

EPR Programmes: Individual versus Collective Responsibility

**Exploring various forms of implementation and their implication
to design change**

Naoko Tojo

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Lund, 15 June 2003

Naoko Tojo

Abstract

An analysis of the implementation of five EPR programmes (electrical and electronic equipment in Japan, the Netherlands and Switzerland, and batteries in the Netherlands and Switzerland) reveals that in parallel with collective systems, a substantial flow of discarded products has been collected and recycled by individual producers in various manners, despite the prevailing assumption of administrative challenges facing individual implementation. Currently, payment for the actual recycling cost of their own products (*individual financial responsibility*) requires producers to separate their products from the rest (*individual physical responsibility*), by, for example, direct collection from end-users, establishment of their own collection points, and sorting at intermediate collection points such as retailers and regional aggregation stations. Development of an identification system, as done by the battery producers, would allow having a collective body handle the products regardless of the brand (*collective physical responsibility*) while reflecting the degree of design for end-of-life management to the recycling costs that individual producers pay (*individual financial responsibility*).

Table of Contents

ACKNOWLEDGEMENTS	I
ABSTRACT	II
LIST OF FIGURES	II
LIST OF TABLES	II
ABBREVIATIONS	III
1. INTRODUCTION	5
1.1 BACKGROUND	5
1.2 PURPOSE.....	6
1.3 DEFINITIONS	6
1.4 SCOPE AND LIMITATION	6
1.5 RESEARCH APPROACH	7
1.6 METHODOLOGY.....	8
1.7 STRUCTURE OF THE REPORT	9
2. IMPLEMENTATION OF EPR PROGRAMMES	10
2.1 EPR PROGRAMME FOR EEE IN JAPAN.....	10
2.1.1 <i>Collection</i>	11
2.1.2 <i>Recycling</i>	12
2.1.3 <i>Monitoring and enforcement</i>	16
2.2 EPR PROGRAMMES FOR EEE IN THE NETHERLANDS.....	16
2.2.1 <i>Collection</i>	17
2.2.2 <i>Recycling</i>	22
2.2.3 <i>Monitoring and enforcement</i>	27
2.3 EPR PROGRAMMES FOR EEE IN SWITZERLAND	28
2.3.1 <i>Collection</i>	29
2.3.2 <i>Recycling</i>	33
2.3.3 <i>Monitoring and enforcement</i>	38
2.4 EPR PROGRAMMES FOR BATTERIES IN THE NETHERLANDS.....	39
2.4.1 <i>Collection</i>	40
2.4.2 <i>Recycling</i>	44
2.4.3 <i>Monitoring and enforcement</i>	45
2.4.4 <i>Other material related restriction</i>	46
2.5 EPR PROGRAMMES FOR BATTERIES IN SWITZERLAND	46
2.5.1 <i>Collection</i>	47
2.5.2 <i>Recycling</i>	49
2.5.3 <i>Monitoring and enforcement</i>	51
2.5.4 <i>Other material related restriction</i>	51
3. COMPARATIVE ANALYSIS OF THE PROGRAMMES: INDIVIDUAL VERSUS COLLECTIVE RESPONSIBILITY	52
3.1 COLLECTION	52
3.1.1 <i>Physical responsibility</i>	52
3.1.2 <i>Financial responsibility</i>	55
3.1.3 <i>Informative responsibility</i>	55

3.2	RECYCLING	56
3.2.1	Physical responsibility.....	56
3.2.2	Financial responsibility.....	58
3.2.3	Informative responsibility.....	64
3.3	MONITORING AND ENFORCEMENT.....	64
4.	CONCLUSION	67
	BIBLIOGRAPHY.....	70
	APPENDIX: LIST OF INTERVIEWEES, TIME AND LOCATION	75

List of Figures

Figure 2-1	Financial mechanism of NVMP and its use of visible fee, the Netherlands.....	24
Figure 2-2:	Amount of collection from different paths under SWICO system, Switzerland	32

List of Tables

Table 2-1:	Size of the Recycling Fee in Japan	14
Table 2-2:	Result of the EPR programme for EEE in Japan (April 2001-March 2003)	15
Table 2-3:	advance disposal fee for different items under NVMP system	25
Table 2-4:	Results of the Dutch EPR programme: white and brown goods (January 1999-December 2001)	27
Table 2-5:	Existing systems and introduction of advance disposal fee for the respective product categories, Switzerland.....	32
Table 2-6.	Advance disposal fee for IT, office and graphics industry equipment in Switzerland (unit. CHF, Euro in []).....	36
Table 2-7:	Advance disposal fee for entertainment, photographic and professional equipment, and white goods in Switzerland (unit. CHF, Euro in []).....	36
Table 2-8:	The result of collection of batteries in STIBAT system, the Netherlands.....	42
Table 2-9:	Size of the advance disposal fee in STIBAT system, the Netherlands (as of June 2002).....	44
Table 2-10:	Collection of batteries in Switzerland.....	48
Table 3-1:	Summary of the characteristics of three systems incorporating individual financial responsibility, and one system incorporating collective financial responsibility	63

Abbreviations

AEHA	Association for Electric Home Appliances
CRT	cathode ray tube
EEE	electrical and electronic equipment
EPR	extended producer responsibility
ICT	information and communication technology
INOBAT	Interesseorganisation Batterieentsorgung (the Swiss PRO for batteries)
IT	information technology
METI	Ministry of Economy, Trade and Industry
MOE	Ministry of the Environment
NVMP	Stichting Nederlandse Verwijdering Metalektro Producten (the Dutch PRO for white and brown goods)
NVRD	vereniging voor afval- en reinigingsmanagement (the Dutch solid waste association representing the waste management division of municipalities)
PC	personal computer
PRO	producer responsibility organisation
STIBAT	Stichting Batterijen (the Dutch PRO for batteries)
SWICO	Swiss Association for Information, Communication and Organisational Technology
S.EN.S	Stiftung Entsorgung Schweiz (Foundation for Disposal in Switzerland)

1. Introduction

1.1 Background

Extended Producer Responsibility (EPR) is a policy principle that aims to reduce the environmental impacts of a product by extending the responsibility of manufacturers to stages of the product's life cycle that were traditionally not included. Since the early 1990s, a number of countries have begun to incorporate the concept of EPR into their environmental policy in relation to end-of-life management of some products, such as packaging materials, small consumer batteries, automobiles, tyres, lubricant oils and electrical and electronic equipment (EEE).

Although the specifics vary, there are two aims that are commonly found among EPR programmes. One is to shift responsibility (partly or fully) for the end-of-life management of targeted product groups from tax payers and conventional waste managers (i.e. public authorities) to manufacturers. The other is to give incentives to manufacturers of a product to incorporate environmental consideration at the design stage of a product life cycle.

A handful of previous studies suggest that some of the EPR programmes have provided more than negligible incentives for environmentally conscious design. For example, a study of the factors affecting the Swedish and Japanese EEE and automobile manufacturers, conducted by the author of this report, indicated that anticipation of EPR legislation had been one of the most significant factors that promote design for end-of-life management.¹

The manner in which the concept of EPR is incorporated in an environmental policy, as well as their implementation, differ from product to product, and from country to country. The difference affects the effectiveness of EPR programmes in promoting design change, as indicated, among others, in the aforementioned study. This leads to a fundamental question surrounding EPR: what would be the manner in which the producers should fulfil their responsibility in order to receive incentives for design change.

This question is often addressed in a discussion of individual versus collective responsibility, manifested, among others, in the lengthy discussion in the development of the EU Directive on waste EEE (WEEE Directive).² That is, in essence, if a producer takes responsibility for the end-of-life management of his/her own products (individual responsibility), or producers of the same product group together fulfil their responsibility for the end-of-life management of their products regardless of the brand (collective responsibility).

There is a general assumption that an EPR programme based on individual responsibility would promote design change more than that based on collective responsibility. On the other hand, there is also an assumption that with regard to implementation, a programme based on individual responsibility would face more administrative challenges than that based on collective responsibility.

¹ Tojo, Naoko. (2001). *Effectiveness of EPR Programme in Design Change. Study of the Factors that Affect the Swedish and Japanese EEE and Automobile Manufacturers*. IIIIE Report 2001:19. Lund: IIIIE, Lund University. The research was also funded by Stiftelsen Svenskt Kretslopp.

² Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE), officially published in February 2003.

The understanding of what is meant by collective responsibility and individual responsibility is diverse. Moreover, the formulation of an EPR programme on paper (legislation) and its actual implementation often differ, which further complicates the discussion. So far, little research has been done in this area, which was pointed out, for example, at the OECD Seminar on EPR.³ In order to discuss the assumption of the superiority of individual responsibility in promoting design change, and to consider measures of diminishing the assumed administrative problems, gaining further understanding of individual versus collective responsibility is of great value.

1.2 Purpose

The purpose of the research is *to contribute to the understanding of the issue of individual versus collective responsibility of an EPR programme.*

As means of achieving the purpose, the following three sub-objectives should be met:

1. Analyse in what manner producers fulfil their responsibility in selected EPR programmes, based on legislation and the practical implementation.
2. Enhance the understanding on the advantages and challenges experienced or foreseen in implementing the EPR programmes individually and/or collectively.
3. Explore various forms of the EPR programmes that may promote design change and further improve the overall environmental performance of a product system, while technically and economically viable.

The content of the research will serve as a building block of the author's Ph. D dissertation, addressing the potentials of EPR programmes in promoting design for end-of-life management and improving the overall environmental performance of a product system.

1.3 Definitions

In this document, extended producer responsibility is understood as:

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 (Lindhqvist, 2000).

Producers refer to manufacturers and importers of products unless otherwise specified.

Batteries means small consumer batteries unless otherwise specified.

1.4 Scope and limitation

The paper focuses on EPR programmes that include take-back requirements, one of the policy instruments most commonly found in the existing EPR programmes. Among them,

³ OECD Seminar on Extended Producer Responsibility, EPR: Programme Implementation and Assessment, Paris, 13-14 December, 2001.

the following five EPR programmes for two product groups, implemented in three countries, are selected for in-depth case studies:

- EPR programmes for electrical and electronic equipment (EEE) in Japan, the Netherlands and Switzerland.
- EPR programmes for batteries in the Netherlands and Switzerland.

With regard to the product group, EEE was selected, as it has been the primary product group the author has been looking into in her research on EPR programmes. It is also the product group where the issues of individual vs. collective responsibility have been discussed intensively. Items in both product groups (EEE and small consumer batteries) have common characteristics such as containment of hazardous substances and/or valuable resources, durability, and diversity. Meanwhile, there are also differences, such as the number of producers, the maturity of the products, size of the products, period of coverage in EPR programmes, and the like. Exploring the experiences of EPR programmes for batteries may provide useful insights to issues surrounding the implementation of EPR programmes for EEE. It is also an opportunity to study EPR programmes for batteries per se, on which the information is rather limited despite its relatively long history of implementation.⁴

The choice of countries is based on, among other things, actual implementation period, difference in the means of allocation of responsibility and implementation.

Aside from these five programmes, EPR programmes for EEE in other countries, as well as the programmes for automobiles are investigated to the extent possible. Just as batteries, there are similarities between automobiles and EEE (e.g. complex, durable, and contain hazardous substances) as well as differences (e.g. actors involved in the end-of-life management prior to the implementation of EPR programmes). The observed influence of EPR programmes on the efforts of automobile manufacturers in design for end-of-life management make it interesting to look at which elements of the EPR programmes trigger such influence.

1.5 Research approach

The study assumed the following research approach: 1) identification of the responsibility under question; 2) investigation of the current status of implementation of the identified responsibilities; and 3) comparative analysis.

As mentioned, the discussion on individual versus collective responsibility has been rather chaotic, with people meaning different things by using the same terminology. The fact that allocation of responsibility, as well as the context in which the EPR programme is implemented, vary, adds to the confusions. *Identification of the responsibility under question* would thus provide a foundation for a fruitful discussion of the advantages and disadvantages of individual versus collective implementation. In doing so, the following steps are taken in this research: *identification of the activities, distinction of the types of responsibility and actors responsible*.

⁴ Indeed, the shortage of reliable information on the EPR programmes for batteries was one of the challenges facing the author's previous research (Tojo, et al., 2001). Information gathering of this research was facilitated greatly by the work of Langrová (2002).

Implementing an EPR programmes requires fulfilment of a number of activities, such as collection, recycling, monitoring and enforcement of these activities, and providing information to the relevant parties. Identification and understanding of the content of these different activities has been a basis of evaluating/analysing EPR programmes, and also serves as a starting point.

The actors involved in carrying out the respective activities, as well as the dimensions of the activities, differ from one EPR programme to another. Lindhqvist (1992) suggested five types of responsibility found in an EPR programme: physical responsibility, economic responsibility, informative responsibility, liability and ownership. Among them, the author tries to distinguish *who* is fulfilling the three elements of responsibility - *physical, financial and informative* -, and *how*, a methodology which has been useful to further clarify how an EPR programme works.

When identifying the actors and their responsibility, the relationship of the actors are also investigated to the extent possible, with a view of investigating potentials for various forms of implementation, and of learning the content and the extent to which the actors communicate with each other.

Once the functions and the type of responsibilities fulfilled by producers in the respective programmes are identified, the author looks at whether these tasks are carried out *individually or collectively*, and in what manner in concrete terms.

Based on the findings from the respective programmes, a comparative analysis is made, discussing the advantages and disadvantages of the individual and/or collective implementation of the respective tasks.

The comparative analysis then leads to the consideration on various forms of implementation of EPR programmes, which would give incentives to the producers to strive for end-of-life management and further improve the overall environmental performance of a product system, while technically and economically viable.

1.6 Methodology

A case study method is used, partly to get a concrete picture of how different EPR programmes work in reality. Having multiple sources also makes it possible to compare how a similar issue is dealt with in different context, facilitating the analysis of the issue from wider angles (Yin, 1994).

Data is collected both through *review of official documents* and *interviews* of various actors involved in the formation and implementation of EPR programmes. Legislation that mandate EPR programmes mentioned in the previous section, as well as basic information regarding how the systems actually work, are collected from the Internet homepage of governments, existing academic and trade journals, articles and newsletters. Information gained through the desk-top research is examined and substantiated by interviews with actors conducted in March 2002 (Switzerland), December 2002 – January 2003 (Japan) and April 2003 (the Netherlands). Interviews in person are supplemented by telephone interviews, as well as contacts via e-mails. Interviewees include 5 government officials, 4 representatives from 2 manufacturers of the studied product groups, representatives of 7 organisations that coordinates/fulfils producers' responsibility on producers' behalf, 2 recyclers, a representative of 1 retailer organisation, 1 local government official, 1 representative of

association of waste management issues in local governments and 1 expert. The list of interviewees, the place and timing of the interviews are summarised in the Appendix.

Interviews conducted in Switzerland and the Netherlands in person are transcribed, while telephone interviews are summarised. Furthermore, transcription and/or its summary are sent to some of interviewees to confirm whether the author understand the interviewees correctly.

The research was conducted for five full months over the period of 1 March 2002 to 15 June 2003.

1.7 Structure of the report

Following this introduction, Section 2 describes the findings from the five case studies, clarifying the roles the respective actors in implementing the EPR programmes. Attention is given to the responsibilities of the producers and the way they carry out their responsibility. Section 3 subsequently makes a comparative analysis of the five systems, focusing on the advantages and disadvantages of implementing the identified producer responsibilities in a collective and/or individual manner. Building on the finding in the previous sections, conclusions are drawn, (Section 4), attempting to suggest the various forms of implementing an EPR programme that would lead to the reduction of environmental impacts associated with end-of-life management at source, while technically and economically viable.

2. Implementation of EPR programmes

This section describes the implementation of the five EPR programmes, which are EPR programmes for electrical and electronic equipment (EEE) in Japan (Section 2.1), the Netherlands (Section 2.2) and Switzerland (Section 2.3), and for small consumer batteries (batteries) in the Netherlands (Section 2.4) and Switzerland (Section 2.5).

Each section includes a brief introduction of the programme, followed by the description of concrete activities and actors involved in the three of the main functions in implementing EPR programmes. These three functions are 1) collection (all the activities that is necessary for the discarded products to be brought to recycling plants), 2) recycling (including treatment), and 3) monitoring and enforcement. As mentioned in Section 1.5, 1) collection and 2) recycling are looked at from three dimensions; *physical management* of the discarded products, *financial mechanism* behind the collection and recycling activities, and collection and provision of *information* on these activities. The section of monitoring and enforcement discusses issues such as measures to secure quality of collection and recycling activities, to identify free riders and make them participate in the system, and to prevent illegal export and dumping. It also supplements what was discussed in the information-related dimension of collection and recycling.

Reflecting the purpose of the report, attention is given to the roles of the producers in the system, and in particular the manners in which producers fulfil their responsibilities.

2.1 EPR programme for EEE in Japan

The Specified Home Appliance Recycling Law, enforced in 1 April 2001 in Japan, is the basis of EPR programme for four large home appliances; large TV sets, washing machines, air conditioners and refrigerators.⁵ The pressing scarcity of the final disposal sites,⁶ increase of EEE in the waste stream, and the inadequate capacity of existing treatment plants (mainly local governments), together with the growing use of EPR programmes abroad, are the main driving forces for the development of the Law.

In a separate legislation, Revised Law for Promotion of Effective Utilisation of Resources, producers of personal computers (PC) are required to establish a take-back and recycling system for PCs. Following the enforcement of the take-back from businesses in April 2001, producers of PCs are, from 1 October 2003, required to take-back PCs from households. The allocation of responsibility in the case of PC producers is different, reflecting the difference between the four large appliances and the PCs (type of customers, distribution channels, existing infrastructure, etc.). The focus of the discussion is on the programme for large home appliances, however.

⁵ The product categories covered by the legislation are determined by the government ordinance. They should be home appliances that meet all of the following four criteria: 1) difficult to be recycled under existing facilities and technologies possessed by local governments; 2) contain valuable resources that can be recycled and the cost for recycling is economically feasible; 3) whose design or selection of raw materials or components by the manufacturers exert a great influence on the recyclability; and 4) Delivered mostly by retailers so that smooth take-back by retailers can be secured.

⁶ As of April 2001, the remaining capacity of the final disposal site is estimated to be 3.8 years for industrial waste and 12.2 years for municipal waste (national average) (MOE, 2003b; MOE, 2003e).

The main actors in the Japanese EPR programme for EEE include producers, which formed two groups (Group A and Group B), retailers, local governments, consumers (end users), designated legal entities, the Association for Electric Home Appliances (AEHA), and two government bodies, which are Ministry of Economy, Trade and Industry (METI) and Ministry of Environment (MOE).

2.1.1 Collection

Physical management

The following activities are required for the discarded products to reach recycling plants: 1) collection of discarded products from household to regional aggregation stations; and 2) transport of discarded products from regional aggregation stations to recycling plants.

1. Collection from households

Retailers are the primary actors responsible for collecting the end-of-life products from household to regional aggregation stations. Upon request of the consumers, the retailers are responsible for accepting a) an old appliance when selling a similar new product (old-for-new), and b) an old appliance that they themselves have sold.

Municipalities and *designated legal entities* collect the products not collected by the retailers. The government appointed the Association for Electric Home Appliances (AEHA) as a designated legal entity. With regard to collection, designated legal entities collect products from remote areas in response to the request of municipalities governing the area or of local residents themselves.

The total number of products collected in the first year of implementation was 8,538,000 (April 2001-March 2002) while the figure for the second year (April 2002-March 2003) was 10,147,000 (see Table 2-2 for details). The legislation does not set any collection target.

2. Transport of discarded products from regional aggregation stations to recycling plants

Unless the products are reused, retailers, municipalities and designated legal entities must bring the discarded products to the regional aggregation stations established by the producers.

Producers have the obligation to establish the regional aggregations stations and transfer the discarded products to recycling plants. Prominent Japanese manufacturers established two groups, referred to as Group A and Group B, and companies within the two groups cooperate with each other in fulfilling their tasks.⁷ As of May 2003, Group A consists of 16 companies, while Group B consists of 14 companies (AEHA, 2003c). Producers that put

⁷ As of 2001, Toshiba and Matsushita Electric, leading Group A, together hold roughly 30% of the market share of air conditioners and TV sets, and 40% of refrigerators and washing machines. The market share of Hitachi, Sanyo, Mitsubishi, Sharp and Sony, five of the prominent members of Group B, is 35% for air conditioners, 30% for TVs, and more than 55% for refrigerators and washing machines. Figures taken from Hosoda (2002).

limited number of products on the Japanese market may delegate their tasks to designated legal entities.⁸ Currently, 29 producers belong to the last category.

As of May 2003, both Group A and Group B established 190 regional aggregation stations respectively, covering all the areas in Japan. In terms of types of regional aggregation stations, Group A established substantial number of regional aggregation stations (close to one third) directly at recycling plants, while most of the regional aggregation stations of Group B are transport companies. Retailers, municipalities and designated legal entities must bring the products manufactured by manufacturers belonging to the respective groups. Products belonging to the producers who delegate their tasks to designated legal entities come to the regional aggregation stations set up by Group B.

Financial mechanism

It is the *end users (consumers)* who pay for the collection at the time of disposal (end-user-pays). The fee is announced by those who are physically responsible for collection. The majority of the fee per item set by the retailers have been between 500 and 2500 JPY (3.5-17.4 Euro)⁹, while in some cases, the set fee is more than 3100 JPY (21.6 Euro).¹⁰ This fee also covers the management of the regional aggregation stations (Takahashi, 2003). The cost associated with the physical responsibility of the producers (establishment of regional aggregation stations and transport of discarded products from the regional aggregation stations to recycling plants) is covered within the recycling fee, thus discussed in the next section.

Information management

Those who are physically responsible for collection (retailers, municipalities, designated legal entities) must announce the fees in advance. According to the survey conducted by METI right after the enforcement of the law, 324 of the 328 major retailers announced the fee. According to the law, retailers must inform the consumers of the fee in advance by putting posters on the walls. Retailers where the author visited in winter 2000-01 put small posters on the walls, providing information about the law to the consumers. Some municipalities also provide information on the new law to the residents via, among others, brochures.

According to the law, producers must announce the location of the regional aggregation stations by putting the names of the company and address on daily newspapers. They are also found on the homepage of the Association for Electric Home Appliances (AEHA).

2.1.2 Recycling

Physical management

⁸ According to the Ministerial Order, manufacturers or importers who manufactured/imported less than 900,000 air conditioners/TV sets, or less than 450,000 refrigerators/washing machines may delegate their physical responsibility to designated legal entities.

⁹ With the exchange rate of 1000 JPY = 6.95 Euro (Forex, 2003). The same exchange rate is used for the rest of the document.

¹⁰ The percentage of the products whose collection fee is more than 3100 yen are 12% for air conditioners and refrigerators, 6% for TV sets, and 5% for washing machines (METI, 2001).

Producers have the responsibility to recycle their products either themselves or delegate their responsibility to the third party. In the initial phase, they need to achieve differentiated recycling rate targets on weight basis, which are 60% for air conditioners, 55% for TV sets, and 50% for refrigerators and washing machines. The recycling rate must be achieved by reuse of components or material recycling. Only the recycled materials that have positive or zero monetary value can be included when calculating the recycling rate. Recycling of products whose producers cease to operate in the market (orphan products) is done by the *designated legal entity*.

Producers also have to recycle the ozone depleting substances used as freezing agents in refrigerators. If the freezing agents cannot be used within the producers' own products or be sold/given away for free for reuse, the agents should be destroyed. They also need to treat printed circuit boards within products in a manner specified in the Waste Management Law.

As mentioned in Section 2.1.1, the prominent producers established two groups, and companies within the respective groups cooperate with each other in fulfilling their tasks. It is said that companies in Group A tend to utilise existing recycling plants and aim to achieve the recycling level stipulated by the law, while companies in Group B aim to establish their own recycling plants, carry out recycling themselves, and strive to achieve higher recycling rates.¹¹ The general direction of the respective groups is reflected in the actual result as well (see Table 2-2). However, all the prominent manufacturers in both groups established and manage at least one recycling plant themselves to facilitate communication between the upstream and downstream and to grasp the actual recycling costs.

As found in Table 2-2, in the first year of implementation, approximately 8.3 million products, corresponding to 319,000 tons, are recycled, while the figure increased to 10.1 million products, or 387,000 tons in the second year.¹² The achieved recycling rate for all the four products exceeds the recycling rate requirement stipulated by the law. Orphan products constituted roughly 5% of the recycled products.

Among the separated materials, the decrease of market for cullet from the Cathode Ray Tubes (CRTs) has been feared (Takahashi, 2003; Miyasaka, 2002). Shift of production facility from Japan to China in recent years, combined with ban of export of cullet to China, has made the demand of recycled cullet very low (Takahashi, 2003; Miyasaka, 2002). Restriction of the use of brominated flame retardants makes it difficult to find use of plastics containing the brominated flame retardants (Takahashi, 2003).

Financial mechanism

Just as collection, *end users (consumers)* must pay for the recycling fee announced in advance by the individual producers/designated legal entities. The size of the fees is summarised in Table 2-1. Consumers pay the recycling fee by purchasing a recycling ticket, referred to as a manifest, either at the retailers or at post offices. The recycling fee collected by retailers or post offices are transferred on monthly basis to the recycling ticket centre, a body

¹¹ Anticipation of the raise of mandatory recycling rate in the future is one of the reasons to strive for the achievement of recycling rate higher than the level currently mandated (Tojo, 2001).

¹² The figures translate to 2.5 kg per capita in the first year, and 3.0 kg per capita in the second year. The calculation is based on the population of 127,291,000 as of October 1 2001, and 127,435,000 as of October 1 2002, respectively (Statistic Bureau, 2003a; Statistic Bureau, 2003b).

administrating the money flow. The recycling ticket centre is established within the AEHA. The AEHA then transfer the money to the individual producers (AEHA, 2003a).

Table 2-1: Size of the Recycling Fee in Japan

	Air conditioners	TV sets	Refrigerators	Washing machines
Size of the fee	3,500-4,490JPY (24.3- 31.2Euro)	2,700-3,615 JPY (18.8-25.1 Euro)	4,600–5,600 JPY (32.0-38.9 Euro)	2,400-3,280 JPY (16.7-22.8 Euro)

Source: AEHA (2003b).

It turned out that all the prominent manufacturers announced the same recycling fee (the lower end of the fee found in Table 2-1). However, the level of the announced fee is considerably low compared to the estimated recycling costs under municipal waste management systems (Tanaka, 2001). It is also lower than the level of fee set by the designated legal entity (the higher end of the fee found in Table 2-1), who recycle the orphan products as well as the products delegated by smaller manufacturers. Among the manufacturers who delegate the task of recycling to the designated legal entities, some set the level of the fees as the same as the prominent manufacturers, covering the difference within their budget (Sekii, 2002).

The recycling fee collected is used for the transportation from the regional aggregation stations and the recycling plants, recycling and administration. In the case of Group B, a fee per item, differentiated among the four product groups was set for transportation. Out of the recycling fee collected from the consumers, producers in Group B pay the amount decided for the respective products multiplied by the number of treated products, to the system organised by the producers. If the recycling fees collected from the consumers do not cover the operation, it is the individual producers that must pay for the rest (Takahashi, 2003; Sekii, 2002).¹³

One of the producers in Group B mentioned that within the company, the cost exceeding what can be covered by the recycling fees collected by the consumers is currently borne by the recycling plant. However, for the products that are developed now, the cost would be borne by the manufacturing plant. The manufacturing plants thus consider 1) personnel costs at the recycling plant (how long does it take to dismantle products), 2) expected revenue from the recovered materials, and 3) disposal costs (for the materials that cannot be recycled and/or the materials the recycling of which should be paid). (Takahashi, 2003).

The amount of the fee that consumers must pay for collection and recycling amounts to minimum 2,400 JPY (16.7 Euro) to close to up to 10,000 JPY (69.5 Euro). However, in comparison to the situation prior to the introduction of the legislation, the increase of illegal dumping has not been as significant as had been feared (MOE, 2003c; MOE, 2003d). Aside from the initial few months after introducing the legislation, the percentage of the illegal dumping, as compared to the number of discarded products, has been less than 2 % (MOE, 2003a).

Informative management

¹³ With regard to the financial mechanism of companies in Group A, the author could not grasp the information regarding their funding mechanism due to its confidentiality.

As mentioned, *individual producers* and *designated legal entities* must announce the size of the recycling fee in advance.

The manifest (recycling ticket) that must be purchased at the time of the disposal serves as a receipt for end-users, as well as a carrier of various information. Issued when the products are actually taken back, the manifest contains information such as: date of the issuance, identification of the end users, retailers/designated legal entity, regional aggregation stations to which the product is transported, and the type and the model of the product, and its producer.

The information contained in the manifest allows each recycling plant to keep track of not only the total number and weight of the received products, but also the brand, the type and model of the each product that comes into the plant (Takahashi, 2003).

Individual producers must keep record of some aspects of recycling such as, the total weight of the recycled products, the total weight of components and materials reused or recycled, and the amount of ozone depleting substances collected and destroyed. The result achieved by the individual producers have been posted on the website of the respective companies. One of the designated legal entities (AEHA) compiles the information presented by the individual producers. The producers are also obliged to keep record of the entities that either purchase the components and materials reused or recycled, or take them for free.

Table 2-2 summarises the result of collection and recycling of four large appliances covered under the Specified Home Appliance Recycling Law in fiscal 2001 and 2002.

Table 2-2: Result of the EPR programme for EEE in Japan (April 2001-March 2003)

	Air conditioners	TV sets	Refrigerators	Washing machines	Total
Fiscal 2001 (April 2001-March 2002)					
Number of products came to the regional aggregation stations	1334000	3083000	2191000	1930000	8538000
Number of orphan products	34577	205376	138130	80234	458317
Number of products recycled	1301000	2981000	2143000	1882000	8307000
Total weight of the products treated (tons)	57634	79978	127596	54041	319249
Total weight of the products recycled (tons)	45019	58814	76359	30783	
Achieved recycling rate in average (%)	78	74	60	57	
Fiscal 2002 (April 2002-March 2003)					
Number of products came to the regional aggregation stations	1636000	3520000	2565000	2426000	10147000
Number of orphan products	40784	227478	167409	95684	531355
Number of products recycled	1624000	3515000	2556000	2409000	10104000
Total weight of the products treated (tons)	72009	95134	148662	71053	386858
Total weight of the products recycled (tons)	56739	72110	91006	42967	
Achieved recycling rate in average (%)*	79	76	61	60	
Achieved recycling rate by some companies in Group A (%)**	76	68	59	58-59	
Achieved recycling rate by some companies in Group B and designated legal entity (%)***	80	80-81	62	61	
Recycling rate required by law (%)	60	55	50	50	

*The recycling rate should be achieved by material recycling, and the recycling materials have to have zero or positive monetary value.

**Results achieved by Toshiba and Matsushita, two of the leading companies in Group A.

***Results achieved by Mitsubishi, Sanyo, Sharp and Sony, four of the leading companies in Group B.

Source: METI and MOE (2002), METI and MOE (2003a), AEHA (2002), AEHA (2003e), Matsushita (2003), Mitsubishi (2003), Sanyo (2003), Sanyo Air Conditioner (2003), Sharp (2003), Sony (2003), Toshiba (2003)

2.1.3 Monitoring and enforcement

As discussed in the previous section, once the products are returned to retailers or designated legal entity, the manifest system is used to keep track of the discarded products.

The information contained in the manifest, as well as the obligation of the *retailers* and *producers/designated legal entities* to keep the receipt for three years after issuance, enable *end-users* to trace whether, where in what manner the products they discarded are recycled. It also makes it possible for producers/designated legal entities to grasp the number and the type of products collected and recycled, and in which plant. The producers/designated legal entities are obliged to keep record of the information.

As mentioned earlier, the AEHA was appointed as a designated legal entity. Aside from its supporting role (e.g. collection from remote areas, recycling of orphan products and products of delegated by small producers, administration of recycling ticket and money flow), the AEHA has the task to collect and disseminate information of the system, and to secure the sound implementation of the whole system.

National government may order the submission of the record, and may inspect the facility if necessary. The result of the recycling activities have been submitted to the government, and also collected by the AEHA. The aggregated information has been published both by the government, and by AEHA. The author could not come across any information whether any inspection has been done by the parties other than the producers themselves.¹⁴

Monitoring of illegal dumping has been carried out by municipalities, and is aggregated by MOE. The situation in 276 municipalities, representing 21% of the entire population, was monitored in fiscal 2001, while in fiscal 2002, total of 2392 municipalities (89% of the population) was monitored.

2.2 EPR programmes for EEE in the Netherlands

Among the member countries of the European Union, the Disposal of White and Brown Goods Decree¹⁵ in the Netherlands was the first national law for EEE that incorporates EPR principle and has been implemented.¹⁶ Problem arisen from the high toxic substance

¹⁴ METI and MOE, in their press release in 2002 and 2003 that announced the result of the implementation, mentioned that the system is generally working well.

¹⁵ White and brown goods are “the assortment of electric and electronic domestic appliances and office equipment” (VROM, 1999). White goods include various large and small household appliances, such as refrigerators and freezers, air conditioners, washing machines, dishwashers, stoves, cookers, microwaves. Brown goods, also referred to as consumer electronics or entertainment (audio/visual) equipment, include products such as TV sets, digital cameras, video cameras, stereos, CD players, DVDs, and the like. The Dutch legislation covers not only these products but also other types of EEE, including, among others, ICT and office equipment (= gray goods) (see footnote 18). In this document, the term “brown goods”, “consumer electronics” and “entertainment equipment” are used interchangeably.

¹⁶ Efforts had been made to conclude a voluntary agreement between the government and industry since 1991, but it failed, which led to the introduction of the legislation (Veerman, 2003; Vonkeman, 2003).

content in incineration sludge¹⁷, the fact that some EEE have been included in the list of Priority Waste Stream in the National Environmental Policy Plan, and having producer responsibility as one element of the waste policy, are the driving forces behind the Decree.

Among the wide range of products covered by the Decree, on 1 January 1999, the collection and recycling of large home appliances (e.g. refrigerators and freezers, washing and drying equipment, TVs) and ICT and office equipment started. Enforcement for the rest of the appliances (various small household appliances) began a year later (1 January 2000).¹⁸

In response to the decree, two structures were developed: NVMP¹⁹ and ICT milieu. Representatives of the branch organisations that consist of manufacturers and importers of white and brown goods constitute NVMP, while and ICT milieu coordinate collection and recycling of ICT and office equipment. These organisations that carry out/coordinate the fulfilment of the responsibility of producers, often referred to as producer responsibility organisation (PRO), play instrumental roles in the actual implementation of the EPR programme for EEE in the Netherlands.²⁰

Other important actors in the Dutch EPR programme for EEE include: the Dutch solid waste association representing the waste management division of municipalities (NVRD); a retailers; Ministry of Housing, Spatial Planning and the Environment (VROM), consumers and recyclers.

In some product groups, such as ICT and office equipment, business waste constitutes substantial portion of the waste flow. Although the systems that the author investigated deal mainly with the waste stream from households, reference to the business waste is made, wherever relevant for the discussion on individual versus collective responsibility.

2.2.1 Collection

Physical management

In the case of products from private households, activities required for the discarded products to reach recycling plants in the Netherlands include: 1) collection of discarded products from household to regional aggregation stations, 2) sorting at the regional aggregation stations; and 3) transport of discarded products from regional aggregation stations/retailers to recycling plants (Veerman, 2003; NVMP, 2002; Vonkeman, 2003; Goorhuis, 2003).

¹⁷ For example, according to the calculation conducted by the Netherlands Organisation for Applied Scientific Research (TNO), it is expected that the bromide content in bottom ash and fly ash can be reduced by 90% and the copper content by 40-50%, if separate collection of small white and brown goods is achieved (VROM, 1999).

¹⁸ Product categories include 1) large and small white goods 2) large and small brown goods 3) ICT and office equipment (e.g. computers; paper printing equipment, telecommunication equipment); 4) electric and electronic household tools (e.g. handsaws, drills, garden equipment); 5) musical instruments; 6) toys; and 7) other electric and electronic household appliances (e.g. sewing, knitting and embroidery machines, heating and hot water apparatus, fans). (adapted from VROM, 1999; and NVMP, 2002).

¹⁹ Stichting Nederlandse Verwijdering Metalektrische Producten, meaning the Dutch Association for Disposal of Metalectro Products.

²⁰ Development of a collective system, especially for the white and brown goods, was a coincidence of experience with the battery recycling, and the emergence of people who managed to establish agreements with the branch organisations, and with the industries behind the branch organisations (Veerman, 2003).

1. Collection from households

With regard to collection from households, *retailers* have the obligation of collecting an old product when selling a new product (old-for-new), while the *municipality* are responsible for collecting the rest.

Different perceptions have been found with regard to the collection from households. According to the representative of the retail association, old-for-new collection service for large home appliances has already been a business practice prior to the introduction of the legislation, and acceptance of appliances free of charge has been implemented smoothly (Veenstra, 2003). A representative of a municipality, on the other hand, mentioned that some retailers neglect the responsibility for collection, give consumers a discount instead, and suggest to the consumers that municipalities would collect the old products. This has created the problem of littering on the street.²¹

Besides having a home collection service, consumers can bring the products at municipal collection points (Vershoor, 2003; Goorhuis, 2003).

Challenges of collecting small appliances have been commonly recognised (Veerman, 2003; Vershoor, 2003; Goorhuis, 2003, Veenstra, 2003; NVMP, 2002). The retailers are reluctant to collect the small appliances: in fact, the retail association does not promote consumers to bring back end-of-life products to retailers (Veenstra, 2003). According to the retailers, bringing back old products to retailers is something that consumers are not used to, and they perceive collection of small appliances to be the role of municipalities (Veenstra, 2003). The retail association has been suggesting to the government that in order to promote separation of small EEE from the municipal waste stream, instead of stores, collection facilities in the shopping centres should be utilised, together with the existing separate collection of items such as glass/paper/board/textiles (Veenstra, 2003). Some local governments, on the other hand, try to make it attractive for retailers to collect small appliances by way of, for instance, putting an artistic collection box (Vershoor, 2003). In the City of Rotterdam, the municipal official would also like to establish collection points at school and supermarkets (Vershoor, 2003).

According to the Dutch law, producers are responsible for take-back and recycling of the products collected by the retailers, municipalities and repair companies. In reality, in order to avoid unnecessary traffic and to increase efficiency, NVRD (the association representing the waste management department of municipalities) and NVMP (PRO for white and brown goods) agreed on establishing *regional aggregation stations* (Goorhuis, 2003; Vonkeman, 2003).²² Currently, there are 65 regional aggregation stations, where discarded products from more than 500 municipalities and 18000 retailers are gathered (NVMP, 2002b). All the products covered under the Dutch EPR programme for EEE (white and brown goods, as well as ICT and office equipment) are gathered here (Goorhuis, 2003). All the regional aggregation stations have the identical contracts with NVMP and ICT milieu (Goorhuis, 2003).

²¹ After the introduction of the legislation, the City of Rotterdam received in total of 4300 phone calls from the citizens per year, requesting them to get rid of refrigerators on the street (Vershoor, 2003). The author does not have information on the situation prior to the introduction of the legislation.

²² Regional aggregation points are also referred to as regional storage stations or regional transfer stations. In this document, the word “regional aggregation points” is used.

Among the products coming to the regional aggregation stations, 80% are collected by the municipalities (Veerman, 2003). Retailers have the possibility of either bringing the collected products to the aggregation stations, or having them collected by the PROs at their shops (ICT milieu, 2003; Vonkeman, 2003). When the discarded products contain valuable products (e.g. washing and drying machines), the retailers bring them to specialised recyclers, instead of bring them to the aggregation points (Vonkeman, 2003; Veenstra, 2003).²³

In order to avoid the overflow of discarded products at the municipal collection points, NVMP and NVRD made a “gentleman agreement” to direct retailers to bring the collected products directly to the regional aggregation stations. However, sometimes, retailers bring the collected products to municipal collection points instead of regional aggregation stations. This obliges the municipalities to empty their collection container more frequently, creating friction between the industry and the municipality (Goorshuis, 2003).

Municipalities in general are perceived to wish to keep their responsibility for collection. The national government also would rather maintain the responsibility for collection to local government instead of transferring it to producers.²⁴

2. Sorting at the regional aggregation stations

Discarded products taken to the aggregation stations are sorted into 5 categories: cooling and refrigerating equipment (e.g. refrigerators, freezers, air conditioners), large white appliances (e.g. washing machines, ovens, dishwasher), TV sets, all the other brown and white equipment (e.g. sewing machines, microwaves, shavers, toothbrushes), and ICT and office equipment (Goorshuis, 2003). Containers for the respective categories are provided by NVMP and ICT milieu (Vonkeman, 2003; Huisinga, 2003). Separation at the regional aggregation stations does not make any distinction between brands. Some of the large retailers, called *distribution centres*, play the same role as the regional aggregation stations: instead of bringing the products to the aggregation stations, they are equipped with containers and sort the discarded products that are brought to them (Vonkeman, 2003).

Regional aggregation stations sometimes serve as a refurbishment plant (Vershoor, 2003). However, a representative of NVMP mentioned that once the products come to the regional aggregation stations, they should all be taken to the recycling plants (Vonkeman, 2003).

Some of the challenges at the regional aggregation stations include theft, especially ICT equipment, and the health problems of the workers who need to carry heavy equipment. In order to improve the latter, the regional aggregation stations are structured in such a way that it allows the use of lorries and fork lifts (Vershoor, 2003).

3. Transport to the recycling plants

When a container becomes full at the regional aggregation stations, it is picked up, within 2 working days upon notification, by the transport companies contracted with the respective

²³ Unlike the Japanese programme, the retailers do not have the obligation to bring the collected products to the aggregation stations.

²⁴ “When you have a producer responsibility also for collection, we should make a situation where the producers can set up their own collection system. And when this situation is there, as the government we would have many problems with local community systems. And that is something we did not want. So that’s why we choose for making local authorities responsible for collection.” (Veerman, 2003).

PROs and sent to the recycling plants, while an empty container is brought as replacement (Vonkeman, 2003). Retailers can also have contracted transport companies pick up the collected WEEE and bring them to recyclers (Vonkeman, 2003; ICT milieu, 2003).

As of 2001, 87% of the products that reach the recycling plants contracted with NVMP come from the regional aggregation stations (NVMP, 2002). The rest come directly from the retailers, including the distribution centres (Vonkeman, 2003).

The Dutch legislation does not have any collection target, although once the EU legislation is transposed, it will be subjected to the annual collection targets of 4 kg per inhabitant from private households. The collection rate achieved by the two collective systems in 2002 (i.e. excluding the products directly taken back by the individual producers) was 4.8 kg per person per year (Veerman, 2003). The result of collection for some product categories is found in Table 2-4.

4. Discarded products from non-household

In the case of ICT and office equipment, there are more professional users than private users, and collection by retailers on old-for-new basis is limited. (Huisinga, 2003; Veenstra, 2003).²⁵ Aside from having the products take back from retailers on old-for-new basis, the consumers may make an arrangement with the producers to take back their products. Alternatively, products can be transported directly from the end users (business) to recyclers as business waste as well (ICT milieu, 2003).

Financial mechanism

Retailers must take back products *free of charge* from household on old-for-new basis. With regard to white and brown goods, retailers get the compensation of 10% of the recycling fees (Veenstra, 2003; NVMP 2002).²⁶ Concerning ICT and office equipment, all the costs are integrated in the price of the products, thus retailers do not receive any compensation.²⁷

Legally speaking, *municipalities* have the *possibility of charging* both the private consumers and retailers.²⁸ In reality, most of the municipalities are taking back the products from private consumers free of charge. Introduction of waste fee based on weight in many municipalities makes the situation a little bit confusing (Veerman, 2003).

Despite the legal possibility, there was an agreement between NVMP and NVRD to enable retailers to bring back products free of charge to the municipal collection points (Goorhuis, 2003). In reality, when a retailer brings collected products to the municipal collection points instead of regional aggregation stations, some municipalities charge the retailer (Veenstra,

²⁵ Approximately 10% of the total collection is done by retailers (Huisinga, 2003).

²⁶ As the NVMP stopped collecting fees from some of the products, they are currently paying the amount that is somehow equivalent to 10% of the fee.

²⁷ As most of the customers of ICT and office equipment are professionals (business), however, the trade of the equipment (e.g. printers, copying machines) is done directly between the manufacturers and customers. Exceptions are mobile phones and PCs.

²⁸ The transposition of EU legislation should enable both private households and retailers to bring back the products to the collection system established for WEEE free of charge, provided that they are discarded from private households (Article 5 Paragraph 2).

2003). This is not in line with the agreement between NVMP and NVRD, and makes the retailers unhappy (Goorhuis, 2003; Veenstra, 2003).

When retailers and municipalities bring the products to the regional aggregation stations, the cost of transportation is borne by retailers and municipalities respectively (Goorhuis, 2003; Vonkeman, 2003).

Cost of the operation of the regional aggregation stations is shared by the municipalities and the producers. The producers get the benefit with the logistics, while the municipalities also get the benefit: because the responsibility of sorting is gone, they need less space and personnel. At the moment, the municipalities are paying a fee per inhabitant (average 0.16 Euro), while the producers are paying per kilogramme of products (0.08-0.132 Euro). The contribution is more or less equal. The amount of payment is different between one station to another, depending on issues such as the efficiency of the activity at the station, collection activities at the respective regions, type of the respective regions (e.g. countryside or city), and the like (Goorhuis, 2003).

The cost for transportation of discarded products to the recycling plants from regional aggregation stations/and retailers are borne by NVMP or ICT milieu.

In the case of brown and white goods, costs associated with the collection is paid through the recycling fees collected from the consumers at the purchase of a new product. Cost associated with transportation and management of the regional aggregation stations constitute roughly 40% of the current expenditure (Bonkeman, 2003; NVMP, 2002b). For the ICT equipment, the collection and logistic cost is about 50% of the total cost (Huisinga, 2003).

When a product is discarded from business end-users without accompanying the purchase of a similar new product from a retailer, the producers do not have the obligation to receive the discarded product free of charge (ICT milieu, 2003). Transposition of the EU WEEE Directive may affect this financial mechanism. How it affects remains to be seen, especially as the amendment of the clause related to the historical non-household WEEE has been proposed.²⁹

Information management

Actors involved in informing the households about how they can discard their products include municipalities and the producer responsibility organisations (PROs) (NVMP, 2003; Goorhuis, 2003; Vershoor, 2003). The information tools that NVMP uses include leaflets, TV commercials, websites, posters at the bus stops, and free telephone service. NVMP also

²⁹ The EU WEEE Directive stipulates that the financial responsibility for the discarded products from non-household consumers, which are put on the market after 13 August 2005, are to be borne by producers (Article 9 Paragraph 1). For the historical products (those put on the market before 13 August), the current provision says that producers shall bear financial responsibility for the end-of-life management, unless the Member States make the non-household consumers partly or fully responsible (Article 9 Paragraph 2). According to the Commission, this implies individual responsibility for both historical and new products for business waste (Commission of the European Communities, 2003). As it is perceived to put relatively heavy burden on producers that had large market share in the past but no longer does compared to the new players in the market, the Commission made a proposal to amend this clause. The amendment applies old for new rules to producers with regard to financial responsibility of historical products, while the cost of end-of-life management of the discarded products which are not replaced by similar new products would be born by the consumers. (Commission of the European Communities, 2003). For new products (put on the market after 13 August 2005), the proposed amendment retains the same clause as the current directive.

provide leaflets and newsletters to the retailers. 10% of the recycling fee is used for the information provision (NVMP, 2002).

The information as to how much EEE is still discarded in the municipal waste stream has been difficult to grasp (Veerman, 2003; Vershoor, 2003). The reliability of data taken from a sample municipal waste stream is much lower than the data for batteries (Veerman, 2003). The City of Rotterdam started a project to investigate what is in their waste stream, as done 5 years ago and 8 years ago (Vershoor, 2003).

2.2.2 Recycling

Physical management

As mentioned, the discarded products that reached the regional aggregation stations are sorted into five categories. These products are sent to the specific recyclers with whom the two collective systems have contract. At present, 4 recycling companies with 7 plants have contract with NVMP, while ICT milieu have contracts with 1 recycling company with 2 sites (NVMP, 2003; Huisinga, 2003).³⁰ Small stream of products (10-15%) come directly from the retailers (Goorhuis, 2003; Huisinga, 2003; NVMP, 2003).

Brown and white goods taken back in the collective scheme (NVMP) are recycled without identification of brand. On the other hand, until 2002, the brand name and the weight of respective ICT and office equipment taken back in the collective scheme were registered before they are recycled (Huisinga, 2003; Zwart, 2003).

The differentiated recycling targets for different product categories are specified in the notification, which is presented by the PROs and approved by the government. In the case of brown and white goods, instead of establishing different recycling targets for all sorts of products, NVMP agree with the government to have uniform recycling targets for the respective four categories they separate: 75% for cooling and freezing equipment, 73% for large white goods, 69% for TV sets and 53% for other white and brown goods (NVMP, 2002). The Dutch government has been active in having this type of target setting as the standard at the EU level (Veerman, 2003).

As found in Table 2-4, all of the recycling targets for white and brown goods have been met during the first 3 years of implementation.³¹ It should be noted that in the Netherlands, energy recovery, for example, use in cement kilns, is also regarded as recycling.

Aside from the products that come from the two collective systems, recyclers contract directly with individual producers as well. For example, a representative of Mirec, a recycling company that has contract with NVMP for the recycling of TV sets, mentioned that this part constitutes roughly 60% of their business in the Netherlands, while the rest of the 40% are contract with individual producers (Zwart, 2003).³² Contract with the individual producers

³⁰ ICT milieu used to contract with two recyclers, but the smaller one merged into the bigger one.

³¹ With regard to the ICT and office equipment, the government and the industry did not agree on the recycling target. However, the target stated in the guideline for notification that is published by the government was 65%. As of 2001, the achieved recovery rate for ICT and office equipment was about 90% (Veerman, 2003).

³² Mirec has plant in 5 other countries. The rough ratio between the business with collective arrangement and individual waste stream in the respective countries is as follows: Germany: 30 % collective (from municipalities) and 70%

often involves extensive discussion with people in the environmental department, procurement, and logistic departments (Zwart, 2003). Products brought to the recycling plants are often prototypes of new models, or rejected products during the production process (Zwart, 2003). Mirec also offers refurbishment service (Zwart, 2003). In the case of Recydur, another recycler who takes care of half of the small appliances that are collected by the collective system, 5-10% of their business is direct contract with ICT producers (van Kalkeren, 2003).

Among the recycled materials, shortage of market for plastics and glass in CRTs poses challenges (Zwart, 2003; van Kalkeren, 2003). Plastics contained in the products currently coming back are mixed, and have low quality. Although efforts have been made,³³ it has been difficult to identify reliable plastic recyclers.³⁴ Glass in CRTs is a new market, and Mirec is still seeking for different possibilities with producers (Zwart, 2003).

The government prefers a collective system. "It is very difficult to get the brand appliances back to the brand. When somebody makes a separate system, all appliances have to be separated for this brand." "You cannot simply extract the products of a particular brand, and the brand must have an agreement with the collective system on a way of handling their products." The government also fears that it creates more transport movement, which is "environmentally very unfriendly" (Veerman, 2003).

The introduction of the EPR programme for EEE induced steep increase of the volume of products that come into the recycling industry. This gives opportunities to large-scale recyclers who have the capacity to duplicate/triplicate its operation in accordance with the demand of the market. Meanwhile, smaller recyclers tend to disappear, or to join in the system of a bigger recycler (Zwart, 2003). Adjusting the capacity with the demand from the market also poses challenges (Zwart, 2003). As the collective system made contract with very limited number of recyclers, those who did not get the contract ended up being bankrupt or closing part of their operation (Zwart, 2003; van Kalkeren, 2003). For example, recognising the possibilities, there were 4 or more companies who were ready to recycle CFC containing equipment. "Everyone thought that they would get part of the share once the legislation was enacted. In the end, only one got a contract." (van Kalkeren, 2003).³⁵ Meanwhile, the recyclers anticipate that the introduction of EU Directive and its clause on individual responsibility brings them new business opportunities (van Kalkeren, 2003).

Financial mechanism

Different financial mechanisms have been used by the two collective systems. In fact, the disagreement in the financial mechanism was one of the reasons why two separate systems emerged in the Netherlands (Huisinga, 2003).

individual; Sweden: 80% collective and 20% individual, UK, France and Italy, 100% individual, as there is no legislation yet (Zwart, 2003).

³³ Recydur has a contract with a company that cleans the mixed plastics and sorts PS (polystyrene), which gives the recycling rate of 51% (van Kaleren, 2003).

³⁴ As Mr. Zwart at Mirec put it, "There are a lot of promises, and very few implementation of these promises. All the stories on the plastics are 70% stories and 30% reality".

³⁵ Aside from the refrigerators and freezers, the collective system made contract with more than one recycler to spread the risk. "We decided that we pay a little bit more, but not to depend entirely on one recycling company". (Vonkeman, 2003).

1. Producers of white and brown goods

Producers of white and brown goods decided to finance the system with *visible, fixed, advance disposal fee*, without differentiation between brands. It was partly influenced by the shift in the market share of some of the major producers in the Netherlands.³⁶ All the producers supply an independent body working with NVMP with the information on the number of products put on the market on bi-monthly basis, which would be used to determine the recycling fee (Vonkeman, 2003).

The financial system used by NVMP is now a combination of pay-as-you-go (pension) system and up-front fee for the new products used for future recycling (Veerman, 2003; Vonkeman, 2003).³⁷ NVMP would wish to keep the visible fee until 2011, as allowed in the new EU Directive, to finance all the historical waste both coming back now and in the future with the visible fee collected before 2011 (a and c in Figure 2-1). Meanwhile, new appliances will be sold from 2005, which start to come back (b in Figure 2-1). They need to finance the new waste with invisible fee, or however they can find in 2011. (Veerman, 2003).



Source: drawn by Kees Veerman, Ministry of Housing, Spatial Planning and the Environment, at the interview with the author

Figure 2-1 Financial mechanism of NVMP and its use of visible fee, the Netherlands

The fixed visible fee has been criticised by competition authority (Veenstra, 2003; Veerman, 2003). The issues raised by the competition authority include 1) the fact that the fee is fixed and is not negotiable; and 2) feasibility of the visible fee system (Veerman, 2003). The accumulation of the large reserve was also criticised by the industry.³⁸ This led NVMP to

³⁶ The decrease of Philip's market share, from 60-65% of TV 15 years ago to 30-35% now, and increase of market share of Sony's, from zero to approximately 40%, made it difficult for them to accept individual responsibility. When implementing the regulation, Philips and Sony made an agreement to have a visible fix fee, which made it unnecessary to have an individual system. Sony agreed because of the visible fixed fee. With the visible fixed fee there will be any cost for the industries themselves: it can be put to the consumers directly (Veerman, 2003).

³⁷ The intention in the beginning was to have a pay-as-you-go (pension) system, but accumulation of a large reserve necessitated justification. Saving part of the collected fee for future recycling of historic waste was the reason they gave, with which they could get the agreement with their industry (Veerman, 2003).

³⁸ The size of the reserve in 2000 was more than 65% of the expenditure in the first year, as opposed to nothing in the case of ICT milieu (ENDS, 2001; Mayers, 2002). Two miscalculations contributed to the development of the reserve: 1) the

change their argument, as mentioned above. The issues still exist, but it is perceived that the competition authority will withdraw the charge, as the upcoming EU Directive allows the use of a visible fee until 2011 (Veerman, 2003).³⁹

As shown in Table 2-3, there are several products from which the NVMP are collecting the recycling fees, but there are several others, for which they no longer, or at least for some period of time, plan to collect fees. The accumulation of the large reserve, due to the uncertainties they had prior to the implementation, makes it unnecessary to collect fees from all the products (Vonkeman, 2003). The fee collected from some appliances can be used for the recycling of other appliances (cross financing) (Veerman, 2003).

Table 2-3: advance disposal fee for different items under NVMP system

Product categories	Fee (unit: Euro)
Cooling and freezing equipment	17
Large white goods	5
TV sets	8
DVD players	3
Frying pans, vacuum cleaners, coffee makers, power tools, sewing machines	1
The rest of the products	None

Source: NVMP (2002)

NVMP has 5 separate foundations for different product categories (white goods, brown goods, power tools, ventilation systems, and the rest of the small appliances), and within these 5 product categories, they cross finance. So far, the five foundations have not come to an agreement to cross finance among the five groups (Vonkeman, 2003; Veerman, 2003).

NVMP does not require any membership fee, which contribute to the reduction of so-called free riders (in this case, producers who sell products without paying the advance disposal fees in accordance with their market share). (Vonkeman, 2003). Currently, roughly 98% of the volume put on the market is the product of the member of the NVMP (Veerman, 2003).

2. Producers of ICT and office equipment

Producers of ICT and office equipment, on the other hand, finance the system with invisible fee. The main reasons producers chose to have an invisible fee system include; high proportion of business customers, the preference of producers to have flexibility in choosing where in the product chain they allocate the cost, difficulty of determining the recycling fees, and objection towards forming a fund (Huisinga, 2003).

Until 1 January 2003, based on the weight of the recycled products, individual producers received a monthly invoice directly from the recycler. Aside from their own products, producers also cover the cost of orphan products and products of free riders (producers who

number of the EEE actually collected was lower than estimated; and 2) the actual cost of recycling was lower than estimated (Veerman, 2002).

³⁹ Retailers in general do not like visible fees, as they could be a cause for misunderstanding. They would like to have just one price for a product, which include different types of tax and recycling fees. In reality, not all the retailers use visible fees (Veenstra, 2003).

avoid paying the recycling costs by not registering themselves on the system), which is allocated to the respective producers in proportion to the weight of the recycled products.⁴⁰ It turned out, however, that in the first year of implementation, orphaned and free rider products constituted 44% of the total volume of products processed under the collective system, which doubled the cost for the participating producers. It is reduced to 30-31 % now, out of which about 25% are orphaned products (Huisinga, 2003).

From the beginning of 2003, the financing system changed to allocation of cost based on the current market share (Huisinga, 2003; Zwart, 2003). The recycling cost for IT equipment, paper printing equipment and telecommunication equipment is allocated to individual producers in proportion to the weight of the respective products put on the market (no cross subsidising).⁴¹ Parallel importers and difficulty in identifying the producers, change in the proportion of the market share, existence of nameless brand, and difficulty for the individual companies in predicting the recycling costs, were some of the reasons that induced the change (Huisinga, 2003).

As 50% of the cost associated with end-of-life management is used for logistics, and only the rest of the 50% for recycling, Ms. Huisinga of ICT milieu was rather sceptical if the Dutch EPR legislation drives design change.

In order for a producer to participate, he/she needs to pay a rather expensive membership fee to the branch organisation. This makes some producers want to establish an independent system.⁴²

Information management

The results of the recycling from all the contracted recyclers are gathered by the NVMP and ICT milieu from the recyclers, who should report it to the ministry (Veerman, 2003; NVMP, 2003). Currently, KPMG monitors the mass balance (van Kalkerren, 2003; NVMP, 2002), but it does not verify, for example, whether the recycling procedure reported by the recycler is the same as what actually happens.

It is the information on the total weight of the mix of small household appliances that is available to grasp the general picture. However, recyclers are requested to periodically check the number of respective items contained in the flow in order to figure out the status of collection of individual items (van Kalkerren, 2003).⁴³

⁴⁰ Municipalities are responsible for recycling of orphan products and products of free riders. However, in order to distinguish the orphan products and products of free riders from the rest, the products should be sorted at the municipal collection station. The producers thought that it would be cheaper to take the whole flow of the products, including the orphan and free rider products and share the cost among themselves, than having the municipalities sort at the municipal collection points. (Huisinga, 2003).

⁴¹ As the system is aiming at products discarded by consumers, the producers need to register only those weighing less than 35 kg (Huisinga, 2003).

⁴² The membership fee for ICT branch organisation depends on the number of employees. The size of the fee range from 1,875 Euro for producers with the 0 to 10 employees, to 35,625 Euro for producers with more than 1500 employees (Veerman, 2003).

⁴³ In the case of Recydur, they separate the 5% samples of incoming products into different categories on monthly basis (Kalkaren, 2003).

Table 2-4 summarises the result of collection and recycling of white and brown goods under the NVMP system in the first three years of implementation.

Table 2-4: Results of the Dutch EPR programme: white and brown goods (January 1999-December 2001)

		Cooling & freezing equipment	Large home appliances	TV sets	Small home appliances
1999	Amount collected	460,000 items	136,000 items	192,000 items	2500 tons
	Recycling rate achieved %	79	74	75	-*
2000	Amount collected	550,000 items	272,000 items	296000 items	5420 tons
	Recycling rate achieved %	86	74	78	64
2001	Amount collected	608,000 items	346,000 items	300,000 items	9,450 tons
	Recycling rate achieved %	85	74	80	60
Recycling rate requirement %**		75	73	69	53

* The decree started to cover small appliances in 2000.

** Recycling by energy recovery, e.g. use in cement kiln, can be counted as recycling in the Netherlands.

Source: adapted from NVMP (2002).

2.2.3 Monitoring and enforcement

As mentioned above, the cost of management of all the WEEE coming to the two collective systems is initially covered by the producers, who transfer it to consumers in the form of advance disposal fees (white and brown goods) or allocate it to somewhere in the product chain (ICT equipment). Identification of the free riders - producers who do not participate in the system and contribute to financing without establishing their own systems –, and making them participate is of great importance in order not to give participating companies competitive disadvantage.

Initially, the enforcement agency of the Ministry of the Environment visited the companies which the government themselves knew were not participating in the collective systems (Veerman, 2003). A few months after the implementation, a system was established, where the collective systems and the enforcement agency work together (Veerman, 2003). The collective systems first notify the non-participants of his/her legal obligation and introduce him/her to the collective system (Vonkeman, 2003). If the company does not have its own end-of-life management system and still does not participate, the collective systems give the name of the company to the government, followed by a visit of the government staff to the company (Veerman, 2003). A rather severe sanction by the enforcement agency was perceived to be effective in making the companies comply.⁴⁴

This collaboration lead to significant increase of participants: in the case of ICT milieu, the number of participating companies increased from 75 to 162, making the percentage of free rider products less than 10% (Huisinga, 2003). NVMP “normally have problems with” 10 free riders per year (Vonkeman, 2003), and as mentioned earlier, approximately 98% of the volume currently put on the market are products of NVMP members (Veerman, 2003). Free rider through electronic commerce is not perceived to be a concern at the moment as the volume of products purchased via Internet is relatively small (Veerman, 2003).

⁴⁴ The enforcement agency can impose, as an initial penalty, maximum of 15,000 Euro, which has been used for approximately 10 times so far. The penalty could also go up for further violation. It is also possible to bring the violator to the court (Veerman, 2003).

As mentioned in Section 2.2.3, monitoring of recycling activities has been done by the collective system. Although this reporting procedure is perceived to be working well by the government and PROs, it has been argued that it is necessary to have an independent body monitor the recycling activity, as well as where the recycled materials go (Zwart, 2003). It is feared that lack of monitoring would encourage unwanted export of waste, and lead to unfair competition among recyclers.⁴⁵ The requirement set forth in the upcoming EU WEEE Directive would, if implemented as stated, give more stringent control over these issues.⁴⁶

With regard to the export of electronic waste or components of electronic waste, there was a concern for cooling appliances, because of the ban of the trade of CFC containing appliances. Since the regulation was implemented in 1992, much efforts have been put to enforce this rule. The government regards that the enforcement was rather successful. However, with regard to the export of other appliances, despite the recognition that there is a large export of appliances, the government cannot do much. As long as the appliances are exported as reusables, the government cannot regulate the export under waste regulations (Veerman, 2003).

2.3 EPR programmes for EEE in Switzerland

Involvement of producers in the recycling activities in Switzerland started before 1990. At that time, producers of IT (information technology) and office equipment had individual systems, where producers took back their own products from their business customers (Bornand, 2002). Meanwhile, S.EN.S (Stiftung Entsorgung Schweiz), the Foundation for Disposal in Switzerland, which organises and checks the quality of recycling activities, initiated a voluntary initiative of collection and recycling of refrigerators (Hediger, 2002; Bornand, 2002). All the big distributors and a number of manufacturers supported and participated in this initiative (Hediger, 2002).

In the beginning of the 90's, producers of ICT equipment started to get demand from their customers to have all the old products back regardless of the brand. The producers come to their industry association, SWICO (Swiss Association for Information, Communication and Organisation Technology) to seek for solution, which led to the introduction of recycling guarantee programme in 1994 (Bornand, 2002). The development of EU Directive, as well as perception of the industry to find proactive involvement to be advantageous, may also explain the movement (Tellenbach, 2002). Meanwhile, the activities of S.EN.S. was expanded in 1996, covering the whole range of household appliances (Hediger, 2002).

The ordinance on the return, the taking back and the disposal of electrical and electronic appliances (ORDEA), enforced 1 July 1998, was developed, reflecting these existing private initiatives. Limitation of the incineration capacity in Switzerland, and containment of hazardous substances in EEE are some of the reasons why the government decided to introduce the legislation (Ardiot, 2002). The industry welcomed the legislation, as it would provide a legal framework to the respective actors involved in collection and recycling

⁴⁵ "...we are quite sure that some competitors try to avoid to work themselves, just put the appliances to containers and ship them to wherever in the world." (Zwart, 2003).

⁴⁶ Recydur, one of the recyclers, mentioned that upon the implementation of the Directive, it will require all the buyers of the materials to report back to Recydur 1) percentage of recycling, 2) percentage of recovery, and 3) where the materials go, and make it as a condition to have contract with Recydur (van Kalkerren, 2003). In the case of Mirec, aside from plastics, and from materials that have been commodities (e.g. irons), they know the destination of the components/mix metals/hazardous materials, and how they are treated (Zwart, 2003).

activities, and create a level playing ground (Tellebach, 2002; Bornand, 2002, Hediger, 2002). The Ordinance is also appreciated for its conciseness (Hediger, 2002; Bornand, 2002). Though somewhat limited compared to the Dutch legislation or upcoming EU legislation, the Ordinance covers wide range of EEE.⁴⁷ The product categories covered under the two voluntary systems have been thus expanding.

SWICO Environmental Commission (SWICO) and S.EN.S are the two main actors who coordinate and “hold responsibility over the whole system” (Bornand, 2002). SWICO, being an industry association for ICT and office equipment, is involved in the end-of-life management of ICT and office equipments as well as consumer electronics. S.EN.S is an organisation that coordinates end-of-life management activities. It has contract with producers and distributors, and manages mainly white goods. The two organisations cooperate and coordinate their activities with each other (Bornand, 2002; Hediger, 2002). Other important actors involved in the implementation of the EPR programme include recyclers, distributors, consumers, inspectors and governments.

2.3.1 Collection

Physical management

There are mainly 3 channels through which discarded EEE from consumers reach the recycling plants in Switzerland: 1) via *retailers*⁴⁸, 2) via *collection points*, and 3) *direct collection by producers*. The Swiss Ordinance explicitly gives consumers the obligation to return WEEE to retailers, producers, recycling facility, or collection points.⁴⁹

1. Collection through retailers

Retailers are obliged to accept the products that they normally stock from consumers (end-users). It is regardless of the brand, and is not limited to the acceptance on old-for-new basis.

S.EN.S already has a large membership of retailers, including some of the major retail chains in Switzerland (Hediger, 2002). With regard to SWICO, retailers automatically become part of the system as long as they deal with products that SWICO’s members import/produce (Bornand, 2002). Together, they have participation of more or less all the distributors in Switzerland (Bornand, 2002).

The unbalanced distribution of responsibility among retailers (retailers conveniently located for consumers receive a large amount of products without them being able to sell, while discount stores in the suburb manage to sell well without having to take back) has not been perceived as a problem (Hediger, 2002)

⁴⁷ As of February 2000, appliances subject to the Swiss legislation include 1) entertainment electronics = brown goods (TV sets and other image receiving equipment, audio visual equipment); 2) ICT and office equipment; 3) refrigerating and freezing equipment and other large and small household appliances = white goods; and 5) PCB containing ballasts. Those that are not subjected to the legislation include industrial electronics, large telecommunication equipment (e.g. telephone exchanges), lavatory and measuring equipment, tools, garden machinery, built-in household machinery (e.g. boiler), accessories, appliances in vehicles, aircrafts and ships, toys and musical equipment (adapted from SAEFL, 2000).

⁴⁸ The term “retailers” is used interchangeably with the term such as distributors, point of sales and dealers.

⁴⁹ Inclusion of this obligation was triggered by the intervention of the producers. “...we said, you can’t tell the producers to take back the products and not to involve the consumers.” (Bornand, 2002).

Besides consumers bringing back the end-of-life products themselves, there is also a home pick up service, utilized mostly for large appliances. There is also a tradition of old-for-new take back service in which the products are delivered to the consumers.

As of 2001, 45% of the products under SWICO system (covering ICT and office equipment, mobile phones and graphic industry) came back through retailers (SWICO, 2002). The figure increased to 58% in 2002, reflecting the inclusion of consumer electronics (e.g. TVs, VCRs, audio equipment) in the system since 1 January 2002 (SWICO, 2003a) (see Figure 2-2).

Once products are collected, retailers can have transporters deliver collection boxes, which are filled, and picked up by the transporters within 24 hours. The collected products are then delivered to the recyclers that have contract with S.EN.S and/or SWICO (Hediger, 2002; SWICO, 2003). The transporters have contract with S.EN.S and/or SWICO, and are coordinated centrally.⁵⁰

Besides the collective collection regardless of the brand, a few manufacturers have a special contract with S.EN.S, so that their products are separately collected and come back to them.⁵¹ Under the SWICO system, retailers themselves can also reuse/resell the used products, which as of 2002, constitute 5-7% of the products that the retailers accept.

2. Collection through collection points

Aside from retailers, private households can also bring WEEE to the collection points. Approximately 300 collection points have been established by S.EN.S and SWICO (Hediger, 2002; SWICO, 2002).

As of 2002, 24% of the products under SWICO system (covering ICT and office equipment and consumer electronics) are received at these collection points (SWICO, 2003a) (see Figure 2-2). Some of the products are taken back from consumers with home pick-up service.

Products coming to the collection points are sent directly to the recyclers that have contract with SWICO/S.EN.S.

3. Direct collection by the producers

As found in Figure 2-2, aside from the channel via retailers and collection points, there has been a constant flow of products that are handled directly by producers. As of 2001, before the consumer electronics are included, it constituted 36% of the IT and office equipment covered under SWICO system. This represented 44 out of 203 companies, referred to as A-participants. The figure in 2002 dropped to 18%, or 43 out of 250 companies, reflecting the inclusion of consumer electronics in the scheme, as well as the increased use of small and medium-sized equipment and decrease of large-scale equipment (SWICO, 2003a).

⁵⁰ Concern has been shown about the fact that SWICO contracted with only one company to arrange all the transport. Having only one company may reduce the cost, but also make the system less flexible for different producers. In the case of S.EN.S, it was said to allow a little bit wider room for flexibility, allowing individual producers, for example, to use the transport service that they have been using before (Rissotti, 2002).

⁵¹ Examples of such companies include Jura, a manufacturer of coffee machines, and V-Zug and Miele, a manufacturer of large appliances such as washing machines, refrigerators and tumblers (Hediger, 2002). See footnote 56 for more information about the operation of Jura.

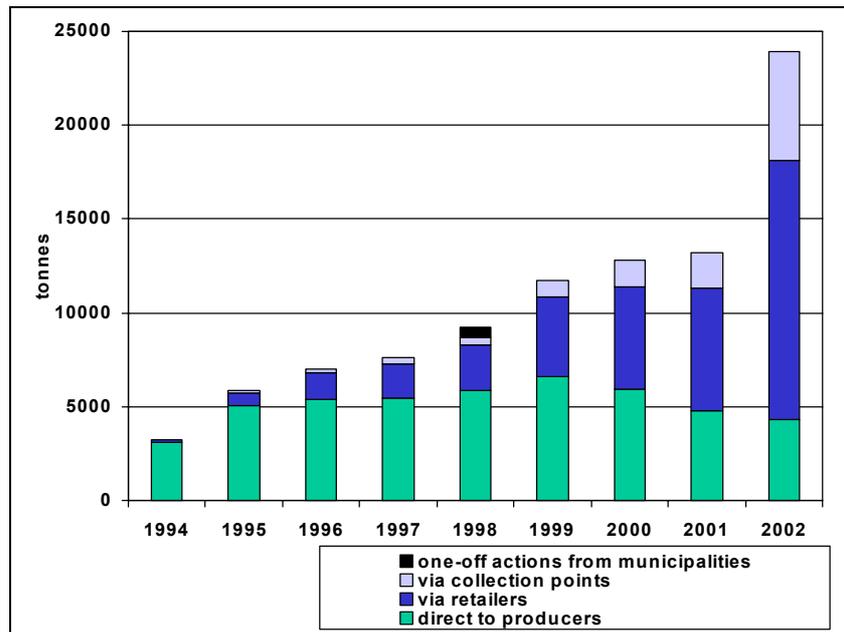
The signatories of the SWICO system can negotiate the price with the recyclers as they wish, but only with the recyclers selected by SWICO to secure the quality of recycling.

4. Roles of municipalities

The Swiss legislation does not allocate any specific responsibility to the municipalities. In fact, it intentionally did not put additional burden on the municipalities, neither physically nor financially (SAEFL, 2000). It is no longer allowed to dispose WEEE with municipal waste (in bags or through bulky waste collection (SAEFL, 2000)). However, municipalities play a role in, for example, collecting the illegally dumped products, which can be brought to retailers or collection points. (Hediger, 2002). They could decide which roles to play: they could apply to be collection points, could collect a few times per year, or do nothing, except for providing information to consumers (Hediger, 2002; SAEFL, 2000).

Figure 2-2 summarises the amount of collected products under SWICO system from the respective paths. As of 2000, approximately 40,000 tons have been collected in the S.EN.S system.⁵²

The Swiss Ordinance does not set any collection targets. The government made an estimation that the total number of discarded products amount to 110,000 tons (SAEFL, 2001a). When comparing to the number collected through the two systems, this suggests significant amount of products are disposed improperly. Mr. Hediger of S.EN.S poses questions to this figure.⁵³



Source: adapted from SWICO (2001) and SWICO (2003)

⁵² The figure includes part of the products under SWICO system, as many of the recyclers they use are the same (Hediger, 2002).

⁵³ S.EN.S is aware that 10-15,000 tons of products are recycled in recycling plants which are outside of their contract. This still suggests that more than 30 000 tons of products disappear somehow. Considering that landfilling of EEE is no longer allowed in Switzerland, it is difficult to explain what happens to the remaining 30 000 tons (Hediger, 2002). Export as second-hand products may explain the difference in figure.

Figure 2-2: Amount of collection from different paths under SWICO system, Switzerland

Financial mechanism

Financial mechanism of the EPR programme for EEE in Switzerland is in transition. Namely, some of the voluntary initiatives started with the *end-user-pays* system (e.g. refrigerators, home appliances), while others started with *advance disposal fee*⁵⁴ system (e.g. IT and office equipment). This led to the confusion of *consumers*, as sometimes they can give away the products free of charge, while in other occasions they needed to pay. The legislation introduced in 1998 did not specify the financial mechanism, either (Bornand, 2002; Ardiot, 2002).

Currently, the change in the legislation has been proposed to clarify that the consumers have the possibility to return the products free of charge (Ardiot, 2002). Meanwhile, free-of-charge acceptance, financed by the advance disposal fee paid at point of sales, has been gradually introduced to different product groups, from IT and office equipment in 1994 (voluntary initiative organized by SWICO) to white goods in 1 January 2003. The differentiated timing for introduction of advance disposal fee reflects the timing when the producers of the respective product categories commit to work on end-of-life management (Bornand, 2002). Table 2-5 summarises the existing end-of-life management system for the respective product categories, and timing of the introduction of the advance disposal fee system.

Table 2-5: Existing systems and introduction of advance disposal fee for the respective product categories, Switzerland

Product categories	Existing system prior to the advance disposal fee system	Introduction of advance disposal fee system	Organiser
IT and office equipment	Individual systems by manufacturers	1994	SWICO
Refrigerators	Voluntary collection systems by manufacturers and retailers since 1991	2003	S.EN.S
Mobile phones	These items have been collected and recycled when the consumers bring back the products since 1996 under S.EN.S system, but until advance disposal fee system was introduced, consumers in principle had to pay.**	1999	SWICO
Graphical industry (digital/analog/video cameras)		2000	SWICO
Telephone equipment		2001	SWICO
Consumer electronics		2002	SWICO
Large and small white goods		2003	S.EN.S
Garden, construction and hobby equipment*		planned	S.EN.S

* Swiss Ordinance does not cover these product categories.

** The Swiss legislation obliges consumers to bring back WEEE, and retailers and producers have been (until the enforcement of the revision to make it free of charge) only responsible for accepting the products that are brought to them and recycle them properly.

⁵⁴ In Switzerland, the term "advance recycling fee" has been used. In this document, the term "advance disposal fee" is used, as it is commonly used for other EPR programmes and represents the same as advance recycling fee in Switzerland.

Source: SWICO (2003a), Hediger (2002), Bornand (2002).

Due to the mandate given by the legislation, retailers do not receive any compensation (Hediger, 2002). Management of the *collection points*, as well as *transportation* from collection points and retailers to recycling plants, are financed by the advance disposal fees collected at the purchase of new products. As of 2002, 2% of the overall expenses are used for collection points, while 12% is used for transportation (SWICO, 2003a).

Home pick-up service is not financed by the advance disposal fee. Although it is up to the retailers to decide, S.EN.S gives the recommended price of 25 CHF (16 Euro)⁵⁵ per item (Hediger, 2002).

The size of the fee for the respective products, as well as the management of the collected fee, is discussed in Section 2.3.2.

Information management

The Swiss Legislation does not allocate responsibility for information provision with regard to collection. SWICO made a brochure that is available at the store, introducing the consumers to the overview of the system, including information such as where to hand in the products, the advance disposal fees, and the like (Bornand, 2002). Information is also available from the homepage of SWICO and S.EN.S.

SWICO has been also auditing the practice of collection points since April 2001. They check, among others, if the products are taken back free-of-charge (Bornand, 2002). This, in turn, would help inform the consumers of the advance disposal fee system and the possibility of bringing back the products they wish to discard free of charge. The audit of the collection points is discussed more in Section 2.3.3.

2.3.2 Recycling

Physical management

The Swiss legislation establishes a general requirement of having the appliances treated in an environmentally tolerable way under the state-of-art technology. It in particular requires 1) components containing hazardous substances to be treated separately; 2) cathode ray tubes and metal containing components to be recycled; and 3) organic chemical components not recycled, including plastic casing, to be incinerated in the appropriate incineration. The government provides detailed instruction in the Guideline for the legislation regarding the recycling and treatment of specific products and their components. There is no recycling target.

At the recycling plant, the products collected via retailers and collection points are treated together without being separated in accordance with the brand (Bornand, 2002; Hediger, 2002).

⁵⁵ With the exchange rate of 1 Swiss Franc = 0.63 Euro (Forex, 2003). The same exchange rate is used for the rest of the document.

The white goods collected under S.EN.S system are sent to 20 recyclers that have currently contract with S.EN.S. These recyclers receive governmental permit, as well as the license from S.EN.S, which sets more stringent standard than the one given by the government. Aside from the refrigerators that are brought to 3 specific recyclers that have the capacity to treat ozone depleting substances, the recyclers themselves decide which products they recycle. The recycling of refrigerators started in 1991, and the scope was expanded to other EEE in 1996 (Hediger, 2002).

Likewise, the products under SWICO system are sent to 15 recyclers that have contract with SWICO. SWICO divides Switzerland into 22 geographical areas, and every 2 years ask recyclers to make offers. The 15 recyclers that currently have contract with SWICO were chosen from those who made offers, and receive both government permit and SWICO's own license which is more stringent than the government permit. Once the recycler gets one area, he will keep this area for 2 years, and will receive all the products collected within this area. With regard to dismantling, the recyclers normally work together with social institution such as prisons or working place for handicapped people (Bornand, 2002).

Some of the recyclers have license both from S.EN.S and SWICO, and have contract with both (Hediger, 2002; Bornand, 2002).

As mentioned in Section 2.3.1, individual producers also accept substantial flow of products directly from the consumers and bring them to the recycling plants (A-participants). The participants of SWICO must bring the products to the 15 recyclers that have SWICO's license and have contract with them, "because these 15 are controlled by us, and we want to make sure that the recycling is done properly." (Bornand, 2002). So far, SWICO has not encountered a situation where participants of SWICO bring their products to recyclers other than those that have licence from SWICO.

Aside from this flow, 10-15,000 tons of products are recycled in recycling plants that do not have contract with S.EN.S (Hediger, 2002).

The capacity of the Swiss recyclers is more than enough to handle discarded products generated within Switzerland (Bornand, 2002; Hediger, 2002). The recyclers are investing for the future, looking at the market opportunity that may arise with the introduction of EU WEEE Directive (Bornand, 2002). The fact that upon the establishment of the contract with SWICO, all the products collected in the respective areas are brought solely to the contracted recyclers has perceived to pose threat to the rest of the recyclers (Ardiot, 2002; Rizzotti, 2002).

If recyclers abroad fulfil the same quality standard as they set in Switzerland and get permit from the Swiss government, they would be potential candidates for licensed recyclers (Hediger, 2002; Bornand, 2002). In order for the recycler to get permit, the Swiss exporter must apply to the government, showing, in essence, the consent from the importing country and any transit company upon receiving the notification, the contract and the standard of the recycling activity to be the same as Switzerland. Currently, all the recyclers are in Switzerland, although some components and materials within the products that cannot be recycled in Switzerland (e.g. printed circuit board, copper) are treated abroad (Hediger, 2002; Bornand, 2002; Ardriot, 2002). Some of the main destination countries include Germany, Belgium and the Netherlands (Hediger, 2002; Bornand, 2002). The government concerns the potential effect of the participation of recyclers abroad on the domestic recyclers (Ardriot, 2002).

With regard to the recycled materials, all the materials find destinations, often in new products (in the case of metals and glass), with the exception of plastics. The share of plastics within the returned products is increasing, due to the growing production of printers and of PCs. In Switzerland, it is forbidden to reuse plastics that contains brominated flame retardants, so they are incinerated. Even when the plastics do not contain brominated flame retardants, the challenge would be to compete with the cheap virgin plastics. In order to facilitate recycling, some producers started to use metals instead of plastics, even if the production cost is more expensive (Bornand, 2002).

The reuse of white goods is limited (Hediger, 2002). There is not so much second-hand market in Switzerland, and most of the second-hand products are likely be exported (Hediger, 2002). However, as mentioned in Section 2.3.1, a few manufacturers request their products to be separated from the rest of the waste stream and remanufacture them. One of such manufacturers is Jura, a manufacturer of coffee machine.⁵⁶

Some of the producers of ICT and office equipment, on the other hand, collect their own equipment (A-participants), with the intention of reusing either the whole equipment or their components. The volume of the reused equipment is steadily increasing, from 500 tons in 1994 to 2100 tons in 2002 (SWICO, 2003a).⁵⁷ SWICO forbid recyclers to reuse and resell equipment/components that are brought to the recycling plants under the collective system, however (Bornand, 2003).

Financial mechanism

As mentioned in Section 2.3.1, there used to be two streams of financial mechanisms: end-user pays system for white and brown goods, and advance disposal fee system for ICT and office equipment. As of 2003, end-of-life management of all the products covered under the legislation is financed by fixed advance disposal fees.

1. Advance disposal fee and determination of the size of the fee

Aside from making it less confusing for consumers and complying with the revision of the legislation, various advantages have been perceived to have advance disposal fee system. It would be more difficult to have the consumers pay at the time of disposal than when selling a new product. It also releases the municipalities from charging the tax payers, and encourage consumers to separate from the municipal waste steam/reduce littering. When EU WEEE Directive is implemented, Switzerland cannot be isolated, either. From the producers' point of view, there is no additional cost for producers, as the end-of-life management is financed by the advance disposal fees paid by the consumers (Hediger 2002; Bornand, 2002).

There are different possibilities in setting the level of the fee (Bornand, 2002). Two types were chosen for the Swiss system. For IT, office and graphics industry equipment and, the fee is paid based on the price of the product published by the producers before discount. The fee for consumer electronics is determined per a product/product system. The Environmental Commission of SWICO, which consists of 10 of their 200 members, makes

⁵⁶ Operating within Switzerland, Jura wants to have all of their products back in their manufacturing plant, dismantle the coffee machines and reuse some components in the new machine or as a replacement of those used in the market. They use a bar-code system for their information loop about their product. See also footnote 51.

⁵⁷ The figure includes the reuse of both by producers and by retailers (Bornand, 2003).

the final decision on the size of the fee, as well as other activities of SWICO Recycling Guarantee. The current size of the fees is found in Table 2-6 and Table 2-7.

Table 2-6. Advance disposal fee for IT, office and graphics industry equipment in Switzerland (unit. CHF, Euro in [])

List price for end users* (without VAT)	Electronic office equipment/ graphic industry equipment (without VAT)	IT equipment (without VAT)
0 – 250 [0-157.5]	0 [0]	0 [0]
251 – 1000 [158.1-630]	5 [3.2]	5 [3.2]
1001 - 3000 [630.6-1890]	20 [2.6]	7 [4.41]
3001 – 6000 [1890.6-3780]	50 [31.5]	10 [6.3]
6001 – 15000 [3780.6-9450]	100 [63]	20 [12.6]
15001 – 30000 [9450.6-18900]	200 [126]	50 [31.5]
30001 – 60000 [18900.6-37800]	350 [220.5]	100 [63]
60001 – 150000 [37800.6-94500]	500 [315]	250 [157.5]
150001 – 600000 [94500.6-378000]	1000 [630]	500 [315]
> 600000 [>378000.6]	1500 [945]	1000 [630]

*list price published by the producers before discount.

Source: SWICO (2002).

Table 2-7: Advance disposal fee for entertainment, photographic and professional equipment, and white goods in Switzerland (unit. CHF, Euro in [])

Product categories	Fee (incl. VAT)
TV sets/video projectors >65cm (incl. rear projection)	30 [18.9]
TV sets/video projectors <65cm (incl. video beamers)	15 [9.5]
Full radio and DVD systems, incl. Speakers, key boards (audio-acoustic equipment)	10 [6.3]
VCRs, DVDs, satellite receivers	5 [3.2]
Camcorders	5 [3.2]
Audio and Hi-Fi equipment, speakers	5 [3.2]
Portable equipment incl. Consumer electronics in cars, cameras, other small equipment	2 [1.3]
Digital cameras	2 [1.3]
Analogue cameras	1 [0.6]
Professional TV studio cameras, audio and video recorder, professional projectors, sound mixers that costs more than 10000 CHF [6300Euro]	20 [12.6]
Large home appliances category 1 (e.g. refrigerators, freezers, air conditioners, dehumidifier)	40 [25.2]
Large home appliances category 2 (e.g. ovens, dishwashers, heaters, cookers, tumble driers, washing machines)	25 [15.8]
Large home appliances category 3 (e.g. knitting machines, small washing machines, refrigerators)	15 [9.5]
Small home appliances category 1 (e.g. boilers, steam cleaners, microwave ovens, sewing machines, sauna heaters)	7 [4.4]
Small home appliances category 2 (e.g. electric wok, rice cookers, fondue heater)	3 [1.9]
Small home appliances category 3 (e.g. toasters, hair cutters, clocks, toothbrush)	1 [0.6]

Source: SWICO (2002), SWICO (2003b), SWICO (2003c), S.EN.S (2002)

In order to calculate the recycling fee, the collective systems need to know 1) the amount of products that would be collected, 2) the cost for recycling them, and 3) the amount of products they sell. The number of products collected is estimated by looking at the import figure of the last 10 years. Recycling cost is estimated from the actual recycling cost at the moment. Sales figure has been taken from the import figures of all the products (Bornand, 2002).

The size of the fee is not differentiated between brands. Differentiation of fees depending on the degree of design for end-of-life management has been discussed, but is not implemented (Bornand, 2002; Hediger, 2002). There was a strong conviction among the people in charge of the collective systems that having a good recycling system is complicated enough, and the system does not drive design for environment (Bornand, 2002; Hediger, 2002). Most of the producers in Switzerland are in fact importers, and it is perceived to be less likely for the producers to reflect upon the recycling activities in Switzerland when they manufacture products in another country (Bornand, 2002). The relatively small size of the fee within the price of the product would make it difficult to give consumers an incentive to select the products that have less environmental impact at the end-of-life management stage.⁵⁸

The distributors must state in their receipt that the price the consumers are paying includes advance disposal fee. The size of the fee can be visible or invisible to consumers. This has been difficult to enforce, and there has been many discussions between manufacturers and distributors (Hediger, 2003).

In order to make it simple for consumers, advance disposal fee for those covered under different EPR programmes (EEE, batteries and packaging) have been combined (Bornand, 2003). Consumers pay the combined fee, and SWICO pays the global sum to INOBAT, the organisation that manage the fund of the collection and recycling of batteries,⁵⁹ the end-of-life management of all the batteries contained in the product (Bornand, 2002). This constitutes 5% of the expenditure in 2002 (SWICO, 2003a). Likewise, 15% of the advance disposal fee is for packaging materials (Bornand, 2002).

2. Management of the fee

In principle, consumers pay the fee to the retailers when purchasing a new equipment, the retailers pay the fee to the producers when purchasing a new equipment, and the producers set aside the fees (Bornand, 2002).

Under the SWICO system, producers can either keep the advance disposal fee in their individual accounts (A-participants), or transfer them into the common account managed by SWICO (B-participants). A-participants (43 out of 250 companies as of 2002) who take back used equipment directly from the consumers and bring them to one of the licensed recyclers, pay for recycling directly to the recycler from their own account. B-participants, on the other hand, have SWICO take care of the products of the B – participants collectively, and let SWICO organize the financial management for them as well (Bornand, 2003).

Under the S.EN.S system, the producers pay the fee to the fund every 3 or 6 months, depending on the individual contract (Hediger, 2002).

The fee collected is used only for the products currently collected (pension, or pay-as-you-go system). Unless products are separated at the stage of collection, there would be no distinction between brands, thus all the historical and orphaned products are covered under

⁵⁸ In fact, in this effect, end-user-pays system is considered to be more effective in making the difference clear to the consumers than the advance disposal fee system (Hediger, 2002).

⁵⁹ See Section 2.5 for more information as to how the INOBAT system works.

the system (Hediger, 2002; Bornand, 2002).⁶⁰ Electronic commerce has not been perceived as a threat to the system (Hediger, 2002).

As of 2002, 71% of the total expense of 28.44 million CHF (17.9 million in Euro) was used for recycling (SWICO, 2003a). SWICO pays to the recyclers one average price per kg for all the six categories, which stays the same for the respective product during the contract period of 2 years (Bornand, 2003). The price is different among the recyclers, depending on the volume (Bornand, 2003). “We want to keep it simple, knowing that the real cost for recycling of a copier, compared to a handy, is different. But why should we care about that” (Bornand, 2002). The fund is financing the whole system regardless of types of products (cross financing).

Recycling fee for IT and office equipment has been lowered twice, in 1995 and 98 (Bornand, 2003). The expenditure in 2001 was more than the size of the revenue, thus the fee should be increased.

Information management

Both SWICO and S.EN.S have a very stringent monitoring system on the recycling activities. They require recyclers to keep record of their own activities, and document the material flow (inputs and outputs) much more precisely than what is required by the government. Recyclers also must keep track of the destination of the components and recycled materials and method of the treatment of these materials. EMPA, Swiss Federal Laboratory for Materials Testing and Research, serves as an independent control office for SWICO, and also monitor the recycling plants that have contract with S.EN.S (Bornand, 2002; Hediger, 2002).

The monitoring and controlling of the recycling activities is discussed more in Section 2.3.3. The information of the overall recycling activities can be found in their homepage and annual reports.

2.3.3 Monitoring and enforcement

As mentioned earlier, both SWICO and S.EN.S have a rigid monitoring system both for collection and recycling activities. As Mr. Bornand of SWICO put it, “it makes no sense to say that you are responsible and send the product somewhere. You must have a control.” Likewise, S.EN.S describes its work as “to check the quality of the collection points, to secure that the equipment which has to be recycled is to be transported to our recycling facilities” and to “check the quality of recycling” (Hediger, 2002).

As the first step, the recyclers must obtain a disposal permit from the government. It is the Canton government who is responsible for issuing the permit within its jurisdiction, provided that it is proved in the application made by the recycler that the recycler have the appropriate technology and personnel to meet the standards set by the government.

The recyclers having contract with S.EN.S and SWICO must be able to meet higher requirement than what is required by the government. Then they get the license from S.EN.S and/or SWICO. As mentioned in the previous section, EMPA, an independent control body, works both for S.EN.S and SWICO as an auditor. They check the recycling

⁶⁰ 35-40 % of the products that are currently coming back are orphaned products (Bornand, 2002).

activities at least once a year. Special attention is given on the material flow and destination of the components and recycled materials, and methods of treatment in the destination (Bornand, 2002; Hediger, 2002). EMPA also monitors dismantle facilities, which are normally social institutions such as prisons or working place for handicapped people (Bornand, 2002). So far, 2 licenses had to be taken away, while 2 other recyclers decided to return the license as they stopped their activities (Bornand, 2002).

Besides recycling activities, the management of the collection points has also been audited. The dimensions the collection system check include: 1) if the products are taken back products free of charge, 2) if the materials are stored under lock, and 3) if it is easy for consumers to bring back products (Bornand, 2002). Since January 2003, they are also checking issues such as the origin of the products, as well as if the SWICO and S.EN.S process (acceptance, storage and transport) has been coordinated without trouble (SWICO, 2003a). The audits led to the closure of 3 collection points, while the performance of the rest of the collection points was ranked between satisfactory and very good (SWICO, 2003a). Although not yet organised, establishment of a system to monitor the practice of the retailers has been planned as well (Hediger, 2002).

Approximately 90% of the market is covered by the collaborated activities of S.EN.S and SWICO (Hediger, 2002). Free rider has not been perceived to be a threat to the system, as “it is only the benefit for the producers to participate” (Bornand, 2002). Problem of free rider is perceived to be the role of the government to deal with (Bornand, 2002), and establishment of legislative framework helped increased the participation.⁶¹

The Swiss EPR programme for EEE addresses the issue of export explicitly, both at the legislative level and in practice.⁶² A substantial part of the legislation is devoted to the export, where it prescribes, among others, what can be exported, and what procedure is required to export them, the form of tracking. As Mr. Bornand of SWICO puts it, “The government did not want the export of WEEE as a result of this obligation.”

As mentioned earlier, as of now, it has been only the recyclers in Switzerland that SWICO and S.EN.S have made contracted with so far. Both SWICO and S.EN.S have a stringent requirement to the recycling plants with regard to the destination of the materials and components, and treatment. Control of export is also regarded as an important role of the government. (Bornand, 2002).

From the interview, the author got an impression that the two collective systems have strong commitment to keep all the products that come under their system under control. It has not been very clear what may be still outside of their system, how much grip does the government have, and what have been the actions taken by the government.

2.4 EPR programmes for batteries in the Netherlands

The Decree of 31 January 1995 laying down rules for the collection and processing of spent batteries (Batteries Disposal Decree) provides the legal basis for the implementation of an

⁶¹ “Without legislation, it is hard to, for a private initiative, get more than 50-60% of the market” (Hediger, 2002).

⁶² In most of the nations where EPR programme for EEE has been introduced, issue of export is addressed in other regulation and is not included under the scope of the EPR programme. A clause on export was included in the upcoming EU WEEE Directive, although it was not explicit in the proposal from the Commission.

EPR programme for batteries in the Netherlands. Enforced on 1 March 1995, the Decree was developed as a means of implementing the EU Directive on batteries and accumulators containing certain dangerous substances.⁶³

The Decree covers both primary and secondary (rechargeable) batteries that weigh not more than 1 kg. In response to the introduction of the Decree, in 1995, 9 major importers of batteries in the Netherlands established a foundation, Stichting Batterijen (STIBAT), which serves as a collective body (PRO) to implement the EPR programme on behalf of producers. Besides the system established and managed by STIBAT, Battrex, an importer of special batteries used mainly for mobile phones, has established its own collection and recycling system prior to the introduction of the legislation.

STIBAT is the major actor in organising the whole EPR programme for batteries in the Netherlands: as of 2001, 653 producers, of whom more than 90% are importers, participate in the STIBAT system (STIBAT, 2002b; Broers, 2003). Other important actors in the system include municipalities, retailers, recyclers, and consumers.

The system established by Battrex is introduced to an extent that is relevant in the discussion of collective versus individual responsibility. Aside from issues surrounding collection and recycling of batteries, the Decree stipulates the restriction of sales of batteries containing certain hazardous substances. Section 2.4.4 introduces some of these mandates that are related to design change.

2.4.1 Collection

Physical management

In principle, the responsibility for collection of batteries start “from the border of the municipalities” in the Netherlands (Broers, 2003). However, in order to achieve the mandated recycling rate set in the Decree, efforts have been taken by the producers to collect via retailers, schools and campsites (Broers, 2003). There are also batteries that are within discarded appliances, such as EEE. All the batteries collected are then brought to a central depot. Besides the system organised by STIBAT, Battrex has its own collection system.

1. Collection by municipalities

Collection of batteries from the households have been done under the small-scale chemical waste (KCA) system, part of a source separation system of the municipal waste stream present prior to the introduction of the Battery Disposal Decree. When the Decree was introduced, municipality was perceived to wish to keep the responsibility for collecting

⁶³ Directive No.91/157/EEC of the Council of the European Communities of 18 March 1991 on batteries and accumulators containing certain dangerous substances. OJ L 078, 26/03/1991 p. 0038-0041.

batteries.⁶⁴ However, collection paths established by STIBAT have been also appreciated by the municipalities.⁶⁵

The collected batteries are further collected by approximately 16 professional collectors that have contract with STIBAT, and are brought to the central depot in Ermelo (Broers, 2003; Langrová, 2002). The percentage of the batteries collected through this venue is unclear, as the professional collectors are collecting batteries not only from the municipalities, but also from retailers and some business consumers (Broers, 2003).

2. Collection other than municipalities

Finding the KCA system in municipalities to be insufficient to meet the collection requirement set by the legislation, STIBAT started to investigate other collection paths. Since 1998, they have established in total almost 10,000 collection points at retailers, primary schools and campsites (Broers, 2003).

Reflecting on the preference of consumers found in their survey,⁶⁶ STIBAT started to recruit the participation of retailers in collecting the spent batteries in 1998 (STIBAT, 2002b). Their targets have been the major retail chains that sell batteries in one way or another, including supermarkets, photo shops, do-it-yourself shops, and toy shops (Broers, 2003). The participating retailers are provided with a collection bin and a box that can be put within the bin. When the box is filled, a logistical service company will come and pick it up within 5 working days upon informing STIBAT, and replace the box with an empty one (Broers, 2003). The spent batteries are collected by professional collectors who then bring them to the central depot, or directly to the central depot (Broers, 2003).

In 1998, STIBAT also started to collect batteries at primary schools in the Netherlands (STIBAT, 2002b). For every kilogramme of batteries collected, the school gets some point (Broers, 2003). With the accumulation of several points, they can get different prizes that can be used at school (Broers, 2003). Close to 3200 schools participated in the collection programme in 2001, contributing the collection of 322 tons, or 17% of the batteries collected under the STIBAT system (STIBAT, 2002a).

Besides these two venues, STIBAT also started a programme at the campsites, as many batteries are used due to the lack of electricity. Approximately 500 campsites currently participate in the collection programme. From the campsites and schools, collected batteries are directly sent to the central depot (Broers, 2003).

3. Collection from discarded appliances

⁶⁴ Prior to the introduction of the Decree, a draft was presented on 23 November 1993. Besides the general preference of producers and retailers to retain the responsibility for collecting batteries with municipalities, the Association of Netherlands Municipalities also shared this preference (VROM, 1995). The perceived reason was that batteries are the most known products that fall under the categories of small-scale chemical waste (KCA), and that bringing batteries out of the scope of KCA system would make it difficult for municipalities to communicate this system to the citizens (Broers, 2003).

⁶⁵ For example, in the city of Rotterdam, the municipal official showed their willingness to identify some of the local retailers that have not been part of the STIBAT system and encourage these retailers to participate (Verschoor, 2003).

⁶⁶ The survey in March 2002 showed that more than 90% of the consumers said they always (65%) or usually (26%) hand in spent batteries instead of throwing them in the municipal waste stream, thinking it is not environmentally friendly to do so. When asked where they would want to bring the batteries, the place people referred to most was supermarkets (Broers, 2003; STIBAT, 2002).

The Decree also covers the batteries within appliances, as long as they are reloadable (removable). When the batteries are sorted at the recycling plants, they are eventually sent to the STIBAT system (Zwart, 2003; Van Kalkerren, 2003; Vonkeman, 2003; Broers, 2003). There has been a discussion as to who should be responsible for built-in batteries (Broers, 2003). As long as they are removed from the appliances and sent to their system, STIBAT sort and recycle them (Broers, 2003).

4. Sorting at the central depot

All the batteries brought from the paths mentioned above are hand-sorted at the central depot in Ernelo into less than 10 streams. In order to keep track of the incoming batteries, the process starts with the weighing of batteries (Broers, 2003).

The main starting point for sorting is separation of batteries that can be recycled: i.e. what type of batteries the contracted recyclers can take. They first pick up big ones, whose size and shape make it possible to tell the chemicals they contain. Sorting of round cells follows, and of lithium and nickel-cadmium batteries comes after that. Putting the batteries under a small box can make the distinction between mercury-containing and mercury-free batteries: those that grow are the ones without mercury.⁶⁷

STIBAT used to use an automatic sorting machine (Broers, 2003; Vershoor, 2003). The machine stopped its operation, however, as the size of the machine was too large for the amount of batteries collected in the Netherlands (Broers, 2003).

Sorting between brands is not done.

As found in Table 2-8, the achieved collection rate has been above 70% since 1998, falling short of the requirement set in the Decree (80% by 1 January 1996 and 90% by 1 January 1998). STIBAT, in their 3rd statement, where it expressed their plan of means of fulfilling the responsibility given by the legislation, set up the recycling rate of 80 % by January 2008 (STIBAT, 2002b; Broers, 2003).⁶⁸ Difference in the calculation method, as well as in the coverage of the type of batteries, makes it difficult to compare the result between different countries, such as Switzerland (See Section 2.5.1).⁶⁹

Table 2-8: The result of collection of batteries in STIBAT system, the Netherlands

Year	1998	1999	2000	2001
Amount collected in STIBAT system (tons) (a)	2533	1849	1856	1876
Amount found in the municipal waste stream (tons) (b)*	845	805	675	823
Total amount discarded (tons) (a + b)	3378	2654	2531	2699

⁶⁷ The manufacturers of mercury-free batteries started to put a special coating around the batteries, so that the batteries can be distinguished easily (Broers, 2003). The manufacturers used to argue that the sorting of mercury-free batteries could not be done, and that would make the recycling costs very high.

⁶⁸ With regard to the 3rd statement, refer to the subsection “Information management” of this section.

⁶⁹ Method of calculating the collection rate has been changed from the methods that use sales figures to the one using the amount discarded (Langrová, 2002). The current method of calculating the collection rate is weight of batteries discarded in an environmentally friendly way (i.e. those on STIBAT system), divided by the weight of batteries discarded in an environmentally friendly way plus those discarded in an environmentally unfriendly way (i.e. those put in the municipal waste stream) (STIBAT, 2002b).

Collection rate (%) a/(a + b)	75	70	73	70
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*The amount of batteries found in the municipal waste stream is figured out by separating batteries contained in a sample municipal waste, which is done 6 times a year (Veeman, 2003; Broers, 2003).

Source: STIBAT (2002a).

In the case of Battrex, it takes advantage of its rather limited distribution paths and half of their customers being business customers, and established a collection system through their retailers (Struijk, 1992). There have been cases when batteries dealt with by Battrex is mixed in the STIBAT collection paths, and visa versa (Langrová, 2002). The difference between the two systems have not been perceived to be significant, thus the two systems recycle the batteries that come into the respective system (Langrová, 2002). The two systems have been cooperating rather well (Broers, 2003).

Financial mechanism

Municipalities finance the collection of batteries that come under the KCA (small-sized chemical waste) system. The rest of the activities involved in collection; i.e. provision of bins and boxes at retailers, schools and campsites; transport from municipalities, retailers, schools and campsites either via collectors or directly to the central depot, logistic arrangement for the transport; sorting at the central depot, are financed by the fee collected from the producers. As the fee is also used for the recycling of batteries, the size of the fee, as well as mechanism of managing the collected fee, is discussed in Section 2.4.2.

Participating retailers are compensated with convenience (i.e. provision of bins and boxes, pick-up service upon request) and with publicity (e.g. having their names on the brochure and homepage of STIBAT). They do not get monetary compensation.⁷⁰ Aside from getting prizes for the students, schools receive environmental education programme which can be utilised by teachers (Broers, 2003).

With regard to the batteries separated from appliances at the recycling plant, the transportation to the STIBAT system is not financed by STIBAT.

Information management

Collection from the household has been perceived to be the most difficult task (Broers, 2003). Aside from making it convenient for consumers to bring back batteries by establishing additional collection points with retailers, schools and campsites, different attempts have been made to inform the consumers of the system, as well as the environmental benefits of sorting batteries. Approximately 50% of the budget of STIBAT is spent on information campaigns (Veerman, 2003).

The aims of collecting batteries at school are two folded: to educate the children to take care of batteries, and through children, educate their parents. STIBAT provides educational programmes that teachers can utilise. They also run a painting contest for students, and made a card game, using the paintings of the winners (Broers, 2003).

⁷⁰ There was also a notion that retailers are benefited from participating in the STIBAT system, as the retailers, despite the fact that they are not legally responsible, receive spent batteries anyway from the consumers. "...the shops also have to get rid of the battery waste. They have to bring them to a collector, and the collector may ask for money..." (Broers, 2003).

Having a large collection bin with the logo of STIBAT with retailers and campsites make the STIBAT system visible. The existence of the bins in the campsites may help remind the consumers the necessity of throwing spent batteries that they keep at home, and in the appropriate stream (Broers, 2003). Brochures, leaflets and posters are provided at the participating retailers (Langrová, 2002).

Besides information to consumers, producers have the obligation to provide the government with information as to how they are planning to implement their responsibility. As an organization that implements the responsibility of producers on their behalf, STIBAT has been making a joint statement. The statement should be approved by the government, and upon approval, must be implemented. STIBAT must also report the result of the implementation to the government every year.

2.4.2 Recycling

Physical management

When STIBAT started the programme in 1995, it was difficult to find recyclers who have the capacity to recycle batteries, due to the lack of demand in the market at that time. The number of recycling companies increased a little since then. Currently, aside from some of the zinc-carbon and alkaline batteries recycled in one company, Nedstaal, in the Netherlands, all the other batteries are recycled abroad (France, Switzerland, Belgium and Germany). Some of the recycling companies recycle only batteries, while others are smelters who have battery recycling as a part of their business (Broers, 2003).

In order for STIBAT to recycle batteries abroad, they need to get a permit from the government, who provide the permit only when the batteries are recycled, not incinerated or disposed without recycling (Broers, 2003).

Financial mechanism

As mentioned earlier, activities of STIBAT are financed by the fee collected from the producers, paid per amount of batteries they put on the Dutch market (advance disposal fee). At the moment, STIBAT categories the batteries into 6 types, the parameter being weight and the distinction between rechargeable and non-rechargeable batteries (Broers, 2003). As found in Table 2-9, aside from the button cells, the current size of the fee is differentiated in accordance with the weight, but not between rechargeable and non rechargeable. There is no differentiation of the fee between brands.

Table 2-9: Size of the advance disposal fee in STIBAT system, the Netherlands (as of June 2002)

Type of batteries	Size of the fee (in Euro, excl. tax)
Batteries weighing up to 50 grams	0.02
Batteries weighing 51-150 grams	0.06
Batteries weighing 151-250 grams	0.13
Batteries weighing 251-500 grams	0.27
Batteries weighing 501-750 grams	0.40
Batteries weighing 751-1000 grams	0.54
Button cells	0.003

Source: STIBAT (2002).

It is up to the individual producers to decide if the fee is visible to the consumer or not. In reality, most of the producers are perceived not to have visible fee. When the system was started, STIBAT asked the producers to make the fee explicit on the bill, with the aim of acquainting the consumers with the STIBAT system. However, the government competition authority did not allow STIBAT to force companies to have visible fee, on the ground that it would hinder freedom of the enterprise to negotiate (Broers, 2003).

The collected fee is managed in a pension (pay-as-you-go) system. STIBAT experienced an establishment of a large reserve in the beginning. Currently, it comes down to zero, however.

Information management

As a means of monitoring the overall activities, which is part of the responsibility of producers stipulated by law, STIBAT keeps track of the recycling process that the respective recyclers use, the outcome of recycling (recycled materials), as well as the destination of the recycled materials (Broers, 2003). As mentioned in Section 2.4.1, they must report the result of monitoring to the government. The result can be also found in their annual report.

Producers must mark the batteries that contain specified heavy metals exceeding the level stipulated in the Decree.⁷¹ The requirement is applied also to the producers of batteries that are used within EEE and other appliances. In the case of the latter, unless the producers inform the heavy metal content, as well as the method of its safe disposal, use of such batteries within the products is prohibited. Instruction as to how to remove batteries from products also have to be given by the producers.

2.4.3 Monitoring and enforcement

As mentioned above, producers must monitor collection and recycling activities, and report the result of monitoring back to the government.

With regard to collection, as mentioned in connection with the collection rate, STIBAT has contract with a specialised company who checks the amount of batteries contained in the sample municipal waste 6 times a year (Broers, 2003; Veerman, 2003).

STIBAT visits the recyclers on regular basis, and makes sure if the permit the recyclers receive from the government is still valid. As mentioned, in order to get the permit from the government, the activities of the recyclers have to be recycling. So far the quality of the recyclers have not been a problem. However, STIBAT sometimes the permit of the company has expired, which has lead STIBAT to stop transport of batteries for some months (Broers, 2003).

As mentioned in the beginning, the member companies increased from 9 in the beginning to more than 600. Importers of various products that contain batteries contributed to the large increase (Broers, 2003).

⁷¹ The batteries whose heavy metal content has to be marked include: the alkaline batteries that contain more than 0.025% of mercury by weight, the rest of the batteries that contain more than 25mg of mercury, batteries that contain more than 0.025% of cadmium per weight, and those that contain more than 0.4% of lead by weight.

2.4.4 Other material related restriction

Aside from the collection and recycling requirement, the law prohibits “to manufacture, import, make available to other or keep in trade stocks alkaline batteries containing more than 0.025%” of mercury by weight (Article 2). Exceptions are those that are used in extreme conditions: in that case, use of mercury up to 0.05% is allowed (with the marking, see footnote 71). Button cells are also excluded from this material restriction. Batteries must be easily removable from appliances.

2.5 EPR programmes for batteries in Switzerland

In Switzerland, retailers have been responsible for accepting the batteries for a long time. Up until 1991, the collected batteries were exported to Eastern Germany and dumped. In 1991, the government stopped giving export license, which had been very easy to obtain before that. The movement of the government coincided with the development of a battery recycling plant in Switzerland.⁷²

Restriction of exporting batteries for recycling meant the sharp increase of recycling cost; from 0.35 CHF (0.22 Euro) per kg to 4 CHF (2.52 Euro) per kg. Moreover, the fact that responsibility of the retailers to accept was not restricted to old-for-new basis or to those the retailer himself had sold before created a situation where some retailers receive many batteries, while others do not. This, together with the increase of price, started to disrupt the market, and retailers who used to pay for recycling no longer afford to do so (Jordi, 2002).

Retailers could bring the batteries to the producers, who would have faced the same challenge as the retailers. In order to cover the cost of recycling, producers decided to introduce, on voluntary basis, an advance disposal fee system, and established a cooperative called BESO, which later became INOBAT.⁷³ They made a contract with Ernst and Young, who ran the fund on behalf of INOBAT (Jordi, 2002).

In order to deal with the free rider problem, while increasing the collection rate at the same time, INOBAT and the government both agreed that it is necessary to make not only the acceptance, but also the disposal mandatory (Jordi, 2002). The Amendment was made on the Ordinance relating to Environmentally Hazardous Substances, which came into force on 1 October 1998. Due to the struggle to determine which organisation actually runs the system, the actual implementation started on 1 April 2001 (Jordi, 2002).⁷⁴ In the end it was decided that Ernst and Young continued its task of running the system on behalf of producers.

INOBAT, which contracts the operation to Ernst and Young, is an integral actor that coordinate the collection and recycling activities. Retailers, recyclers and consumers play a vital role in implementation as well.

⁷² It was a joint venture of the Canton and Central government, Migros, which is one of the largest retailer chains in Switzerland, and Sumitomo (Jordi, 2002).

⁷³ Interesseorganisation Batterieentsorgung (interest organisation for end-of-life management of batteries).

⁷⁴ The legislation stipulates, among others, that the system should be run by a private organisation who has the running period of maximum five years. Aside from Ernst and Young who had been managing the voluntary system, there was another organisation who aspired to run the system, leading to a rather severe conflict between the two organizations that last for 2 years (Jordi, 2002).

Although the legislation covers different types of batteries, this section focuses on the primary and secondary batteries that are less than 5 kg and used by civil purpose (not in the army or civil defence), unless otherwise mentioned.⁷⁵ Material restriction in batteries, as well as their sales in Switzerland, is introduced to an extent that is related to design change.

2.5.1 Collection

Physical management

Just like the EPR programme for EEE, the law stipulates that the *consumers* are responsible for bringing back spent batteries to a retailer or hand them in to a collection point. So far, no collection points have been established, thus unless the batteries are still in appliances, it is via the *retailers* that spent batteries are collected.

Retailers have the obligation to accept any spent batteries that are discarded from consumers, regardless of a new purchase (old-for-new), brand, or if they themselves had sold the batteries or not. At the moment, all the batteries are collected without sorting different types of batteries (Jordi, 2002).

Retailers do not have the obligation to participate in the INOBAT system, however, which poses challenge to INOBAT.⁷⁶ As part of their effort of providing consumers with convenience and increasing the visibility of the system, INOBAT is ready to provide retailers with collection boxes, as well as transportation of the collected batteries to the recycling plant. Among others, Migros, a large retail chain that has 30-40% of the market share of batteries, participate in the INOBAT system.⁷⁷ However, there are many other retailers who were not aware of their responsibility, and ignored the offer from INOBAT.⁷⁸

With regards to batteries within EEE, the batteries are taken out at the recycling plants of the EEE and are sent to the recycling plant of batteries.

Before legislation came into force, transportation from the retailers to the recycler was organised by the retailers themselves. Now it is part of the task of INOBAT.⁷⁹ Retailers can call the transporters who have contract with INOBAT, and ask them to pick up the spent batteries, who would come and pick them up within 10-14 days. In order to enhance the cost efficiency, INOBAT has contracted with several transporters that are working in different communities, instead of having one transport company. The transportation service

⁷⁵ For example, dealers who sell lead batteries more than 5 kg must accept the batteries sold by them. There is no mandate for producers to pay advance disposal fee, however.

⁷⁶ Mr. Jordi, who has been in charge of running INOBAT (including the period when it was voluntary), pointed out four weak points in the system, which are; 1) lack of incentives for consumers to bring back; 2) lack of convenience for consumers to collect at home; 3) limited participation of retailers, and 4) lack of experience in managing the transportation from the retailers to the recycling plant.

⁷⁷ On the other hand, it should be noted that Migros has been proactive in battery recycling, and even provided some resources for the establishment of a recycling plant in the early 1990. See footnote 72.

⁷⁸ When INOBAT contacted 10,000 retailers, asking if they would like to receive the collection box, only 400 replied (Jordi, 2002).

⁷⁹ The law stipulates transportation of the spent batteries as one of the items that should be financed by the advance disposal fee, which is managed by INOBAT. As an appointed private organisation, INOBAT has the task of managing the fee as well as organising the activities that should be covered by the fee.

should be provided to all the retailers, regardless of whether they are using the materials provided by INOBAT or not (Jordi, 2002).

As shown in Table 2-10, the collection rate of batteries in Switzerland has been approximately 60%. In the case of Switzerland, instead of the amount disposed, the amount sold is used as a denominator when calculating the collection rate (Buser, 2002; Langrová, 2002) (see footnote 69).

Table 2-10: Collection of batteries in Switzerland

Year	Consumption (sale) (tons)	Amount collected (tons)	Collection rate (%)
1993	3888	2240	58
1994	3700	2240	60
1995	3700	1980	54
1996	3700	2220	60
1997	3700	2018	55
1998	3700	2210	60
1999*	3700	2400	65
2000	3800	2376	63

* Figures: estimation by SAEFL
Source: BESO, in SAEFL (2001b).

Financial mechanism

When retailers wish to use the collection box prepared by INOBAT, they will get them free of charge. The manufacturing and provision of collection box, as well as transportation of spent batteries from retailers to recyclers and logistical arrangement behind it, is financed by advance recycling fee (Jordi, 2002). It should be noted that coverage of cost of these activities by the advance disposal fee is stipulated in the legislation.

The size of the advance disposal fee, as well as the management of the fee is discussed in Section 2.5.2.

Information management

Various information campaigns, utilising media such as commercials on TVs and cinemas, posters, bags, stickers, brochures, are made in order to encourage the consumers to bring back spent batteries (Jordi, 2002). The strategy for the consumers have been to establish a notion that it is abnormal to throw a spent battery together with other municipal waste (Jordi, 2002).⁸⁰ Visibility of the programme in the shops would make it easy for consumers to identify the shops that accept the batteries. The information campaign cost them 1.5 million CHF (945000 Euro) per year, and with double repetition, it would be 4 million CHF (2.52 million Euro) in 3 years (Jordi, 2002).

⁸⁰ Examples of pictures found on the brochure include a young nice-looking lady having an unwrapped raw fish in ta handsome handbag, dirty shoes in the toaster, and the like.

Even when the retailers do not use the materials provided by INOBAT, they have, by law, the obligation to display a “prominent notice”,⁸¹ so that consumers are informed of 1) their obligation of returning the spent batteries, 2) the fact that the recycling fee is included in the batteries they currently purchase,⁸² and 3) the possibility of returning the spent batteries to shops.

Retailers can find the telephone number of the transportation companies on the homepage of INOBAT (Jordi, 2002).

2.5.2 Recycling

Physical management

All the batteries collected are sent to Batrec AB in Wimmis, the only recycling plant in Switzerland. Aside from nickel-cadmium batteries which are recycled in France, all the batteries are recycled in this plant. According to Mr. Jordi, Batrec has a very sophisticated recycling facility, and the achieved recycling is 99% “clean” (Jordi, 2002). No distinction between brands is made (Jordi, 2002).

The fact that there is only one company does not allow a market mechanism to work. There are companies outside of Switzerland, offering recycling service to INOBAT. However, export is only allowed provided that the plant has the same standard as Switzerland, and currently none of the recyclers abroad have the same level of facility as Batrec has (Jordi, 2002).

There used to be another plant, Recymet in Aclens, Switzerland. Due to the limited amount of batteries collected in Switzerland and the relatively high price in Switzerland that hindered the companies from attracting import of spent batteries, the two plants suffer from over capacity.⁸³ In the end, the two companies merged, and only Batrec is left (Jordi, 2002; Langrová, 2002).⁸⁴

Financial mechanism

Recycling as well as activities surrounding collection (e.g. information provision, transportation and provision of collection boxes to retailers/bags to consumers) are financed by the advance disposal fee. The fee is universal per weight regardless of the types of batteries, and regardless of brand. From the universal figure determined per kilogramme of batteries, INOBAT determines the size of the fee of the respective types of batteries, using the average weight of the batteries belonging to the same type (Jordi, 2002).

⁸¹ The wording used in the legislation. It also says that “Advertising for batteries and accumulators shall draw the attention of consumers to the obligatory return of used batteries and accumulators” (Subsection 32 para 2, Annex 4.10).

⁸² Prior to the introduction of the legislation, INOBAT recommended the retailers to make the recycling fee visible. Some retailers, such as Migro, did show the fee outside of the batteries. Upon the introduction of the legislation, they must state the fee separated from the price of a product (Jordi, 2002).

⁸³ STIBAT, who organises the Dutch EPR programme for batteries, are now exporting batteries for recycling to Batrec (STIBAT, 2002a).

⁸⁴ Even when there used to be two recycling companies, due to their over capacity, the companies were subsidised by the government. Thus “after the merger of those two, we have no market, and before we had no real market” (Jordi, 2002).

Upon the introduction of legislation, the fee level was raised from 3.2 CHF (2.02 euro) per kg to 4.8 CHF (3.02 euro) per kg. The increase in the cost of recycling from 4.75 CHF (2.99 euro) per kg to 5.4 CHF (3.40 euro) per kg, as well as additional tasks surrounding collection that should be covered by the advance disposal fee, is perceived to necessitate this steep increase (Jordi, 2002). The costs for recycling, which was used to be determined through negotiation between INOBAT and the recycling plant, is now determined by the government. Likewise, the size of the fee, which should be between 2 to 7 CHF (1.26-4.41 Euro) per kilogramme of batteries, is determined by law.

The cost is perceived to be very high, and has been criticised by the producers (Jordi, 2002). However, the fact that there is only one company in Switzerland, and that export of batteries for recycling is only allowed when the exporting countries have the standard as high as Switzerland made it inevitable for INOBAT to have Batrec recycle the batteries (Jordi, 2002; Langróva, 2002).⁸⁵ According to Mr. Jordi, compared to the 99% cleanness that can be achieved by Batrec, what can be achieved in other countries would be 90%.⁸⁶ As mentioned earlier, the only exception is nickel cadmium batteries. As the cost of recycling for nickel cadmium batteries done in France is cheaper than recycling of the rest of the batteries done at Batrec, INOBAT receives some refund from Batrec (Jordi, 2002).

INOBAT asks every company to inform them of the number of the respective types of batteries he/she puts on the market on monthly basis.⁸⁷ Based on this, the total amount of payment is calculated (Jordi, 2002).

As mentioned in Section 2.3.2, efforts have been made to coordinate the payment of the advance disposal fee for batteries and that for EEE. SWICO, one of the organisations managing the EPR programme for EEE, pays the global sum to INOBAT all the batteries included in the product (Bornand, 2002; Jordi, 2002).

Information management

Aside from their reporting obligation to INOBAT (see footnote 87), producers are obliged to report to the government the quantities of the respective types of batteries put on the market annually. Recyclers also has to report to the government on annual basis, 1) the quantity of small nickel-cadmium rechargeable batteries (weighing less than 1 kg) that are recycled, stored or exported by them, and 2) the same for the rest of the batteries, whose end-of-life management is financed by the mandatory advance disposal fees.

Section 3 of the Swiss legislation on batteries, entitled information, allocate various informative responsibility to the producers. The legislation mandates labelling of the name of the brand, and for batteries that contain heavy metals more than the level determined by the law⁸⁸, information on the heavy metal content and the way of its disposal should be

⁸⁵ As Mr. Jordi put it, "That is a political dimension. That was the first time that people did this, and it is clear that it costs very much..... the canton and the government paid for that, so we can say, we pay that so that the plant does not go bankrupt."

⁸⁶ Mr. Jordi mentioned that the cost for recycling is said to be only 1CHF (0.63 Euro) per kilogramme if the achievement of cleanness would be 90%.

⁸⁷ In fact, the duty for producers to inform the organization running the system, in this case INOBAT, of the quantities of the respective types of batteries is stipulated in the legislation.

⁸⁸ The batteries containing more than 0.025% of cadmium by weight, or 0.4% of lead by weight, or more than 25mg of mercury per cell. The types of batteries whose heavy metal content must be marked are the same as the one given by

available on the products or their packages. In the case when batteries are fixed in products, information should be included in the instruction for use of products.

2.5.3 Monitoring and enforcement

As mentioned earlier, the problem with free riders was the starting point of introducing the legislation. According to Mr. Jordi, introducing a mandatory system did improve the situation, although there is more to be done. INOBAT is aware of the producers who are selling big batteries. The difficulty has been to capture the importers of products which contain batteries (e.g. EEE, toys). Notification from the competing producers often helps identify the free riders.

With regard to export of nickel cadmium batteries, there is a tracking system that makes it possible to trace the destination, their recycling activities, and the result of recycling.

In the case when the retailers do not participate in the INOBAT system, it is questionable whether and how the informative responsibility given to them is enforced.

2.5.4 Other material related restriction

Just as the Dutch legislation, the Swiss law prohibits the import of alkali-manganese batteries containing more than 0.025% of mercury by weight, with the exception of those that are used in extreme conditions, where use of mercury up to 0.05% is allowed, and button cells. It also prohibits the import of carbon-zinc batteries that contain more than 0.01% of mercury, or 0.015% of cadmium by weight.

Section 5 of the legislation introduces the phase out of small nickel-cadmium rechargeable batteries. Namely, from 2004, cadmium content within small nickel-cadmium batteries in household waste shall not exceed 3000 kg per year. The law stipulates that if this cannot be achieved, a mandatory deposit-refund system could be introduced.

the Dutch legislation, except for the alkaline batteries that contain more than 0.025% of mercury by weight. See footnote 71, as well as Section 2.5.4.

3. Comparative analysis of the programmes: individual versus collective responsibility

Based on the investigation of the implementation mechanisms of the five EPR programmes found in the previous section, this section discusses the advantages and challenges for producers to implement their tasks in a collective and/or individual manner. Just as in the previous section, recognising the different activities that constitute implementation of EPR programmes, separate analysis is made for the three activities: *collection*, *recycling* and *monitoring and enforcement*. Likewise, the responsibility for collection and recycling are looked at from three angles: *physical*, *financial* and *informative*.

The analysis focuses on the roles of the producers and the implementation of such roles in the programmes. Thus discussion on the roles of the other actors (e.g. central and local government, retailers, recyclers) is limited to the extent that is relevant to the individual and/or collective implementation of the roles of producers.

As mentioned earlier, what is meant by the terms “individual responsibility” and “collective responsibility” varies. The analysis of this section is based on the understanding that a producer has an *individual responsibility* when he/she takes responsibility for the end-of-life management of his/her own products. When producers of the same product group together fulfil their responsibility for end-of-life management of their products regardless of the brand, these producers have *collective responsibility*. Using this categorisation, the paper attempts to clarify the differences among various systems in incorporating individual responsibility, and/or collective responsibility.

Although the analysis is mainly based on the five programmes examined in this study, reference to other programmes and initiatives are made wherever appropriate to illustrate an argument.

3.1 Collection

3.1.1 Physical responsibility

Although the implementation mechanism for collection varies among the five EPR programmes investigated, it generally consists of three steps: 1) collection from consumers, 2) sorting of the collected products, and 3) transportation of the collected products to the recycling plants.

1. Collection from consumers

In all the programmes studied, actors other than producers are involved in the collection from consumers, such as retailers, municipalities, collection points, schools and campsites. This is generally the case when the discarded products are collected from *private households*. Actors involved in collection do not distinguish between brands when they collect.

The involvement of the producers in this activity is limited, although in the case of the two programmes for batteries and the Swiss programme for EEE, producers are actively engaged in encouraging these actors to participate in collection, establishment of collection points, providing collection bins, and the like. Under the two programmes for batteries, producers

are by law responsible for collection (Switzerland) or for achievement of collection target (the Netherlands). In all the three cases, it is the body that carry out the task of the producers on behalf of producers collectively (producer responsibility organisations: PROs) that are involved (*collective physical responsibility*).

On the other hand, a significant flow of used products, the collection of which from consumers is organised by *individual producers*, was also identified (*individual physical responsibility*). Examples include producers of ICT equipment in Switzerland and Japan, and Battrex, an importer of special batteries in the Netherlands. The consumers of these products are typically *businesses*.

Organising the collection of used products from scattered sources (i.e. private households) is perceived to be one of the most challenging tasks, especially when the size of the products are small (e.g. batteries, small EEE). It would be both economically and environmentally inefficient when all the individual producers start to collect their own products directly from households. It should be noted, however, that as a way of collecting personal computers (PCs) from households, one of the producers (IBM) started to accept used products sent to them by postal service (IBM Canada, 2001). The same mechanism has been considered as one of the collection paths in the upcoming Japanese programme for PCs from household.⁸⁹ Likewise, producers of nickel-cadmium batteries utilise postal service for direct collection from consumers (Fishbein, 1997).⁹⁰

2. Sorting of the collected products

In the Swiss EPR programme for batteries, all the collected batteries go to one recycling plant without sorting. In the rest of the EPR programmes, before the products collected from *private households* are sent to the recycling plants, they are sorted in one way or another. Sorting can be done between the product categories, and/or between brands.

Sorting between the product categories is done in, for example, the Dutch EPR programme for EEE and batteries. In both cases, sorting is coordinated by the respective PROs (*collective physical responsibility*).

Under the Japanese EPR programmes for four large appliances, the prominent producers formed two groups. The two groups established separate collection points. Thus the discarded products are sorted into two depending on the brands and are sent to the respective regional aggregation stations.

In the Swiss EPR programme for EEE, sorting of products of specific brands has been done upon request of these brands. The sorted products are sent back to producers, instead of being sent to recyclers (*individual physical responsibility*).

A number of interviewees that are involved in running the collective system mentioned the difficulty of sorting the products depending on the brands. The challenges often mentioned included the space and the cost. If all the producers request sorting in accordance to the brand at the regional aggregation points/collection centres/retailers, it is not difficult to

⁸⁹ IBM Canada accepts all the computers regardless of brand. Under the Japanese system, if a consumer chooses to use postal service, he/she has to send the product to the manufacturer of the product (brand specific).

⁹⁰ Possible additional environmental impacts from increased use of packaging materials arisen from postal service should be considered, however.

foresee the limitation in space. However, the examples in Switzerland suggest that sorting of a limited type of products at the retailers/collection points should be possible, at least in a small scale. Alternatively, producers can set up a separate collection site, as found in the case of producers in Japan.

However, when there is only one collective body for a certain product group in the country, the strong negotiation power of the body often makes it difficult for producers to establish an alternative solution. For example, a company that provides services related to the collection and recycling of used ICT in Sweden⁹¹, wishing to establish an alternative collection system, requested consultations with municipalities.⁹² However, the consultations were refused, on the ground that a PRO that represents the majority of EEE producers already established collection depots. After 9 months of strenuous communication efforts to the municipalities, as well as consultation with the national environmental agency, some of the municipalities finally started to respond, and came to an agreement with the company. The company now established 100 collection points where the products of their members can be returned separate from the rest of the WEEE (Gulvik, 2003).

With regard to the products from *businesses*, the collection of which was organised by *individual producers*, at least the product category would be the same. The author has no information on what happens when the collected products consists of different brands.

3. Transportation to the recycling plant

In all the programmes studied, once the used products are collected from *private households*, producers are responsible for the arrangement of all (both of the programmes for batteries, programme for EEE in Switzerland) or part (from the regional aggregation stations in programme for four large appliances in Japan and the Netherlands) of the transportation. Except for the Japanese system, the respective PROs coordinate the logistics of the transportation (*collective physical responsibility*). In the case of Japan, the respective groups contract with the regional aggregation stations, who coordinate the transportation on their behalf. Products of different brands within the same group are sent together (*collective physical responsibility*).

In the case of products from *businesses* for which collection is directly coordinated by the individual producers, the transportation to the recycling plant is naturally coordinated by the respective producers (*individual physical responsibility*). In fact, products directly collected by the producers may not necessarily be taken to the recyclers (e.g. Swiss programme for EEE). The whole equipment and/or components can be refurbished and resold without reaching the recycling plants.

Unless the products are sorted, it is practically impossible for individual producers to take care of the transportation of their own products. Thus it is a natural consequence that the transportation is handled collectively. Transportation becomes economically and

⁹¹ Reflecting the frustration of some of the manufacturers of ICT equipment in Norway with regard to the solution proposed by their industry association, a company called Euroenvironment was established. When the EPR programme for EEE in Sweden was introduced, the company expanded its business to Sweden. Having producers of ICT equipment as their main members, the company, in essence, tries to provide services related to the collection and recycling of used products, in a manner that reflects the environmental objectives of the respective members (Gulvik, 2003).

⁹² The Swedish EPR legislation for EEE requires producers to consult with local governments when setting up a collection system.

environmentally efficient if a certain amount of volume is transported together. The fact that businesses often discard a relatively large number of products at one time (e.g. 50 PCs from the whole floor instead of 1 PC from a household) facilitates collection by individual producers. However, as long as the discarded products are sorted, arrangement can be made to make the transportation of these products economically viable and environmentally efficient. For example, when the volume of products is not very large, it can be combined with the transportation of other products.

3.1.2 Financial responsibility

Allocation of financial responsibility with regard to the collection more or less corresponds to the allocation of physical responsibility of the producers. Exceptions are the compensation to the actors involved in collection, either in monetary term (e.g. to retailers in the Dutch programme for white and brown goods), or in provision of awards (e.g. to schools in the Dutch programme for batteries).

In terms of individual versus collective responsibility, most of the activities that are managed collectively are financed collectively (*collective financial responsibility*), while financing of the activities of individual producers (e.g. sorting of products of specific brands in the Swiss system for EEE, collection and transportation of ICT equipment from businesses) is financed individually (*individual financial responsibility*). In the case of Japanese programme for four large appliances, one of the groups determines the unit price for transportation for the respective products, and the individual producers finance the transportation cost in proportion to the number of products transported. The cost for transportation is not differentiated between brands.

Regarding the relation between physical and financial responsibility for collection, the current system seems to be reasonable. As the costs of collection do not differ much between the products of similar type, when the products are collected together, differentiation of the collection cost per unit of products between brands is not necessary.

3.1.3 Informative responsibility

Regardless of their involvement in collection from consumers and of their legal obligation, producers are involved in providing information to the consumers of the system. The PROs for the Dutch system for white and brown goods are active in providing information although they are not legally responsible, and so is the Swiss system for EEE, though in lesser extent. In the case of two programmes for batteries, significant amount of resources is put on the public campaigns. Aside from the homepage of the industry association, the author could not find examples of involvement of individual producers in providing information about the EPR programme to the consumers.

Regarding the result of their collection activities, when the collection is done collectively, the PROs gather the information and report to the government, as well as to the general public. Individual producers of large home appliances in Japan announce the result of their activities (collection and recycling) in their homepage every year. The industry association for large home appliances also aggregates and announces the information on collection on monthly basis. In the case of producers of ICT and office equipment in Switzerland, their PRO, SWICO, provide information on the activities of both producers under the collective system and producers having their own systems.

Providing information about the system through collective bodies, such as PROs or industry association, is rather effective, as the message to the *private households* is, in principle, not different between the individual producers. Provision of information by individual producers (e.g. on the packaging of the products) would be helpful, and, when introducing an individual collection system, is certainly necessary.

With regard to the result, the actors who actually handle the tasks would most likely have good access to information about their activity. When the PROs are the primary actors to contact them, as is the case in collective systems, it is practical and efficient that the PRO provides information on its activities on behalf of producers. Even when producers fulfil their responsibility in an individual manner, the collective bodies can play a role as an intermediate body to aggregate information. This may also help establish a standard for the definition of certain type of data, e.g. calculation of collection rate.

3.2 Recycling

3.2.1 Physical responsibility

In the case of the four European systems, discarded products that are transported to the recyclers collectively are not sorted between brands, and are recycled together (*collective physical responsibility*). The distinction of the brand name and weighing of the equipment was done in the case of ICT equipment under the Dutch collective system, although the recycling itself is done altogether. The PROs do not allow the recyclers to reuse and refurbish equipment that are brought to them via the collective systems.

When the collection from the consumers is organised by individual producers and discarded products are brought to the recyclers directly (e.g. part of ICT and office equipment in Switzerland, Battrex in the Netherlands), this stream of product is recycled separately from the others (*individual physical responsibility*). Some of the recyclers provide refurbishment service as well, thus reuse of equipment and/or components can be done at the recyclers (Zwart, 2003). As found in the case of Jura, the manufacturer of coffee makers in Switzerland, refurbishment can be also done without involving recyclers.

In short, unless products are collected separately from the consumers, recycling is currently done collectively.

Under the Japanese system for home appliances, prominent individual producers established and run at least one recycling plant on their own (*individual physical responsibility*). At the moment, once the equipment arrives in the recycling plant, refurbishment/reuse of the equipment/components is not done. The products that are not recycled in their own plants are recycled at the plants managed by other producers belonging to the same group (as discussed earlier, the producers formed two groups), or in some existing recycling plants. Utilising the manifest (tracking card with receipt), the distinction of the brand names, models and weight is made prior to recycling the products.

Two positive influences are perceived when individual producers themselves run at least one recycling plant, as is the case in Japan for EEE (*individual physical responsibility*). One is to improve design for end-of-life management. Communication between the upstream and the downstream have been enhanced through measures such as provision of a lecture by personnel in the recycling plants to the designers, regular meetings, communication with Intranet, and the like (Tojo, 2001). In some cases, designers are given an opportunity to

dismantle the products themselves (Tojo, 2001). Moreover, with regard to products that are manufactured now, some companies started to make the production site finance the cost of recycling that cannot be covered by the fee (Takahashi, 2003).

The other is the competition among the producers with regard to the advancement of recycling technologies (Takahashi, 2003). At the moment, the fee that consumers pay at the time of disposal barely covers the actual cost for recycling, such as running the facility, paying for the recycled materials that cannot be recycled, and the like. The fee must also cover the cost of transportation from the aggregation points. As the size of the fee is already rather high, it is difficult to raise it further. Improvement of recycling technology is regarded as a means of differentiation, and a measure to cut the costs (Takahashi, 2003).

Establishment and management of recycling plants by producers does not necessarily mean the replacement of existing recycling plants. On the contrary, when highly-skilled recyclers exist in the market already, the expertise of these existing recyclers can be utilised. In fact, prior to the implementation of the legislation, a handful of Japanese manufacturers conduct a number of recycling experiments with some of the existing recyclers (Sony, 1999; Matsushita, 1999). Some of these recyclers became their official recyclers as well.

However, making the recycling activity economically viable necessitates a certain volume of products. In fact, one of the primary concerns of the Japanese producers prior to the implementation of the legislation was whether enough products are collected to make their recycling activities economically viable. When the size of the producers differs substantially, the relative burden that the respective producers would have may give disadvantages to small and medium-sized producers. Also, the possibility for importers to communicate with the recyclers would be limited when they are importers. Thus, having individual producers run their own recycling plants would not always be a viable solution.

Another form of *individual physical responsibility* would be for the individual producers to make direct contract with the recyclers to recycle their own products, as found in the case of ICT equipment in Switzerland and EEE in the Netherlands. As seen in the example in the Netherlands, recyclers and producers have a possibility of communicating rather intensively in the process of developing a contract. Having proto-types as well as rejected products recycled with close communication with a recycler would give producers excellent opportunities to examine the new models from the angles of reusability, ease of dismantlement, recyclability of the materials, value of recycled materials, and the like.

Implementation of physical responsibility in a collective manner has the advantage of making recycling economically viable, especially when the flow of products from individual producers is small. It also has the advantage of covering all the products, including historical and orphaned products. However, when only one collective body exists in a country, and if it makes contract with only one or limited number of recyclers, the rest of the recyclers may go out of business. On one hand, if the collective body is committed to strive for higher recycling quality, its involvement contributes to the enhancement of the level of the overall recycling industry (see Section 3.3). On the other hand, when only one or few recyclers exist in the market, it creates a monopolistic situation, which would hinder the technological development of the recycling industry in the long run. As found in the Swiss system for batteries, having only a limited number of recyclers makes recycling more expensive.

Sorting at the recycling plant is technically feasible, but it would require extra manpower, thus making it more expensive (Zwart, 2003). From the environmental point of view, usefulness of sorting would be limited unless the producers of the products have the willingness and possibility of learning from the recyclers, either through communication or through the invoice. The usefulness would be even more limited when producers already establish a good communication channel with recyclers with regard to their new products, or when the producers are small importers who have little market share in the country.

As mentioned earlier, under the Japanese programme for large home appliances, the manifest system allows the manufacturers to keep record of the brand and models treated in the respective recycling plants. This would, if they wish, make it possible to calculate the exact recycling cost for individual products (Takahashi, 2002). In the future, it may be possible to establish a system where the information related to design for end-of-life management (e.g. material properties, recyclability) of all the new products are registered and transferred to the recycling plants. By just checking the model of products, costs for recycling could be calculated. This may be one way of having a collective physical system, while having an individual financial system. Producers may be able to have a standardised system to identify the products that contain/do not contain certain types of materials, as has been done by the battery producers to distinguish mercury-free batteries from the rest.

Finding usage of some of the recycled materials, such as glass and plastics are problems identified in all the three programmes for EEE. The limitation in providing constant supply of certain recycled materials is one of the identified reasons that hinder the development of the market for the recycled materials. As done in the case of cars in Sweden and packaging in Norway, PROs could play a role in cultivating the demand for recycled materials (Kim, 2002; Lee, 2002).

3.2.2 Financial responsibility

In the two programmes for batteries, all the physical management and information management that is conducted by the respective PROs are financed by advance disposal fees. The fees are visible to consumers in Switzerland, and can be visible or invisible in the Netherlands. In both of the programmes, the size of the fee is not differentiated between brands, nor is it differentiated depending on the property of the batteries, with the exception of button cells (*collective financial responsibility*). The unit fee is determined based on the weight of the battery in question. Under the Swiss programme for batteries, it is the law that determines the size of the fee. The fee is managed as a pension (pay-as-you-go) system. Exception is Battrex in the Netherlands, who collect their batteries separately from the rest of the batteries (*individual financial responsibility*).

The Dutch programme for white and brown goods and the Swiss programme for EEE implemented by the respective PROs are financed by visible, advance disposal fee. The size of the fee is differentiated between the product categories, but not between brands, nor between the properties of the products (*collective financial responsibility*). Cross financing between different types of products are found. The fee is managed as a pension system.

The Dutch programme for ICT and office equipment, on the other hand, used to have a system where individual producers pay in proportion to the weight of the products currently recycled. Although the fee did not necessarily reflect the degree of design for end-of-life management, the producers did pay for the recycling of their own products, and had an element of *individual financial responsibility*. The programme now introduced a new system,

where individual producers pay in proportion to the weight of products they currently put on the market. The fee has been invisible to consumers. The fee is collected from individual producers to cover the actual cost of recycling, thus no reserve has been made as in the case of pension system.

Some of the producers of ICT and office equipment in Switzerland, who handle collection on their own and have direct contract with recyclers, pay the same advance disposal fee as the rest of the producers of ICT and office equipment in Switzerland. However, instead of transferring the fee to the common account, they keep the fee in their own account, and pay for recycling from their account. The fee in the account can play the role of a guarantee, while the actual recycling cost would depend on the contracts that the respective producers make directly with the recyclers (*individual financial responsibility*).

The Japanese EPR programme for four large appliances has an end-user-pay system. The size of the fee is determined by the *individual producers*, thus also has an element of *individual financial responsibility*.

Aside from the Dutch programme for ICT and office equipment, none of the system whose physical implementation is done collectively has an individual element in their financial mechanism. The simplicity and low cost are two of the assets of a collective financial system that a number of the interviewees pointed out. As the system does not make distinction between brands, it covers both orphaned and historical products. However, the system has the drawback of not being able to reward the producers of the products whose environmental impacts surrounding end-of-life management is lower than their competitors. In fact, there was a strong conviction among the people that runs and/or supports a collective system that EPR programme does not promote design change (Veerman, 2003; Bornand, 2003; Vonkeman 2003; Hediger, 2003; Huisinga, 2003). The fund is managed as a pension system, and some of the systems (e.g. Dutch programme for white and brown goods, and for batteries) experienced an accumulation of a large reserve. Moreover, when there is only one collective body for a certain product group in the country, the body's monopolistic behaviour becomes a concern. As discussed in Section 3.1.1, it often makes it difficult for individual firms to establish an alternative system. Additionally, the claim of a collective solution being less expensive than an individual solution may not always be well grounded, especially when there is only one solution in a country. For example, with the emergence of an alternative solution, the industry association for ICT equipment in Norway cut the proposed budget of implementing an EPR programme by 90% (Gulvik, 2003).

Individual financial responsibility is perceived to have the advantage of providing incentives to the producers to strive for design change by differentiating the recycling fee depending on the actual recycling cost of the respective products. However, complexity of the products in terms of structure and material use, durability and uncertainty regarding the future recycling costs and its technology, complexity of managing the fund, non-coverage of orphan products, lack of future guarantee, minute difference in the "greenness of the products", and relatively small share of recycling cost within the entire cost covered by the fee, are some of common challenges often mentioned as hindrance to its implementation.

It should be noted that in the study of the implementation of 5 EPR programmes, different types of financial mechanism, which has the element of individual financial responsibility, are identified. The financial mechanism of the respective fee systems varies in terms of: who initially pays for recycling, how is the recycling cost determined, how is it financed, what types of physical implementation mechanism they have, and the like. Among them, the

author attempts to see how the challenges mentioned above are dealt with in the 3 programmes: the Dutch programme for ICT and office equipment until 2002, part of the Swiss programme for ICT and office equipment, and the Japanese programme for large home appliances. The three were chosen as the author has a clear picture of how the financial mechanism of the three works. Meanwhile, the author also tried to identify other advantages or disadvantages of the respective systems.

Until 2002, in the Dutch programme for ICT and office equipment, the producers are paying the recycling cost based on the weight of the products currently coming back. Making it weight-based make the calculation of the recycling cost simple and clear. Payment for the products currently coming back makes the consideration of future uncertainty unnecessary. There was no fund building. Orphan products and products of free riders turned out to be a serious problem, much more than the producers originally had thought. Having the existing actors pay in proportion to the discarded waste/new products put on the market was the solution, along with a vigorous efforts to identify free riders and make them participate in the system. As all the existing members participating in the system finances the recycling cost of products currently coming back, it was unnecessary to keep a guarantee. However, the system faced challenges such as unpredictability of the recycling costs, and unfair share of burden between the producers that had large market share in the past and those who have large market share now. Moreover, the weight of the products does not necessarily represent the environmental profile of the product.⁹³ The fact that the recycling cost constitutes only half of the total cost makes the producers reluctant to reflect “greenness” of the products on the size of the fee.

Some participants of the Swiss programme for ICT and office equipment have been keeping the fee that are collected from the consumers in their own account. As they negotiate with the recyclers directly, it is most likely that the degree of design for end-of-life management is reflected in the recycling cost. As the fee currently collected is used for the products currently recycled, future uncertainty does not have to be considered. Individual producers have their own account, and the incoming fee is used to finance the current recycling cost, thus management of the fund is not complex. Difference in the design for end-of-life management between the product produced by the account holder and his/her competitors can be looked at by how much more does he/she have to add to the account to finance recycling, or how much surplus remains in the account. In sum, this system contains elements that provide signals to the producers the degree of end-of-life management of their products, while being rather simple. Although the fee collected is not linked to the recycling of the product with which the fee is paid, the fact that the producers can grasp the recycling costs would help producers make a stronger linkage between upstream and downstream. It still has the problem with orphaned products, which should be covered by other means. As the fee currently collected is directed to the recycling of the products currently returned, there is no guarantee for recycling in case the producers disappear. At present, the collective system running in parallel takes care of orphaned products.

Under the Japanese programme for large home appliances, producers announce the recycling fee for products consumers wish to discard. All the prominent producers announced an identical fee, which are not calculated for different product models. However, just as the Swiss system, the collected fee is set aside by the individual producers, and these producers pay for recycling. The author does not have information on whether and how the respective

⁹³ As the product group was limited to ICT and office equipment, and a distinction between computers, mobile phones and copying machines was made, the weight-base fee may have reflected the actual recycling cost more or less.

producers calculate the recycling costs of individual products. This, together with the actual management of recycling plants, helps them establish a good communication channel between the upstream and the downstream. Using the end-user-pay systems eliminate the problem of uncertainty caused by the durability of the products and coverage of orphan products and products of free-riders. End-user pay system has a risk of inviting illegal dumping/putting the used products in municipal waste, however.

Table 3-1 summarises the characteristics of the three systems where producers bear individual financial responsibility, as discussed above, as well as a system incorporating collective financial responsibility. For the latter, the Dutch programme for white and brown goods is used as an example.

Table 3-1: Summary of the characteristics of three systems incorporating individual financial responsibility, and one system incorporating collective financial responsibility

	Dutch programme for ICT and office equipment (until 2002)	Swiss programme for ICT and office equipment (separate account)	Japanese programme for four large home appliances	Dutch programme for white and brown goods
Who initially pays for recycling?	Individual producers	Individual producers	Individual producers	PRO, on behalf of producers
How is it financed?	Invisible fees	Visible advance disposal fees	End-user pays: recycling fees announced by individual producers	Visible advance disposal fees
Does the recycling cost paid by the individual producers reflect the degree of design for end-of-life management?	Not necessary, as the payment was based on weight of the products currently recycled (see footnote 93)	Yes	Cannot be judged from the information available	No
Do the fees consumers pay reflect the degree of design for end-of-life management?	Depends on how the producers internalise the cost of recycling	No	No	No
Account management	Separate account not mandated (managed within the company)	Individual	Separate account not mandated (managed within the company)	Collective accounts managed by the PRO
Coverage of recycling cost (current and/or future)	Current	Current	Current	Current and future
How is the uncertainty of future recycling dealt with?	Not necessary to consider	Not necessary to consider	Not necessary to consider	Reserve and adjustment of the size of the fee
Complexity of fund management	None, as there is no fund	Rather simple, as it is an individual account	None, as there is no fund	Accumulation of high reserve has been a concern
Coverage of orphan products	Yes: the existing producers share the cost in proportion to the amount of products recycled	None: currently by the collective system running in parallel	Yes: end-users	Yes
Future guarantee	Not necessary, as the existing producers cover the cost for products coming back now	None: under the current system, the collective system running in parallel will take care of the orphan products	Not necessary: end-users	Yes
Physical responsibility for recycling (collective or individual)	Collective	Individual	Individual	Collective
Other challenges	Unpredictability of the recycling costs, unfair share of burden between the producers that had large market share in the past and those who have large market share now		Concern on illegal dumping	The system is perceived not to promote design for end-of-life management Monopolistic behaviour

In all the three systems with individual financial responsibility examined here, the fees are designed to cover the cost for current recycling. It should be noted that in some of the EPR programmes incorporating individual financial responsibility, such as the one for cars in Sweden and Japan, the recycling fee currently collected is saved for the future recycling fee of the product, the purchase upon which the fee is paid. The key feature of the system is the

linkage between the recycling fee and the recyclability of the respective product models, which is perceived to facilitate design change. Some of the concerns raised on these systems include the non-coverage of historical products, complexity of managing the fund in the case when a common fund is established, lack of guarantee when individual producers set aside the future recycling costs, and difficulty of calculating future recycling costs. Regarding the historical products, the Swedish EPR programme for cars have an advance disposal fee system running in parallel for the old cars, while in Japan, the recycling fee will be charged for the old cars when a mandatory annual checking is conducted. Just as the Swiss and Japanese programme for EEE examined above, the difference between the actual recycling cost and the collected fee will be borne by the producers in both of the programmes for cars.

3.2.3 Informative responsibility

When the producers implement both physical and financial responsibility in a collective manner (e.g. the two programmes for batteries, the Dutch programme for white and brown goods, the Swiss programme for EEE), information regarding the recycling activities are also gathered and communicated collectively (*collective informative responsibility*). The PRO for the Dutch programme for ICT and office equipment also report the activities of its members on their behalf, although the role of the PRO is limited to coordination (*collective informative responsibility*).

Under the Swiss system, SWICO, the PRO for ICT and office equipment, also aggregate the information on the activities of the individual companies and present it together with the activities of the rest of their participants (who are under the collective system). In the case of the Japanese programme, individual producers announce the result of their activities in their homepage every year. The industry association for large home appliances also announce the aggregated result. As mentioned in Section 3.1.3, the collective body can play an important role in aggregating the information, present it, and make it comparable. It may become especially important in the systems where producers implement their responsibility in an individual manner.

3.3 Monitoring and enforcement

In all the EPR programmes studied, efforts have been made in areas such as 1) to secure quality of collection and recycling activities; 2) to monitor and control various types of illegal export and dumping; and 3) to identify free riders and make them participate in the system. In all the areas, the collective body, namely PROs and industry association, are playing an important role.

1. Secure quality of collection and recycling activities

In cases where physical and financial responsibility is implemented collectively, the PROs have been playing instrumental roles in securing the standard of the activities surrounding end-of-life management. The most significant can be the programme for EEE in Switzerland, where the two PROs set a more stringent standard than the government, and monitor the activities of recyclers on annual basis by a third party. They also keep track of where the recycled materials go, and how they are treated. Additionally, they check how the collection centres are run.

It should be noted, however, that leaving the responsibility for monitoring entirely to the collective body raises concern. Keeping the cost of recycling low is one of the mandates of

the PROs, which may conflict with quality of recycling. In some cases, such as the programme for EEE in the Netherlands, it is the industry that should make a proposal as to how to monitor their activities. Likewise, it is unclear how the recycling activities, as well as the recycled materials sold from the recycling plants, is monitored under the Japanese system. Even when a third party, such as an accounting firm, is involved in the verification process, the question still remains unless the issues to be verified are determined by bodies other than the PROs themselves (Zwart, 2003).

As mentioned, part of the producers of ICT and office equipment coordinate the collection and recycling activities themselves. One of the conditions these producers must meet is making contract with the recyclers that receive license from the PRO. In principle, the author finds the quality control to be an important role that the PRO can play. A similar approach is taken in the EPR programme for cars in Sweden. The Swedish car association select the recyclers that have sufficient recycling standard, and recommend their members to contract with these recyclers (Kim, 2002).

In the case of the Swiss programme for EEE, considering the stringent quality control that the PRO has, this would be very effective in keeping the quality of recycling high. Meanwhile, it would make it difficult for the recyclers that have the license from the government, but not from the PRO, to continue their business. It would also limit the choice of producers who may have different level of ambition with regard to environment. Without knowing the capacity of the government to monitor and enforce, however, it is difficult to judge the appropriateness of the choice of the PRO in restricting the possibility of their members to choose the recyclers.

2. Illegal export and dumping

In relation to the quality control, it is essential to monitor and prohibit illegal export, either as second hand products, or components/materials to be recycled. Illegal export threatens the environment and health of the people in the importing countries through recycling activities performed under lax environmental and health standard. Moreover, it would make it difficult for a domestic recycling industry who tries to keep to the high standard to compete. PROs can play a vital role in keeping track of the material flow, even after it goes out of their recyclers, as found in Switzerland. In fact, reporting on the recycling activities of some of the developing countries under mal conditions seemed to give the Swiss PRO even higher determination to make sure that the products of their members will not be found under such conditions.

An even more difficult task is the control of the discarded products that do not reach the system put up by the producers. For example, in Japan, taking advantage of the reluctance of consumers in paying a rather expensive disposal fee at the end of the product life, some business start to offer take back service free of charge or with very low price.⁹⁴ Some of them may go to second-hand shops and are used. However, some may be illegally dumped in the mountains, or are exported. Prior to the introduction of the EPR programme, some people ran a shadow business with such export or dumping. It had been feared that these people may start to come around private households to pick up product from them, as they no longer can get them from retailers or municipalities (Tojo, 1999). Aside from information campaign, the role of producers and PRO is limited in this area.

⁹⁴ During the stay of 2 months, the author found a notice, advertising the free take back several times in the mail box.

3. Free rider

The fact that legislation is enforced is certainly not enough to make all the relevant actors participate. Recognising the limitation of the capacity of the government, reporting by the fellow competitors (producers) is the first step commonly found to identify the free rider. After the identification, the enforcement (i.e. making the free rider participate in the system, unless he/she has its own collection and recycling system) is the role of government, as found in the Dutch EPR programme for EEE.

4. Conclusion

Examination of the five EPR programmes, as well as the comparative analysis of them, led the author to the following conclusions regarding the manner in which producers implement their responsibility, and its relation to design change, as well as the improvement of the overall environmental performance of the product system.

1. Co-existence of collective and individual physical responsibility

All the European programmes examined in the study have implemented collective systems, organised by the respective PROs on behalf of producers (*collective physical responsibility*). The respective collective systems take care of majority of the products coming back from private households. However, in parallel with the collective systems, end-of-life management for a substantial flow of products are organised by individual producers (*individual physical responsibility*). Most of the individual producers handle products discarded by businesses (e.g. ICT and office equipment in Switzerland, the Netherlands and Japan, batteries in the Netherlands), but a few producers who collect products discarded from private household (e.g. coffee makers and some large white goods in Switzerland) are also identified. These individual producers also aim to reuse and recycle the products and components that are taken back to them.

2. Physical and financial responsibility and collective and individual implementation

Under the current implementation, when discarded products are handled collectively (*collective physical responsibility*), no distinction between brands is made with regard to the size of the recycling fee for the respective product models (*collective financial responsibility*). An exception found from the cases was the Dutch programme for ICT and office equipment until 2002, where producers pay the recyclers in proportion to the weight of their own products that are recycled (*individual financial responsibility* under *collective physical* system).

When individual producers handle the end-of-life management of their own products (*individual physical responsibility*), they pay for the actual collection and recycling cost (*individual financial responsibility*). In some cases, the fees that consumers pay are not differentiated in accordance with the degree of design for end-of-life management (e.g. ICT and office equipment in Switzerland, large home appliances in Japan), and cover the recycling of the products that are discarded now. The extra cost that cannot be covered by the collected fee is supplemented by the producers. In other cases, producers try to estimate the future recycling costs of their own products and set up the fee accordingly (e.g. cars in Sweden and Japan).

3. Advantages and disadvantages of collective and individual responsibility

Stated advantages of the *collective* systems investigated in the study include its simplicity and low cost of implementation, as well as coverage of historical and orphaned products. Meanwhile, collective implementation does not include a mechanism that provides producers with incentives to strive for design-change. Monopolistic behaviour of PROs has made it difficult for individual producers to establish alternative systems for collection and recycling. Considering the current situation where the majority of discarded products from private households are handled collectively, the fact that PROs make contract with a limited number

of recyclers may lead to the creation of monopoly in the recycling market. This would most likely make recycling more expensive, as found in the Swiss programme for batteries.

Programmes based on the *individual responsibility* have the advantage of linking the design and end-of-life management of the products. Financial mechanisms employed in the respective programmes incorporating individual financial responsibility vary. A close examination of the respective systems reveals that although each system has different drawbacks, a number of challenges perceived to face individual implementation either do not exist, or are, at least, solved in the actual implementation.

4. Roles of the collective bodies

There are a number of important roles that collective bodies, such as PROs and industry association, have been playing/have potentials to play. These roles include establishment of collection points that are convenient for consumers, gathering information from individual producers in a consistent manner, provision of information about the system as well as status of implementation to various actors, including governments, consumers, and producers themselves, securing the quality of collection and recycling activities, cooperation with the government in making free riders participate, and the like.

5. Possible paths to implement individual responsibility: necessity of separate collection/sorting and development of identification system

In light of lack of marking system for the products produced in the past, it is not possible for the recyclers to distinguish the degree of design for end-of-life management until the products are actually dismantled. This makes it very difficult to handle the product collectively, while having producers pay the actual recycling costs of their own products (combination of *collective physical responsibility* and *individual financial responsibility*).

For the products produced in the past, in order for the individual producers to get a signal regarding design for end-of-life management from the recyclers, it is necessary to separate their own products from the rest of the waste at one point. As has been done, products from businesses could be collected directly from the consumers. Use of different means of transportation, such as postal service, can also be considered. The potential of establishment of separate collection points, as well as sorting at the aggregation points can be further explored. However, usefulness of sorting from the environmental point of view may vary, depending on the willingness and possibility of the individual producers to learn from recyclers through communication and/or through invoice. For example, when the producers are small importers, the cost for sorting and making contracting with recyclers themselves may outweigh the benefit of learning from recyclers, especially when there is a remote likelihood for the designer of the product to get the information about their product design from the recyclers, or to see the recycling costs themselves.

For the products produced in the future, an establishment of a system where the information related to design for end-of-life management (e.g. material properties, recyclability) of all the new products are registered and transferred to the recycling plants can be considered. Industry-wide standard can be developed with regard to the containment of certain materials, as has been done by the battery producers to distinguish mercury-free batteries from the rest.

Making the shift mentioned above may take some time, and it would be difficult to move all the industry to this direction at the same time. However, such movement could be triggered

by a group of producers who have the willingness to allocate resources to develop an identification system mentioned above. They could select a few recyclers who could utilise the new system. When the number of the producers participating in this initiative reaches a critical mass, the rest of the producers, as well as recyclers, may start to adopt the system. Some producers may start to develop an alternative system, which would contribute to the development of better systems.

Making recycling activities economically viable and environmentally efficient necessitates a certain volume of products. Even when more producers start to implement their responsibilities individually, some flow of products (e.g. products from small importers, small products such as batteries) would most likely be handled better by collective bodies than individual producers.

6. Future research

While doing the research, the author identified the existence of a handful of cases where individual producers handle the collection and recycling of their products themselves. In order to explore potentials of implementing individual responsibility and make such potential visible, further research should be conducted to explore more cases where producers implement their responsibility individually, and examine these examples in depth. Learning from recyclers who have contract with individual producers may be one way of identifying such cases.

Moreover, the author noticed that various institutional and market factors, often qualitative rather than quantitative in nature, have affected whether the respective producers implement their responsibility collectively or individually. These factors include, *inter alia*, attitude of government and its policy goals, negotiation power of the producers within the product group, changes in the market share, characteristics of products and product systems (e.g. distribution paths, customers, duration), attitude of the collective bodies, and the ambition of the individual producers as well as the industry as a whole with regard to design for end-of-life management. Further research on the implication of these factors to the choice of individual versus responsibility would be valuable when considering the potentials for implementing individual responsibility.

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- Producer Responsibility for Electrical and Electronic Products Ordinance, 6 April 2000 (SFS 2000:208), Sweden.
- Regulations regarding Scrapped Electrical and Electronic Products, 16 March 1998, Norway.

Tokutei Kateiyō Kiki Saishōhinka Hō [Specified Home Appliance Recycling Law, in Japanese]. (1998, No. 97), Japan.

Appendix: List of interviewees, time and location

Japan

Hosoda, Eiji. Professor of Economics. Keio University. 7 January 2003. 16:00-17:00. Keio University. Tokyo.

Saita, Masayuki. Environmental Product Manager, Environment Management Division. NEC Corporation. 26 December 2002. 10:00-11:30. Headquarter, NEC Corporation. Tokyo.

Seki, Toshinori. Environment Management Division. NEC Corporation. 26 December 2002. 10:00-11:30. Headquarter, NEC Corporation. Tokyo.

Takada, Environment Management Division. NEC Corporation. 26 December 2002. 10:00-11:30. Headquarter, NEC Corporation. Tokyo.

Takahashi, Tetsuya. Strategic Planning, Corporate Environmental Management Department. Mitsubishi Electric Corporation. 22 April 2003, 23-24 May 2003. Interview via e-mail. E-mail to Naoko Tojo. "Recycling law in Sweden" [23 May 2003]. "About Specified Home Appliance Recycling Law" [24 May 2003]. "About the fee setting in the Specified Home Appliance Recycling Law" [24 May 2003].

Netherlands

Broers, Sander. Operational manager. STIBAT 8 April 2003. 14:00-16:00. STIBAT. Zoetermeer.

Goorhuis, Maarten. Senior Sector Manager. NVRD. 9 April 2003. 16:00-17:00. NVRD. Arnhem.

Huizinga, Annetje. ICT Milieu. 11 April 2003. 14:30-16:00. ICT Milieu. Woeden.

Van Kalkerren, Bart. Director. Recydur BV. 28 May 2003. 14:50-15:45. Interview via telephone. E-mail to Naoko Tojo. "Re: thank you: summary of the interview" [28 May 2003]

Veenstra, Sjoerd. Raad Nederlandse detailhandel (the Dutch retail organisation). 31 March 2003. 15:00-16:00. Interview via telephone.

Veerman, Kees. Deputy Commissioner. VROM (Ministry of Housing, Spatial Planning and the Environment). 10-11 December 2002, at OECD Workshop on Extended Producer Responsibility. Economics of EPR. Tokyo International Forum. Tokyo. 9 April 2003 10:00-12:30. VROM. Den Haag. E-mail to Naoko Tojo. "Re: thank you: summary of the interview and additional questions" [05 June 2003]

Vershoor, Peter. Roteb (Waste Management Department of the City of Rotterdam). 10 April 2003. 14:00-17:00. roteb. Rotterdam.

Vonkeman, Bert. managing director. NVMP. 8 April 2003. 10:00-12:00. NVMP. Zoetermeer.

Zwart, Johan. Group Director. MIREC. 11 April 2003. 10:00-12:00. MIREC. Eindhoven.

Switzerland

Ardiot, Amélie. Waste Management Division. Swiss Agency for the Environment, Forests and Landscape (SAEFL). 27 March 2002. 13:30-15:00. SAEFL. Bern.

Bornand, Peter. Chairman. SWICO (Swiss Association for Information, Communication and Organisational Technology) Environmental Commission. 28 March 2002. 16:00-18:00. SWICO. Zürich. E-mail to Naoko Tojo. "Re: Summary of your interview, additional questions" [09 June 2003].

Buser, Hansjörg. Waste Management Division. SAEFL. 27 March 2002. 10:30-11:30. SAEFL. Bern.

Frey, Beat. Industrial Waste Section. SAEFL. 27 March 2002. 15:00-16:30. SAEFL. Bern.

Hediger, Robert. S.EN.S (Foundation for Disposal in Switzerland). 28 March 2002. 10:00-12:00. S.EN.S. Zürich.

Jordi, Hanspeter. INOBAT Secretariat. Ernst & Young. 27 March. 08:45-10:00. Ernst & Young. Bern.

Rizzotti, Natalie. Student Intern at the SAEFL. 12 August 2002. 10:00-12:00. Discussion with Naoko Tojo. IIIIEE. Lund.

Tellenbach, Mathias. Head. Industrial Waste Section. SAEFL. 27 March 2002. 15:30-16:00. SAEFL. Bern.

Sweden

Gulvik, Hans Christian. CEO. Euroenvironment AB. 11 June 2003. 10:45-11:30. Interview via telephone.