "take back" (except in ISI because this results in too many hits) and "computer*" are connected to EPR and WEEE with OR, respectively. These results C will give results about EPR within one product category irrespective of the geographical boundary;
3. The WEEE keywords are combined with the geographical boundary by combined them with "China", "India", and "Asia" using AND. These

results D will give results about WEEE within the geographical boundary irrespective of policy approaches; and,

4. The final results – E – are obtained by combining the results from #2 and #3 with OR. They are about EPR for WEEE and/or WEEE in Asia.

Table 3-3 A list of databases for the literature review

Databases	**Description**	**Coverage**	**Screened hits**
Science Citation Index Expanded (ISI)	ISI collects index of articles from some 5,200 scholarly journals in medicine, natural sciences and technology.	1900 – present	43
Compendex	Compendex is a database for engineering research literature with over 5,000 journals. Its collection also includes conference reports and books.	1970 – present	133
Cambridge Scientific Abstracts (CSA)	CSA is more a gateway than a database in itself. It provides access to numerous databases in many disciplines, including a few in environmental studies. Its collection also includes conference reports and books.	Varies between 1806 and 1998 to current	51
ABI/INFORM	ABI/INFORM is a database of business information. ABI/INFORM Trade & Industry contains over 700 publications. It also includes industry and company periodicals.	1971 – present	32

The screened results include 180 full-text publications from 1991 to 2007. Figure 3-2 maps these publications along the timeline. It can be seen that the issue of WEEE management in developing countries has gained an increasing attention in recent years.

Besides the exercise which focusing on WEEE, literature review also covers key literature on EPR in general. In addition, a wide range of literature in the field of industrial ecology and environmental behaviours and psychology has been reviewed during a series of PhD courses I have participated in.

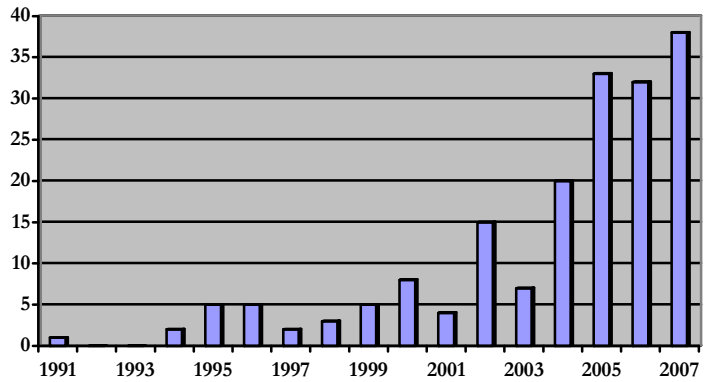

Figure 3-2 The number of screened articles from the literature search by year (1991-2007)

3.4.2 Qualitative interviewing

Interviewing was instrumental in the context studies. Information about the non-OECD contexts was much less documented than the information about the evaluated programmes, the availability of which is partly owing to the monitoring and controls in the EPR programmes. This section focuses on qualitative interviews in India and Thailand.

The qualitative interviews were topical. A *topical interview* seeks descriptions and explanations of complex events and processes (Rubin and Rubin 1995). My role in structuring and guiding the conversation as a researcher and an interviewer was greater than it would have been in cultural interviews. The selection of interviewees was based on preliminary research on the cases and background knowledge. A rather tightly design interview protocol was a main data collection tool. These were to ensure that necessary information was sufficiently covered in one-shot interviews. Only in some occasions, a second interview with the informant was possible during the study period. In the other cases, follow-ups were carried out through telephone and/or e-mails.

Despite being structured, the design of research interviewing was flexible, iterative, and continuous (Rubin and Rubin 1995). It is next to impossible to predetermine a qualitative research project and, as Kvale and Brinkmann (2009) suggest, a researcher becomes wiser throughout the investigation with conversational partners. Interview questions in the protocol were constantly reviewed and revised if necessary; often new questions were added in the

light of information gained in previous interviews. For example, the issue of black/grey markets was brought up in a few interviews with the trade associations in India and since became one of the key themes in the interviews with more elaborated questions. Interactions with actors in the field also opened up new contacts, the so-called snowball sampling.

The combination of planned and evolving elements differed in the Indian and Thai projects. In the former, most of the meeting were prearranged and the schedule was tight with a lot of travelling in the country because the field work lasted only for a period of ten days and I had to rely on a local correspondent to make the appointments. The opportunity for snowballing was thus very limited. On the other hand, the questions in the interview protocol were rather general.

In Thailand, with more time, acquaintance with the homeland and policy actors, and better understanding of the topic from the previous research, I was able to design an elaborated battery of interview questions from which interview protocols for different groups of interviewees were derived while navigating and expanding the contacts. The number of questions and interviews was thus greater in the Thai project.

Nevertheless, together the research in India and Thailand can be viewed as different part of a tree-and-branch model. The first project in India explored the topic – the tree – and identified issues that could be salient for EPR in non-OECD countries – branches. The Thai project investigated the issues in more details and tested the generalisability of the findings.

Appendix A gives the details of interviews featuring in Papers I, III, and IV. Interview guidelines are presented in Appendix B. The guidelines are of generic nature and the exact number, wording, and orders of questions were different from interview to interview.

CHAPTER
FOUR

4. Main Findings

This chapter reads findings from the programme evaluations and the context studies together and divides them into four related themes. The first subsection describes the diffusion of EPR among the developed and developing countries and identifies problems with existing approach to policy transfer. The next three subsections draw policy lessons about variances of programmes and policy proposals, policy outcomes, and key considerations in actual contexts from the cases studied.

4.1 Diffusion of EPR

Based on the cases presented in this thesis, the diffusion of EPR can be divided into *two periods*. The first period is when it became an underlying principle in the first generation of ELV and WEEE programmes in Europe and Northeast Asia in the end of the 1990s and the beginning of the 2000s. The second period is a contemporary discussion of its application, potentially a second generation of EPR programmes, in non-OECD countries such as China, India, Argentina, and Thailand. Table 4-1 presents key features of the policy transfer in the two periods. The following two subsections provide the details with more weight given to the characteristics of the policy process in Period II which is the focus of this thesis.

Table 4-1 The diffusion of EPR in two periods

Period	***When*** did the transfer start?	***What*** was transferred?	***Where*** to is it transferred?	***Who*** are key actors in policy transfer network?
I	In the 1990s	Policy direction	Developed countries	Intergovernmental organisations
II	In the 2000s	Programmes	Developing countries	Developmental agencies Environmental NGOs

4.1.1 Period I

In the first period, EPR gave a new *policy direction* for the end-of-life management of complex products. Previous application of EPR in the management of waste packaging reinforced the cognitive change. Two intergovernmental organisations, the European Union (EU) and the Organisation for Economic Co-operation and Development (OECD), were instrumental in international policy learning. The intergovernmental organisations monitored, accumulated, and disseminated information about new developments in EPR policies among their members (OECD 1999a; 1999b; 1998a; 1998b; 1998c). Paper I shows how this internationalism activated and changed ELV policy networks in the UK and in Sweden despite the absence of a policy at the national level in the former case. Car producers (and other actors), who once were in the periphery of the ELV policy network, simply could not turn a blind eye to the policy discussion at the EU level. The impact on the rhetoric of WEEE policies in Taiwan, Japan, and South Korea is also evident in Paper II.

However, at the programme level, first generation EPR policies diverged considerably at the beginning. The divergence is unsurprising because concrete operational lessons were very limited for the first movers. The making of ELV and WEEE programmes in the 1990s, such as in Sweden, Japan, and Taiwan among the cases, should be described as a trial-and-error process. Only later did the element of policy transfer become stronger, especially in the EU where a series of Directives were enacted in the 2000s. The Directives speeded up the diffusion and reduced, but not eliminated, disparities between programmes by prescribing a set of standard measures to be transposed in national policies of Member States. The evaluation in Paper I illustrates the harmonisation resulted from a negotiated policy transfer using the ELV Directive (2000/53/EC) as an example.

4.1.2 Period II

The transfer in the second period has had a strong focus on the management of WEEE in developing countries. WEEE became the centre of attention after NGOs, such as Basel Action Network (BAN), Silicon Valley Toxics Coalitions (SVTC), Greenpeace, and Toxics Link, exposed that, despite the presence of recycling programmes in developed countries, the waste flowed to developing countries and ended up causing grave health and environmental problems in the hands of the so-called informal recycling sector. Not only does the environmental justice movement demand that the

programmes in developed countries must be tightened, but they also lobby governments and electronic producers in developing countries for EPR policies and practices. As a matter of the fact, the research presented in Papers III and IV is a product from projects commissioned by Greenpeace International within this context.

In this period EPR takes a form of a *policy solution*. Policy makers and advocates in developing countries look at EPR programmes in developed countries as examples of how to solve the WEEE problem. Paper IV highlights the role of developmental agencies, such as GTZ and EMPA in India and JETRO in Thailand, in transferring lessons from their home to the host countries. It is observed that their influence can colour the outlook of EPR and the policy transfer. For example, in India almost all interviewees identified EPR with the EC WEEE Directive (2002/96/EC) while in Thailand the dominating image was that of Japanese SHARL. A further note can be added that the reception of foreign models has been only lukewarm with a typical scepticism over their applicability in a developing country context.

The tendency to identify *the shorthand* for complex EPR programmes is, however, not healthy for the policy transfer perspective. As will be seen in the next sections, there is not one but several variances of actual EPR programmes and they are not equally effective in achieving the two sets of EPR objectives. Moreover, the evaluation research shows that it might not be necessary that the actual outcomes can be attributed to the perceived key core components of the programmes such as monetary (dis)incentives, targets, etc.

The shorthand approach commits the three sins to policy transfer. First, it hides rather than shows the many possibilities to translate the principle into an operational programme. Because lesser known variances such as the governmental-fund model in Taiwan have little chance to surface in the shorthand approach the interspatial policy learning can result in uninformed transfer – where a more famous variance is dogmatically copied because it is *the* EPR model – or reinventing the wheel – where the shorthand is rejected and the policy making ventures from policy transfer into policy invention without knowing that the "new invention" has already been out there all along. The almost lost opportunity for policy learning is highlighted in the case of the Thai WEEE policy which proposes a governmental-fund model but had failed to examine experiences of any existing governmental funds before my intervention in the process (see the story in the Epilogue).

Second, the shorthand approach is highly susceptible to incomplete transfer. Because only the perceived core character of existing EPR programmes is highlighted, it rarely gives a rounded picture of programme configurations. Neither does it bother to validate whether the actual outcomes (if ever documented in this approach) are attributable to the core components nor specify the conditions and supporting mechanisms under which these components work. Deprived of these critical details the transferred lessons can hardly be complete.

Third, the approach is not conducive to policy transfer because the shorthand process often takes place at the level of actual policy instruments instead of a more generalisable realm of generative mechanisms. It is not surprising that EPR portrayed as a *free* take back mandate followed the EC WEEE Directive would seem out of place in the non-OECD contexts with lucrative waste trading (see Section 4.4.4). However, the lesson can be reformulated that a programme should create a more financial attractive channel to encourage end users to participate in its collection scheme. Then, it is not difficult to see that in developed countries where consumers used to pay for electronic recycling a free take back might be sufficiently attractive but where consumers usually get paid for their electronics we might need to think about a stronger incentive such as a buy-back, a deposit-refund, or a trade-in instrument (if not other entirely different types of leverages) – still the underlying mechanism is the same.

To navigate the interspatial policy learning, the next three sections group key findings of the evaluation research and the context studies into three themes. Section 4.2 provides a (non-exhaustive) list of EPR variances as seen in the evaluated programmes and policy proposals. Section 4.3 summarises policy outcomes and investigates the issue of causal attribution. Section 4.4 then identifies and explains the significance of key contextual factors.

4.2 Variances of EPR programmes

EPR programmes and policy proposals reviewed in Papers I, II and IV show that the principle can give birth to multiple forms of interventions, as shown in Table 4-2.

Table 4-2 Variances of EPR programmes and proposals

Variance	Case	Financial mechanism	Fee	Target
Rowing	Sw ELV (1975-2006) [I]. A deposit-refund system: Consumers pay deposits into a governmental fund and get premiums back upon delivering ELV to authorised dismantlers	PAYG	Visible	No
	Tw WEEE [II]. Producers pay recycling fees into a governmental fund. The fund provides subsidies to authorised recyclers for the verified amount of waste.	PAYG	Invisible	No
	Cn WEEE [II]. A governmental fund will be erected under the Ordinance (Article 7). Producers contribute financially to the fund.	n/a	n/a	No
	Th WEEE [IV]. A proposal to establish a governmental fund.	n/a	n/a	n/a
	Arg WEEE [IV]. A proposal to establish a governmental fund.	n/a	n/a	n/a
Steering (Mandatory)	UK ELV [I]. Producers ensure free take back for new cars. Consumers pay for the cost of historical products.	Return share	Market price for historical products: Invisible for new products	Recycling, Recovery
	Sw ELV (1997-2006) [I]. Producers ensure free take back for new cars.	Future guarantee	Invisible	Recycling, Recovery

Variance	Case	Financial mechanism	Fee	Target
Steering (Mandatory)	Kr WEEE [II] (until 2007). Producers have to meet annual collection quotas calculated from the amount of product shipments.	PAYG	Invisible	Collection, Recycling
	Jp SHARL [II]. End users buy recycling tickets when delivering waste to the collection points.	Return share	Visible	Recycling
	Jp PC [II]. Producers label and arrange future guarantees for new products. End users pay for products without the label including historical products.	Return share for historical products	Visible for historical products	Recycling
		Future guarantee for new products	Invisible for new products	
Steering (Voluntary)	In WEEE [IV]. The government issues a guideline with a passing attention to EPR.	n/a	n/a	n/a

As a starting point, I borrow a metaphor from Osborne and Gaebler's "Reinventing Government" (1992) to group state interventions. States can either row or steer the boat. However, unlike the original use, no normative stand has been taken at this point and the values of the two have yet to be assessed in evaluation research and contextual analysis. Besides the programme evaluation, Paper I also demonstrates how the social and cognitive aspects of network management and external factors can influence policy choices and programme design.

4.2.1 Rowing strategy and governmental funds

The rowing strategy sees a government establish and control a *governmental fund* to administer the system. The fund is financed by fees collected from producers (invisible fees, not shown separately in the price of products) or consumers (visible fees, e.g. deposits in the Car Scrapping system in Sweden) in a pay-as-you-go (PAYG) fashion. In these programmes and policy

proposals, economic instruments, such as deposit-refund, product fees, and performance subsidies, are preferred to administrative instruments. Because the government is the one who does the job, no binding targets are prescribed. But, this does not necessarily mean that there is no check on performance. The programme in Taiwan in particular has an elaborated auditing system. Monitoring and control mechanisms give feedbacks to the government in fine-tuning economic instruments to achieve the desirable level of performance.

It is worth noting that most of the second generation policies in developing countries seem to go down this road. However, at the time of writing, not much information exists on the exact configurations of the proposed programmes. The exception is India where the government has not yet planned a direct intervention but instead issued a guideline encouraging voluntary actions based on EPR (Central Pollution Control Board 2008).

4.2.2 Steering strategy and its variety

When a government chooses the steering strategy, it only prescribes *targets and conditions* that have to be met but leaves operational details to economic actors. Steering can be subdivided into issuing a mandatory framework or providing a framework for voluntary actions. The latter allows the industries to make a necessary step to pre-empt mandatory legislation that might follow if the voluntary actions fail to perform. The subdivision might reflect the evolution of a programme as in several cases a voluntary agreement is later supplemented or replaced by a legal framework. The longitudinal analysis in Paper I shows how the Automobile Consortium on Recycling and Disposal (ACORD) Agreement was replaced by the statutory instruments in the UK. A well-known example of a more supplementary change is the WEEE system in Switzerland (Khetriwal et al. 2009).

Table 4-2 shows that the variety between programmes is great when the government takes a steering role. The point of departure is whether there is a new/historical split in the programme. Because laws should not apply retrospectively, the split enables the state to demand more responsibility for new products from the producers with a supplement way to manage waste from historical products. In two of three cases, producers arrange individual future guarantees for new products. But the guarantees are not required by law in any of the cases and producers can easily cancel the arrangement and switch to other financial model, as happened in the Swedish ELV programme documented in Paper I. Programmes that do not have the

new/historical split can either require producers to finance waste management based on their return or current market share.

There are, nevertheless, two common features in the steering approach. First, the framework provides the baseline conditions of take-back operation. Three conditions can be seen from the cases studied: producers have to offer free take-back; retailers have to accept waste products of the same types they sell; and, retailers have to accept waste products on a one-to-one basis. Because the last condition deems insufficient to ensure a sufficient level of collection, the programme in South Korea has also collection targets on the top of that. The second basic requirement is a performance indicator for the management of collected waste. All programmes, except the guideline in India, set binding recycling and/or recovery targets.

4.3 Policy outcomes

This section describes and discusses outcomes of EPR policies in upstream and downstream areas. It covers both actual outcomes of existing programmes evaluated in Papers I and II and possible consequences of implementing such a programme in non-OECD contexts which are outlined in Papers III and IV. In general, it is observable that the downstream effects are more evident than the upstream. This might be partly because of the nature of development cycles of these durable products and the difficulty in measuring and attributing design changes. But it might also reflect the fact that most of the intervention mechanisms in the programmes and the policy proposals have paid more attention to the management of historical products.

4.3.1 Upstream changes

One common area of design changes is *the reduction in the use of restricted hazardous substances* in the products. The restrictions on the use of hazardous substances (RoHS) or requirements to disclose and label products with excessive concentration of substances seem to be effective drivers for the technological changes. However, bans and restrictions might be ones of the most difficult type the administrative instrument for the government to pull off unless there are ample evidences to justify their use.

Besides RoHS, among the programmes evaluated only two cases show a sign of other upstream changes. They are the ELV programme in Sweden (Paper I) and the programmes in Japan (Paper II). However, this finding can be expected from their implementation theories. These programmes had/have generative mechanisms that are/were conducive for product design improvements. The car producers in Sweden, at least until 2006, agreed to comply with the financial requirements in the Producer Responsibility Ordinance (SFS 1997:788) by arranging *future guarantees* for one own (new) products. The Association of Swedish Automobile Manufacturers and Wholesalers (today BIL Sweden) suggested an indicative level of a per unit guarantee at 1,300 SEK. Some producers invested in and demonstrated design improvements and, as a result, could set aside guarantees at discounted rates. In Japan, on the top of differentiated fees[4], collected waste products are sorted by brands at regional aggregation stations. The *identification by brands* increases the certainty that products and investment in design improvements will return to the producer. In addition, several producers in the two cases set up full-scale recycling plants or experimental workshops providing a testing and learning ground to incorporate end-of-life aspects in product design and development (Tojo 2004).

The contextual analysis in Papers III and IV shows that EPR mechanisms can, however, work in an opposite direction and generate *unintended negative consequences* under some unfavourable conditions in non-OECD contexts. If a programme cannot keep free riders in check, they would gain an advantage over the competitors who have to pay the compliance cost. The identifiable producers would be further punished if they also have to shoulder the cost of managing born-to-be-orphan products which can have a lion share in some developing markets. In addition, the new market rule might not be in favour of (identifiable) local manufacturers who have limited product development and design capacity and little experience in end-of-life management compared to multinational corporations (MNCs).

4.3.2 Downstream changes

As mentioned above, downstream changes such as *improvements in infrastructure* have been more evident than the upstream changes. EPR

[4] In practice, most producers however decide not to compete on this front and the recycling fees of each product types are rather universal across brands with few exceptions.

programmes utilise and expand the existing capacity of recycling and waste treatment sectors. In Paper I, the producer responsibility organisation (PRO) representing car makers in Sweden was instrumental in developing and installing a tailor-made environmental management system (EMS) for dismantlers in its network. The contribution in the WEEE area is more extensive, as shown in Paper II, possibly because the recycling of WEEE was not as financially attractive as that of ELV before the time of EPR. The governmental fund in Taiwan uses subsidies to stimulate the recycling businesses and the number of authorised WEEE plants in the island has grown from 6 to 14 (Wu et al. 2009; Shih 2001). In Japan and South Korea, some EEE producers even own and operate recycling plants. Based on these existing experiences, Papers III and IV suggest that in the future the second-generation programmes hold a promise of upgrading the recycling and waste treatment systems in developing countries. Additional resources from an EPR programme can also be able to level up the formal sector in its competition with the informal sector and might convince actors to move/upgrade from the latter sector to the former.

The trend is also positive in terms of *recycling rates* of collected waste reflecting an effect of recycling targets and/or learning curve. Papers I and II show that recycling targets have been met in mature programmes. But it should be noted that the direction to which recycling in EPR programmes is steered might not be environmentally optimal. Recent studies (Chancerel and Rotter 2009; Huisman et al. 2008; Bohr 2007; Laner and Rechberger 2007) criticise not only the weight-based targets in the EU but also the way recycling rates are determined in practice. In general, only the weight of inputs and outputs from intermediate recycling plants is measured and the quality and destination of recycled materials are not taken into account in the calculation of recycling rates. In Taiwan this is correctly called a "potential recycling rate" (Wu et al. 2009). To my knowledge, only the SHARL programme in Japan has made headway in the issue by counting only recycled materials with positive values or zero towards the targets.

Programmes, however, differ in their *ability to collect regulated waste*. On one hand, the difference can be expected. Table 4-2 shows that the evaluated programmes employed different economic instruments and financial mechanisms, some of which give monetary incentives to end users while the other asks them to cover part of the cost. On the other hand, Paper II discovers that the direction of expectation is not necessarily in line with the actual performance. Based on a common nominator, the number of units collected per capita, the programme in Japan with end-user-pays managed to

get ahead the programme in Taiwan with an incentive-based instrument. The analysis suggests that for collection we need to understand consumer behaviours and conditions influencing the behaviours beyond the homo-economicus model. This finding also comes at the right time as a reminder for policy development and discussion in developing countries that there is more to it than the money aspect of interventions.

The difference in collection rates also exists across product groups. The gap of 10% between the collection rates of ELV in Sweden (~99%) and in the UK (~90%) presented in Paper 1 looks trivial when they are compared with the collection rates of WEEE. This is mainly due to the deregistration system for ELV (see Section 4.4.6). The system also provides a reliable basis to calculate collection rates. With the absence of database for product retirement, the collection rates of WEEE are normally calculated using the so-called survival analysis with estimated lifespan, although recent research explores the potential of using ownership statistics in the calculation (Lin 2008; Liu et al. 2006). This issue of contextual conditions will be taken up in more details in the next section.

4.4 Key considerations in actual contexts

Because the intervention does not exist in a vacuum, we need to understand its actual context in order to develop a practical explanation of an EPR programme. Some contextual conditions might make it difficult to extend the responsibility of the producer or for the extension to result in desirable results while the other might facilitate the internalisation of responsibility.

For example, we can first look at *characteristics of a product and the product system*. This thesis features two groups of durable products: cars and electrical and electronic equipment (EEE). Although both are considered complex, cars are (much) more homogenous than EEE. The heterogeneity of the latter demands sorting and grouping mechanisms to limit the extent of cross subsidisation in a programme. In addition, car producers do normally have more direct relations with consumers than the EEE producers, except in the cases of large institutional users of electronic equipment. Nevertheless, the longevity of both products poses a challenge to the internalisation. On one hand, it is difficult for the front-end mechanisms to truly reflect future costs. On the other hand, the rear-end mechanisms would rob any feedbacks of their immediacy of and run a risk of orphan products. In addition, the time lag creates uncertainties in design changes and end-of-life planning.

Papers III and IV analyse the implications of non-OECD conditions for the efficacy of EPR. The principle was formulated in the context of OECD countries in the late 1980s and the early 1990s and thus loaded with some assumptions about products and product systems. The motivation behind the research is to check whether the assumptions are compatible with the conditions in India, Thailand, and Argentina. To a lesser extent, the Chinese context is captured in Paper II.

Principally, the research finds *non-OECD specificities* in three areas. The first is the development and the structure of product markets that can be unsaturated and not sufficiently legalised. The second is selective domination of the informal sector in the recycling of post-consumer WEEE. The third is a demand for both used products and WEEE that can intertwined with the first two features causing problems for the custom control. Here, key issues in the three areas are discussed in relation to the evaluated programmes in OECD contexts.

4.4.1 Historical consumption of products

In the developing countries, the markets have not yet reached saturation and stocks of historical products are relatively low. This provides an *opportunity* for EPR to unleash its full potential sooner. As van Rossem et al. (2006) point out, the product-design improvements work best with new products. The EPR programmes in OECD countries normally came in to existence after the markets were saturated and the waste problem ripe. So, most of the effort and attention have been put to the management of historical products, unless there was another mechanism to take care of them, such as deposit-refund system for ELV in Sweden (see Paper I).

4.4.2 Traceability of producers

Amid the opportunity, some demand in a growing economy is satisfied by semi- or informal markets. A large share of no-brand products in some developing markets presents a serious *threat* to the viability of EPR because the producers of these products are not easily identifiable. This expands the horizon of orphan products that was traditionally limited to the case of market withdrawal in OECD contexts. In Paper III, I coin the term "born-to-be orphan" for this class of products. In general, the problem is a matter of controlling free riders and the activities in black markets. But for assembled products it might be possible to identify the makers of key

components (such as hard disks, motherboards, drivers, monitors, and accessories in the case of assembled computers) who are more visible to be producers in the system.

4.4.3 Municipal solid waste management infrastructure

At the end-of-life stage, there can be a *barrier* because the non-OECD countries have yet to develop integrated solid waste management. The municipal solid waste management in general limits to waste removal and disposal of mixed waste. The public sector in these countries faces resource constraints to implement recycling practices and technologies as seen in industrialised countries. Households do not have civic culture to separate non-saleable items at source and often mistrust the ability and commitment of formal waste management systems due to their experiences with inconsistent campaigns and failures in the past (Manomaivibool 2005).

4.4.4 End-of-life value

The remaining value of some obsolete products is sufficiently high to create lucrative reuse and recycling markets tapping on low cost labours in developing countries and demand for raw materials to fuel the economy. The analysis in Paper III and IV shows that business-oriented reuse is rather independent from EPR programmes and might be preferable as a way to extend the lifespan of products. *Complication* might arise when reused products are reassembled from components of used products rendering them assembled no-(or mis-)brand products. But as long as the original producers are identifiable, the challenge is manageable.

The demand of used products in developing countries might also explain low collection rates for a few product groups such as notebook computers in EPR programmes in developed countries. Due to shorter possession spans in developed countries, obsolete but still functional products might be shipped and sold as used products in developing countries. Although it is a common practice to import used products, it can be used as a channel to illegally import waste into a country if there is no operational way to distinguish the two. This problem can be solved in the future if the developing countries have an EPR programme and the importers of used products would be held as responsible producers. Although the compliance cost might not be so high as to spoil the profit margin of reuse, it should be an effective deterrent as far as the economics of recycling is concerned.

Recycling businesses primarily target the metal content of waste. ELV and WEEE are considerably rich in metals but at the same time very complex. Not only do improper dismantling and insufficient pre-treatment result in loss of materials, but they can also lead to grave environmental consequences. Research has showed that uncontrolled thermal and chemical processes to recover precious metals from WEEE components in India and China are among the worst possible sources of pollution (Bi et al. 2007, Gullet et al. 2007, Huo et al. 2007, Wong et al. 2007, Deng et al. 2006, Yu et al. 2006, Brigden et al. 2005, Wang et al. 2005, Toxics Link 2003, and BAN 2002). On the other hand, investment in advanced technologies and compliance with treatment and environmental standards is costly and can be more than enough to offset the material values.

4.4.5 Authorisation

The direction that the recycling sector develops into is *contingent* largely on the efficacy of authorisation. Most if not all car dismantlers in Sweden had been authorised well before the time of the EPR programme while the formalisation in the UK was rather swift after the end of transposition of the ELV Directive in 2005 with 1,190 operators having obtained the licence by May 2006. Paper I shows that in both cases authorised treatment facilities (ATFs) became strong allies in the programmes. On the contrary, the problem of law enforcement in the non-OECD countries allows operators to hide in the informal sector. Papers III and IV show that the informal recycling sector can give an EPR programme a hard time with a cut-throat competition for high-value WEEE.

4.4.6 Registration and deregistration

Another *enabler* behind the success of authorisation in the ELV cases is the registration system for the products. In addition, the ELV Directive demands the use of certificates of destruction (CoDs) in Member States for deregistration. Dismantlers thus have an incentive to be authorised and then be able to issue CoDs to the owners who want to deregister ELV and be free from road taxes and fees. In this respect, it is understandable why authorisation and collection are more problematic in for WEEE: not only is there no (de)registration for EEE, but some products are also small and easy to be stored even when they are no longer in use.

CHAPTER
FIVE

5. Conclusions

This chapter concludes the thesis by first revisiting the six research questions and highlights the contribution of the research. An epilogue at the end of the chapter tells a story about ongoing and planned journeys that continue and contribute to my PhD research.

5.1 Revisiting the research questions

This licentiate thesis engages in a process of making sense of EPR programmes in the context of policy transfer. The research shows that the EPR discourse has gradually gained its currency in contemporary product/ waste policies. The first wave of diffusion beginning in the late 1990s saw an emergence of several EPR programmes for various waste streams in industrialised countries at the turn of the century. The second wave started a decade later with a still ongoing discussion in several less developed countries with a focus on WEEE management. However, the interspatial policy learning has so far been dominated with what I called the shorthand approach that is vulnerable to the pitfall of uninformed, incomplete, and/or inappropriate transfers.

To enhance the prospect of policy transfer, this research developed a framework to structure policy lessons about the contexts, mechanisms, and outcomes of EPR programmes. The framework was based on qualitative TBE and MFA. TBE reconstructed the causal relationships between a programme and policy outcomes in the form of its intervention and implementation theories. This did not only make possible an attributional analysis but also tested theory and implementation failures. MFA was used to render the scope of the contextual studies. The analysis of material flows identified and gave a deeper understanding about key contextual conditions that could moderate or mediate the effects of an intervention.

The evaluation research demonstrates its ability to capture a more complete picture of more EPR variances than what normally seen in the shorthand

approach without getting lost in the complexity. In this thesis, the results from the evaluations were prepared by first dividing the programmes into two groups, "rowing" and "steering", according to the degree of direct interventions from the government in the programmes. Then the first two research question were answered:

> *RQ1: What are policy instruments and key components of the evaluated EPR programmes?*
>
> *RQ2: What are the outcomes of the evaluated programmes?*

The rowing group included the two oldest programmes in the evaluations where the governments employed economic instruments in the form of deposits and refunds or fees and subsidies and established a fund to administer the money. The governmental-fund model appeared to regain its popularity when the reviewed policy proposals in developing countries were added into the categorisation. However, in practice, there seems to be a limitation on programme innovations and variations that the model can accommodate. The economic instruments can rarely go beyond a crude differentiation of fees and the involvement of producers in the end-of-life management is often minimal.

In the steering camp we see more variations and innovations. Here a government employs administrative instruments to set the conditions and standards that the producer schemes have to meet. Although the strategy can be too lenient and carries too little weight to have any significant changes as in the case of the guideline in India, it can also result in an innovative product system capable of integrating end-of-life issues into design imperatives like in the late Swedish ELV and the Japanese WEEE programmes.

Indeed, it is the difference between the programmes in the two categories in stimulating upstream changes that the evaluation research highlighted in its answer to the second research question. But, for downstream changes, outcomes are more unified across the board. Proxies of intermediate outcomes show that both governmental subsidies and industrial partner/ownership have been successful to an extent in setting up an environmentally sound treatment system for the end-of-life products that have been collected or taken back in the evaluated programmes. This is good news for developing countries from the perspective of the fourth and fifth questions:

> *RQ4: What are the main issues in the end-of-life management of durable, complex products in developing countries?*
>
> *RQ5: How can the EPR mechanisms address these issues in developing countries?*

The contextual studies find that deficiencies in formal waste management systems and pollutions from mishandling of complex products in the informal are among the dominating issues there. So, resources mobilised through an EPR programme and administrative instruments can be used to upgrade the end-of-life infrastructure. This encouraging conclusion comes with a caveat that these core mechanisms need to be accompanied with functional auditing and enforcement. These supporting mechanisms are often overlooked in the shorthand approach but nevertheless necessary for the effectiveness of a programme.

The bottleneck of downstream changes that was identified but could not be fully explained in the evaluation research is the issue of collection. Contrary to what normally believed, this research did not find monetary incentives to be a satisfactory explanation of participation and collection rates in the evaluated programmes. Although this does not deny the importance of the mechanism, it can be concluded that alone it is far from being a sufficient condition. This conclusion suggests that a discussion about the issue has to transcend its fixation on the economic aspect. In this regard, one merit of the evaluation framework and its multiple-case design is the ability to answer the third research question:

> *RQ3: What are the key conditions under which the evaluated programmes deliver (or fail to deliver) desirable outcomes?*

At least two factors seem to contribute to the variations in collection rates: the remaining value of the end-of-life products and the presence of deregistration system.

To further investigate the role of contexts, the contextual studies focused on the last research question:

> *RQ6: What are the conditions in developing countries that can affect the way EPR mechanisms work to achieve its objectives?*

Compatibility is indeed a valid concern and has been at the heart of the debate about the relevancy of EPR in developing countries. Unfortunately, the issue is sometimes blown out of proportion when it is used as a blanket rejection against interspatial learning without specific qualification. The analysis identifies traceability of producers in the grey/black markets, illegal imports of waste, and the competition from the informal sector as threats to the working principles of an EPR programme. But it also indicates that these challenges are manageable and the market anomalies should be perceived as a call for corrective actions rather than an excuse for status-quo. Other seemingly problematic conditions turn out to be far less serious. Some are common and have already been taken into account in industrialised countries, such as the presence of assembled computers. The others are not a source of problem in itself; for example, reuse is just a recirculation of products in a system and does not amount to any serious concern unless the products in their first life are from grey/black markets. Moreover, some characteristics of growing markets in developing countries, for example relatively low historical stocks and a relatively large share of institutional users, can even be positive conditions for the timely application of EPR.

All in all the answers to the six research questions reflect a *recurring theme* that EPR programmes and contexts are complex constructs and we need a framework to decompose them and to reconstruct their constituents into comprehensible and transferrable policy lessons. The *main contribution* of this work is to be a first step towards such a framework. The thesis combines a strand of evaluation research, TBE, with a contextual analysis based on MFA. However, at this moment the framework has not yet been truly integrative. The combination is comparable to multi-disciplinary work when the two lines of inquiries, each which its own assumptions, are pierced together. The next section will conclude the thesis with subsequent research that has been carried out for a better integration and policy development.

5.2 Epilogue

This licentiate thesis is the exploratory part of my PhD research. As the title suggests, it helps me making sense of what EPR can mean operationally in terms of intervention programmes and of the relevancy it holds to the policy problems in developing countries. Equipped with the knowledge, a sensible policy development is within the reach of the PhD research.

The project in Thailand commissioned by Greenpeace International (see Table 3-2) can be considered as a link between the work that constitutes this thesis and the major work that has followed. Paper IV in this collection included some preliminary findings from the project. But in its entirety the research project was an attempt to construct a practical explanation that integrated policy and contextual analyses. Because a detailed policy proposal existed in Thailand, this integration is possible. A full account of this research is presented in (Manomaivibool et al. 2009) and (Manomaivibool 2009).

Besides the substantive contribution, the project acquainted me with the WEEE policy network in Thailand. The data collection and review processes in the year 2008 opened up a great opportunity for future collaboration. In February 2009, I was approached by the National Center of Excellence for Environmental and Hazardous Waste Management (NCE-EHWM), Chulalongkorn University, which had just been awarded a project from the Pollution Control Department to study and recommend buy-back criteria and fee-setting methodology for the proposed Thai WEEE policy.

The NCE-EHWM project aims to advise the government on the methodology to determine the fee rates for the ten priority electrical and electronic products. In order to achieve this aim, we divide product fees into three components: buy-back, technical, and administrative costs. The buy-back cost is estimated using a contingent valuation method to probe the willingness to accept of households and statistical techniques to test hypotheses about factors influencing the willingness to accept such as the level of collection services, information provided, environmental values and norms, etc. For the second component, a hybrid quantitative MFA is employed to estimate the net cost of collection, storage, transport, treatment, recycling and disposal activities. The administrative cost is determined based on consultations with relevant agencies and the estimation of the cost of a third-party auditing system. Because all the calculations are contingent to assumptions about future policies and implementation, in the final stage we will run a sensitivity analysis to check the robustness of the results.

This project has fully tapped the knowledge and experiences gained in the previous research activities. Based on the key findings of the Greenpeace project, new data, and the feedbacks from public hearings and workshops (see below), we have prepared policy recommendations about the implementation details and policy scenarios (Vassanadumrongdee and

Manomaivibool 2009). Among them is an opt-out option for proactive producers to create more rooms for system innovations in the governmental-fund model (see Manomaivibool et al. 2009). At the same time, the quantitative research well supplements the findings of the qualitative research presented in this thesis. For example, Papers III and IV articulate that additional resources from producers can help upgrading the end-of-life infrastructure in developing countries. The final products of the NCE-EHWM project – the fee rates – will give an idea about the size of resources needed in the Thai context. Similarly, the forecast of WEEE generation with a logistic growth model and bounding analysis (Yang and Williams 2009) and a Weibull distribution (Tasaki et al. 2001) will enable us to say with more precision about the size of historical stocks and the time of market saturation.

Apart from the cognitive side, the research has benefited tremendously from the social interactions in the NCE-EHWM project. As part of the terms of reference, during the lifetime of the project we have to organise five public hearings and workshops to report the progress of our work and to get inputs from stakeholders and focused groups. In one of the workshops, we had to invite a foreign expert for the experience-sharing session. Because there was an untapped learning potential in the Taiwanese model which was fairly similar to the policy proposal in Thailand (see Section 4.1.2), I persuaded the research team and the Pollution Control Department to invite someone from Taiwan instead of from Europe as initially planned. On 29 April 2009, we had an Environmental Specialist from the Recycling Fund Management Board of the Taiwan Environmental Protection Administration (TEPA) who had a long working experience in the programme to present the Taiwanese experiences and give his feedbacks on the policy proposal to establish a governmental fund in Thailand. As expected, this social interaction that has continued well after the workshop proves to be very beneficial to both sides. One of the late developments was in November 2009 when our project was contacted by a research arm of the Taiwanese government – the Chung Hua Institution for Economic Research (CIER) – about a project that could lead to a bilateral recycling industrial cooperation and environmental communication between Taiwan and Thailand.

Besides the Thai WEEE policy, I have been working in two other areas related to the management of WEEE. The end-of-life management of mobile phones is the first area. Due to the characters of the product that is small yet highly valuable, of the sector with a handful of large and proactive

international producers, and of the product system that relies heavily on local network providers, this is the product group that is very special in the heterogeneous WEEE stream. To push back the frontiers, I started with the supervisions of two master theses both with a focus on the policy development and business strategies in China (Huang 2009) and in Argentina (Maneschi 2009). Then, there are two new joint projects on (1) comparing the management of used mobile phones and the role of network providers in European countries with the National Institute for Environmental Studies (NIES), Japan (until May 2010), and on (2) the emergence of assembled ("Shanzhai") phones in China with a researcher from Shandong University (in planning process). The former can lead to a North-North policy transfer as Japan has not yet had a legal framework for used mobile phones, unlike in most European countries. The latter investigation will examine a contextual change that has shaken up the ground reality in China in the last few years. The change which has seen a rapid increase in the market share of assembled products can add considerable complication to the identification of producers and the implementation of the China WEEE programme under the new ordinance which will become effective in 2011.

The second area of research interest has stemmed from a shared personal commitment of a group of young researchers working with WEEE-related issues to explore the potentials and limitations of trans-/interdisciplinary research. The 17 researchers from different institutes met in a five-day summer school organised by a Dutch PRO – NVMP – and the United Nations Environmental Programme (UNEP)'s Solving the E-waste Problem (StEP) Initiative in September 2009. After the summer school and the interlinked conference, several of us including myself have been expressing our enthusiasm in creating an interdisciplinary research project based on our combined strengths. However, we have encountered a number of hindrances to such collaboration ranging from mere practicalities such as funding, logistics, and support from our affiliated institutes to more abstract but nonetheless equally important barriers, such as loaded terminologies (EPR is one of them), assumptions, and worldviews embedded in our disciplines. Against this backdrop, we have agreed to step back and first work out the nature of interdisciplinary research before proposing a more concrete research project in the future.

In summary, my PhD research has been and will continue to be very organic with pieces and bits emerging from cognitive furtherance and social interactions in a complex web of policy networks and epistemic

communities. Nevertheless, despite the seeming messy threads, the process has been rewarding and contributes to the overarching theme of the PhD research – a better understanding and policy development for the management of end-of-life products in developing countries based on the EPR principle.

References

Bamberg, S., and Schmidt, P. (1998). Changing travel-mode choice as rational choice: results from a longitudinal intervention study. *Rationality and Society*, 10, 223-252.

BAN (Basel Action Network). (2002). *Exporting Harm: the High-tech Trash of Asia.* Edited by J. Puckett and T. Smith. Produced and distributed by Basel Action Network.

Benjamin, L.M. and Greene, J.C. (2009). From program to network: the evaluator's role in today's public problem-solving environment. *The American Journal of Evaluation* 30, 296-309.

Bennett, C.J. (1991). What is policy convergence and what causes it? *British Journal of Political Science*, 21, 215-233.

Berry, F.S., and Berry, W.D. (2007). Innovation and diffusion models in policy research. In P.A. Sabatier, *Theories of the Policy Process*, 2nd ed. (223-260). Cambridge, USA: Westview.

Bhaskar, R. (1998). General introduction. In M. Archer, R. Bhaskar, A. Collier, T. Lawson, and A. Norrie, *Critical Realism: Essential Readings* (ix-xxiv). New York, USA: Routledge.

Bi, X., Thomas, G. O., Jones, K. C., Qu, W., Sheng, G., Martin, F.L., and Fu, J. (2007). Exposure of electronics dismantling workers to polybrominated diphenyl ethers, polychlorinated biphenyls, and organochlorine pesticides in South China. *Environmental Science & Technology*, 41, 5647-5653.

Birckmayer, J.D., and Weiss, C.H. (2000). Theory-based evaluation in practice: what Do We Learn? *Evaluation Review*, 24, 407-431.

Bohr, P. (2007). *The Economics of Electronics Recycling: New Approaches to Extended Producer Responsibility*. PhD thesis, TU Berlin, Berlin, Germany.

Brigden, K., Labunska, I., Santillo, D., and Allsopp, M. (2005). *Recycling of Electronic Wastes in China and India: Workplace and Environmental Contamination.* [Online]. Available: www.greenpeace.org/raw/content/international/press/reports/recycling-of-electronic-waste.pdf (Accessed 4 October 2009).

Carisma, B. (2009). *Drivers and Barriers of E-waste Management: A Case Study of EPR.* Master's Thesis, IIIEE, Lund University, Lund, Sweden.

Carvalho, S., and White, H. (2004). Theory-based evaluation: the case of Social Funds. *American Journal of Evaluation*, 25, 141-60.

Central Pollution Control Board. (2008). *Guidelines for Environmentally Sound Management of E-waste (as approved vide MoEF letter No. 23-23/2007-HSMD dt. Match 12, 2008)*. Delhi: Central Pollution Control Board, Ministry of Environment & forests.

Chancerel, P. and S. Rotter. (2009). Recycling-oriented characterization of small waste electrical and electronic equipment. *Waste Management*, 29, 2336-2352.

Chen, H.T. (1990). *Theory-driven Evaluation*. London, UK: Sage.

Cole, G. (1999). Advancing the development and application of theory-based evaluation in the practice of public health. *American Journal of Evaluation*, 20, 453-470.

Connell, J.P., Kubisch, A.C., Scchorr, L.B., and Weiss, C.H. (1995). *New Approaches to Evaluating Community Initiatives: Concepts, Methods and Contexts*. Washington, D.C., USA: Aspen Institute.

Dahler-Larsen, P. (2001). From programme theory to constructivism: on tragic, magic and competing programmes. *Evaluation*, 7, 331-349.

Deng, W.J., Louie, P.K.K., Liu, W.K., Bi, X.H., Fu, J.M., and Wong, M.H. (2006). Atmospheric levels and cytotoxicity of PAHs and heavy metals in TSP and PM2.5 at an electronic waste recycling site in southeast China. *Atmospheric Environment*, 40, 6945-6955.

DiMaggio, P.J., and Powell, W. (1983). "The iron cage revisited" institutional isomorphism and collective rationality in organizational fields. *American Sociological Review*, 48, 147-160.

Dolowitz, D., and Marsh, D. (2000). Learning from abroad: the role of policy transfer in contemporary policy making. *Governance*, 13, 5-24.

Dowding, K. (2001). There must be end to confusion: policy networks, intellectual fatigue, and the need for political science methods, *Political Studies*, 49, 89-105.

DTI (Department of Trade and Industry, UK). (2005). Waste electrical and electronic equipment (WEEE): innovating novel recovery and recycling technologies in Japan. *Report of a DTI Global Watch Mission*, September. [Online]. Available: http://www.cfsd.org.uk/aede/downloads/JapaneseWEE.PDF (Accessed 4 October 2009).

EC Commission (Commission of the European Communities). (2001). *Green Paper on Integrated Product Policy*. Brussels, Belgium: Commission of the European Communities.

Evans, M. (ed.). (2004). *Policy Transfer in Global Perspective*. Aldershot, UK: Ashgate.

Fitz-Gibbon, C.T., and Morris, L.L. (1996). Theory-based evaluation. *Evaluation Practice*, 17, 177-184.

Haas, P.M. (1992). Introduction: epistemic communities and international policy coordination. *International Organization*, 46, 1-35.

Hall, P.A. (1993). Policy paradigms, social learning, and the state: the case of economic policymaking in Britain. *Comparative Politics*, 25, 275-296.

Huang, Z. (2009). *Producer's Role in Managing Used Mobile Phones: China Case*. Master's Thesis, IIIEE, Lund University, Lund, Sweden.

Huisman, J., F. Magalini, R. Kuehr, C. Maurer, S. Oglivie, J. Polk, C. Delgado, E. Artim, J. Szlezak, and A. Stevels. (2008). *2008 review of directive 2002/96 on waste electrical and electronic equipment*. ENV.G.44/ETU/2006/0032. Bonn, Germany: United Nations University.

Huo, X., Peng, L., Xu, X., Zheng, L., Qiu, B., Qi, Z., Zhang, B., Han, D., and Piao, Z. (2007). Elevated blood levels of children in Guiyu, an electronic waste recycling town in China. *Environmental Health Perspectives* 115, 1113-1117.

Ikenberry, J.G. (1990). The international spread of privatization policies: inducements, learning and 'policy bandwagoning'. In E. Suleiman and J. Waterbury, *The Political Economy of Public Sector Reform* (88-110). Boulder: Westview.

Jain, A. and Sareen, R. (2006). E-waste assessment methodology and validation in India. *Journal of Material Cycles and Waste Management*, 8, 40-45.

Khetriwal, D. S., Kraeuchi, P., and Widmer, R. (2009). Producer responsibility for e-waste management: Key issues for consideration - Learning from the Swiss experience. *Journal of Environmental Management*, 90, 153-165.

Kickert, W.J.M., Klijn, E.-H., and Koppenjan, J.F.M. (1997). *Managing Complex Networks: Strategies for the Public Sector*. London, UK: Sage.

Klijn, E.-H., and Koppenjan J.F.M. (2000). Public management and policy networks: foundations of a network approach to governance, *Public Management*, 2, 135-158.

Kokusai Kogyo. (2004). *Raay-ngaan-cha-bap-som-buun Kaan-sam-ruat-kaan-thing-saak-pha-lit-ta-phan-khrueng-chay-fay-faa-lae-i-lek-thraor-nik Kaan-sam-ruat-kaan-thing-saak-thaor-ra-sap-mue-thue thaan-fay-chaay lae laort-fluu-aor-reet-sen* [Final Report: A Survey on Disposal of Waste Electrical and Electronic Equipment and A Survey on Disposal of Waste Mobile Phones, Batteries, and Fluorescence Lamps]. Bangkok: Japan External Trade Organization (JETRO) and Pollution Control Department (PCD).

Kroepelien, K. F. (2000). Extended producer responsibility – new legal structures for improved ecological self-organization in Europe? *Review of European Community & International Environmental Law*, 2, 165-177.

Kuhn, T. (1970). *The Structure of Scientific Revolutions*, 2nd ed. Chicago, USA: University of Chicago Press.

Kvale, S. and Brinkmann, S. (2009). *Interviews: Learning the Craft of Qualitative Research Interviewing*, 2nd ed. London, UK: Sage.

Landman, T. (2000). *Issues and Methods in Comparative Politics: An Introduction*. London, UK: Routledge.

Laner, D. and H. Rechberger. (2007). Treatment of cooling appliances: interrelations between environmental protection, resource conservation, and recovery rates. *Resources, Conservation and Recycling*, 52, 136-155.

Lawson, T. (1998). Economic Science without Experimentation. In M. Archer, R. Bhaskar, A. Collier, T. Lawson, and A. Norrie, *Critical Realism: Essential Readings* (114-185). New York, USA: Routledge.

Lin, C.H. (2008). A model using home appliance ownership data to evaluate recycling policy performance. *Resources, Conservation and Recycling*, 52, 1322-1328.

Lin, C.K., Yan, L., and Davis, A.N. (2002). Globalisation, extended producer responsibility and the problem of discarded computers in China: an exploratory proposal for environmental protection. *Georgetown International Environmental Law Review* 14, 525-576.

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.

Lindhqvist, T. (1992). Mot ett förlängt producentansvar – analys av erfarenheter samt förslag [Towards an Extended Producer Responsibility – analysis of experiences and proposals]. In Ministry of the Environment and Natural Resources, *Vanor som faror – Underlagsrapporter* [Products as Hazards – background documents] (DS 1992:82) (229-291). Stockholm, Sweden: Ministry of the Environment and Natural Resources.

Lindhqvist, T., and Lidgren, K. (1990). Modeller för förlängt producentansvar [Models for Extended Producer Responsibility]. In Ministry of the Environment, *Från vaggan till graven - sex studier av varors miljöpåverkan* [From the Cradle to the Grave - six studies of the environmental impact of products] (7-44). Stockholm, Sweden: Ministry of the Environment.

Lindhqvist, T., and Lifset, R. (1997). What's in a name: producer or product responsibility? *Journal of Industrial Ecology*, 1, 6-7.

Liu, X., Tanaka, M., and Matsui, Y. (2006). Generation amount prediction and material flow analysis of electronic waste: a case study in Beijing, China. *Waste Management & Research*, 24, 434-445.

Mackenzie, M., and Blamey, A. (2005). The practice and the theory: lessons from the application of a theories of change approach. *Evaluation*, 11(2), 151-168.

Manda, B.M.K. (2008). *E-waste Management in India: Stakeholders' Perceptions and Media Attention*. Master's Thesis, IIIEE, Lund University, Lund Sweden.

Maneschi, D. (2009). *Proactive Approaches towards Producer Responsibility Regulation: The Case of Nokia in Argentina.* Master's Thesis, IIIEE, Lund University, Lund, Sweden.

Manomaivibool, P. (2009). Prospect of extended producer responsibility: Waste electrical and electronic equipment, Thai context and policy. Submitted in August 2009 to *Journal of Industrial Ecology*.

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.

Manomaivibool, P. (2005). *Municipal Solid Waste Management in Bangkok: The Cases of the Promotion of Source Reduction and Source Separation in Bangkok and in Roong Aroon School.* Master's Thesis, IIIEE, Lund University, Lund, Sweden.

Manomaivibool, P., Lindhqvist, T., and Tojo, N. (2009). *Extended Producer Responsibility in a non-OECD Context: The management of waste electrical and electronic equipment in Thailand*. Lund: IIIEE, Lund University, (available in English and Thai).

Mickwitz, P., and Birnbaum, M. (2009). Key insights for the design of environmental evaluations. *New Directions for Evaluation*, 122, 105–112.

Mungcharoen, T. and Varabuntoonvit, V. (2006). Current status and future prospects for recycling-based economy: case study of Thailand. In *Proceedings of the 1st International Conference on Green and Sustainable Innovation*, 29 November-1 December 2006, Chiang Mai, Thailand, p. 86-90. Chiang Mai: Chiang Mai University.

Nnorom, I.C., and Osibanjo, O. (2008). Overview of electronic waste (e-waste) management practices and legislations, and their poor applications in the developing countries. *Resources, Conservation and Recycling*, 52, 843-858.

OECD (Organisation for Economic Co-operation and Development). (2001). *Extended Producer Responsibility: A Guidance Manual for Governments*. Paris: OECD.

OECD. (1999a). Part 1: extended producer responsibility. In *OECD Joint Workshop on Extended Producer Responsibility and Waste Minimisation Policy in Support of Environmental Sustainability*, Paris, 4-7 May 1999.

OECD. (1999b). Part 2: waste minimisation through prevention. In *OECD Joint Workshop on Extended Producer Responsibility and Waste Minimisation Policy in Support of Environmental Sustainability*, Paris, 4-7 May 1999.

OCED. (1998a). *Extended Producer Responsibility Phase 2: Framework Report*. Paris, France: OECD.

OCED. (1998b). *Extended Producer Responsibility Phase 2: Case Study on the Dutch Packaging Covenant*. Paris, France: OECD.

OCED. (1998c). *Extended Producer Responsibility Phase 2: Case Study on the German Packaging Ordinance*. Paris, France: OECD.

Osborne, D., and Gaebler, T. (1992). *Reinventing Government: How the Entrepreneurial Spirit is Transforming the Public Sector*. Massachusetts, USA: Addison-Wesley.

Ottosson, S. (2003). Participatory action research: a key to improve knowledge of management. *Technovation*, 23, 87-94.

Outhwaite, W. (1987). *New Philosophies of Social Science: Realism, Hermeneutics and Critical Theory*. London, UK: Macmillan.

Pawson, R. (2002a). Evidence-based policy: in search of a method. *Evaluation*, 8, 157-81.

Pawson, R. (2002b). Evidence-based policy: the promise of 'realist synthesis'. *Evaluation*, 8, 340-58.

Pawson, R., and Tilley, N. (1997). Realistic Evaluation. London, UK: Sage.

PCD (Pollution Control Department). (2008). *Raay-ngaan-sa-thaan-na-kaan-mon-la-phit-khaorng-pra-theet-Thai Pii 2549* [Pollution report of Thailand, year B.E. 2549]. [Online]. Available: infofile.pcd.go.th/mgt/Report_Thai2549.pdf (Accessed 4 October 2009).

PCD. (2007). *Yut-tha-saat-kaan-jat-kaan-saak-pha-lit-ta-phan-khrueng-chay-fay-faa-lae-i-lek-thraor-nik-chueng-buu-ra-naa-kaan (cha-bap-thii-kha-na-rat-tha-mon-trii-mii-ma-ti-hen-chaorp mue-wan-thii 24 Ka-rak-ka-daa-khom 2550* [The National Integrated Strategy for the Management of Waste Electrical and Electronic Equipment (as approved by the Cabinet on July 24, 2007)]. [Online]. Available: www.pcd.go.th (Accessed 4 October 2009).

Pellow, D.N. (2007). *Resisting Global Toxics: Transnational Movements for Environmental Justice*. Cambridge, USA: Massachusetts Institute of Technology.

Rose, R. (1993). *Lesson-Drawing in Public Policy: A Guide to Learning Across Time and Space*. New Jersey, USA: Chatham House.

Rose, R. (1991). What is lesson drawing? *Journal of Public Policy*, 11, 3-30.

Rubin, H.J., and Rubin, I.S. (1995). *Qualitative Interviewing: The Art of Hearing Data*. Thousand Oaks, USA: Sage.

Sabatier, P.A., and Jenkins-Smith, H. (1993). *Policy Change and Learning: An Advocacy Coalition Approach*. Boulder, USA: Westview.

Sabatier, P.A., and Weible, C. (2007). The advocacy coalition framework: innovations and clarifications. In P.A. Sabatier, *Theories of the Policy Process*, 2nd ed. (189-220). Cambridge, USA: Westview.

Sanders, K.; Schiling, S.; Tojo, N.; van Rossem, C.; Vernon, J. and George, C. (2007). *The Producer Responsibility Principle of the WEEE Directive*. DG ENV. Study Contract No. 07010401/2006/449269/MAR/G4. Hamburg, Germany: Ökopol Gmbh.

Sanderson, I. (2002). Evaluation, policy learning and evidence-based policy making. *Public Administration*, 80, 1-22.

Shaw, I., and Crompton, A. (2003). Theory, like mist on spectacles, obscures vision. *Evaluation*, 9, 192-204.

Shih, L.-H. (2001). Reverse logistics system planning for recycling electrical appliances and computers in Taiwan. *Resources, Conservation and Recycling*, 32, 55-72.

Stolaroff, J. (2009). *White Paper: Products, Packaging and US Greenhouse Gas Emissions*. Athens, USA: Product Policy Institute.

Tasaki, T., Oguchi, M., Kameya, T., and Urano, K. (2001). A prediction method of number of waste durable goods. *Journal of the Japan Society of Waste Management Experts*, 12(2), 49-58 (in Japanese with English abstract, figures and tables).

Terazono, A. (2007). Material flow of e-waste in Japan and other Asian countries. In *Proceedings of the Fourth NIES Workshop on E-waste*, 21-22 November 2007, Tsukuba, Japan, p. 55-66. Tsukuba, Japan: National Institute for Environmental Studies.

Termeer, C.J.A.M., and Koppenjan, J.F.M. (1997). Managing perceptions in networks, in W.J.M Kickert, E.-H. Klijn, and J.F.M. Koppenjan, *Managing Complex Networks: Strategies for the Public Sector* (79-97). London, UK: Sage.

Tojo, N. (2004). *Extended Producer Responsibility as a Driver for Design Change – Utopia or Reality?* Ph.D. Dissertation, IIIEE, Lund University, Lund, Sweden.

Toxics Link. (2007). *Into the Future: Managing E-waste for Protecting Lives and Livelihoods*. New Delhi, India: Toxics Link.

Toxics Link. (2003). *Scrapping the hi-tech myth: Computer waste in India*. New Delhi, India: Toxics Link.

US HSS (U.S. Department of Health & Human Service). (2009). Household Product Database: Health & Safety Information on Household Products. [Online]. Available: http://householdproducts.nlm.nih.gov/index.htm (accessed on 4 October 2009).

Van Bueren, E.M., Klijn, E.-H., and Koppenjan J.F.M. (2003). Dealing with wicked problems in networks: analyzing an environmental debate from a network perspective, *Journal of Public Administration Research and Theory*, 23, 193-212.

Van Rossem, C. (2008). *Individual Producer Responsibility in the WEEE Directive: From Theory to Practice?* Ph.D. Dissertation, IIIEE, Lund University, Lund, Sweden.

Van Rossem, C., and Lindhqvist, T. (2005). *Evaluation Tool for EPR Program*s. Lund, Sweden: IIIEE, Lund University.

Van Rossem, C., Tojo, N., and Lindhqvist, T. (2006). *Extended Producer Responsibility: An Examination of its Impact on Innovation and Greening Products.* [Online]. Available: http://www.greenpeace.org/raw/content/eu-unit/press-centre/reports/extendend-producer-responsibil.pdf (accessed on 4 October 2009).

Vassanadumrongdee, S., and Manomaivibool, P. (2009). *Policy Recommendations for the Management of Waste Electrical and Electronic in Thailand.* Unpublished document, (available in English and Thai).

Wang, D., Cai, Z., Jiang, G., Leuang, A., Wong, M.H., and Wong, W.K. (2005). Determination of polybrominated diphenyl ethers in soil and sediment from an electronic waste recycling facility. *Chemosphere*, 60, 810-816.

Weiss, C.H. (1997). How can theory-based evaluation make greater headway? *Evaluation Review*, (August).

Weiss, C.H. (1995). Nothing as practical as good theory: exploring theory-based evaluation for comprehensive community-based initiatives for children and families. In J.P. Connell, A.C. Kubisch, L.B. Scchorr, and C.H. Weiss, *New Approaches to Evaluating Community Initiatives: Concepts, Methods and Contexts.* Washington, D.C., USA: Aspen Institute.

Wendt, A. (1999). *Social Theory of International Politics.* Cambridge, UK: Cambridge University Press.

Widmer, R., Oswald-Krapf, H., Khetriwal, D.S., Schnellmann, M., and Böni, H. (2005). Global perspectives on e-waste. *Environmental Impact Assessment Review* 25, 436-458.

Williams, E., Kahhat, R., Allenby, B., Kavazanjian, E., Kim, J., and Xu, M. (2008). Environmental, social, and economic implications of global reuse and recycling of personal computers. *Environmental Science & Technology*, 42, 6446-6454.

Wong, C.S.C., Wu, S.C., Duzgoren-Aydin, N.S., Aydin, A., and Wong, M.H.. 2007. Trace metal contamination of sediments in an e-waste processing village in China. *Environmental Pollution* 145, 434-442.

Wu, Y.-Y., Cheng, C., and Lin, C.-H. (2009). A review on Taiwan's national recycling scheme for waste electrical and electronic equipment. In *8th International Electronics Recycling Congress*, 21-23 January, Salzburg, Austria.

Yang, Y., and Williams, E. (2009). Logistic model-based forecast of sales and generation of obsolete computers in the U.S. *Technological Forecasting & Social Change*, 76, 1105-1114.

Yin, R.K. (2003). *Case Study Research: Design and Methods*, 3rd ed. London, UK: Sage.

Yu, X.Z., Gao, Y., Wu, S.C., Zhang, H.B., Cheung, K.C., and Wong, M.H. (2006). Distribution of polycyclic aromatic hydrocarbons in soils at Guiyu area of China, affected by recycling of electronic waste using primitive technologies, *Chemosphere*, 65, 1500-1509.

Appendix A – List of interviews

Date	Organisation	Category	Interviewees	Format
06/07/06	Consortium for Automotive Recycling (CARE)	Trade association	Chairman	Semi-structured, telephone, tape-recorded
08/09/06	Association of Swedish Automobile Manufacturers and Wholesalers (BIL Sweden)	Trade association	Environment	Semi-structured, telephone, tape-recorded
16/04/07	Toxics Link	NGO	Programme Officer	Semi-structured, face-to-face, note-taking
16/04/07	IRG Systems South Asia P.Ltd.	Consultant	Managing director	Semi-structured, face-to-face, note-taking
16/04/07	Department of Information Technology (DoIT), Ministry of Communication & Information Technology	Government	Economic Advisor	Semi-structured, face-to-face, note-taking
17/04/07	Consumer Electronics & Appliances Manufacturing Association (CEAMA)	Trade association	Secretary General	Semi-structured, face-to-face, note-taking
17/04/07	ELCINA Electronic Industries Association of India	Trade association	Secretary General Additional Secretary	Semi-structured, face-to-face, note-taking
17/04/07	HCL	Producer	Executive Vice President Head, Marketing Communica-tions	Semi-structured, face-to-face, note-taking
18/04/07	Department of Environment, Government of Delhi	Government	Senior Scientific Officer	Semi-structured, face-to-face, note-taking
21/04/07	Ash Recyclers	Recycler	Owner Engineer Worker	Semi-structured, face-to-face, note-taking
21/04/07	E-Parisaraa P.Ltd.	Recycler	Director Director	Semi-structured, face-to-face, note-taking

Date	Organisation	Category	Interviewees	Format
21/04/07	Swiss Federal Laboratories for Material Testing and Research (EMPA)	Bilateral agency	India e-Waste Project Coordinator	Semi-structured, face-to-face, note-taking
01/04/08	Thai Electrical and Electronics Institute (EEI), Ministry of Industry	Government	President	Semi-structured, face-to-face, tape-recorded
			Director, Information and Technical Service Department	
02/04/08	Fiscal Policy Office (FPO), Ministry of Finance	Government	Senior Economist 8	Semi-structured, face-to-face, tape-recorded
02/04/08	Pollution Control Department (PCD), Ministry of Natural Resources and Environment	Government	Director, Hazardous Waste Management Division	Semi-structured, face-to-face, tape-recorded
			Environmental Official 7	
03/04/08	Department of Industrial Works (DIW), Ministry of Industry	Government	Engineer 6	Semi-structured, face-to-face, tape-recorded
04/04/08	Federation of Thai Industries (FTI), Electrical & Electronics & Allied Industries Club	Trade association	Deputy Secretary General	Semi-structured, face-to-face, tape-recorded
	Eco Group (Thailand) Co Ltd	Consultant	Managing Director	
05/04/08	A major lighting producer	Producer	(not disclosed)	Unstructured, telephone, note-taking
16/04/08	A dealer of lighting equipment	Dealer	(not disclosed)	Unstructured, telephone, note-taking
17/04/08	Social Research Institute (SRI), Chiang Mai University	Researcher	Deputy Director	Unstructured, face-to-face, tape-recorded
20/04/08	An insurance broker	Insurer	(not disclosed)	Unstructured, telephone, note-taking
20/04/08	Hewlett-Packard (Thailand) Ltd, Asia Pacific & Japan	Producer	Environment Director	Structured, e-mail
			Environmental Program Manager	

Date	Organisation	Category	Interviewees	Format
21/04/08	Dell Inc.	Producer	Senior Manager, Environmental Sustainability	Unstructured, face-to-face, note-taking
22/04/08	Nokia Pte Ltd	Producer	Environmental Manager, Market Environmental Affairs	Semi-structured, face-to-face, tape-recorded
			Legal Counsel, Asia Pacific, Customer and Market Operations	
			Customer Care Manager, Customer Care Thailand	
22/04/08	National Center of Excellence for Environmental and Hazardous Waste Management (NCE-EHWM), Chulalongkorn University	Researcher	Researcher	Unstructured
23/04/08	Department of Chemical Engineering, Kasetsart University	Researcher	Director, Cleaner Technology and Eco-Design Research Unit	Semi-structured, face-to-face, tape-recorded
	National Metal and Materials Technology Center (MTEC)	Government	Acting Director, Focus Center on Life Cycle Assessment & EcoProduct Development	
23/04/08	Thai Environmental Institute (TEI)	NGO	Research fellow	Semi-structured, face-to-face, tape-recorded
25/04/08	Faculty of Economics, Thammasart University	Researcher	Professor	Semi-structured, face-to-face, tape-recorded
28/04/08	Japan External Trade Organization (JETRO)	Bilateral agency	Director, Energy & Environment Technology	Semi-structured, face-to-face, tape-recorded

Date	Organisation	Category	Interviewees	Format
28/04/08	A major importer of mobile phones (not disclosed)	Importer	(not disclosed)	Unstructured, face-to-face, note-taking
	An environmental consulting company	Consultant	(not disclosed)	
	A waste management company	Waste management company	(not disclosed)	
29/04/08	A major producer of electrical appliances	Producer	(not disclosed)	Semi-structured, face-to-face, tape-recorded
29/04/08	Federation of Thai Industries (FTI), Environmental Management Club	Trade association (recyclers)	Honorary Chairman	Semi-structured, face-to-face, tape-recorded
30/04/08	Department of Industrial Works (DIW), Ministry of Industry	Government	Director, International Hazardous Waste Management Division	Semi-structured, face-to-face, tape-recorded
30/04/08	Federation of Thai Industries (FTI), Environmental Management Club	Trade association (recyclers)	Deputy Secretary General	Unstructured, telephone, note-taking
	Unicopper Trade Ltd Part	Recycler	Managing Director	
02/05/08	Department of Primary Industries and Mines (DPIM), Ministry of Industry (MoI), Bureau of Value-Added Industries (BVAI)	Government	Director,	Semi-structured, face-to-face, tape-recorded
			Senior Metallurgist	
06/05/08	Suankaew Foundation	Charity, donation of used products	Secretary	Semi-structured, face-to-face, tape-recorded

Date	Organisation	Category	Interviewees	Format
06/05/08	National Electronics and Computer Technology Center (NECTEC)	Government	Director	Semi-structured, face-to-face, tape-recorded
07/05/08	Siam Cement Trading (SCT) Co Ltd	Material trading company	Senior Business Development Manager, Recycling Business Division	Semi-structured, face-to-face, tape-recorded
			Marketing Executive	
08/05/08	Panasonic	Producer	Deputy General Manager, Environmental Management Office	Semi-structured, face-to-face, tape-recorded
			Corporate Governance Manager, Planning Group	
21/05/08	Dell Inc.	Producer	Senior Manager, Environmental Sustainability	Structured, e-mail

Appendix B – Interview Guidelines

I. The management of ELV in the UK and Sweden

General

1. What were the driving forces that stimulated car producers to form the organisation? (e.g. customers' demands, differentiation from competitors, economic benefit, regulatory requirements, pressure from society, retailers, or others, corporate social responsibility, industry associations and industry trends, top management commitment/company policy, personnel's individual awareness and others)
2. What are the factors that hinder collective actions? (e.g. costs (please specify whose and what costs), lack of regulatory pressure, lack of top management commitment, lack of available technology, lack of demand from customers/retailers/society and others)
3. What are the communication channels, who uses them and how frequently? (e.g. a roundtable meeting, newsletter, website, discussion forums)
4. To what extent are the interactions between producers and recyclers done through the organisation? (e.g. information sharing, physical visits to AFTs, selection of ATFs with 'good practices', close partnership, encouraging ATFs to employ environmental/quality management systems such as ISO, developing a reporting routine)

Changes in the environment

1. How did the development in the late 1990s and the enactment of the EU ELV Directive affect the operation of the organisation?
2. How did the national legislative process affect the organisation?

Social fixations/variations

1. Who has joined/left the organisation (when and why)?
2. Whose resources (defined broadly to include money, personnel, knowledge etc.) and approval are indispensable to the existence of the organisation?
3. Have there been any incidents threatening the existence and/or hampering the operation of the organisation?
4. Have any study projects of the organisation resulted in social variation? (e.g. experts and researchers were brought into the project, the project identified the importance of new actors or new role of already active actors)

Cognitive fixations/variations

1. Can you identify and describe shared norms/values/rules of the organisation?
2. Has the organisation changed its positions/directions regarding the management of ELVs? (e.g. refining and redefining problems and solutions, changing cooperative strategies, forming and adapting shared norms/values/rules)
3. Have there been any clashes of ideas/positions/problems definitions/solutions among and within industries and, if so, what are they?
4. Is there any established procedure to resolve such conflicts or are they resolved on a case-by-case basis?
5. Who initiates the projects and what are the criteria to decide whether to pursue them?
6. Can you identify and describe new ideas brought up by the inclusion of new actors?

II. The management of WEEE in India

About the WEEE problem

1. How important is the WEEE problem?
2. What are the important issues?
3. Who should be a responsible party and why?

About WEEE management

1. What is the proper scope of a WEEE system for India (e.g. selective or comprehensive)? Why?
2. Should used products be included in the system?
3. How big is the problem of WEEE importation?
4. In a WEEE management system there is need for a formal treatment infrastructure, how such an infrastructure can be developed? Who can take the lead, especially in contributing endowment?
5. Have your organisation ever worked with the informal sector in helping them upgrade their operations? If yes, what are the achievements and major obstacles?

About the industry

1. Have you ever heard about no-name-brand products and what are they??
2. Is it likely that manufactured goods fail quality control would be sold as cheap no-name-brand products?
    a. If yes, how big would this fraction be?
    b. If yes, who would sell them?
3. Can you brief the market structure of the EE sector you are in terms of types of manufacturers (MNC, local brand, assembled) and importers?
4. How big is the price difference between the following pair of products?
    a. MNC and local brand;
    b. Brand and no-name brand;
    c. New and used products
5. In general, who determine the product design? What is the degree of freedom, Indian manufacturers have in products designs?
6. Does leasing products exist in India? How does it work?
7. What do you do with the waste from the manufacturing processes?
8. What do you do with the waste from the after-sale service?

About EPR

1. Have you ever heard about Extended Producer Responsibility?
2. What do you perceive as a proper role and level of involvement of the government in the system?
3. Is there a need for the act from the Federal Government to ensure unity?
4. Is IPR possible? What can be its obstacles?
5. Is it possible to establish a producer responsibility organisation in India? Who can take the lead (e.g. which trade organisation)? What can be the obstacles?
6. What do you expect as a consequent on the business from the implement of EPR?

III. The management of WEEE in Thailand

The salience of the WEEE issue as a policy agenda in Thailand.

1. Do you agree with the statement that "there should be a separate management system for WEEE in Thailand"? Please motivate your answer.
2. Do you think the management of WEEE is an urgent issue in Thailand merit a policy action now?

The objectives and scope of the WEEE policy

1. Please choose the statement that better reflects your opinion on the objective(s) of WEEE policy
    a. It should not only ensure an environmentally sound management of WEEE, but also stimulate the development of products and product systems designed for end-of-life management.
    b. It should only focus on ensuring an environmentally sound management of WEEE and tries to limit its impacts on the development of products and product systems.
2. What do you think should be an appropriate scope for the WEEE policy in terms of product groups? Please motivate your answer.
3. Which approaches do you think more suitable for the situation in Thailand: (a) defining EEE and providing an example, non-contained list of products (the comprehensive approach), or (b) listing a few products that fall into the scope (the selective approach).
    a. For (b) which criteria should be used to select product groups (for example, toxicity, possibility to be disposed with MSW, volume, weight, the difference in performance of best and worst products in the market, etc.)
4. Do you think there should be a distinction between WEEE from different sources, i.e. from institutional users (B2B) and from private households (B2C), in the following aspects? If yes, how?
    a. Financial arrangement
    b. Physical arrangement (collection, transportation, sorting, treatment, recover, disposal)
5. Please identify other exemptions or limitations to the scope of the WEEE policy (if any).

The WEEE management system

1. Do you think the local governments in Thailand have a capacity to provide dedicated services (separate collection, storage, sorting, treatment, and disposal) for WEEE? You can answer by types of local governments and activities.
2. Who and how many people are involved in WEEE-related businesses?
3. What are advantages and disadvantages of the existing system?
4. Under the conditions in Thailand, do you think an environmentally sound management of waste of following product groups would be profitable? Assumption: the management aims for material recovery.
5. Has there been any discussion on the possibility to strengthen the supply of reusable parts to support refurbishing businesses? Or has there been any involvement of the refurbishing businesses in the consultation?
6. Do you think the government should run a recycling plant(s)? If yes, in which form, a governmental agency, public enterprise, public organisation, public-private partnership? Or the investment and physical operation should be rested upon the private sector (possibly with some subsidies)?
7. Which systems both in Thailand and elsewhere have been studied?
8. Have there been any aids from inter-governmental bodies, other governments, or private and other organisations on the issue? Please specify

The capacity of WEEE management in Thailand

1. Is there sufficient capacity to collect and treat WEEE in Thailand now?
2. What do you perceive as main obstacles for the development of such a capacity, in particular for the investment in WEEE facilities? (examples: financial resources, low return, uncertainty of the supply, small scale, lack of legal framework, authorisation process, lack of technologies)

Producers' responsibility

1. Which statement do you agree? Please motivate your answer.
    a. The producers of E&E products as a whole should be financially responsible for the end-of-life management of the products, i.e. collective responsibility;
    b. Each producers of E&E products should be financially responsible for the end-of-life management of his/her products, i.e. individual responsibility; or,
    c. None of the above.

2. Do you think each producer should have a control over his/her designated money for the WEEE management, e.g. in the form of separate account in the company? What can be problems related to the practice? (Examples: accounting practices, risk in case of bankruptcy, transparency)

3. Do you think producers collectively should have a control over their designated money for the WEEE management, e.g. in the form of producer responsibility organisation (PRO)? What can be problems related to the practice? (Examples: power structure, transparency, cross subsidisation)

4. Has there been any involvement of the insurance businesses or any remark on the so-called recycling insurance for the WEEE management in Thailand?

5. Do you think producers should have physical responsibility or other responsibilities beyond the financial responsibility?

6. These responsibilities (if any) should be collective or individual?

Product fees/Eco-tax

Background: Product/Eco-tax is an economic instrument that has been supported by responsible agencies in the development of the Thai WEEE Strategy and the related draft legislation. Because the configuration of the tax can be conceived in various ways, this section contains questions about its design.

1. Do you think the tax should be levied on all products put on the market or only as a sanction against producers who cannot meet a requirement, i.e. to provide a deterrent effect on potential free-riding behaviours (e.g. in Korea and some EU member states, on those who cannot meet allocated amount of WEEE, or those who do not join any producer responsible schemes for packaging waste)?

2. How should the collected tax be used in which proportion between a) sent to the treasury as revenue of general purposes, or b) channeled back to the management of WEEE?

3. Do you think the tax rates should be a) flat for each product group, or b) differentiated between brands and models?

4. Because free riders can get an advantage by evading the tax, do you think the market structure of E&E products in Thailand have any characteristics that would undermine the tax? (Examples, the existence of black, grey, and assembling markets)

5. For comparison, are there any problems in collecting the value-added tax (VAT) on E&E products?

Consumers' motivation and participation

1. From a survey in the past (by PCD), most consumers said they were willing to participate in an environmentally sound management, however, in practice, source separation is not a common practice in Thailand. What do you think underline this discrepancy?
2. Do you think how a) institutional users and b) private households can be motivated to participate in the WEEE management system in terms of proper disposal? (Examples: investment in infrastructure, regulations, economic instruments, and information campaigns)
3. Has there been any discussion on the possibility to involve existing waste-agent and recycling networks in the WEEE management system?
4. Has there been any discussion on the possibility to involve existing refurbishing businesses in the WEEE management system?
5. Has there been any discussion on the possibility to involve retail and other distributional channels of the E&E products in the WEEE management system?

Appended papers

The following articles are appended to the thesis

Paper I: 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, 2006-2017.

Paper II: Manomaivibool, P. (2008). Extended producer responsibility in East Asia: approaches and lessons learnt from the management of waste electrical and electronic equipment. In *Proceedings of 5th International Conference on East Asian Studies*, 21-22 September 2008, Osaka, Japan, p. 267-286. Osaka: Osaka University of economics and Law.

Paper III: 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, 136-144.

Paper IV: Manomaivibool, P., Lindhqvist, T., and Tojo, N. (2008). EPR in non-OECD context: an introduction to research projects on the management of WEEE. In *8th Asia Pacific Roundtable for Sustainable Consumption and Production*, 18-19 September 2008, Cebu, Philippines. Manila: Asia Pacific Roundtable for sustainable Consumption and Production.

IIIEE Dissertations

Tareq Emtairah
Lost in Transition: Sustainability Strategies and Social Contexts
IIIEE Dissertations 2009:6

Åke Thidell
Influences, Effects and Changes from Interventions by Eco-labelling Schemes. What a Swan can do?
IIIEE Dissertations 2009:5

Helen Nilsson
Finding a Balance. Placing Farmers' Markets in the context of sustainability in modern society
IIIEE Dissertations 2009:4

Dagmara Nawrocka
Extending the Environmental Focus to Supply Chains. ISO 14001 as an inter-organizational tool?
IIIEE Dissertations 2009:3

Beatrice Kogg
Responsibility in the Supply Chain. Interorganisational management of environmental and social aspects in the supply chain. Case studies from the textile sector
IIIEE Dissertations 2009:2

Charlotte Leire
Increasing the Environmental and Social Sustainability in Corporate Purchasing. Practices and tools
IIIEE Dissertations 2009:1

Chris van Rossem
Individual Producer Responsibility in the WEEE Directive – From Theory to Practice?
IIIEE Dissertations 2008:3

Camelia Tepelus
Destination Unknown? The Emergence of Corporate Social Responsibility for Sustainable Development of Tourism
IIIEE Dissertations 2008:2

Luis Mundaca
Markets for Energy Efficiency – Exploring the new horizons of tradable certificate schemes
IIIEE Dissertations 2008:1

Adriana Budeanu
Facilitating Transitions to Sustainable Tourism
IIIEE Dissertations 2007:4

Carl Dalhammar
An Emerging Product Approach in Environmental Law – Incorporating the life cycle perspective
IIIEE Dissertations 2007:3

Kes McCormick
Advancing Bioenergy in Europe: Exploring bioenergy systems and socio-political issues
IIIEE Dissertations 2007:2

Kaisu Sammalisto
Environmental Management Systems – a Way towards Sustainable Development in Universities
IIIEE Dissertations 2007:1

Murat Mirata
Industrial Symbiosis : A tool for more sustainable regions?
IIIEE Dissertations 2005:1

Andrius Plepys
Environmental Implications of Product Servicising. The Case of Outsourced Computing Utilities
IIIEE Dissertations 2004:3

Naoko Tojo
Extended Producer Responsibility as a Driver for Design Change – Utopia or Reality?
IIIEE Dissertations 2004:2

Oksana Mont
Product-service systems: Panacea or myth?
IIIEE Dissertations 2004:1

Philip Peck
Interest in Material Cycle Closure? Exploring evolution of industry's responses to highgrade recycling from an industrial ecology perspective
IIIEE Dissertations 2003:2

Zinaida Fadeeva
Exploring cross-sectoral collaboration for sustainable development: A case of tourism
IIIEE Dissertations 2003:1

Peter Arnfalk
Virtual Mobility and Pollution Prevention: The emerging role of ICT based communication in organisations and its impact on travel
IIIEE Dissertations 2002:1

Mårten Karlsson
Green concurrent engineering: A model for DFE management programs
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Making Sense of Extended Producer Responsibility

Towards a framework for policy transfer

Policy transfer of complex interventions often falls into the trap of uninformed, incomplete, and/or inappropriate transfer because the interventions are insufficiently identified with some of their perceived core components. This is no exception in the interspatial learning about extended producer responsibility (EPR) programmes. This thesis aims to transcend this shorthand approach to policy transfer. It combines the evaluations of EPR programmes for the management of end-of-life vehicles (ELV) and waste electrical and electronic equipment (WEEE) in the developed world with the analysis of the contexts in developing countries. The political areas include the United Kingdom, Sweden, Japan, South Korea, Taiwan, China, India, Argentina, and Thailand. The evaluation research applied theory-based evaluation (TBE) to archival and case data. The context studies used topical interviews and secondary data to conduct qualitative material flow analysis (MFA). The thesis maps out different variances of programmes and policy proposals, linking their mechanisms with policy outcomes, and then specifies key moderating and mediating factors in the actual contexts. In this way, it contributes to the prospect of policy development in developing countries by increasing the analytical tractability and checking the transferability of policy lessons.

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