

# **Waste management policies and policy instruments in Europe**

An overview

**Naoko Tojo**

**International Institute for Industrial Environmental Economics  
at Lund University, Sweden**

**Alexander Neubauer and Ingo Bräuer**

**Ecologic - Institute for International and European  
Environmental Policy, Germany**

Report written as part of project HOLIWAST:  
Holistic Assessment of Waste Management Technologies

© You may use the contents of the IIIIEE publications for informational purposes only. You may not copy, lend, hire, transmit or redistribute these materials for commercial purposes or for compensation of any kind without written permission from IIIIEE. When using this material you must include the following copyright notice for the authors to the respective parts of the report:: 'Copyright © Naoko Tojo, IIIIEE, Lund University and Alexander Neubauer and Ingo Bräuer. Ecologic - Institute for International and European Environmental Policy, Germany'. All rights reserved' in any copy that you make in a clearly visible position. You may not modify the materials without the permission of the author.

Published in 2006 by IIIIEE, Lund University, P.O. Box 196, S-221 00 LUND, Sweden,  
Tel: +46 – 46 222 02 00, Fax: +46 – 46 222 02 10, e-mail: [iiiiee@iiiiee.lu.se](mailto:iiiiee@iiiiee.lu.se).

ISSN 1650-1675



PRIORITY [policy-oriented research priority SSP/8.1]

SPECIFIC TARGETED RESEARCH OR INNOVATION PROJECT

## **HOLIWAST**

**Holistic assessment of waste management technologies.**

Contract number: 006509

Deliverable n° 1-1

Title: Waste Management Policy and Policy Instruments in Europe – an overview

Start date of project: 1<sup>st</sup> August 2005

Duration: 2 years

Organisation name of lead contractor for this deliverable: International Institute for Industrial Environmental Economics (IIIEE) at Lund University, Sweden

Project co-funded by the European Commission within the Sixth Framework Programme (2002-2006)		
Dissemination Level		
<b>PU</b>	Public	√
<b>PP</b>	Restricted to other programme participants (including the Commission Services)	
<b>RE</b>	Restricted to a group specified by the consortium (including the Commission Services)	
<b>CO</b>	Confidential, only for members of the consortium (including the Commission Services)	

Project home page: <http://holiwast.brgm.fr>



## **Preface**

This report constitutes a part of the Work Package one of the two-year (2005-07) research project entitled Holistic Assessment of Waste Management Technologies (HOLIWAST), funded by the European Commission. The HOLIWAST project is a collaborative effort of partners in seven Member States (Austria, Germany, Denmark, Finland, Italy, Poland and Sweden). Among them, the authors of this report are Naoko Tojo at the International Institute for the International Environmental Economics at Lund University in Sweden (Chapter 1, 2, 3, 5 and 6), and Alexander Neubauer and Ingo Bräuer. Ecologic - Institute for International and European Environmental Policy, Germany (Chapter 4). The report was originally submitted to the European Commission as a project report in 2006 and was subsequently modified.

The authors would wish to thank the European Commission for providing funding as well as comments to the report. Gratitude is also directed to the partners of the projects for their valuable inputs. The full responsibility for the content of the report remains, however, with the authors.



## Executive Summary

This report constitutes a part of the Work Package 1 of the two-year research project entitled Holistic Assessment of Waste Management Technologies (HOLIWAST), funded by the European Commission. The HOLIWAST project is a collaborative effort of partners in seven Member States (A, D, DK, F, I, PL and S). Among them, the authors of this report are the partners in Sweden (Chapter 1, 2, 3, 5 and 6) and Germany (Chapter 4).

The HOLIWAST project was launched with the following primary objectives:

- To provide a multidisciplinary (environmental, economic, social) comparison of different waste management technologies.
- To identify how the most appropriate technologies can be implemented within an integrated waste management framework, for different socio-economic context.
- To evaluate the opportunity of policy instruments for promoting these technologies and support decision makers in waste management.

Work Package 1 of the project has the overall objective of *providing insights into the environmental effectiveness of policy instruments related to waste management applied in selected socio-economic contexts*. The study presented in this report is the first step to fulfil this task.

The purpose of this report is to *provide an overview of municipal solid waste management policies of the European Union and highlight the potential of selected existing policy instruments in reducing environmental impacts related to municipal waste generated in Europe, focusing on their implication to local governments*. In doing so, it aims to facilitate the evaluation of policy instruments implemented and/or discussed in the three case communities examined in the HOLIWAST project – Torino, Italy, Katowice, Poland and Tølløse, Denmark – and their effectiveness in decreasing the environmental impacts relating to waste.

Among various waste streams, the scope of the HOLIWAST project is limited to municipal waste. Within the municipal waste, the following waste is covered under the project: mixed waste, mixed secondary materials, plastics, metal, glass, paper, composite packaging, biodegradable waste, garden & park waste, manually collected road waste, market waste, textile, batteries, fluorescent tubes, small waste electrical and electronic equipment (WEEE) and oil and fat.

Reflecting upon the aforementioned scope of the project, the report provides a summary of selected EU legislation, focusing on the parts related to local governments. Concerning the policy instruments, they are divided into administrative, economic and informative instruments. The general characteristics and effectiveness of the selected instruments are concisely described, using concrete examples. The examples are employed to illustrate the content of the instruments as well as what an instrument can manage to achieve in a given context. They are by no means exhaustive lists of all the existing cases.

The study is based primarily on the review of existing literature (reports, legislation, books, academic articles, newsletters), complemented by limited number of interviews.

Following the introductory chapter, Chapter 2 provides an overview of relevant EU laws and policies on waste. Chapter 3, 4 and 5 describes selected administrative instruments, economic instruments and informative instruments. The report ends with a concise concluding section (Chapter 6).

## Legal and policy framework for waste management in Europe

The following EU legislation on waste, their subsequent amendments and (proposal for) revisions are reviewed, together with the thematic strategy on the prevention and recycling of waste.

- Directive 2006/12/EC on waste.
- Directive 91/689/EEC on hazardous waste.
- Regulation No 1013/2006/EEC on the supervision and control of shipments of waste within, into and out of the European Community.
- Directive 1999/31/EC on the landfill of waste.
- Directive 2000/76/EC on the incineration of waste.
- Directive 96/61/EC concerning integrated pollution prevention and control.
- Directive 94/62/EC on packaging and packaging waste.
- Directive 2006/66/EC on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC.
- Directive 2002/96/EC on waste electrical and electronic equipment (WEEE).

As of spring 2007, the EU policies on waste are in transition. A new framework directive that replaces the existing framework directive has been proposed. In addition to some of the structural changes, some issues governing all waste policies in the EU – such as the distinction between waste and recovered materials, waste for recovery versus waste for disposal – are addressed in the proposal. The outcome will have implications to, among others, the movement of waste/material streams within and across the national boarder and the use of incineration with energy recovery.

Some of the EU legislation, especially those governing specific waste streams, contains within them many policy instruments and serves as examples of these policy instruments. Some of them, such as material restriction, set the same standards for all the Member States, while the fulfilment of requirements such as minimum collection/ reuse/ recycling targets is partially left in the hands of Member States. The WEEE Directive and the Directive on batteries and accumulators are based on the concept of EPR (extended producer responsibility). Implementation of the packaging directive in the majority of the old-15 Member States has also been based on EPR. Meanwhile, the implementation in practice often retains the collection responsibility in the hands of municipalities. Local governments seem to want to keep control over the municipal waste collection system for various reasons. The optimal solution may differ depending on the socio-economic context. What will remain in the waste stream handled by the municipalities have implication to the technological solutions they should select.

## Review of policy instruments

In total of 18 policy instruments – categorised into administrative, economic and informative – are reviewed. The discussions of the respective instruments include the general characteristics of the instrument and its effectiveness. A straightforward comparison of these instruments is difficult due to the following reasons:

- Each instrument has different aims (addressing different level of hierarchy) and different targeted groups (municipal solid waste in general or specific waste streams).



- Most of the instruments are not introduced in isolation: one policy intervention typically integrates several instruments. Moreover, there are many other factors influencing the behaviour of addressees. This poses challenges to delineate the impact of one single instrument.
- Effectiveness of a given instrument is a combination of its mechanism in theory as well as its implementation.
- Some instruments are introduced recently or in limited locations and do not have sufficient experience.
- The quality of studies evaluating the instruments as well as the methodology employed differs.

Thus instead of comparing, characteristics of different instruments are highlighted.

### **Administrative instruments for waste management**

Administrative instruments reviewed in this report include:

- Substance restriction;
- Source separation;
- Producer's take-back of specific discarded products;
- Collection, reuse/refill and recycling targets;
- Minimum recycled material content standards;
- Landfill restriction/diversion targets; and
- Environmentally sound treatment standards.

The description of each instrument contains the *content*, *objectives* and *addressees* of the instruments, the *environmental effectiveness* of the instruments and its potential in *introducing at the local level*.

The reviewed instruments intend to address different parts of waste hierarchy, from waste prevention to environmentally sound disposal. Although all of them in the end have some implications to environmentally sound treatment of a waste stream, some of them (e.g. substance restriction) take a preventative approach, while others (e.g. environmentally sound treatment standards) deal with the problem at end-of-pipe. Although “prevention is better than cure” – that is, it would be preferable to take measures at source than remedy the problems once they occur – the reality of the production and consumption system today requires measures that address the respective part of waste hierarchy.

Most of the instruments discussed are introduced at the EU level and are transposed into national level. However, the implementation of many of these instruments is diverse among the national governments. Local governments have the possibility to influence the concrete forms of implementation although perhaps in different degree depending on the power distribution among government entities as well as power relation between private and public sectors in each country. The following table highlights issues that are related to the local governments, either in terms of roles they can take or potentials of introducing the instruments at the local level.

*Selected administrative instruments for waste management and issues related to local government*

<b>Instruments</b>	<b>Examples of application</b>	<b>Issues related to local governments</b>
Substance restriction	RoHS Directive, Battery Directive	Local introduction may create trade distortion  Possible inclusion in informative instruments
Source Separation	In various countries for waste streams such as packaging, batteries, EEE, biodegradable waste, tyres	Various local solutions exist. 1) convenience, 2) incentive and 3) awareness raising are among the key influencing factors
Producers' take-back	In various countries for waste streams such as packaging, EEE, batteries	The collection from private households is often left fully or partly in the hands of local government despite the legal text.  Separation of small products face difficulties
Collection/reuse/refill/recycling targets	In various countries for waste streams such as packaging, EEE, batteries	Centralised system run by PRO often neglect rural areas  Local targets can be set for waste streams under municipalities such as biodegradable waste
Minimum recycled material content standards	Included in the government procurement policies	Local introduction may create trade distortion  Possible inclusion in informative instruments/procurement policies
Landfill restriction/diversion targets	Implementation of landfill Directive, Battery Directive	High potential for local/regional governments to introduce restriction
Environmentally sound treatment/disposal standards	Incorporated in permits based on Directives on installations, national standards for some types of installations	High potential for local/regional governments through enforcement (permits and inspections)

The degree of implication to the local governments varies. Nevertheless, it seems that local government have roles to play in maximising the potential of the respective instruments.

### **Economic instruments for waste management**

The following economic instruments are reviewed:

- Landfill tax
- Waste disposal tax
- Recycling credit scheme
- Subsidies for secondary products/taxation of quarry products
- Waste pricing: “pay-as-you-throw” approach
- Deposit-refund systems

The criteria upon which the instruments described include *addressees*, *immediate objectives* and *effectiveness* of the instruments, as well as the *frequency of application* and *political acceptance/enforceability* of the instruments.

The various instruments are applied with differing frequency in the European Union. The aforementioned limitations makes it difficult to rank the effectiveness of the instruments. Nevertheless the analysis with the use of the different criteria allows some general conclusions, as summarised in the following table.

*Overview of the economic instruments including frequency of application*

<b>Instrument</b>	<b>Frequency</b>	<b>Effectiveness/Experience</b>
Landfill tax	Many countries in the European Union.	Easy to implement; effectiveness depends on the concrete tax rate per ton waste
Waste Disposal Tax	Two examples.	More elaborated version of the landfill tax; effectiveness depends on the concrete tax rate of the respective waste disposal methods per ton waste; promotion of waste recycling depends on other factors as well (demand for and prices of secondary materials).
Recycling Credit Scheme	Primarily the UK.	High effectiveness, raises profitability for recycling, but limited application (UK) due to special situation (separation of waste disposal and waste collection authorities).
Subsidies for secondary Materials / quarry tax	Only two examples.	Innovative measure but rarely applied so far, effectiveness depends on the tax rate, prone to resistance of lobby groups.
Pay as you throw	Many pilot projects, much experience in Germany.	Easy to implement and effective, but precaution against illegal waste dumping or misuse of recycling facilities (“mishthrows”) should be taken, full financing of waste management infrastructure through waste fees has to be assured, sufficient awareness raising is necessary.
Deposit-refund systems	Many countries in the European Union.	Effective for certain goods, prone to resistance of lobby groups.

Even though this study could not examine the waste policies of all Member States, and hence the enumeration contained in the table above may not be complete, it is clear that instruments such as the landfill/ waste disposal tax, pay-as-you-throw schemes, and deposit-refund systems have gained importance in Europe. The landfill tax has been introduced in an important number of “old” Member States of the European Union and can thus be labelled a common measure to help divert waste into recycling schemes.

The effectiveness of these fiscal measures will depend on the concrete rate of the taxes or deposits levied on the respective goods and material. In addition, the instruments will be more effective if public authorities effectively communicate the existence, reasons for, and also the possibilities to avoid the taxes (quarry tax, waste disposal tax).

In order to attain the objective of promoting recycling, the existence and adequacy of secondary materials to be used by industry must be advertised and fostered by public

authorities. Hence, public authorities can raise the effectiveness of their waste policies through catchy information campaigns. If no demand for secondary materials exists, the landfill tax may not be able to bring about a rise in recycling activities for economic reasons. In order to promote the use of secondary materials, the gravel tax is an interesting approach; however, it is prone to diverse lobby resistance by raw materials producers and, therefore, a high rate of such a tax is for now unlikely. Therefore, a combination of a landfill tax (waste disposal tax) and a gravel tax might be an interesting approach to promote recycling and the use of secondary goods, even though the combined impact is difficult to evaluate due to the different addressees of the two taxes.

Furthermore, it should be emphasised that the employment of the different economic instruments must fit with various regional circumstances. Thus, each country should devise a mix of instruments according to their traditions and waste management systems. For example, a recycling credit scheme like the UK's is not effective in countries where there is no distinction between waste disposal and waste collection authorities, or where a sophisticated recycling scheme has been in place for an extended period. For the latter, private firms need not be incited to set up new collection services to raise recycling rates.

Pay as you throw away systems, in turn, can be applied anywhere; however, the optimal mix of fixed and variable elements of the waste management fees is very important. While PAYT is intended to foster waste reduction and waste recycling, it can in practice lead to "escapism" from the municipal waste management system and favour illegal waste dumping or misuse of recycling facilities. For economic reasons, the fees have to be set at a level that securely finances the work of the waste management institutions. If the variable elements of a waste fee are of only minor importance (for example  $< 20\%$ ), then the effect of PAYT is only very limited and the environmental sense of introducing such a PAYT would become questionable.

All economic instruments can, moreover, be judged on their effectiveness only in the context of concrete regional and local circumstances.

### **Informative instruments for waste management**

The following informative instruments are discussed:

- Eco-labelling scheme
- Green shopping guide
- Marking of products and components
- Information campaigns to residents
- Information provision to treatment facilities

The criteria against which the instruments are described include the *content*, *objectives* and *addressees* of the instrument, its *environmental effectiveness* and its potential in *introducing at the local level*.

The five informative instruments reviewed contain various different characteristics. Concerning the issues addressed in the instruments, two of them (eco-labelling schemes and green shopping guidance) cover environmental impacts arising from various parts of life cycle of products including end-of-life phase. The rest addresses waste as the primary issue. Regarding the level of coerciveness towards the primarily addressees, all the instruments reviewed leave it up to the receivers of the information to utilise it or not. Meanwhile, some of the instruments often mandate the provision of information from the producers (marking

requirement, information to treatment facilities), while in the case of, for instance, eco-labelling scheme, it is up to the producers to decide if they would like to participate in the scheme or not.

The informative instruments that primarily address waste (marking, information campaign to residents, information to treatment facilities) are supplementary to other instruments. Eco-labelling schemes and green shopping guidance can be a stand-alone instrument. However, there are many factors that influence the behaviour of the addresses – both the consumers and the producers. Just like other policy instruments, evaluation of the respective instrument is difficult, especially regarding attributability.

The following table summarises how local governments can utilise the respective instruments.

*Selected informative instruments for waste management and issues related to local government*

<b>Instruments</b>	<b>Examples</b>	<b>Issues related to local governments</b>
Eco-labelling scheme	German Blue Angel, Nordic Swan, Swedish Good Environmental Choice, EU Flower (in total 26 countries and regions are members of the Global Ecolabelling Network)	Local governments can help raise awareness of consumers regarding eco-labelling schemes.  Criteria in the scheme can be incorporated in the government green procurement program.
Green shopping guidance	Communication of the existence and content of materials (e.g. handbooks, leaflets) assembled by others  Provision of information via consumers' advisers	Local governments can be an effective channel in communicating information materials
Marking of products and components	Directives on packaging, WEEE and batteries, voluntary initiatives by manufacturers	Different requirements introduced by different local governments may face resistance and inefficient. Local governments can be an effective channel in communicating information materials
Information campaign to residents	Various initiatives (e.g. labelling on the waste containers, information materials to private households, posters in the public transports, advertisement on TVs)  Both by public and private entities	Local governments should take the lead especially for the waste that come into municipal waste streams.
Information to treatment facilities	EU WEEE and ELV directives, voluntary initiatives by manufacturers	Local governments can direct treatment facilities to the source of information.

Local governments can play an essential role in implementing some of the instruments (e.g. information campaigns to residents on source separation). Moreover, they can serve as an important channel to connect the information to the primary users (consumers, treatment facilities) of the information.

## **Steps forward**

In the next step of the Work Package 1 of the HOLIWAST project, the use of instruments presented in this report in the case communities are analysed in depth. The case studies aim to enrich the understanding on the implementation of some of the EU Directives and to provide insights into the use of policy instruments in practice in different context. Based on the

findings of the situation of each community, what instruments may supplement the existing ones can be considered.

# Table of Contents

List of Figures

List of Tables

<b>1</b>	<b>INTRODUCTION .....</b>	<b>5</b>
1.1	BACKGROUND.....	5
1.2	PURPOSE .....	6
1.3	SCOPE AND LIMITATION .....	6
1.4	METHODOLOGY .....	7
1.5	TERMINOLOGIES USED IN THE REPORT .....	8
1.6	STRUCTURE OF THE REPORT .....	8
<b>2</b>	<b>LEGAL AND POLICY FRAMEWORK FOR WASTE MANAGEMENT IN EUROPE.....</b>	<b>10</b>
2.1	PRINCIPLES OF WASTE MANAGEMENT .....	10
2.2	STRUCTURE OF THE EU WASTE LEGISLATION.....	10
2.3	FRAMEWORK LEGISLATION ON WASTE .....	12
2.3.1	<i>Waste Framework Directive .....</i>	<i>12</i>
2.3.2	<i>Hazardous waste.....</i>	<i>15</i>
2.3.3	<i>Transboundary movement of waste.....</i>	<i>15</i>
2.4	LEGISLATION ON WASTE MANAGEMENT INSTALLATIONS .....	16
2.4.1	<i>Landfilling of waste .....</i>	<i>17</i>
2.4.2	<i>Incineration of waste .....</i>	<i>19</i>
2.4.3	<i>Operation standards for waste treatment installations.....</i>	<i>19</i>
2.4.4	<i>Discharge of waste from ships .....</i>	<i>20</i>
2.5	LEGISLATION ON SPECIFIC WASTE STREAMS .....	20
2.5.1	<i>Packaging and packaging waste.....</i>	<i>20</i>
2.5.2	<i>Waste electrical and electronic equipment (WEEE).....</i>	<i>23</i>
2.5.3	<i>Spent batteries and accumulators .....</i>	<i>27</i>
<b>3</b>	<b>ADMINISTRATIVE INSTRUMENTS .....</b>	<b>33</b>
3.1	ADMINISTRATIVE INSTRUMENTS FOR WASTE MANAGEMENT .....	33
3.2	SUBSTANCE RESTRICTION.....	34
3.3	SOURCE SEPARATION .....	36
3.4	PRODUCERS' TAKE-BACK OF DISCARDED PRODUCTS.....	38
3.5	COLLECTION, REUSE/ REFILL AND/ OR RECYCLING TARGETS .....	41
3.6	MINIMUM RECYCLED MATERIAL CONTENT STANDARDS .....	43
3.7	LANDFILL RESTRICTION/ DIVERSION TARGETS.....	44
3.8	ENVIRONMENTALLY SOUND TREATMENT/ DISPOSAL STANDARDS.....	45
3.9	CONCLUSIONS .....	47
<b>4</b>	<b>ECONOMIC INSTRUMENTS.....</b>	<b>49</b>
4.1	INTRODUCTION .....	49
4.1.1	<i>Definition of Economic Instruments.....</i>	<i>50</i>
4.1.2	<i>Types of Economic Instruments .....</i>	<i>50</i>
4.1.3	<i>Economic Instruments in the waste management process .....</i>	<i>51</i>
4.1.4	<i>Qualities of the different Economic Instruments.....</i>	<i>52</i>
4.2	TAXATION (CHARGES ON WASTE DISPOSAL) .....	53
4.2.1	<i>Landfill tax .....</i>	<i>53</i>
4.2.2	<i>Waste disposal tax .....</i>	<i>55</i>
4.3	RECYCLING CREDIT SCHEME .....	56
4.4	SUBSIDIES FOR SECONDARY PRODUCTS / TAXATION OF QUARRY PRODUCTS.....	59
4.5	WASTE PRICING: "PAY-AS YOU-THROW APPROACH" .....	61
4.6	DEPOSIT-REFUND SYSTEMS .....	65

4.7	CONCLUSIONS .....	67
<b>5</b>	<b>INFORMATIVE INSTRUMENTS .....</b>	<b>71</b>
5.1	INFORMATIVE INSTRUMENTS FOR WASTE MANAGEMENT .....	71
5.2	ECO-LABELLING SCHEME .....	71
5.3	GREEN SHOPPING GUIDANCE.....	74
5.4	MARKING OF PRODUCTS .....	75
5.5	INFORMATION CAMPAIGN TO RESIDENTS .....	76
5.6	INFORMATION PROVISION TO TREATMENT FACILITIES .....	77
5.7	CONCLUSIONS .....	79
<b>6</b>	<b>CONCLUSIONS .....</b>	<b>80</b>
	<b>BIBLIOGRAPHY .....</b>	<b>83</b>
	SOURCES OTHER THAN LEGISLATION.....	83
	LEGISLATION .....	90
	PERSONAL INTERVIEWS .....	92
	<b>ABBREVIATIONS .....</b>	<b>94</b>



## List of Figures

Figure 2-1: Current structure of EC Law (Adopted from European Commission (n.d.) and Krämer (2003)).....	11
Figure 2-2: <i>Proposed revision of the structure of EC Law (Adopted from European Commission (n.d.), Krämer (2003) and Com(2005)666 final)</i> .....	11
Figure 2-3: The current situation of biodegradable municipal waste treatment in selected EU Member States and regions (Crowe et al., 2002).....	18
Figure 2-4: Key treatment methods for waste packaging in the old 15EU Member States (EEA 2006). ....	23
Figure 2-5: WEEE systems for private households in Europe (Van Rossem, Tojo & Lindhqvist, 2006).....	26
Figure 3-1: Effectiveness evaluation (adapted from Vedung, 1997).....	34
Figure 3-2: GNP (real) and Packaging Consumption of private consumers in Germany 1988 – 2002 (Source: German Statistical Federal Authority, GVM (Society for the research of the packaging market) and DSD).....	41
Figure 4-1: Types of economic instruments (Source: adapted after Coggan & Whitten 2005) 51	
Figure 4-2: Analysed economic Instruments and their field of application within the waste management process.....	52

## List of Tables

Table 2-1: reduction requirement of biodegradable municipal waste to be landfilled .....	17
Table 2-2: Recovery and recycling targets set forth in the amended packaging directive 94/62/EC.....	22
Table 2-3. Recycling rates for packaging in selected EU Member States .....	23
Table 2-4: Material/ substance reuse/ recycling/ recovery rate stipulated in the WEEE Directive .....	25
Table 2-5: Allocation of Physical Responsibility for Collection of WEEE from private households- Member State transposition legal text outcomes .....	27
Table 2-6: Physical and financial responsibility given to producers under the proposal for new directive on batteries and accumulators .....	29
Table 2-7: Recycling mandate stipulated in the proposal for new directive on batteries and accumulators.....	30
Table 2-8: The result of collection of consumer portable batteries in STIBAT* system, the Netherlands .....	32
Table 2-9: The result of collection of consumer portable batteries in Switzerland* .....	32
Table 3-1: Varying involvement of producers in organising collection from private households when they are responsible for take back.....	39
Table 3-2: Selected administrative instruments for waste management and issues related to local government .....	48

Table 4-1: Selection of Levied taxes on landfills in different EU-Member States.....	53
Table 4-2: The Environmental Protection (Waste Recycling Payments) (England) Regulations 2006.....	57
Table 4-3: Litter reduction (beverage containers).....	66
Table 4-4: Overview of the economic instruments including frequency of application .....	67
Table 5-1: Selected informative instruments for waste management and issues related to local government .....	79

# 1 Introduction

This report constitutes a part of the Work Package 1 of the two-year research project entitled Holistic Assessment of Waste Management Technologies (HOLIWAST), funded by the European Commission. The HOLIWAST project is a collaborative effort of partners in seven Member States (A, D, DK, F, I, PL and S). Among them, the partners in Sweden and Germany are the authors of this report.

This introductory chapter describes the background and the purpose of this report, its scope and limitation and the methodology used. It also explains the meaning of three terminologies discussed in the report: administrative, economic and informative policy instruments. The last section provides the structure of this report as well as the authors of the respective chapters.

## 1.1 Background

Despite various efforts taken in the last several decades, overall waste generation is still increasing, with the significant contribution of the increase of municipal solid waste.<sup>1</sup> Due to the increase of the absolute amount of waste generated, the absolute amount of waste landfilled has not decreased. This is despite the increase in recycling and incineration.

Waste management is a classical area where subsidiarity principle applies. In the EU context, many of the practical solution to implement the Directives are left in the hands of Member States, and the central government of the Member States often leave rooms to local governments to implement their own waste management plan. The local communities seek to adopt the solution that suits their needs most. This means that policies and approaches taken in different EU Member States and in different communities vary.

The decision makers at the local communities are often most knowledgeable of the local context. However, they may not be aware of the development and solutions taken outside of their communities to deal with similar issues that they face. Identifying the optimal waste management strategies for a local community may not be a straightforward task considering the necessity of evaluating the situation from various dimensions of sustainable development. The selection they need to make is not limited to technological solutions. They also need to select the policy instruments that would help make the most out of the technological solutions they (intend to) have.

Recognising these challenges, the HOLIWAST project was launched with the following primary objectives:

- To provide a multidisciplinary (environmental, economic, social) comparison of different waste management technologies.
- To identify how the most appropriate technologies can be implemented within an integrated waste management framework, for different socio-economic context.
- To evaluate the opportunity of policy instruments for promoting these technologies and support decision makers in waste management.

---

<sup>1</sup> Between 1995 and 2003, the generation of municipal waste in EU-25 increased by 19%, which is coupled with the growth of economy. It is predicted that MSW is increased by 42.5% by 2020 compared to 1995 levels (COM (2005) 666 final, 5).

Work Package 1 of the project has the overall objective of *providing insights into the environmental effectiveness of policy instruments related to waste management applied in selected socio-economic contexts*. The study in this report is the first step to fulfil this task.

## 1.2 Purpose

The purpose of this report is to *provide an overview of municipal solid waste management policies of the European Union and highlight the potential of selected existing policy instruments in reducing environmental impacts related to municipal waste generated in Europe, focusing on their implication to local governments*. In doing so, it aims to facilitate the evaluation of policy instruments implemented and/ or discussed in the three case communities examined in the HOLIWAST project,<sup>2</sup> and their effectiveness in decreasing the environmental impacts relating to waste.

## 1.3 Scope and limitation

Among various waste streams, the scope of the HOLIWAST project is limited to municipal waste, which can be defined as *waste from households as well as commercial, industrial and institutional waste, which because of its nature and composition is similar to waste from households*.<sup>3</sup> Within the municipal waste, it was agreed that the following waste is covered under the project: mixed waste, mixed secondary materials, plastics, metal, glass, paper, composite packaging, biodegradable waste, garden & park waste, manually collected road waste, market waste, textile, batteries, fluorescent tubes, small waste electrical and electronic equipment (WEEE) and oil and fat.

Reflecting upon the aforementioned scope of the project, the report provides a summary of selected EU legislation, focusing on the parts related to local governments. The legislation include the framework directive,<sup>4</sup> the directive on hazardous waste,<sup>5</sup> the waste shipment regulation,<sup>6</sup> the landfill directive,<sup>7</sup> the incineration directive,<sup>8</sup> the IPPC directive,<sup>9</sup> the directive

---

<sup>2</sup> These three communities are Torino (Italy), Katowice (Poland) and Tølløse (Denmark).

<sup>3</sup> Excerpt from the definition of mixed municipal waste as found in Art. 3.3 of the Directive 2000/76/EC on the incineration of waste.

<sup>4</sup> Directive 2006/ 12/ EC of the European Parliament and of the Council of 5 April 2006 on waste. OJ L 113, 27.4.2006, p. 0009–0021.

<sup>5</sup> Council Directive 91/689/EEC of 12 December 1991 on hazardous waste. OJ L 377, 31/12/1991 P. 0020 – 0027.

<sup>6</sup> Regulation (EC) No 1013/ 2006 of the European Parliament and of the Council of 14 Juen 2006 on shipments of waste. OJ L 190 , 12/07/2006. P. 0001 – 0098.

<sup>7</sup> Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste. OJ L 182, 16/07/1999 P. 0091 – 0019.

<sup>8</sup> Directive 2000/ 76/ EC of the European Parliament and of the Council of 4 December 2000 on the incineration of waste. OJ L 332, 28/12/2000 P. 0091 – 0111.

<sup>9</sup> Council Directive 96/ 61/ EC of 24 September 1996 concerning integrated pollution prevention and control. OJ L 257 , 10/10/1996 P. 0026 – 0040.

on packaging and packaging waste,<sup>10</sup> the directive on batteries and accumulators,<sup>11</sup> the WEEE directive<sup>12</sup> and the subsequent amendments of these directives.

The study of each directive is by itself a topic of a full-scale research. Comprehensive coverage of all the aspects related to the respective directives or their implementation in Member States is therefore beyond the aim of this work. The intention of the report is instead to highlight elements that may have implication to the management of the streams covered by the project in local communities. To this end some aspects of the implementation in some Member States are discussed.

Concerning the policy instruments, they are divided into administrative, economic and informative instruments (See Section 1.5 for the terminology). The general characteristics and effectiveness of the selected instruments are concisely described, using concrete examples. The examples are employed to illustrate the content of the instruments as well as what an instrument can manage to achieve in a given context. They are by no means exhaustive lists of all the existing cases.

In many cases, several policy instruments are combined in one government intervention. For instance, a take-back requirement of products given to producers (administrative instrument) are combined with advance disposal fee system (economic instrument), information campaign to consumers and information requirement to recyclers (information instruments) within one program based on extended producer responsibility (EPR). Even one single policy instrument may contain elements of several instruments. For instance, the recycled material content requirement (administrative instrument) can be used in public procurement (economic instrument). Moreover, in addition to government interventions, there are a number of factors – convenience, cost, societal expectation, consumer demands, to name but a few – that influence behaviour of different addressees (citizens, industry, etc). Thus the study does not seek to attribute the effectiveness to one policy instrument, or to suggest the degree of policy instrument in numerical term. Instead, some of other influencing factors identified in the cases are mentioned to illustrate how a policy instrument may be affected by these factors.

In principle, policy instruments described in this report can be introduced by the different levels of government. Meanwhile, except for some of the informative instruments, most of the examples provided in this document are introduced at national level. The possibility of introducing the instruments at the local level and potential challenges surrounding the local introduction is discussed whenever feasible.

## 1.4 Methodology

The study is based primarily on the review of existing literature (reports, legislation, books, academic articles, newsletters), complemented by limited number of interviews. There are some differences in the approaches employed for the description and analysis of the administrative and informative instruments and that of economic instruments. Concrete approaches used are described in the chapters discussing the respective instruments.

---

<sup>10</sup> Council Directive 94/ 62/ EC of 20 December 1994 on packaging and packaging waste. OJ L 365 , 31/ 12/ 1994 P. 0010 – 0023, as well as Directive 2004/ 12/ EC of the European Parliament and of the Council of 11 February 2004 amending Directive 94/62/EC on packaging and packaging waste. OJ L 47, 18.2.2004, p. 0026–0032.

<sup>11</sup> Directive 2006/ 66/ EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/ EEC. OJ L 166, 26.9.2006, p. 0001–0014.

<sup>12</sup> Directive 2002/ 96/ EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE). OJ L 037, 13/02/2003 P. 0024 – 0039.

## 1.5 Terminologies used in the report

In this report the three types of policy instruments – administrative, economic and informative – are understood as follows.

*Administrative instruments* cover various measures that concern fulfilment of certain tasks, such as achievement of a certain recycling rate, elimination of the use of certain substances and prohibition of landfilling. When mandated via legislation, it makes the target entities seek to achieve certain tasks or refrain from doing certain things, in accordance with what is demanded in the legislation (Vedung, 1998, p.31-32; van der Doelen, 1998, p.132). Unless exemption is granted, the target entities have no choice but to obey. The term “regulations” (Vedung, 1998), “judicial control model” (van der Doelen, 1998), “regulatory instruments” or “mandatory instruments” essentially refer to these mandatory administrative instruments. However, economic instruments – for instance tax and subsidies – and informative instruments, such as labelling requirement and provision of certain information, are often mandated by law. Thus, the author chose to use the term “administrative instruments.”

*Economic instruments* generally provide monetary incentives – subsidies, refund and the like – when the addressees carry out tasks that the instrument wishes to promote, or disincentives such as tax, when the addressees do not fulfil the required actions (Vedung, 1998, p.32; van der Doelen, 1998, p.132). The crucial difference between administrative instruments and economic instruments is that in the former, when mandated by government, the addressee has no choice but to fulfil the task, while in the latter, the addressee has the freedom of carrying out the tasks or not.

*Informative instruments*, or information, concern the collection and provision of information, and are used with the assumption that, people behave differently when they have better information and understanding. Also referred to as “moral suasion”, it seeks to influence people “through the transfer of knowledge, the communication of reasoned argument, and persuasion” (Vedung, 1998, p.33).

From the perspective of level of coerciveness, policy instruments can be categorised between mandatory and voluntary. The addressee of the *mandatory* instruments is required to fulfil the tasks laid down in legislation, while the private actors can set up the goals themselves and strive to achieve them via *voluntary initiatives*. Between these two exists, for instance, *negotiated agreements*, where the government and private actors form a contract, in which the government typically agrees to refrain from enforcing legislation on condition that the private actors achieve a certain goal. Establishment of a negotiated agreement may also lead to the development of legislation.

## 1.6 Structure of the report

Following this introductory chapter, Chapter 2 provides an overview of relevant EU Law and Policy on waste.

Chapter 3, 4 and 5 describes selected administrative instruments, economic instruments and informative instruments. Each chapter introduces the approach in which the respective instruments addressed in the chapter are discussed, followed by the description of these instruments. The respective chapters end with a short conclusion section summarising the discussions in the chapters.

The report ends with a concise concluding section (Chapter 6).

Chapter 4 on economic instruments is written by Alexander Neubauer and Ingo Bräuer of Ecologic - Institute for International and European Environmental Policy in Germany. The rest of the document (Chapter 1, 2, 3, 5 and 6) are written by Naoko Tojo at the International Institute for Industrial Environmental Economics at Lund University, Sweden.

## 2 Legal and Policy Framework for waste management in Europe

Waste legislation and policy in the EU Member States should follow what is decided at the EU level, either through transposition (in the case of Directives) or through direct application (in the case of Regulations). In this chapter, the basic principles governing the EU waste policy is briefly described, followed by the overall structure of the EU waste legislation. It is followed by the discussion of selected EU legislation, including the implementation of the legislation in the Member States, highlighting the issues relevant to the overall projects.

### 2.1 Principles of Waste Management

In many European countries waste management as a government activity emerged in the early part of the 20<sup>th</sup> century. Hygiene and public health were the main drivers for government intervention. In the 1980s and 1990s, end-of-pipe responses were increasingly viewed as ineffective in their long-term impact. During the early 1990's many environment administrations started to embrace "source reduction" and "pollution prevention" goals, as also reflected in the waste management area.

The main guiding principles of the EU waste management policy today include prevention principle, producer responsibility and polluter pays principle, precautionary principle and proximity principle (European Communities, 1999).

- the **principle of prevention** – or prevention is better than cure – means that prevention of damage to the environment prior to its occurrence is better than reparation of damage already made.
- the **precautionary principle** means that in the threat of irreversible damage, lack of full scientific certainty does not justify not to take actions.
- the **polluter pays principle** suggests that the one who pollutes should pay for the consequences.
- the **extended producer responsibility (EPR) principle** underpins the allocation of responsibility of environmental impacts related to products to manufacturers of products due to their capacity to make changes at source.
- the **proximity principle** suggests that waste should generally be disposed of as closely as possible to where it is produced.

These principles are operationalised in a so-called **waste hierarchy**, as discussed further in Section 2.3.1.2. The principle of **EPR** has been applied to some directives governing specific waste streams (Section 2.5). With regard to jurisdiction, the **subsidiarity principle** applies, which suggests that only those tasks that cannot be addressed at the lower levels of governments (i.e. local government) are dealt with at the higher levels.

### 2.2 Structure of the EU Waste legislation

Waste legislation in Europe can be categorised into three categories: (1) framework (basic) legislation, (2) legislation on waste installation, and (3) legislation on specific waste streams. A schematic map of the current legislative structure is found in Figure 2-1.



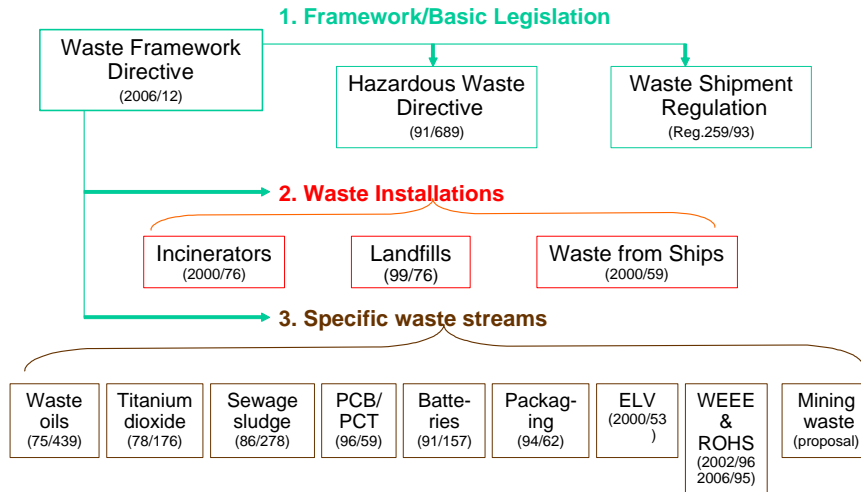


Figure 2-1: Current structure of EC Law (Adopted from European Commission (n.d.) and Krämer (2003)).

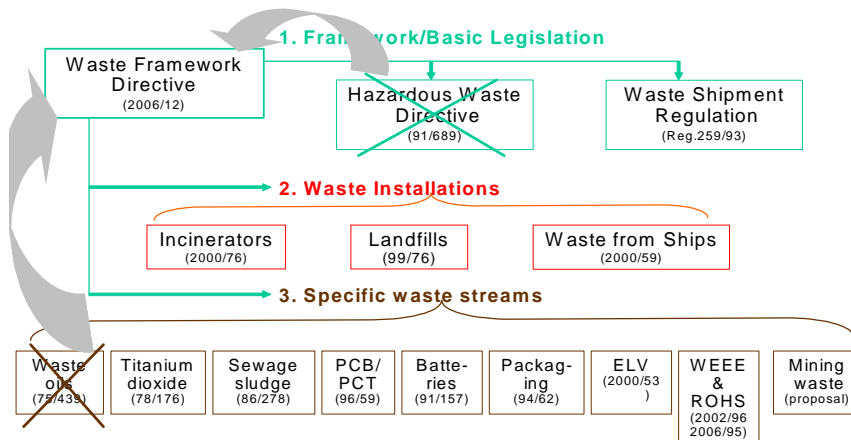


Figure 2-2: Proposed revision of the structure of EC Law (Adopted from European Commission (n.d.), Krämer (2003) and Com(2005)666 final)

As of spring 2007, the overall changes of the waste legislation has been discussed, as found in the proposal for the new framework directive (COM (2005) 667 final) and the thematic strategy on the prevention and recycling of waste (COM (2005) 666 final). Both documents were published December 2005. The main structural changes suggested include merger of the Directive on hazardous waste into the framework directive. The proposed change also includes the inclusion of directive governing waste oil into the framework directive.<sup>13</sup> A schematic map to describe the change can be found in Figure 2-2.

<sup>13</sup> Council Directive 75/439/EEC of 16 June 1975 on the disposal of waste oils.

## 2.3 Framework legislation on waste

The framework waste legislation comprises two Directives, which set general framework of waste management in EU. The first one is on waste and another one is on hazardous waste. In addition, there is also a regulation that governs the transboundary movement of waste within the European Community and between EU and the rest of the world.

### 2.3.1 Waste Framework Directive

The Directive 75/ 442/ EEC on waste established the overall framework for management of waste in 1975, as subsequently amended in 1991 and 1996.<sup>14</sup> In 2006, the Directive 75/ 442/ EEC was replaced by Directive 2006/ 12/ EC, which incorporated all the existing amendments made to the existing Directive.<sup>15</sup> As mentioned, as of spring 2007 a new directive completely replacing the existing directive has been proposed ((COM (2005) 666 final).<sup>16</sup>

#### 2.3.1.1 Definition of waste, waste recovery and waste disposal

The framework Directive 2006/12/EC defines waste as

*any substance or object in the categories set out in annex I which the holder discards or intends or is required to discard (Art. 1 (a)).*

It further enlists activities and operations that are considered as recovery and disposal in Annex II B and Annex IIA respectively.

The two main disputed issues on the definition have been 1) when waste cease to be waste and become secondary products materials or substances again and 2) the distinction between waste recovery and waste disposal.

Regarding the first point, much discussion have been raised by industries who are involved in material recycling, other forms of recovery and/ or disposal of substances that are in the grey zone between waste and recycled materials. The aspiration of the industries have been to have the substances they deal with not to be considered as waste. This is due to the higher administrative burden when handling waste compared to handling non-waste, and negative images associated with waste (COM (2003) 301 final).

In relation to the administrative burden, the line between what constitutes waste recovery and waste disposal have also been controversial. At the European level, this has been disputed especially in relation to shipment of waste across the national borders, as the EU Regulation governing the transboundary movement of waste have more stringent requirements on the shipment of waste for disposal than waste for recovery (See Section 2.3.3). It has been feared that lack of the Community-wide standards for recovery operation may also lead to a situation where recovery is done in a country with less stringent standards and impede the technological development of recycling operation that meet higher environmental standards (COM (2003) 301 final).

---

<sup>14</sup> Directive 91/156/EEC, Directive 91/692/EEC, Commission Decision 96/350/EC and Council Directive 96/59/EC.

<sup>15</sup> Directive 2006/ 12/ EC of the European Parliament and of the Council of 5 April 2006 on waste. OJ L 113, 27.4.2006, p. 0009–0021. The Directive 2006/ 12/ EC does not incorporate any changes suggested in the proposed revision in 2005 found in COM (2005) 666 final.

<sup>16</sup> The proposal went through the first reading of the European Parliament in February 2007 and the content is still debated (ENDS, 2007, February 13).

Another issue related to the distinction between waste recovery and waste disposal is the positioning of municipal waste incineration operations, which are currently considered as waste disposal. Some argue that distinction should be made between incineration with energy recovery and landfilling (now both are considered as waste disposal), and production of energy should be considered when defining what constitute recovery activities (COM (2005) 666 final). Others argue that incineration with energy recovery should not be treated equal to material recycling.

A number of court cases have been brought up to the European Court of Justice as well as national courts on the two issues, which provided some guidance to the interpretation of the definition (COM (2003) 301 final). The cases highlighted the necessity to clarify the definition of waste.

Some solutions proposed in the new framework directive, the thematic strategy and elsewhere are as follows:

### **Development of criteria for “when waste ceases to be waste” on stream by stream basis**

After an extensive consultation with stakeholders the Commission concluded that the definition of waste itself should remain unchanged. However, the proposal for revision suggests that when waste cease to be waste should be considered on specific stream-by-stream basis. It sets forth two criteria upon which the appropriateness of the waste being reclassified as secondary products, materials or substances should be judged. These criteria include the potential environmental impacts caused by the reclassification and the existence of market for the secondary materials. It is proposed that the decision should be made upon consultation with Member States (COM(2005)666 final; COM(2005)667 final; European Commission, n.d.).

Since the proposal of the new Directive appeared in 2005, the main discussion point regarding this is the decision making process for development of criteria. While the Commission proposed the so-called comitology procedure (member states committees chaired by the Commission), the Parliament pushes for the co-decision process, where Parliament is also included in the decision making process (ENDS, 2006, May 5; ENDS, 2006, June 26).

### **Distinction of incineration with the level of energy recovery**

Regarding the waste recovery and waste disposal, the proposed new framework directive seeks to clarify that the distinction of the two should be made based on the substitution of resources. It lists up operations that are considered as recovery in Annex II, and suggests mechanism according to which decisions should be made whether the operation in question is recovery or not. This seems to suggest the growing acceptance of incineration with energy recovery as a way to avoid landfilling of waste. A major driving force behind the increasing acceptance seems to lie on the strong emphasis on climate change in the overall environmental policy agenda. Meanwhile, concerns have been raised that increasing establishment of incineration undermine material recycling.

Regarding the standard, concerns have been expressed regarding the level of the standards. Some countries where incineration plants with high energy efficiency exist (e.g. Denmark) fear a large flow of waste into their country, as they have plants whose operation would be considered as recovery, which other countries do not have (ENDS, 2006, October 11). Other

countries such as France fear that many of their plants will not be qualified as waste-to-energy plant (ENDS, 2006, June 26). Since the emergence of the proposal for the new Directive,

### **Development of standards for recycling facilities**

In order to secure the quality of recycling activities as well as to enhance the competitiveness of the environmentally superior recycling practices, the development of standards for recycling activities is proposed (COM (2005) 666 final). This, together with the development of the criteria for when waste ceases to be waste, is considered to promote the circulation of recycled materials with higher quality.

#### **2.3.1.2 Waste Hierarchy**

As manifested in the explicit mentioning in Fourth environmental action program, waste management hierarchy served as the guiding principle behind the waste management policy of the European Community since the late 1980s (Krämer, 2003, p.313-314). The concept is adopted in, for example, the 1996 general strategy of waste, “which respects the hierarchy of prevention, re-use, recycling, recovery of materials, energy recovery and final disposal” (European Parliament, 1996). The hierarchy was also included in the Article 3 of the 2006 framework directive of waste:

1. *Member States shall take appropriate measures to encourage:*
  - (a) *firstly, the prevention or reduction of waste production and its harmfulness...*
  - (b) *secondly:*
    - (i) *the recovery of waste by means of recycling re-use or reclamation or any other process with a view to extracting secondary raw materials, or*
    - (j) *the use of waste as a source of energy*

The proposed new directive also mentions the hierarchy, which reads as follows.

*... the Member States are to take measures, as a matter of priority, for the prevention or reduction of waste production and its harmfulness and, secondly, for the recovery of waste by means of reuse, recycling and other recovery operations (Article 1, paragraph 2).*

Some have a critical view on the new formulation, as it puts reuse, recycling and other recovery operations at the same level of options. The new formulation, together with the suggested inclusion of incineration with energy recovery in waste recovery instead of waste disposal, is considered to undermine material recycling activities and boost incineration with energy recovery instead. The Parliament first reading in 2007 clearly highlights the five-level waste hierarchy, which are 1) prevention and reduction of waste, 2) reuse, 3) recycling, 4) other recovery operation and 5) the safe and environmentally sound disposal of waste (Council of the European Union, 2007).

It has been recognised that waste prevention, the highest in the waste hierarchy, has not been making much progress. Indeed, the generation of waste per capita has been constantly increasing despite various efforts. The shortcoming has been recognised both in the proposal for the new framework directive and the Thematic Strategy. The proposed new framework directive contains a section that requires member states to develop a waste prevention program (Article 29-31).

#### **2.3.1.3 Other issues**

The Directive 2006/ 12/ EC requires recovery and disposal facilities to obtain permits for their operations from the competent authorities (Art. 9, 10). The proposed new waste framework directive retains the requirements (Art. 19). Meanwhile, it also clarifies that in case a waste management facility already obtains a permit through the IPPC Directive (see Section 2.4.3), the facility does not have to have another permit based on waste legislation such as landfill directive or incineration directive (Art. 20).

The Directive 2006/ 12/ EC requires Member States to develop a **waste management plan** (Art. 7). The proposed new directive maintains the requirements, while further elaborating what should be included in the plan (Art. 26). Among others, it highlights the necessity of the assessment of economic instruments and of the inclusion of the plan for packaging and packaging waste (See Section 2.5.1) as well as the reduction of biodegradable waste going to landfill (See Section 2.4.1).

Other issues discussed since the emergence of the proposal in 2005, and are included in the 2007 Parliament first reading, include the inclusion of waste prevention targets and the development of separate directive for biodegradable waste (Council of the European Union, 2007).

### 2.3.2 Hazardous waste

Complementing the waste framework directive 75/ 442/ EEC, the Directive 91/ 689/ EEC on hazardous waste stipulates further requirements on hazardous waste from non-domestic sources. The Directive aims to introduce harmonisation in the management of hazardous waste among Member States (Art. 1.1). In order to have the same understanding of hazardous waste, it lists in its Annexes types of wastes that can be classified as hazardous, and includes their constituents and properties. Member States must ensure that hazardous waste is recorded and identified, and that they are not mixed with each other or with non hazardous waste (Art. 2). They should also ensure that when hazardous waste is collected, transported and stored, it is packaged and labelled in accordance with the EU/ international standards (Art. 5.1). The Directive also requires that the national competent authorities publish hazardous waste management plans (Art.6). In addition, the national competent authorities must inspect, in particular, installations producing and receiving hazardous wastes, as well as transportation facilities for such waste (Art. 5.2).

As mentioned in Section 2.2, the content of the hazardous waste will be integrated into the new waste framework directive, and the directive itself will be repealed.

### 2.3.3 Transboundary movement of waste

In accordance with the proximity principle, waste should be treated as close to the origin of the waste as possible. However, it may not be economically and environmentally efficient to build state-of-the-art waste treatment plants in a number of localities for all types of waste. When treatment facilities that enable environmentally sound management of waste do not exist within the vicinity/ country, waste is to be transferred to another country where appropriate facilities exist.

In the EU, there existed a Regulation 259/ 93/ EEC that governed the transboundary movement of waste both within the European Community and between Member States and the third party. It is closely related to other international agreements on the transboundary

movement of hazardous waste, such as the Basel Convention<sup>17</sup> and OECD decisions relating to transboundary movements of waste destined for recovery operations.

In July 2006, the Regulation was entirely replaced by Regulation 1031/2006/EC.<sup>18</sup> The revision aims to simplify the procedure laid down in the 1993 Regulation and to integrate all the clauses in the Basel Convention and the OECD Decision C(2001)107/Final (COM(2003)379 final).<sup>19</sup>

The central mechanism set out in the Regulation is the compulsory prior notification system from the exporting party and the authorisation (consent) from the competent authorities in the importing state. The rigidity and the format of notification and consent differ depending on the relative hazardousness of waste (categories found in Annexes III, IV, and V), whether it is destined for recovery or disposal, and their destination (within the European Community, across the boarder of the European Community, OECD or non-OECD countries). In addition, the regulation prohibits mixture of waste documented in accordance with the regulation with other waste (Art. 19) and requires take-back of the dispatching states should the transboundary movement of waste cannot be completed as intended (Art. 22) or if the shipment is illegal (Art. 24).

Depending on the governmental structure surrounding waste, the task of providing consent may fall onto local governments.

On the operational side, the difficulties of distinguishing between second-hand products/recycled materials and waste – when products become waste – have been recognised by among others the enforcement officials in charge of waste shipment regulation (IMPEL, 2004).

Concerning the distinction between waste and second-hand products/recycled materials, efforts have been made to standardise the operation of European port authorities in order to avoid the shipment of waste under the name of second hand products/ recycled materials in ports of less stringent inspections (IMPEL 2004). Project works have been conducted among the port authorities of the EU Member States. The project is in its second phase and involves 13 member states. The main focus areas include exportation of waste electrical and electronic equipment (WEEE) to non-OECD countries in Africa and Asia, and end of life vehicles to Africa (IMPEL 2004). Some member states (for instance the Netherlands and the UK) developed guidance documents/operational manuals for distinction.

## 2.4 Legislation on waste management installations

Legislation on waste management installations includes regulations on waste landfilling and incineration. The so-called IPPC Directive sets standards for permits provided to waste treatment installations. There is also a Directive addressing the discharges of waste and cargo residues from ships.

---

<sup>17</sup> Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. More information can be found at: [www.basel.int](http://www.basel.int)

<sup>18</sup> Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 June 2006 on shipments of waste. OJ L 190, 12/07/2006. P. 0001 – 0098.

<sup>19</sup> Decision of the Council C(2001)107/Final Concerning the Control of Transboundary Movements of Wastes Destined for Recovery Operations.

### 2.4.1 Landfilling of waste

The overall objective of the Directive 1999/ 31/ EC on the landfill of waste is “to provide for measures, procedures and guidance to prevent or reduce as far as possible negative effects on the environment” (pollution of surface water, groundwater, soil and air, on the global environment), and on human health related to landfill (Art. 1.1). It prescribes various requirements for the location, design and operation of landfill. The Directive establishes three types of landfill: landfill for hazardous waste, non-hazardous waste and inert waste (Art. 4), and prescribes types of wastes to be brought to the respective landfills (Art.6).

For waste prevention, it requires Member States to meet with numerical reduction targets for biodegradable waste to be brought to landfill, as found in Table 2-1, and lists up items that should be prohibited from landfilling (hazardous wastes, tyres, and those described in the acceptance criteria in Annex II) (Art. 5).

Measures to achieve the diversion targets for biodegradable waste introduced in the old 15 EU Member States include source separation, incineration, landfill ban, landfill tax, home composting and other fiscal measures addressing households or waste industry. Namely, according to Crowe et al. (2002), except for Luxemburg whose data was not available, all the Member States introduced some measure for source separation (Section 3.3). Landfill tax has been used in 9 countries (Section 4.2.1), and three countries (Netherlands, Denmark and Belgium) introduced landfill restriction (ban or diversion targets), while 6 more countries have planned to introduce it (Section 3.7) (Crowe et al., 2002, p.23-25).

Figure 2-3 shows the treatment practices of biodegradable municipal waste in some European countries as of 2002.

*Table 2-1: reduction requirement of biodegradable municipal waste to be landfilled*

Reduction target for biodegradable municipal waste (by weight)	Deadline	Optional deadline for countries that landfilled more than 80% of MSW in 1995
75% of what is produced in 1995	2006	2010
50% of what is produced in 1995	2009	2013
35% of what is produced in 1995	2016	2020

*(Source: Directive 1999/31/EC)*

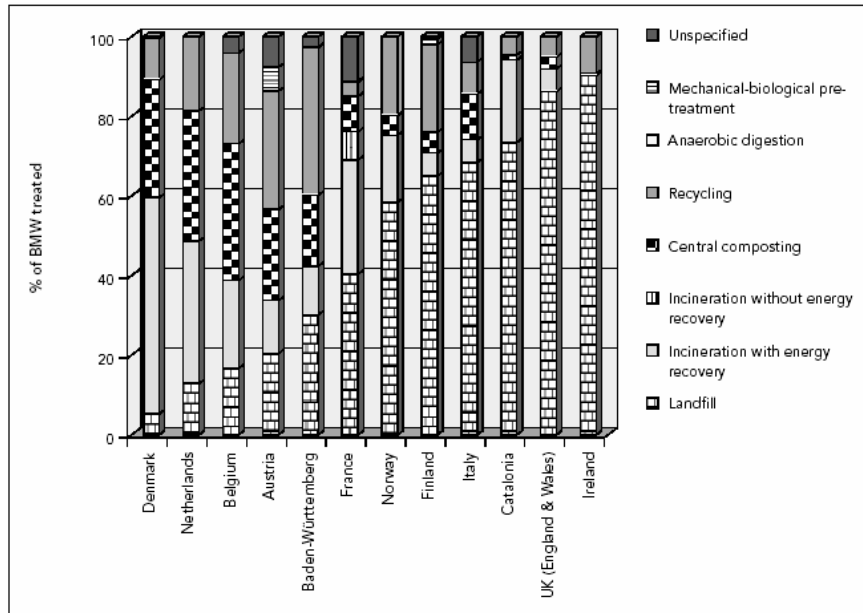


Figure 2-3: The current situation of biodegradable municipal waste treatment in selected EU Member States and regions (Crowe et al., 2002)

As seen, half of the countries are landfilling more than 50% of the biodegradable municipal waste. Member States as well as their local communities that have been relying on landfill are now faced with challenges of selecting methods to achieve the targets. The difficulties lie in deciding whether they select the biological treatment (e.g. creation of compost), and if so, estimating how much of the biodegradable municipal waste could be treated this way without introduction of incineration. The growing acceptance of incineration with energy recovery (See Section 2.3.1.1) seems to drive Member States to be inclined to introduce incineration as at least part of the solution. These include the Helsinki region in Finland (Arnold, 2006, personal interview) as well as Torino in Italy. Ministry of the Environment in Poland is also considering the introduction of incinerators, but the price as well as public resistance poses challenges (Kloptek, 2006, personal interview).

The Directive in its Annex I prescribes an extensive requirements that all the landfills should fulfil. Issues addressed in Annex I include the location and design of landfill. Among others, it specifies general conditions for water and leachate management, with the view to prevent pollution of surface, ground water and soil. The directive prescribes procedures regarding how waste should be accepted, how control and monitoring should be done, what should be done to close the landfill and how it should be taken care of after the closure (Art. 11-13). Annex II provides general principles and guidelines for waste acceptance procedure and criteria. Minimum procedure for control and monitoring, including the procedure and frequency for sampling and monitoring, are described in Annex III.

The Directive stipulates that costs relating to all operations and subsequent closure should be internalised in the price charged by the operator (Art. 10). It also requires that the existing landfills meet what is stipulated in the Directive within 4 to 5 years after the Directive is introduced (Art. 14). The aftercare of existing landfills that are already closed has posed financial challenges in some countries such as Finland, as there is no income generated from the landfills that ceased to operate (Lilja, 2006, personal interview).



## 2.4.2 Incineration of waste

The goal of the Incineration Directive 2000/ 76/ EC is to prevent or limit negative effects on the environment and the resulting risks to human health from the incineration and co-incineration of waste (Art. 1). The Directive was developed to fill in gaps existing among the three Directives (89/ 369/ EEC and 89/ 429/ EEC on new and existing municipal waste plants and 94/67/EC on the incineration of hazardous waste).

The Directive covers waste incineration plants with or without energy recovery as well as co-incineration plants, the main purpose of which is the generation of energy or production of material products (such as cement kilns) (Art. 2, Art. 3.5).<sup>20</sup> The Directive sets requirements relating to permit, operation conditions, management of residues, monitoring and measurement. The Directive establishes limit values for emissions to both air and water (Art. 7 and 8, as further determined in Annex V, II and VI).

Standards for energy plants and other production plants that use waste as part of their energy sources are often national/ local specific, whereas the standards in the incineration directive is applied to all Member States. The national/ regional requirements for these plants or are typically less stringent than standards set in the Incineration Directive. Thus, the inclusion of the co-incineration posed challenges for these plants to meet the requirement for example in Finland (Lilja, 2006, personal interview) and Poland (Kloptek, 2006, personal interview). Meanwhile, the implementation of the Directive should secure the high environmental standards of all the incineration plants across Europe (Krämer, 2005, personal interview).

## 2.4.3 Operation standards for waste treatment installations

Some waste treatment installations are also covered under the Integrated Pollution Prevention Control (IPPC) Directive 96/ 61/ EC. These installations, as listed in the Annex I 5 of the directive, include:

- installations for disposal and recovery of hazardous waste as further specified in the list in the framework directive 75/ 442/ EEC, hazardous waste directive 91/ 689/ EEC and waste oil directive 75/439/EEC, with the capacity exceeding 10 tonnes per day;
- incineration plants for municipal waste with the capacity exceeding 3 tonnes per day;
- installations for disposal of non-hazardous waste further specified in the list in the framework directive 75/442/EEC, with the capacity exceeding 50 tonnes per day; and
- landfills receiving more than 10 tonnes per day or with a total capacity exceeding 25000 tonnes, excluding landfills of inert waste.

This mean that these installations must receive permits for operation from competent authorities in the country. However, technical requirements related to landfills are set forth by the Council thus standardised across the EU (Art. 18).

At present, these installations (at least in some member states) have to obtain permits both under the IPPC Directive and incineration/ landfill directive. The new framework directive

---

<sup>20</sup> Exemptions are plants for specific waste stream (vegetable waste, cork waste, radioactive waste, animal carcasses, and off shore incinerations plants) as well as experimental plants with small capacity (Art. 2.2).

intends to streamline the process by saying that once a permit is obtained under the IPPC Directive, it is not necessary to obtain another.

As a means to facilitate information exchange as stipulated in Article 16 of the Directive, Best Available Technique Reference (BREF) documents have been developed to provide guidance for permit conditions. The emission limit values included in the permits should be based on the best available techniques (Art. 9.4). Meanwhile, the Directive also leaves some rooms for adjusting the content of the permit to the local condition (Art. 9.4).

#### 2.4.4 Discharge of waste from ships

There is also a Directive (2000/ 59/ EC) that addresses the marine pollution due to the discharges of waste and cargo residues from ships. It is a measure taken by the European Communities to implement the so-called MARPOL 73/ 78 Convention.<sup>21</sup> The Directive intends to reduce marine pollution originating from waste generated from the operation of ships by requiring the provision of adequate waste reception facilities in all EU ports including recreational ports and marinas. The masters of all ships, including fishing vessels and recreational craft, must deliver their waste at the port reception facilities and pay fees irrespective of the usage of facilities. The requirements to provide these facilities most likely are put upon local communities that have ports.

### 2.5 Legislation on specific waste streams

In addition to legislation that concerns waste in general, there are Directives that address waste streams consisting of specific post-consumer products or materials/ substances used in products (See Figure 2-1). Among these Directives, those on packaging and packaging waste, electrical and electronic equipment and batteries and accumulators have relevance to the waste streams covered under the HOLIWAST project and will be discussed below.

The common characteristics of these directives include the containment of requirements for source separation, recycling and environmentally sound treatment of the remaining waste, as well as that of material restriction. They also include requirements related to information to consumers. The directives integrate a number of policy instruments discussed in Chapters 3, 4 and 5.

#### 2.5.1 Packaging and packaging waste

##### 2.5.1.1 Content of the legislation

Article 3.1 of the Directive 94/62/EC on packaging and packaging waste defines packaging as

*all products made of any materials of any nature to be used for the containment, protection, handling delivery and presentation of goods, from raw materials to processed goods, from the producer to the user or the consumer. "Non-returnable" items used for the same purposes shall also be considered to constitute packaging.*

They are categorised as sales packaging or primary packaging,<sup>22</sup> grouped packaging or secondary packaging<sup>23</sup> and transport packaging or tertiary packaging.<sup>24</sup> Directive 2004/ 12/ EC

---

<sup>21</sup> International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78)

<sup>22</sup> "packaging conceived so as to constitute a sales unit to the final user or consumer at the point of purchase" (Article 3.1 (a).

(amending Directive 94/ 62/ EC)<sup>25</sup> establishes criteria for packaging and provides illustrative examples in Annex 1.

**Packaging waste** means any packaging or packaging material, which the holder discards or intends or is required to discard.

The overall aim of the Directive is “to harmonise the national measures concerning the management of packaging and packaging waste” in order to prevent environmental impacts relating to packaging and in order to avoid the creation of trade barriers within the internal market. The Directive is adhered to the waste hierarchy and aimed at reducing the final disposal of packaging waste (Art. 1).

The Directive requires the Member States to set up appropriate collection, reuse and recycling system (Art. 7). Specific provision on the management of packaging waste should be included in the national waste management plan required by the framework directive (see Section 2.3.1.3). The directive as amended in 2004 highlights the Member States’ duty to take preventative measures (Art. 4).

In addition to the targets set forth in the original directive (to be achieved by 30 June 2001), the Amending Directive 2004/ 12/ EC mandates Member States to attain the targets by 31 December 2008, as shown in Table 2-2.

Concerning the material restriction, the Directive sets up the maximum concentration level of lead, cadmium, mercury and hexavalent chromium in packaging, which gradually decreased (Art. 11). Furthermore, Annex II of the Directive sets up essential requirements on the composition and the reusable, recyclable and recoverable nature of packaging. Packaging put on the market must meet these requirements (Art. 9), and the details are to be defined further (Art. 10). However, defining the specific content of the essential requirements has arisen much debates, and it took more than 10 years since the introduction of the directive for the proposal made by the European Committee for Standardisation to be approved by the Commission (ENDS, 2005, February 21).

---

<sup>23</sup> “packaging conceived so as to constitute at the point of purchase a grouping of a certain number of sales units whether the latter is sold as such to the final user or consumer or whether it serves only as a means to replenish the shelves at the point of sale; it can be removed from the product without affecting its characteristics” (Art. 3.1.(b))

<sup>24</sup> “packaging conceived so as to facilitate handling and transport of a number of sales units or grouped packaging in order to prevent physical handling and transport damage. Transport packaging does not include road, rail, ship and air containers.” (Art. 3.1. (c)).

<sup>25</sup> Directive 2004/12/EC of the European Parliament and of the Council of 11 February 2004 amending Directive 94/62/EC on packaging and packaging waste. OJ L 47, 18.2.2004, p. 0026–0032

Table 2-2: Recovery and recycling targets set forth in the amended packaging directive 94/62/EC

Recovery or incineration with energy recovery (by weight)	Recycle (by weight)	Deadline
Minimum 50% Maximum 65%	Minimum 25%, Maximum 45% Each packaging material more than 15%	30 June 2001 <sup>26</sup>
Minimum 60%	Minimum 55%, Maximum 80% <ul style="list-style-type: none"> <li>• glass 60%</li> <li>• paper and board: 40%</li> <li>• metal: 50%</li> <li>• plastics 22.5%</li> <li>• wood: 15%</li> </ul>	31 December 2008; for Greece, Ireland and Portugal, 31 December 2011; for 10 new Member States, 31 December 2012 <sup>27</sup>

(Source: Directive 2004/12/EC, Directive 2005/20/EC)

Packaging should bear appropriate markings that facilitate source separation as well as reuse, recycling and recovery (Art. 8). Consumers must be informed of 1) the collection and recovery system, 2) their roles in contributing the reuse, recycling and recovery of packaging and packaging waste, 3) the meaning of the markings and 4) the content of the waste management plans related to packaging waste (Art. 13).

### 2.5.1.2 Status of implementation

In all EU-15 countries economic operators within the packaging chain (manufacturer, packer/ filler, distributor, importer) are responsible for all or part of waste management of packaging.

In the majority of the cases, the industry has established organisations to comply with the obligations imposed by national packaging legislation on behalf of the individual businesses affected. However, industry typically has the option to fulfil their obligations by themselves.

With regard to packaging waste management activities, the responsibility is shared in the majority of countries between municipalities and industry. While collection and sorting of municipal packaging waste is predominately undertaken by the public sector, the collection of industrial packaging waste and the recovery and recycling of both municipal and industrial packaging waste is typically conducted by the private sector.

A study of the involvement of municipalities in Sweden reveals that even when the producers are legally responsible for collection from households, some municipalities strive to retain the collection operation under their control. The approaches taken vary between different municipalities (Tyson, 2005).

The main methods of packaging recovery are material recycling and incineration with energy recovery. Overall the share of disposal in packaging waste treatment in the old 15 Member States is gradually falling, giving way to recycling (See Figure 2-4).

<sup>26</sup> Greece, Ireland and Portugal had a delayed attainment period by 31 December 2005.

<sup>27</sup> The new 10 member states are granted with longer period to comply with the targets set forth in the Amending Directive 2004/12/EC.

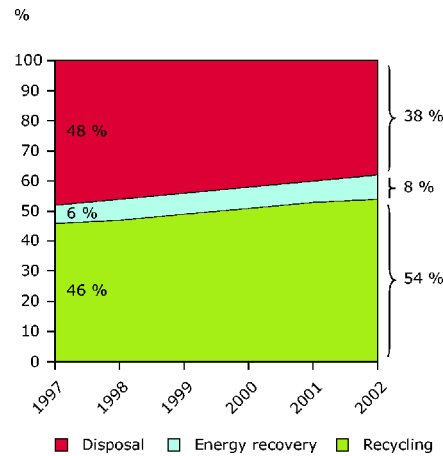


Figure 2-4: Key treatment methods for waste packaging in the old 15 EU Member States (EEA 2006).

Concerning the proportion of packaging waste recycled, in 2001 all the old EU Member States including Greece, Ireland and Portugal which had extended deadline met the target of recycling at least 25% of all packaging (Table 2-3).

Table 2-3. Recycling rates for packaging in selected EU Member States

	1997	1998	1999	2000	2001
Austria	64	65	66	69	64
Belgium	62	64	59	63	71
Denmark	40	50	53	56	57
Finland	42	45	50	50	47
France	40	42	42	42	44
Germany	81	80	79	78	76
Greece	37	35	34	33	33
Ireland	15	15	17	19	27
Italy	30	32	34	38	46
Luxembourg	38	42	40	45	57
Netherlands	55	62	64	59	56
Portugal		35	35	31	38
Spain	34	34	38	40	44
Sweden	58	75	65	58	63
UK	24	28	35	40	42
Total:	46	47	50	52	53

(Source: PIRA International Ltd., & Ecolas N.V., 2005)

## 2.5.2 Waste electrical and electronic equipment (WEEE)

### 2.5.2.1 Content of the legislation

Article 3 of the Directive 2002/96 on waste electrical and electronic equipment (WEEE Directive) defines electrical and electronic equipment (EEE) as

*...equipment which is dependent on electric currents or electromagnetic fields in order to work properly and equipment for the generation, transfer and measurement of such currents and fields falling under the*

*categories set out in Annex IA and designed for use with a voltage rating not exceeding 1000 Volt for alternating current and 1500 Volt for direct current.*

The Directive further lists categories of electrical and electronic equipment as follows:

- Large household appliances
- Small household appliances
- IT and telecommunications equipment
- Consumer equipment
- Lighting equipment
- Electrical and electronic tools (with the exception of large-scale stationary industrial tools)
- Toys, leisure and sports equipment
- Medical devices (with the exception of all implanted and infected products)
- Monitoring and control instruments
- Automatic dispensers

Examples of each of the category (some of which are found in Table 2-4) are found in the Annex IB of the Directive.

Waste electrical and electronic equipment (WEEE) means waste of EEE as categorised in the Directive 75/442/EEC (See Section 2.3.1), including all components, subassemblies and consumables which are part of the product at the time of discarding.

The WEEE Directive is complemented by its twin Directive on the restriction of the use of certain hazardous substances (RoHS) in electrical and electronic equipment.<sup>28</sup> Both Directives were due to be transposed into national law by 13 August 2004 (Art. 17,1, WEEE Directive; Art. 9.1 RoHS Directive).

The objectives of the WEEE Directive are:

- To prevent the generation of waste electrical and electronic equipment;
- To increase re-use, recycling and other forms of recovery thereby contributing to a higher level of environmental protection and encouraging resource efficiency; and
- To improve the environmental performance of all operators involved in the life cycle of electrical and electronic equipment, particularly those involved in the treatment of WEEE (Art. 1).

Among WEEE, it makes an important distinction between 1) the *historical waste* (those put on the market before the directive comes into force fully: 13 August 2005) and 2) *new waste* (those put on the market after 13 August 2005). In terms of origin, it provides different requirements for 1) WEEE from *private households* and 2) WEEE from *business users* concerning both physical management and financial mechanism. WEEE from private households is the main concern of local governments and thus described below.

---

<sup>28</sup> Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

Member States shall take necessary steps to ensure that systems are set up to enable private households to return WEEE free of charge and must endeavour to achieve, no later than 31 December 2006, a minimum rate of separate collection of WEEE from private households of 4 kg per inhabitant per year (Art. 5). The Directive does not specify which actor should be responsible for collecting WEEE from private households. The solution of Member States in this regard varies (See Section 2.5.2.2). However, local governments in the majority of the Member States are somehow involved in collection activities.

Once WEEE are collected, it is the responsibility of producers to set up systems for the recovery of separately collected WEEE. Producers of most of EEE covered by the Directive must meet specified recovery rates by 31 December 2006, (Art. 7, see Table 2-4). Within the recovery rates producers must meet specified rates for the reuse and recycling of components, materials and substances.

From 13 August 2005, producers must finance, at minimum, the collection of WEEE from private households which have been deposited at collection facilities, as well as treatment, recovery and disposal of WEEE. For the *historical waste*, the Directive makes all the existing producers responsible for the activities above collectively. For the *new waste*, it is the individual brands that are responsible for their own products (Art. 8).

Users in private households must be given certain information, for example on the available return and collection systems. Producers must label equipment indicating that WEEE shall not be disposed together with ordinary waste (Art. 10).

Table 2-4: Material/substance reuse/recycling/recovery rate stipulated in the WEEE Directive

Category of equipment	Examples	Recovery (%)	Material and substance reuse and recycling (%)
Large household	Refrigerators, cookers, microwaves	80	75
Small household	Toasters, irons, vacuum cleaners	70	50
IT & Telecommunications	PCs, printers, mobile phones, copying machines	75	65
Consumer	TVs, video recorders, hi-fi recorders	75	65
Lighting	Fluorescent lamps, sodium lamps	70	50
Electrical and electronic tools	Drills, saws, sewing machines	70	50
Toys	Video games, electric trains	70	50
Monitoring and control	Smoke detectors, heating regulators	70	50
Automatic dispensers	Food and drink dispensers	80	75
Medical devices	Radiotherapy equipment, dialysis	To be established by 31 Dec 2008	

(Source: based on the Directive 2002/96)

The RoHS Directive, on the other hand, prohibits the use of specific hazardous substances within EEE from 1 July. These substances are lead, mercury, cadmium, hexavalent chromium and two brominated flame retardants (polybrominated biphenyls: PBB and polybrominated diphenylethers: PBDE). However, there are exemptions, the scope of which has been expanding despite the fierce opposition of the European Parliament.<sup>29</sup> Concerning the product categories, RoHS Directive excludes medical devices and monitoring and control instruments from its scope.

<sup>29</sup> See, for instance, ENDS (2005, April 12) and ENDS (2006, January 10), as well as Commission Decision 2005/747/EC and Commission Decision 2006/310/EC.

The WEEE Directive is based on Article 175(1) of the EC Treaty which seeks to achieve environmental protection. This means that it sets minimum requirements and allows Member States to set more stringent requirements. Meanwhile, the RoHS Directive is based on Article 95 of the EC Treaty that aims at harmonisation of the internal market. In this case the requirement should not vary across EU Member States following transposition.

### 2.5.2.2 Status of implementation

In Europe, just as the situation with packaging waste, producers decided to establish one or more organisations that organise their obligation on their behalf. These organisations are often referred to as producer responsibility organisations (PROs). Figure 2-5 shows how producers in different EU Member States chose to organise their obligations for the take back of WEEE from private households. They are divided into either having multiple collective systems (competing collective systems) or a single collective system (Van Rossem, Tojo & Lindhqvist, 2006).

Within the same countries, sometimes one PRO covers all types of WEEE from households (e.g. Sweden),<sup>30</sup> while in others, different PROs take care of different WEEE. For example, In the Netherlands a PRO called ICT milieu organised the system for ICT and office equipment (grey goods), while another called NVMP organised the brown and white goods.<sup>31</sup> Similar division is found in Switzerland.

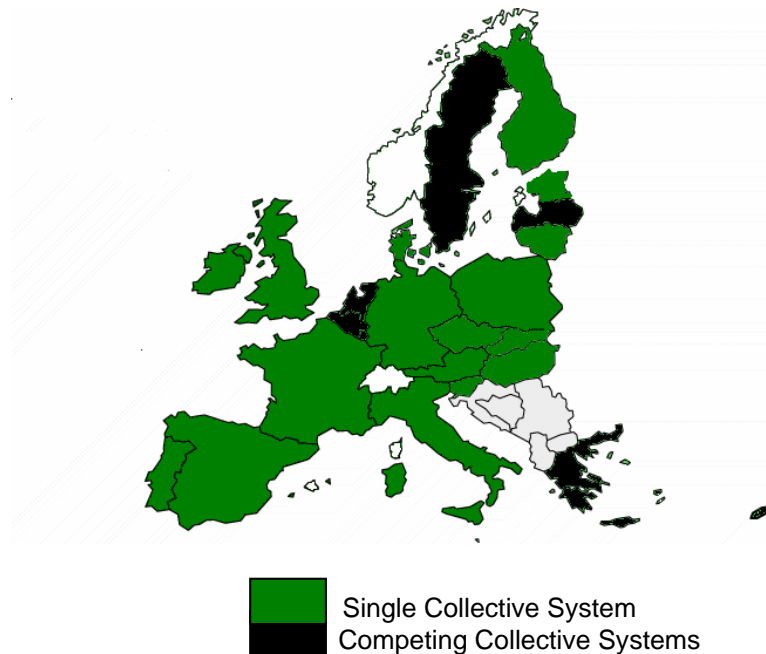


Figure 2-5: WEEE systems for private households in Europe (Van Rossem, Tojo & Lindhqvist, 2006)

<sup>30</sup> For computers mainly from businesses, an alternative system emerged from 2001.

<sup>31</sup> White goods are various large and small household appliances such as refrigerators and freezers, air conditioners, washing machines, dishwashers, stoves, cookers and 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. ICT and office equipment are sometimes referred to as grey goods.



It should be noted, however, that along with the collective systems, there are some producers who establish systems that allow them to fulfil all or part of their obligation on their own. In other words, along with the collective systems, individual elements/individual solutions exist.

Concerning the collection, the WEEE Directive does not specify the entity responsible for the collection of WEEE from private households. Table 2-5 summarises the allocation of responsibility for collection from private households according to the legal text of Member States. As can be seen, municipalities are by law involved in the collection from private households in the majority of the Member States. Moreover, even in cases where municipalities are not responsible according to the national legislation, in practice they become partially responsible. This has been the case in, for example, Sweden and Finland.

*Table 2-5: Allocation of Physical Responsibility for Collection of WEEE from private households- Member State transposition legal text outcomes*

Allocation of Responsibility for Collection of WEEE from private households (legal text interpretation)	Physical Responsibility	Financial Responsibility
Producer only	4: CY, FI, SE, SK	8: CY, EE, ES, FI, LV, PT, SE, SK
Municipalities only	1: DE	1: DE
Producer & Retailers	5: CZ, EE, FR, HU, LV	5: AT, BE, CZ, FR, HU
Retailers & Municipalities	10: BE, DK, EL, IE, IT, LU, NL, PL, SI, ES	6: DK, EL, IE, IT, LU, PL
Producers, Retailers & Municipalities	2: AT, PT	2: NL, SI
Unclear	3: LT, MT, UK	3: LT, MT, UK
Total	25	25

(Source: Van Rossem, Tojo & Lindqvist, 2006.)

## 2.5.3 Spent batteries and accumulators

### 2.5.3.1 Content of the legislation

There existed an EU Directive from 1991<sup>32</sup> that covered specific batteries and accumulators that contain more than certain amount of mercury, cadmium or lead. The Directive as amended in 1998<sup>33</sup> in its Annex I specified the following batteries and accumulators to be covered:

1. Batteries and accumulators put on the market as from 1 January 1999 containing more than 0.0005 % of mercury by weight
2. Batteries and accumulators put on the market as from 18 September 1992 and containing:
  - More than 25 mg of mercury per cell, except alkaline manganese batteries,

<sup>32</sup> Council Directive 91/157/EEC on batteries and accumulators containing certain dangerous substances. OJ L 078, 26/03/1991 P. 0038-0041.

<sup>33</sup> Commission Directive 98/101/EC of 22 December 1998 adapting to technical progress Council Directive 91/157/EEC on batteries and accumulators containing certain dangerous substances. OJ L 1, 5.1.1999, p. 1–2.

- More than 0.025% of cadmium by weight,
  - More than 0.4% of lead by weight.
3. Alkaline manganese batteries containing more than 0.025% of mercury by weight placed on the market as from 18 September 1992.

The 1991 Directive contains *prohibition of the marketing* of certain types of alkaline manganese batteries that contain more than certain amount of mercury. The amendment in 1998 strengthened the restriction and bans the sales of batteries and accumulators that contain more than 0.0005% of mercury by weight from 1 January 2000 (Art. 3).<sup>34</sup> It also required Member States to ensure that the batteries, accumulators and, where appropriate, the appliances containing them are *marked* in such a way that appropriately indicate the source separation, if appropriate recycling, and the heavy metal content (Art. 4).

In terms of *collection and treatment*, the 1991 Directive required Member States to develop programs for separate collection and disposal of the spent batteries and accumulators (Art. 6). It also requires that efficient separation collection systems should be set up (Art. 7). However, it did not specify any numerical targets, and left it in the hands of Member States to allocate responsibility to achieve these mandates.

The 1991 Directive was replaced entirely by a new Directive 2006/ 66/ EC that entered into force on 26 September 2006.<sup>35</sup> The main changes concern the scope, extension of prohibition of marketing, incorporation of the concept of EPR regarding collection, treatment and recycling of waste batteries and accumulators, restriction on disposal in landfills and incinerations, establishment of collection targets and the enhanced information provision to consumers. These changes are the result of intensive discussions taking place both before and after the emergence of the proposal to the Directive.<sup>36</sup>

The *scope* of the new directive is extended to “all types of batteries and accumulators, regardless of their shape, volume, weight, material composition or use” (Art. 2.1). Namely, instead of targeting batteries with hazardous substances the new directive intends to cover all types of batteries. This is primarily due to the difficulties of collecting only the selected types of batteries, as experienced in Member States (COM (2003) 723, final). The Directive excludes the batteries used for military purposes as well as those sent into space (Art. 2.2).

Concerning prevention, the new Directive kept the restriction of the use of mercury as found in the existing Directive (Art. 4.1 (a), 4.2). In addition, the 2006 Directive prohibits the placing on the market of “portable batteries or accumulators, including those incorporated into appliances, that contain more than 0.002% of cadmium by weight”, with some exemptions (Article 4.1 (b), 4.3).<sup>37</sup> The 2006 Directive also *prohibits the landfilling or incineration* of industrial

---

<sup>34</sup> It exempts button cells and batteries composed of batteries that contain mercury no more than 2% by weight (Art. 3). The Directive also requires the easy removal of the batteries and accumulators from appliances, with some exemptions (Art. 5).

<sup>35</sup> Directive 2006/ 66/ EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/ EEC. OJ L 166, 26.9.2006, p. 0001–0014.

<sup>36</sup> COM (2003) 723 final. *Proposal for a Directive of the European Parliament and of the Council on batteries and accumulators and spent batteries and accumulators*.

<sup>37</sup> Inclusion of cadmium ban went through a long debate. A draft proposal of the Directive included the introduction of cadmium ban in secondary batteries, but it was excluded in the final proposal presented by the Commission (COM (2003) 723, final) due to the fierce opposition of the industry (see, for instance, ENDS (2000, December 1) and ENDS (2004, April 6)). As an alternative, the introduction of a mandatory deposit-refund system for nickel-cadmium batteries was also discussed (ENDS, 2001, July 2), but in the end was not included in the proposal. However, with a strong push from the

and automotive batteries and accumulators without undergoing treatment and recycling (Art. 14).

The Directive stipulates the introduction of *EPR*, both in terms of *physical management* and *financing* of the system. Article 8 and 16 assigns different responsibilities to producers for three types of batteries and accumulators (portable,<sup>38</sup> automotive<sup>39</sup> and industrial<sup>40</sup>), as summarised in Table 2-6.

*Table 2-6: Physical and financial responsibility given to producers under the proposal for new directive on batteries and accumulators*

Type of batteries and accumulators	Producers' physical responsibility	Producers' financial responsibility
Portable	Potentially responsible for collection, treatment and recycling	Collection, treatment and recycling, public information campaign
Industrial	Producers shall not refuse to take-back, treatment and recycling	Collection, treatment and recycling (other arrangement can be agreed with the users), public information campaign
Automotive	Set up collection systems, unless already collected through the system for end-of-life vehicles, <sup>41</sup> treatment and recycling	Collection, treatment and recycling (other arrangement can be agreed with the users), public information campaign

(Source: Directive 2006/66/EC)

Concerning collection of portable batteries, the Directive requires distributors to take-back waste batteries and accumulators when supplying a new one, “unless assessment shows that alternative existing schemes are at least as effective in attaining the environmental aims of” the Directive (Art. 8.1 (b)). It also requires free of charge acceptance of portable batteries and accumulators and automotive batteries at an accessible collection points, and of accumulators used in private, non-commercial vehicles (Art. 8.1 (a)(c), 8.4). As long as these conditions are met, the decision as to which entity should be in charge of the collection of portable batteries and accumulators is left in the hands of the Member States (Art. 8.2).<sup>42</sup>

Regarding financial responsibilities, the Directive provides possibilities for Member States to exempt small producers from financing the collection, treatment and recycling so long as the exemption “does not impede the proper functioning of the collection and recycling schemes” (Art. 18.1).

---

European Parliament (see, for instance, ENDS (2004, April 20)), the cadmium ban was in the end included, with the exemptions given to portable batteries and accumulators intended for use in emergency and alarm systems, medical equipment or cordless power tools.

<sup>38</sup> Defined as any battery, button cell, battery pack or accumulator that “(a) is sealed, (b) can be hand-carried and (c) is neither an industrial battery or accumulator nor an automotive battery or accumulator.” (Art. 3 (3)).

<sup>39</sup> Defined as any battery and accumulator “used for automotive starter, lighting or ignition power” (Art. 3 (5)).

<sup>40</sup> Defined as any battery and accumulator “designed for exclusively industrial or professional uses or used in any types of electric vehicle” (Art. 3 (6)).

<sup>41</sup> Directive 2000/ 53/ EC of the European Parliament and of the Council of 18 September 2000 on end-of life vehicles. OJ L269, 21/10/2000 p.0034 –0043.

<sup>42</sup> The idea of introducing a mandatory deposit-refund system for nickel-cadmium batteries was also discussed, but in the end was not included in the final proposal. ENDS. (2001, July 2)

Unlike WEEE, the 2006 Directive does not make distinction between all and new waste (Art. 16.6).

The Directive contains include the minimum collection rate targets of 1) 25% by 26 September 2012 and 2) 45% by 26 September 2016 (6 and 10 years after the entry into force of the Directive respectively).<sup>43</sup> collection targets for all the spent portable batteries and accumulators in absolute term: on the average 160 g per person per year. Moreover, 80% of the total quantity of spent portable nickel-cadmium batteries and accumulators should be collected (Art. 13). Among the batteries collected, the Directive in its Annex III stipulates differentiated recycling targets for portable batteries differentiated based on the content of the batteries and accumulators (lead-acid, nickel-cadmium and others), as summarised in Table 2-7. The sentence “the highest degree that is technically feasible while avoiding excessive costs” was added as a compromise between the Council and the Parliament.<sup>44</sup>

*Table 2-7: Recycling mandate stipulated in the proposal for new directive on batteries and accumulators*

Types of batteries and accumulators	Recycling requirements
Lead-acid	65% by weight, including recycling of the lead content to the highest degree that is technically feasible while avoiding excessive costs
Nickel-cadmium	75% by weight, including recycling of the cadmium content to the highest degree that is technically feasible while avoiding excessive costs
The rest	50% of the materials contained

(Source: Source: Directive 2006/66/EC)

### 2.5.3.2 Status of implementation

Starting as early as the 1980s, industries in some countries (e.g. the Netherlands, the UK) established battery collection and recycling programmes on a voluntary basis (Morrow & Keating, 1997). Due mainly to the relatively unsuccessful outcome of such voluntary programmes or to free-rider problems, some countries (e.g. Austria, Belgium, Germany, The Netherlands) mandated producers (manufacturers, importers and retailers) responsibility for end-of-life management of batteries in different manners (Kiehne, 1997; Raymond, 2001). Some programmes collect all the batteries, while others collect limited types of batteries (for instance nickel-cadmium). The majority of these systems established a collective scheme (PRO) for collection and recycling.

The countries that have mandated some forms of EPR for batteries have set collection targets. This was also case for some EU Member States, despite the lack of numerical targets in the existing EU legislation. Belgium set the collection target at 75%, Austria 65% and The Netherlands 80% by 1996 and 90% by 1998 (Beaurepaire, 1997; Korfmacher, 2001; Raymond,

<sup>43</sup> Regarding collection targets, there are distinctive differences between the proposal (COM (2003) 723, final) and the final Directive text. The collection targets in the proposal of the new Directive were set in absolute term: on the average 160 g per person per year for all the spent portable batteries and accumulators. Moreover, the proposal mandated 80% of the total quantity of spent portable nickel-cadmium batteries and accumulators be collected.

<sup>44</sup> The proposal (COM (2003) 723, final) stipulated recycling of all the lead and all the cadmium (Art. 19 (1)). The common position of the Council in 2005 was to mandate the recycling of lead and cadmium to be done with “the highest degree that is technically feasible while avoiding excessive costs”. The Parliament in their amendment (second reading) deleted these and suggested a closed loop for all the lead and cadmium contained (Council of the European Union, 2006).

2001; Tojo, 2004). In the case of Belgium, it is a combination of voluntary agreement with a threat of eco tax. Namely, the manufacturers, importers and retailers that participate in the common recycling scheme are exempt from the eco-tax so long as the common scheme achieves the collection and recycling targets of 75% (Raymond, 2001).

This has resulted in higher collection rates compared to previous efforts, as found in the example from the Netherlands (Table 2-8). The Dutch system covers both primary and secondary (rechargeable) batteries that weigh not more than 1 kg.

The calculation methods of collection rates for batteries have been debated due to the longevity and hoarding effects of batteries. For instance, in the Netherlands, it is based on the actual amount of waste disposed. The denominator is the sum of the amount of waste streams separately collected and the amount disposed of in the municipal waste stream.<sup>45</sup> In Switzerland, another European country that has an EPR-based legislation and has achieved rather good collection rates (Table 2-9), the collection rate is calculated based on the sales figure.<sup>46</sup>

The collection method used in the two countries is a bring system (See Section 3.3). Collection points in the Netherlands include municipal collection points, schools, campsites and retailers, while in Switzerland the main collection points are retailers (Tojo, 2004).

In Sweden, since the late 1980s, producers of batteries with hazardous substances finance the end-of-life management of their products via advance disposal fees paid to the government (Lindhqvist, 2000). A voluntary take-back scheme of nickel-cadmium batteries by producers started in 1993 (Lindhqvist, 2000). However, despite the initial commitment of collecting 90% of nickel-cadmium batteries by the summer 1995, the actual collection rate was 35%, leading to the re-introduction of the system before 1993 (Fishbein, 1997; Lindhqvist, 2000). There also exists a law that requires consumers to separate hazardous batteries from other waste stream, but there has never been an attempt to enforce it, resulting in a very low separate collection (Lindhqvist, 2000).

In order to reduce the use of cadmium, Sweden introduced a material tax on batteries using cadmium, which is 300 SEK (33 Euro) per kilogram of batteries (e.g. 15 SEK for a battery weighing 50g). This could explain the sharp reduction of the sale of batteries from 328 ton in 1997 to 190 ton in 1998 (Langrová, 2002).

Section 5 of the Swiss law on batteries<sup>47</sup> discusses the introduction of mandatory deposit-refund system for small nickel-cadmium rechargeable batteries. Namely, from 2004 cadmium content within small nickel-cadmium batteries in household waste shall not exceed 3 000 kg per year.<sup>48</sup> The law stipulates that if this cannot be achieved, a mandatory deposit-refund system could be introduced. According to the calculations made by the Federal Agency for the

---

<sup>45</sup> In the Netherlands, the amount of batteries coming into the waste stream is estimated through the sampling of municipal waste taking place six times a year (Tojo, 2004).

<sup>46</sup> For example, in Switzerland, up until 2002, the amount of batteries collected was compared to the amount of batteries sold in the same year. From 2002, the amount of batteries collected is compared to the average of the amount of batteries sold in the same year and two previous years. (Back, 2004, personal interview).

<sup>47</sup> Ordinance relating to Environmentally Hazardous Substances. Amendment of 11 November 1998. Batteries and accumulators. Annex 4.10., Switzerland.

<sup>48</sup> The Ordinance on Substances stipulates that from the year 2001 onwards, the Federal Agency decides annually whether the target value can be achieved.

years 2002 and 2003, the target value was likely to be respected in 2004, making further steps towards a mandatory deposit-refund system unnecessary (Back, 2004, personal interview).

Most of the recycling programmes bring the returned batteries to contracted recyclers (Fishbein, 1997; Raymond, 2001). In programmes where all types of batteries are collected, batteries are, either manually or automatically, sorted prior to the recycling (Vassart, 2001). Today, they are typically sorted into the following categories: nickel-cadmium, primary (alkaline-manganese and zinc-carbon), button cells, and others (Vassart, 2001).

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

Year	1998	1999	2000	2001
Amount collected in STIBAT system (tonnes) (a)	2 533	1 849	1 856	1 876
Amount found in the municipal waste stream (tonnes) (b)**	845	805	675	823
Total amount discarded (tonnes) (a + b)	3 378	2 654	2 531	2 699
Collection rate (%) a/(a + b)	75	70	73	70

(Source: STIBAT, 2002).

\* *STIBAT* is the PRO for batteries in the Netherlands. Parallel to the system introduced by *STIBAT* there is a system organised by an importer of batteries used in mobile phone. The figures in the table do not include the amount collected by the importer.

\*\*The amount of batteries found in the municipal waste stream is figured out by separating batteries contained in a sample municipal waste, which is undertaken six times a year (Veerman, 2003, personal interview; Broers, 2003, personal interview).

*Table 2-9: The result of collection of consumer portable batteries in Switzerland\**

Year	Consumption (sale) (tonnes)	Amount collected (tonnes)	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

(Source: BESO, in SAEFL (2001)).

\* Collection by the PRO covering the primary and secondary batteries that are less than 5 kg and used for civil purposes (not in the army or civil defence)

\*\* Figure estimation by SAEFL

In the case of Belgium where all types of batteries should be collected, it achieves recycling rate of more than 60% for materials in the batteries in 1999 (Bebat, 2001). When using wet chemical process devoted to batteries, which is one of the three recycling processes that is commonly used in Europe, recycling rate of 70% has been achieved (Vassart, 2001).

### 3 Administrative instruments

This chapter addresses selected administrative instruments used and/ or discussed in the field of waste management in various Member States. Administrative instruments cover various measures that concern fulfilment of certain tasks, such as achievement of a certain recycling rate, elimination of the use of certain substances and prohibition of landfilling. When mandated via legislation, it makes the target entities seek to achieve certain tasks or refrain from doing certain things demanded in the legislation. They can also be introduced through non-coercive mechanism, such as inclusion in the criteria in public procurement or in the guidelines.

#### 3.1 Administrative instruments for waste management

The instruments discussed in this chapter include:

- Substance restriction;
- Source separation;
- Producer's take-back of specific discarded products;
- Collection, reuse/refill and recycling targets;
- Minimum recycled material content standards;
- Landfill restriction/diversion targets; and
- Environmentally sound treatment standards.

The description of each instrument contains the *content*, *objectives* and *addressees* of the instruments, the *effectiveness* of the instruments and its potential in *introducing at the local level*.

Concerning the *content*, the general characteristics of an instrument are described as illustrated by examples. In describing the *objectives*, reference to the *waste hierarchy* – whether the instruments aims to achieve waste prevention, reuse, material recycling, energy recovery or environmentally sound proposal, or combination of some of them – are made. The main *addressees* of each instrument – whose behaviour the instrument aims to influence – are also described.

*Effectiveness* of an instrument concerns whether and how much the goals of the instrument have been attained. This can be considered from two viewpoints: 1) whether the outcomes are in accord with the goals (*goal-attainment* measurement), and 2) whether the outcomes are produced by the intervention (*attributability* assessment) (See Figure 3-1). As mentioned in Section 1.3, the role of the contribution of the intervention in attaining the goal will be discussed together with some other influencing factors that facilitate/ hinder the attainment of the results.

Introduction of an intervention often produces effects that are not unintended. These so-called side-effects can be positive or negative. These effects, when observed, are also mentioned, especially when they may influence the implementation of the intervention in question.

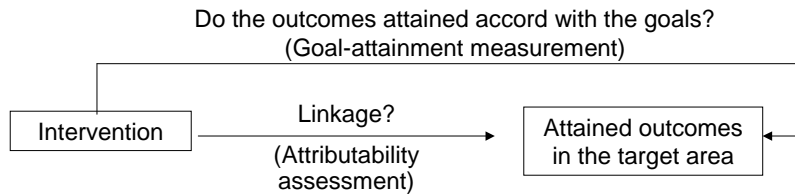


Figure 3-1: Effectiveness evaluation (adapted from Vedung, 1997)

Finally, considering the aim of the project, the feasibility of the instrument to be *introduced at the local level* is also considered.

The intention of the chapter is not to compare the suitability or effectiveness of the instruments. Instead, it seeks to highlight the characteristics of each instrument via illustration with examples.

## 3.2 Substance restriction

### Content

Examples of policy measures taken to *restrict the use of certain substances within products* that, when discarded, have possibilities to enter into municipal waste streams include those related to batteries and accumulators and EEE.

In the case of batteries and accumulators, the Directive 91/157/EEC on batteries and accumulators containing certain dangerous substances restricts the amount of mercury, cadmium and lead contained in primary and secondary batteries, and gradually increased the level of restriction with the subsequent revisions (See Section 2.5.3). Similar legislation was introduced in Switzerland (Tojo, 2004). As for EEE, the so-called RoHS Directive that came into force together with the WEEE Directive restricts the use of following six substances: lead, mercury, cadmium, hexavalent chromium and two brominated flame retardants (polybrominated biphenyls: PBB and polybrominated diphenylethers: PBDE) (See Section 2.5.2).

In both cases, the Directives set a date from which products that contain the specified substances beyond the prescribed limit cannot be marketed in the EU.

This instrument can be introduced on its own. However, when the substance addressed cause harm at the end-of-life of a product (instead of, for example, the use phase of a product), in most of the cases it is accompanied by other instruments that facilitate source separation (discussed further in this chapter). This is due partly to the time rug – there are products that contain hazardous substances already in the market, and those products need to be treated separately when they come into the waste stream. It is also very difficult to eliminate the substance entirely from products.

### Objectives

The objective of substance restriction concerns the highest of the waste hierarchy: source prevention in terms of quality. By restricting the use of hazardous substances within products, it aims to prevent the hazardous substances from coming into the waste stream. It seeks to



force the manufacturers of products to find alternative substances that are less harmful/ cause no harm to the environment at the end of life phase of the products.

As the restriction of the use of substances within products touches upon the circulation of goods in the Internal Market, when introduced in the EU level, the intention is to harmonise the restriction across Europe.

### **Addressees**

It is primarily the manufacturers and importers that produce the products in question that substance restriction requirements aim to address.

### **Effectiveness**

Substance restriction has proven to be very effective in source prevention. Concerning batteries, substantial amount of separately collected batteries started to be, for instance, mercury free (COM (2003) 723 final). This motivated the battery producers to develop technological solutions to distinguish mercury-free batteries from mercury-containing batteries (Broers, 2003, personal interview). Those who made efforts in phasing out the mercury free batteries wish to obtain economic reward by not having to share the cost for recycling of mercury containing batteries. The action of the producers is an evidence of the improvement of the quality of discarded products.

The proposed ban of the use of cadmium in batteries in the EU as well as in some countries (e.g. Sweden) (See Section 2.5.3) has helped stimulate the industry to develop rechargeable battery chemistries that eliminate cadmium. These substitutes, such as nickel metal hydride and lithium ion batteries, are being widely employed in electronic products. The effect was supported by the general awareness of the toxicity of cadmium and the difficulties in reaching high collection rates for recycling.

Regarding EEE, rigorous efforts have been made to eliminate substances addressed in the RoHS Directive. The most prominent example includes development of the lead-free solders used in EEE in the anticipation of the coming into force of the RoHS Directive. The influence was not limited to the manufacturers in Europe but also those in other countries such as Japan. A study from 2001 shows that although various factors influence the upstream changes, the effects of RoHS Directive were unanimously agreed by both Swedish and Japanese EEE manufacturers (Tojo, 2004).

### **Introduction at the local level**

Restriction of the use of certain substances within products often touches upon the core of product development. Thus such intervention often meets strong resistance from the industry that might be affected. A clear example of such case includes the lengthy fight of battery producers concerning the introduction of cadmium ban in secondary batteries when the proposal for the new directive on batteries and accumulators was discussed (see Section 2.5.3.1).

Introduction of substance restriction at the local level faces challenges due partly to the potential conflict with the trade regime.

A potential measure at the local level could be to include the restriction in the public procurement guide, or green-purchasing guidebook for consumers.

### 3.3 Source separation

#### Content

This instrument requires *separation of specific fraction of waste at source*. Source separation can be done in various places. It can be at consumers' residence via provision of bags, containers, boxes and the like, or can be at local collection points.

Two of the EU Directives on specific waste stream addressed in this study – packaging and WEEE – mandate Member States to separate the fractions addressed at source. The Directive on batteries and accumulators also requires the Member States to ensure efficient organisation of separate collection. The landfill Directive requires among others the diversion of biodegradable waste, which drives Member States to strive for source separation of that waste stream (Section 2.4.1). In addition to those mandated by the EU, individual Member States also have requirement of sources separations, such as newsprint in Sweden (Naturvårdsverket, 2005, p.77) and Finland.<sup>49</sup>

Different infrastructures – with different level of convenience and incentives provided to the consumers – have been used for the source separation of recyclables. The main systems include: 1) deposit-refund system (Section 4.6); 2) pay-as-you-throw approach (Section 4.5), 3) kerbside collection system and 4) collection centre (“bring”) system.

The instrument is rarely introduced alone. It is often accompanied by take-back requirements (Section 3.4), achievement of collection, reuse and/ or recycling targets (Section 3.5), deposit-refund system (Section 4.6), various information campaigns (Section 5.5) and the like.

#### Objectives

Source separation of specific waste stream is a prerequisite to achieve the increase in reuse and recycling. When the waste stream in question is hazardous, it is to prevent the waste stream from being mixed with the rest of the stream, thus contribute to environmentally sound treatment.

#### Addressees

In the context of municipal waste management, the primary addressees are citizens/households. Some legislation (e.g. the batteries and WEEE in Switzerland) requires citizens to bring the specified waste streams to the appropriate collection points. In many cases, the source separation is accompanied by other instruments, which address actors other than citizens/households such as producers and local governments.

#### Effectiveness

Generally speaking, the results of source separation are dependent on three factors: *convenience* for consumers, *incentives* for consumers and level of *awareness* (Lindhqvist, 2000).

An example of kerbside collection system for packaging waste combined with take-back requirements is found in Germany, where, in response to the enforcement of the Ordinance

---

<sup>49</sup> No. 883. Government Decision on the Collection and Recovery of Waste Paper. 25 November 1998. Finland.

on the Avoidance of Packaging Waste,<sup>50</sup> industry organized a nation-wide collection system, called *Duales System Deutschland AG (DSD)*. Among the products covered under the Ordinance, plastics, tin plate, composites and aluminium are collected at kerbside, in parallel to the municipal waste management system (OECD, 1998). The collection rate achieved here is also high, between 80 to 95% in 1996 (OECD, 1998).

With regard to the bring system, the result varies. A high collection rate of 83 to 93% is observed for glass (e.g. Switzerland, Austria, the Netherlands and Sweden) (ENDS, 2000, August 7; Lindhqvist, 2000). On the other hand, fairly low collection rates have been observed in Sweden for plastics (34%), paper/ carton (40%), and aluminium packaging (33%) in 1999 (ENDS, 2000, June 6; Lindhqvist, 2000). All of these countries have set collection targets (See Section 3.5).

According to Ricci (2006, personal interview), approximately 2000 cases in Italy suggest that bring system (to the road containers) could achieve less than 30% of source separation of recyclables, while kerbside (door to door) collection system can achieve 50-70% source separation.

A study in UK sought to model how an intensification of bring facilities for recyclables and kerbside source separation might contribute to people's participation in recycling activities and the result of actual source separation. The study generally suggested that kerb-side source separation tends to be more effective in enhancing source separation in intensifying kerbside collection. The study also pointed out that recycling rate is further enhanced when multiple materials are collected kerbside, and when the interventions are accompanied by information campaign (Tucker & Spiers, 2002).

In relation to the convenience, the characteristics of products also influence the results. For instance, when a discarded product is large and heavy, the people have higher tendency to bring the waste to the appropriate collection points instead of discarding it together with the rest of the waste stream. On the other hand, when a product a consumer wishes to discard is light and small, there is a higher tendency for people to put them in the residual waste bin. The effectiveness of source separation is also affected when there are similar products, and only parts of them are covered by separate collection system. Confused consumers may stop sorting those that should be sorted, as they become uncertain about what should be sorted and what does not have to be sorted (Tojo, Lindhqvist & Davis, 2003).

The low collection rate of small consumer batteries, as experienced in countries such as Sweden and Germany, can be explained by the characteristics of the products mentioned above. They are small and light, and can be easily mixed with other waste. Some of the battery collection programs only cover certain types of batteries (e.g., those containing hazardous substances), causing confusion to people. Examples of confusion also include source separation of plastics in the city of Lund, Sweden. Households are supposed to separate only hard plastics. However, it is not always easy to know what constitutes hard plastics and what does not.

These results suggest that the effectiveness of source separation varies depending on the combination with other instruments, characteristics of products, convenience for consumers, provisions of incentives and the like. Between kerbside and bring system, kerbside system tends to achieve higher collection than bring system.

---

<sup>50</sup> Ordinance on the Avoidance and Recovery of Packaging Waste (Verpackungsverordnung – VerpackV) of 27 August 1998 (BGBl I 1998 S. 2379).

As mentioned, a source separation program is most of the time introduced with other policy instruments. It is difficult to compare the effectiveness of source separation program per se. However, especially when combined with other programs, there are many examples where very high source separation rate has been achieved. The results of the programs utilising deposit-refund system (Section 4.6) and pay-as-you-throw approach (Section 4.5) are discussed further in the preceding sections.

## Introduction at the local level

Various possibilities exist for the introduction of source separation at the local level. In fact, it is perhaps one of the most local-specific solutions that local policy makers could take.

## 3.4 Producers' take-back of discarded products

### Content

When this instrument is introduced, producers, which in most of the existing programs manufacturers and importers, *take back their own products that the last owners wish to discard and take care of them in an environmentally sound manner*. It is one of the most common and central instruments found in the existing extended producer responsibility (EPR) programs. By default it comes together with source separation (Section 3.3), and often, but not always, include the mandate to achieve certain collection and recycling targets (Section 3.5).<sup>51</sup> It is also often introduced in combination with other instruments such as substance restriction (Section 3.2), fulfilment of environmentally sound treatment/ disposal standards (Section 3.8), deposit-refund systems (Section 4.6) and various informative instruments (Chapter 5).

In the EU, two EPR-based legislation oblige producers to take-back their products once those products become waste. One is on the end-of-life vehicle,<sup>52</sup> and the other is on WEEE (See Section 2.5.2). Moreover, the majority of the old EU Member States introduce producers' take back requirements when implementing the Directive on packaging and packaging waste (See Section 2.5.1). Switzerland and the Netherlands also mandate producers to take back spent batteries.<sup>53</sup>

The take-back responsibility given to the producers can be divided into *physical* responsibility and *financial* responsibility. The former concerns the organisation of physical management of the discarded products, and the latter is the financing of the activities (Lindhqvist, 1992).

As mentioned in Section 2.5, in Europe, producers typically establish (an) organisation(s) that organise the take back system and fulfil their mandate on their behalf. These organisations are often referred to as producer responsibility organisations (PROs). Among the various stages involved in actualising take-back (collection from households, transportation to treatment

---

<sup>51</sup> For example, the collection targets were not included in the legislation on WEEE management in the Netherlands and Sweden until the WEEE directive came into force. The Swiss legislation for WEEE requires producers to take back their products, but does not have collection or recycling targets.

<sup>52</sup> Directive 2000/ 53/ EC of the European Parliament and of the Council of 18 September 2000 on end-of life vehicles. OJ L269, 21/10/2000 p.0034 –0043

<sup>53</sup> Ordinance relating to Environmentally Hazardous Substances. Amendment of 11 November 1998. Batteries and accumulators. Annex 4.10., Switzerland, and Decree 0 31 January 1995 laying down rules for the collection and processing of spent batteries (Batteries Disposal Decree). Bulletin of Acts and Decrees of the Kingdom of the Netherlands. 1995, 45. The one in the Netherlands was introduced as a means of implementing the EU Directive on batteries and accumulators (Section 2.5.3).

facilities and treatment itself), the level of PROs' involvement in organising the collection from private households varies among programs, as exemplified in Table 3-1. It should be noted that PROs' involvement in organising the collection from private households does not mean that the PROs run the activities themselves. They typically have contract with private collectors and transporters as well as local governments.

Parallel to the systems organised by PROs, some producers organise collection and take-back systems that would allow them to separately recycle their products. For instance, a producer of coffee maker in Switzerland established a special agreement with retailers and their discarded products returned to the retailers are sorted from the rest of WEEE. A Dutch importer of batteries used in mobile phones also establish its own collection and take-back network independent of the collective system organised by the PRO (Tojo, 2004).

An important part of the producers' take back mandate is the financial responsibility. Just as the physical responsibility, which part of end-of-life management is financed by producers varies. Although in the end the cost is born by consumers, there are a variety of financial mechanisms employed in the existing EPR programs.<sup>54</sup> The actual implementation of both physical and financial responsibility influence the effectiveness of the program.

In some cases, producers organise systems to take back their products (or in some cases, their competitors' on old-for-new basis) voluntarily. A classical example includes a take-back of copying machines, toner cartridges and large equipment. The users of the equipment are typically businesses and institutions. It can be done by the request of customers, as found in, for instance, in Switzerland, where voluntary take-back programs of IT equipment before the legislation for WEEE was introduced in 1998. In Switzerland, a take-back program also existed for refrigerators prior to the introduction of legislation. In fact, the legislation was introduced partly with the request of producers to have a common playing field with the rest of the producers who were not participating in the take-back program (Tojo, 2004).

*Table 3-1: Varying involvement of producers in organising collection from private households when they are responsible for take back*

Level of involvement in organising the collection from private households	Examples
PROs take the primary responsibility in organising the collection from private households	Packaging: Germany (household and small commercial outlets), Sweden (aluminium cans and PET bottles through deposit-refund systems) EEE: Switzerland
PROs take part of the responsibility together with other actors such as retailers and municipalities	Packaging: Finland (PROs establish collection points in offices and supermarkets. The collection beyond the recycling targets stipulated by law is borne by municipalities.) Batteries: the Netherlands (aside from municipal collection systems, the PRO developed collection network with schools and retailers)
PROs take back only those products collected by other actors.	EEE: the Netherlands (PROs organise transport of collected materials from regional aggregation points and retailers to recyclers)

(Source: Langrová, 2002; Tojo, Lindhqvist & Davis, 2003; Salo, 2006, personal interview)

<sup>54</sup> For the detailed discussions on different types of financial mechanisms, see, for example, Kim (2002), Tojo, Lindhqvist & Davis (2003) and Tojo (2004).

## Objectives

The objectives of EPR programs that include producers' take back mandate include 1) *design improvements of products* and 2) *High utilisation of product and material quality through effective collection and re-use or recycling* (Lindhqvist & van Rossem, 2005). Take-back responsibility given to the producers aims to provide incentives for prevention, both in terms of quantity and quality. Making producers responsible for the end-of-life management of their products should enhance reuse and recycling, and also enhance environmentally sound treatment of the residues that cannot be reused or recycled.

## Addressees

It is the producers who are the primary addressees of the instrument. It is due to their capacity to make upstream changes. Streamlining responsibility also helps avoid the situation where everyone's responsibility is no one's responsibility.

In most of the EPR program that include take back obligations, both domestic manufacturers and importers are considered as producers.

## Effectiveness

*With regard to waste prevention in terms of volume, the take-back requirements (both physical and financial) introduced in Germany for packaging since 1991 provides an excellent example of reduction of total packaging consumption. As seen in*

Figure 3-2, the use of packaging has been effectively decoupled from the growth of GNP.

Concerning prevention of in terms of quality, efforts to eliminate hazardous substances within components and materials also facilitate recycling. It would lift up the value of recycled materials, and help manufacturers meet higher recycling targets. An EEE manufacturer in Sweden has undertaken voluntary efforts to eliminate beryllium to enhance recycling, even though the legislation does not prohibit them to use these substances (van Rossem, 2001).

Concerning source separation, the collection rate of WEEE in Sweden was more than 10 kg in 2001 (ENDS, 2002, October 1), and around 10 kg in 2003 in Switzerland (Buletti, 2006, personal interview). These countries mandate take back to producers without any collection targets in reference years. Examples of achievement in the area of packaging waste can be found in Section 3.3.

In general, difficulties have been experienced to enhance high collection rates for small products such as batteries and small EEE.

Many of the examples mentioned above are implemented together with instruments such as the fulfilment of collection/ reuse/ refill/ recycling target, information campaigns and the like. Ref to 3.3 It is impossible to delineate the attributability of take-back requirements from the rest of policy instruments and other influencing factors.

## Introduction at the local level

Mandating producers' take back at the local level would face difficulties unless the product in question is produced and sold only in local market. However, in many jurisdictions, national laws incorporate possibility to make producers responsible for collection from households

(See Table 2-5). The actual implementation of this responsibility may lift, at least partially, the financial burden related to collection from local governments. Moreover, it would enhance possibilities to provide more incentives for producers to work on source prevention. However, the experiences in the past suggest that despite the possibility of having producers responsible, local governments tend to retain the collection operation under their control.

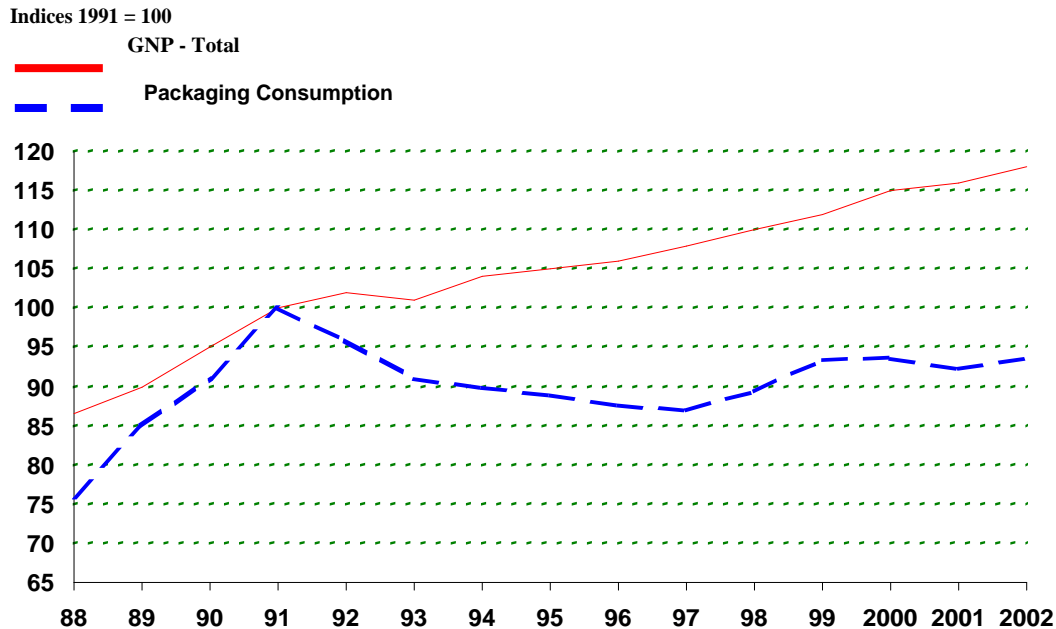


Figure 3-2: GNP (real) and Packaging Consumption of private consumers in Germany 1988 – 2002 (Source: German Statistical Federal Authority, GVM (Society for the research of the packaging market) and DSD)

### 3.5 Collection, reuse/refill and/or recycling targets

#### Content

As discussed earlier, mandate for source production and producers' take back of their products is often combined with the *collection, reuse/refill and/or recycling targets*.

For collection, numerical targets are set for source separation either in absolute or relative terms. Examples for the targets set in absolute term include the WEEE Directive (4 kg per person per year from private households) (See Section 2.5.2.1). Examples for the latter include the legislation for batteries (See Section 2.5.3.2). The proposal for the revised EU directive on batteries and accumulators (COM (2003) 723 final) contains collection targets both in absolute term (160 g per person per year for all the spent portable batteries and accumulators) and in relative term (80% of the spent portable nickel-cadmium batteries and accumulators) (See Section 2.5.3.1).

A challenge facing the target setting in relative term, especially for waste streams of durable products, is what should be the denominator. In some cases – for instance, the mandate for battery in the Netherlands and the new EU proposal – it is based on the actual amount of waste disposed. The denominator in this case is the sum of the amount of waste streams separately collected and the amount disposed of in the municipal waste stream. This method requires monitoring of what comes into the municipal waste stream. Alternatively, it can be based on the sales figure as found in the case of batteries in Switzerland (See Section 2.5.3.2).

Reuse/ refillable targets have been used extensively for beverage containers in countries such as Austria, Sweden and Germany. In Austria, combined reuse and recycling targets were set for beverage packaging for 1994, 1997 and 2000, differentiated among the type of beverages, and ranging from 80 to 96% (Lindhqvist, 2000). The target setting principles in Austria were changed in the revised Packaging Ordinance of 1996, which is only specifying recycling targets for the collected amounts of packaging.

In Sweden, up until 30 June 2001 there used to be a target for refillable PET bottles (90%) and glass bottles (95%) between 1997-2000.<sup>55</sup> In Germany, reuse of packaging is required by mandating at least 72% of beer, mineral water, soft drinks and wine to be sold in refillable containers. If this target is not met, a mandatory deposit would be imposed for the one-way packaging. The targets were met until 1996, but the percentage of refillables for a certain type of beverages fell slightly short in the following years (71.3% in 1997, 70.1% in 1998, 68.7% in 1999) (ENDS, 2000, November 22; ENDS, 2001, July 2).<sup>56</sup>

The WEEE Directive also contains combined targets for component and material reuse and recycling targets (See Table 2-4), which Member States should meet.

Recycling targets are widely used for packaging waste, as found in the EU Directive (See Table 2-2). Some Member States set targets higher than that of EU, such as Germany, Sweden and Finland.

For non-durables such as packaging materials, often the denominator for reuse/recycling targets is the amount of products put on the market during the same period as the discarded products are recycled. Thus, when there are reuse/refill or recycling targets, it is often not necessary to have collection targets.

## Objectives

The objective of collection targets is to facilitate source separation from the rest of the waste streams. It would be the first crucial step for reuse and recycling of components and materials. When the targeted waste stream contains hazardous substances such as batteries and EEE, the aim is to facilitate the environmental sound treatment of the separated waste streams as well as to avoid the contamination of residual waste.

Reuse/ refill/ recycling targets aim to enhance efficient use of resources. Reuse/ refill targets further addresses waste prevention. When the denominators used are not the amount of waste collected but the same as those used for collection targets, reuse/ refill/ recycling targets – as a prerequisite to achieve the reuse/ refill/ recycling targets – simultaneously address source separation.

When introduced together with measures to divert landfilling, mandatory recycling targets also serves as a mechanism to avoid resorting to incineration too much (OECD, 2007).

---

<sup>55</sup> Ordinance on Producers' Responsibility for Packaging, 7 May 1997, Sweden (SFS 1997:185).

<sup>56</sup> Instead of mandating the introduction of a deposit-refund system for one-way containers of a few specific types of beverages, the German government considered in January 2001 imposition of deposits on all "ecologically unfavourable" packaging, including one-way glass bottles and metal cans, as determined by a life cycle assessment of different packages (ENDS, 2001, January 31; ENDS, 2001, May 2). However, the proposal was not adopted by the German Bundesrat, forcing the government to consider the introduction of the deposit-refund system for only some specific types of beverages (ENDS, July 17). The whole situation surrounding this issue became a big confusion, leading to a number of court cases in different level of German courts as well as European Court of Justice.



Setting numerical targets facilitates the measurement and communication of the changes over time.

### **Addressees**

The addressee of the instrument is the entity who is assigned to fulfil the respective targets. EPR programs that include collection and/ or reuse/ refill/ recycling targets typically assign the responsibility of fulfilling reuse/ refill/ recycling targets to producers (domestic manufacturers and importers). Concerning collection targets, addressees vary. Producers, retailers and local governments – and often the combination of two of these actors – are the responsible entities (see Section 2.5.1.2 and 2.5.2.2). Denmark is unique in that, until very recently, local governments are the primary entity in fulfilling both collection and recycling targets.

### **Effectiveness**

As discussed in Section 3.4 some EPR programs with collection targets, implemented with various collection methods, have achieved high collection rates. The battery collection systems in the Netherlands and Switzerland achieved the collection rates of more than 60% (Section 2.5.3.2), a remarkably high figure for battery collection. In Sweden, refillable PET bottles achieved the reuse rate of 91%, and refillable glass bottles, 98% in 1999, exceeding the targets of 90% and 95% in 1997-2000 respectively.

In Germany, the actual recycling rates achieved for different sales packaging in 1996 were between 68 and 92%, all of which went beyond the requirements of 60-70% in the Packaging Ordinance (OECD, 1998). The development of recycling of plastic waste from packaging in Germany increased from close to zero in 1989 to more than half a million tons in 1997, with a dramatic increase between 1992 (less than 50,000 tonnes) and 1994 (450,000 tonnes.) (Lindhqvist, 2000).

### **Introduction at the local level**

When the party responsible for fulfilling the requirements are industry as found in EPR programs, they tend to focus their efforts in the urban areas instead of rural areas (Tojo & Hansson, 2004; Salo, 2006, personal interview). This would create discrepancy among different local communities within one country. However, introduction of collection/recycling targets for waste streams taken care of by local governments, such as biodegradable waste is feasible and should be considered.

## **3.6 Minimum recycled material content standards**

### **Content**

One of the typical concerns when introducing the source separation and recycling targets (Section 3.5) is whether there would be demand for the materials recycled. A way of securing the demand is to *mandate the use of certain amount of recycled materials in the new products*.

The minimum recycled material content standard was used for some time in the United States for paper. However, it was cancelled as it was considered to be a way of protecting the US pulp and paper industry and making it difficult for the Canadian industry to operate.

Instead of mandating the use of recycled materials, some governments take a somewhat softer approach. For example, in Finland, public authority should use as much recycled materials as

possible (Section 4 3), the Waste Act). In the Netherlands, there was a government procurement policy on construction and demolition waste for a while. The road-traffic department of the government, in their planning, specified the use of certain percentage of recycled materials (granulate). Under the public procurement policy of Denmark, municipalities are required to use recycled paper. There has been a handbook/guideline published every half a year or so to promote the use of recycled materials (Tojo, 2006).

### **Objectives**

The objective of this policy instrument is to enhance the demand for recycled materials.

### **Addressees**

If a law demands a certain percentage of the raw materials for the new products to be recycled materials, the addressee would be the manufacturer of the targeted product. If it takes the form of encouraging or the use of recycled materials or the products containing recycled materials, the addressee would be the users as well as the manufacturers. The users can be not only public entities but also industry as well as private households.

### **Effectiveness**

In the case of the Netherlands, the use of recycled materials in the road construction is no longer prescribed, but it is said that the use of the recycled materials continued because granulate became cheaper than other materials (Tojo, 2006).

The Waste Act in Finland faced difficulties in the actual enforcement. There have been an attempt to provide green procurement guidelines to local governments, but it was not perceived to work very well (Tojo, 2006).

### **Introduction at the local level**

Similar to the substance restriction (Section 3.2), mandating the use of recycled material may be perceived to create trade distortion. However, it can be indirectly used as part of the public procurement program or information campaign to the public, as discussed further in Chapter 5.

## **3.7 Landfill restriction/diversion targets**

### **Content**

As mentioned, despite various measures taken, the overall amount of waste, especially that of municipal solid waste, has been growing. Added to the problem is the containment of the (potentially) hazardous substances in the waste stream. Landfill restriction is introduced either to address the former – growing volume of waste – or the latter – hazardous content.

An example of the former is the EU directive on landfill. It requires the gradual reduction of biodegradable waste to be landfilled. As ways of achieving it, a number of Member States introduced landfill restriction (Section 2.4.1).

The Dutch national legislation on WEEE was accompanied by the ban of landfilling and incinerating WEEE (VROM, 1999). The proposed new directive on batteries and

accumulators also includes a clause on banning the landfilling and incineration of industrial and automotive batteries and accumulators (Section 2.5.3.1).

### **Objectives**

The immediate objective of landfill restriction is diverting waste from coming into the landfill in order to reduce the volume and/ or to prevent pollution. In some countries such as Denmark and the Netherlands, the threat to ground water contamination and limitation of space are important drivers behind the restricting landfilling (Tojo, 2006).

Implementation of landfill restriction inevitably requires source separation of the waste streams that cannot be landfilled. The instrument facilitates reuse and recycling especially when accompanied by measures such as collection/ reuse/ recycling targets and source separation. Segregation of specific waste streams also serves as an important first step for environmentally sound treatment of the stream.

### **Addressees**

The addressee of the instrument depends on who is in charge of the management of the waste streams that is covered by the instrument. For instance, in the case of biodegradable waste, the addressees are primarily local governments who are in charge of biodegradable waste as part of the municipal solid waste management. For the waste stream that are under the EPR programs (See Section 2.5), producers and the entity that fulfil the responsibility on their behalf are the addressees. In practice, the addressee also includes the operator of the landfill sites who are responsible for checking the content of the incoming waste.

### **Effectiveness**

As the first deadline for the landfill directive comes only in 2006, it is difficult to see the overall effectiveness of the directive in diverting the biodegradable waste from the landfill. However, it surely has triggered efforts for diversion in many Member States who used to dispose most of their waste in the landfill (See Section 2.4.1).

### **Introduction at the local level**

Local governments are often the entity to determine the destiny of the municipal waste generated from the community. Moreover, the management of the landfill is often in the hands of local or regional governments. Thus unless prohibited by their national laws, it should be possible to restrict the discard of certain substances in the landfill. They may be also in a good position to enforce restriction through licensing and monitoring of the installations.

## **3.8 Environmentally sound treatment/disposal standards**

### **Content**

In the EU, entities that carry out operations for waste recovery and disposal as listed in the Annex IIB and IIA of the Directive 75/ 442/ EEC on waste must obtain permits from competent authorities (See Section 2.3.1.3). Some recovery and disposal operations require obtainment of permits in accordance with the IPPC Directive (see Section 2.4.3).

One of the basic conditions of the permits to be granted from the competent authorities in the Member States is to meet various technical requirements in order to prevent negative impacts to the environment. Directives on landfill and incineration establish specific requirements for the designs and operations of landfills and incineration plants, to which the Member States must adhere to at minimum. Directives on specific waste streams specify some conditions for the treatment conditions. For example, the WEEE Directive stipulates that the treatment should use “best available treatment, recovery and recycling techniques”, and that it shall “as a minimum, include the removal of all fluids and selective treatment” stipulated in the Annex II of the Directive (Art. 6).

For the rest of the recycling and recovery operations the EU lacks the community wide standards. The operations of the installations covered by the IPPC Directive must meet the emission limit values reflecting upon the best available techniques and the local conditions. This leaves possibilities for the competent authorities in the Member States to differentiate the permit conditions (see Section 2.4).

Based on the European-wide requirements, the competent authorities of the Member States decide upon the permit conditions for each installation. In some cases, Member States can also stipulate national standards for certain categories of installations.

In the case of WEEE management in Switzerland the recyclers who wish to have contract with the PROs must obtain a contract with the standards set forth by the PROs which are more stringent than the national standards. The operations of the facilities are subject to the inspections by the third party expert. In the Netherlands, inspection of the WEEE management is also left in the hands of private actors. In this case, however, the inspection mechanism has not been perceived to be sufficient. A recycler is concerned that their competitors may simply put the WEEE in the cargo and ship them abroad without being checked (Tojo, 2004).

## **Objectives**

The objective of the environmentally sound treatment/disposal standards is to minimise the environmental impacts from the treatment/ disposal operation. It addresses the last ladder of the waste hierarchy.

## **Addressees**

The addressee of the instrument is primarily the operator of an installation. Depending on who is the operator, it can be waste management industry as well as the public authorities.

## **Effectiveness**

The effectiveness of the instrument depends largely on the level of the standards and the manner in which public authorities or other entities enforce it. If the level of the permit is not stringent enough to effectively reduce the environmental impacts from the operation, the outcome of the enforcement will be unsatisfactory. This may not be the case for incinerations and landfills where European-wide minimum standards exist, which are perceived to be rather stringent. However, as mentioned, the standards for recycling facilities lack such common standards and it is often up to the Member States to decide.

Experiences concerning the enforcement vary. The management of WEEE in Switzerland is perceived to achieve rather high environmental standards due to the process described above.

The situation in the Netherlands, although may still be achieving high standards in reality, is perceived to have loopholes.

### **Introduction at the local level**

Although the minimum standards for waste installations are set at the national level, provisions of permits and inspections are often left in the hands of local or regional authorities. As the permit provision procedure often leaves a room for the permit providers to take into consideration the local condition, local/ regional governments can set stringent targets if they wish. Effective inspections also enhance the decrease of environmental impacts from the operations.

## **3.9 Conclusions**

Administrative instruments reviewed in this chapter address different parts of waste hierarchy, from waste prevention to environmentally sound disposal. Although all of them in the end have some implication to environmentally sound treatment of a waste stream, some of them (e.g. substance restriction) take a preventative approach, while others (e.g. environmentally sound treatment standards) deal with the problem at end-of-pipe. Although “prevention is better than cure” – that is, it would be preferable to take measures at source than remedy the problems once problems occur – the reality of the waste situation today requires measures that address the respective part of waste hierarchy.

Many of these instruments are building blocks of one policy intervention. This makes it challenging to evaluate the effectiveness of one single instrument in isolation. Moreover, the introduction of some of the instruments is recent, limiting the possibility of evaluating the results.

Most of the instruments discussed are introduced at the EU level and are transposed by national governments. However, the implementation of many of these instruments is diverse among countries. Local governments have the possibility to influence the concrete forms of implementation although perhaps in different degree depending on the power distribution among government entities as well as power relation between private and public sectors in each country. Table 3-2 highlights issues that are related to the local governments, either in terms of roles they can take or potentials of introducing the instruments at the local level.

As found, the degree of implication to the local governments varies. Nevertheless, it seems that local government have roles to play in maximising the potential of the respective instruments.

Table 3-2: Selected administrative instruments for waste management and issues related to local government

Instruments	Examples of application	Issues related to local governments
Substance restriction	RoHS Directive, Battery Directive	Local introduction may create trade distortion  Possible inclusion in informative instruments
Source Separation	In various countries for waste streams such as packaging, batteries, EEE, biodegradable waste, tyres	Various local solutions exist. 1) convenience, 2) incentive and 3) awareness raising are among the key influencing factors
Producers' take-back	In various countries for waste streams such as packaging, EEE, batteries	The collection from private households is often left fully or partly in the hands of local government despite the legal text.  Separation of small products face difficulties
Collection/reuse/refill/recycling targets	In various countries for waste streams such as packaging, EEE, batteries	Centralised system run by PRO often neglect rural areas  Local targets can be set for waste streams under municipalities such as biodegradable waste
Minimum recycled material content standards	Included in the government procurement policies	Local introduction may create trade distortion  Possible inclusion in informative instruments/procurement policies
Landfill restriction/diversion targets	Implementation of landfill Directive, Battery Directive	High potential for local/regional governments to introduce restriction
Environmentally sound treatment/disposal standards	Incorporated in permits based on Directives on installations, national standards for some types of installations	High potential for local/regional governments through enforcement (permits and inspections)

## 4 Economic instruments

In the first section of this chapter, the economic instruments currently employed to encourage the recovery of household waste will be briefly described. The main objectives of the chapter are to:

- give an overview of existing (and potential) economic instruments and their possible uses; and
- provide practicable examples of experience with these instruments in the context of waste management in Europe.

### 4.1 Introduction

In this chapter we discuss the opportunities and importance economic instruments play in the context of integrated waste management within the European Community. Over the last few decades, the predominant tool to achieve the objectives of waste management has been the use of regulations derived from environmental law (known as command and control, CAC methods). This approach has been responsible for much of the improved effectiveness of waste management regarding the prevention of waste, enhancement of recycling activities, and negative environmental effects of waste disposal. In recent years economic instruments have garnered particular attention as an important tool for reinforcing and implementing environmental legislation, while simultaneously contributing to sustainable development. There is discussion about the EU policy on value-added tax (VAT) that promotes recycled products and recycling activities. The Commission raised this question with its proposals on an integrated product policy (COM(2001)68 final). Furthermore, under the terms of Directive 91/ 157 on batteries and accumulators, *research programmes on recycling had to be drawn up* (Art. 6) and in that connection *the Member States may introduce measures, for example economic instruments, in order to encourage recycling* (Art. 7). The results of the Directive vary from one Member State to another (Hannequart, 2002).

From the perspective of economic theory and practical considerations, economic instruments such as taxes, charges, or tradable permits have several advantages compared to regulations:

1. They allow a flexible response to price signals and encourage innovation.
2. They are cost effective and encourage improvements to be achieved in the cheapest and most efficient manner.
3. They decrease externalities so that those who pollute should bear the cost.

Also:

4. They generate revenues that may be used for financing further environmental investments;
5. Finally, they may be capable of addressing problems where current traditional command-and-control instruments often fail.

Through incorporating marginal costs and using market forces, economic instruments are more cost effective than traditional CAC instruments. This means that either more goals/ effects may be reached using a given budget or, in respect to a given aim, substantial cost savings may be achieved. In the field of environmental protection, where economic

instruments are more common and have more established traditions, these effects have already been observed. For example, Carlson et al. (2000) estimated that the policy of the US Environmental Protection Agency to reduce SO<sub>2</sub> emissions by using allowance trading may save \$700–800 million per year, compared to a command and control programme based on a uniform emission standard. In a study carried out for the EPA, Anderson (1999) estimated that the potential savings of the use of economic instruments could sum up to almost one-fourth of the expenditures on environment pollution control in the United States.

The idea is that if the right price signals are given, allowing actors free choice and flexibility to act in the manner that most benefits them, the aims of the instrument should be more easily achievable. However, economic instruments are not always the most appropriate policy response. Their success depends on potential gains from economic mechanisms. They should not interfere with the successful regulatory mechanisms already in place. Secondly, the transaction costs involved cannot exceed the benefits of the EI.

#### **4.1.1 Definition of Economic Instruments**

Economic instruments (EIs) create incentives for behavioural changes. Accordingly, they are often named as incentive-based measures. Economic instruments as defined in this report are political measures constituting an incentive for waste producers to have their waste recovered/ recycled (instead of disposing of them, i.e. in a landfill site). In this study the term “recovery” also includes waste incineration, provided that the electric and thermal energy generated in the incineration process is utilised to a satisfactory extent, for example in public heating or industrial processes.

As a consequence, this chapter does not focus on waste legislation that forces waste industry / households to recycle a prescribed amount of waste. Rather, it will focus on those economic instruments that provide incentives to recover/recycle waste but reserve the choice to households / industry to make use of the recovery/recycling option.

#### **4.1.2 Types of Economic Instruments**

In order to successfully implement economic instruments, it is important to know how they “work” in theory as well as in practice. In respect to the general mechanisms used, economic instruments can be categorised as either price- or quantity-based instruments. In addition, instruments aimed at improving the operation of existing markets, termed ‘market-friction’ instruments, are sometimes included as market instruments (Coggan & Whitten, 2005). The categories of instrument are illustrated in Figure 4-1.

##### **4.1.2.1 Price Based Instruments**

Direct positive incentives in the form of subsidies, tax breaks, or negative incentives in the form of increased prices, taxes, charges and fees may be attached to environmentally beneficial or damaging activities. In other words, this attributes a price to these activities that they formerly lacked, such as an attempt to incorporate the external costs (or benefits) of an action. Individuals or companies will normally respond by adopting the behaviour which costs them least. If these signals are set at the right level, this should lead to better resource use.

A disadvantage to price (and compensation) based instruments is that they cannot guarantee the *extent* of changes in behaviour, since they rely on price signals rather than inducing scarcity. The extent of changes in behaviour can only be assessed in advance if the shape of the



demand curve is known. Often, the price elasticity of the demand side is quite low, as the poor/disappointing effects of increased waste charges for private households demonstrate.

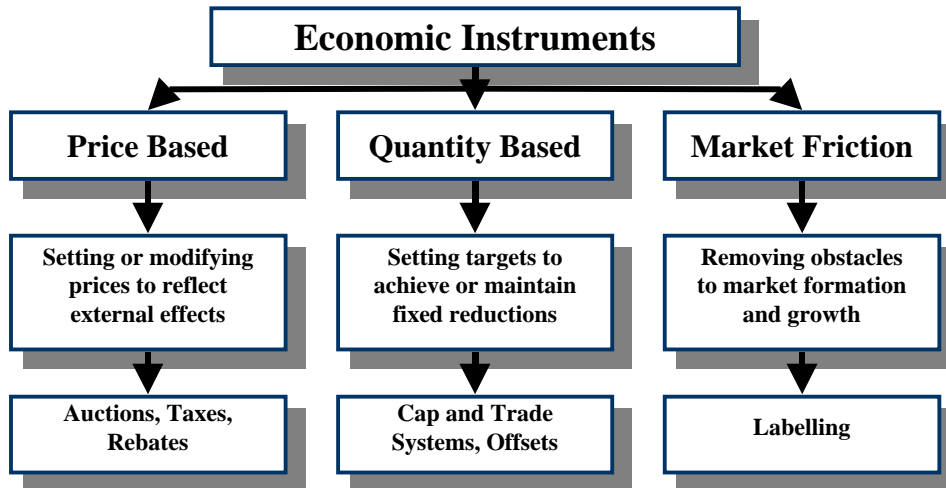


Figure 4-1: Types of economic instruments (Source: adapted after Coggan & Whitten 2005)

#### 4.1.2.2 Quantity based Instruments

Also known as indirect incentives, quantity based instruments create a market for distributing permits to carry out an activity associated with specified resource uses or environmental damage. Potential polluters may trade for rights to, for example, recycle or emit a certain volume of pollutant. A limit is set on the number of permits, allowing, in theory, the total amount of damage to be controlled. This generates more flexibility than a tax system, as those who find it cheapest and easiest to change their behaviour may make the biggest changes and then sell their permits to those who find such changes very expensive. In addition, these types of economic instruments may more likely cause long-term behavioural changes but require the greatest amount of administration. The most prominent examples include the CO<sub>2</sub> and SO<sub>2</sub> trading schemes in the US or Europe.

#### 4.1.2.3 Market Friction

These instruments should improve the manner in which the current market functions by providing more information and reducing transaction costs. Advising consumers on such matters gives them additional choices about the range of products to buy. Consequently, producers of sustainable products may differentiate their goods from those produced by competitors in an unsustainable manner<sup>57</sup>. This should allow sustainable producers to gain higher revenues (assuming consumers value conservation of the environment). Such differentiation may be achieved through the use of certification and labelling schemes.

#### 4.1.3 Economic Instruments in the waste management process

Within the study a set of different economic instrument will be analysed that act at different stages of the waste management process (s. Figure 4-2). We analyse three different taxes (waste disposal, landfill tax and taxes for quarrying), a credit scheme (the recycling scheme

<sup>57</sup> sustainable refers here to (i) production of less waste, (ii) waste with less critical substances like cadmium or DFCs etc and (iii) waste that can be recycled more easily.

from UK), subsidies (subsidies for the use of secondary products) as well as an example of a

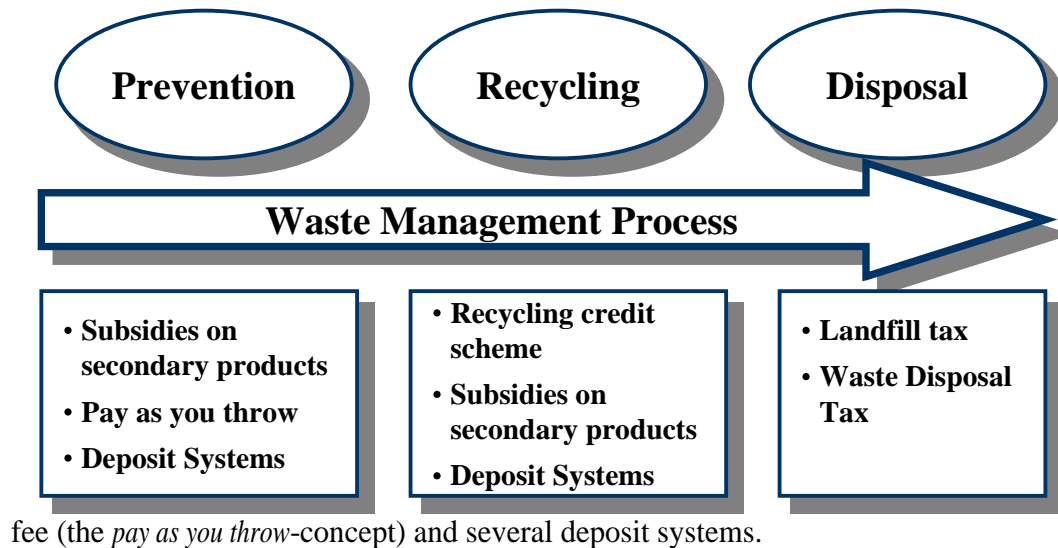


Figure 4-2: Analysed economic Instruments and their field of application within the waste management process.

#### 4.1.4 Qualities of the different Economic Instruments

To assess the suitability of differing economic instruments for multiple waste management strategies and settings, the instruments are characterised with regards to their field of application and past experiences. Therefore, each economic instrument will be described in the same manner under the following criteria:

##### Addressees of the instruments

The economic instruments described in this study will be categorised according to their (immediate) addressees. These instruments are directed towards private consumers and industry, which encourage them (as waste producers) to either reduce the amount of waste they produce or to take measures promoting the recovery of their waste. Other economic instruments influence public waste management, for example in the way that communal authorities design public waste management concepts.

##### Immediate objectives

Economic instruments can be further qualified according to their objectives either to reduce the overall amount of municipal waste or to promote the recovery of waste generated. All economic instruments are intended to curb waste disposal.

##### Effectiveness

The economic instruments are also qualified by their – albeit presumed – effectiveness. Given that empirical figures used to evaluate the respective economic instruments exist, this study will assess the effectiveness of the economic instruments in attaining the aims of reducing waste or encouraging the recovery of waste. The scientific basis used to assess the effectiveness will be comprised by studies conducted in the European Union and the OECD countries.

### Frequency of application

Another good indicator for the feasibility of economic instruments is the extent to which they are applied. There will be more experience with instruments applied to a greater extent than with instruments that have been tested only on a pilot level. Therefore municipalities might be more inclined to make use of well-known instruments than other instruments lacking large scale practise .

### Political acceptance/ enforceability

A very important precondition for the use of economic instruments is their political enforceability and the general acceptance of the public regarding the specific instrument. If an instrument aimed at reducing or recovering waste is not accepted by the public or by waste authorities, the objective cannot be attained. In the worst of cases, the opposite is achieved.

In the following sections, economic instruments aimed at reducing waste or promoting waste recovery will be described.

## 4.2 Taxation (charges on waste disposal)

By imposing taxes on waste disposal, methods of waste recovery become relatively cheaper. There are different taxation concepts of waste disposal, the most simple one being the introduction of a landfill tax, while the most sophisticated includes the imposition of a disposal tax foreseeing different tax rates for each mode of waste disposal (including waste incineration in compliance with the legal terminology) according to their respective environmental effects.

### 4.2.1 Landfill tax

A **Landfill tax** is paid on top of normal landfill fees by businesses and local authorities who want to dispose of waste at a landfill site. It is intended to encourage municipalities / private consumers and businesses to produce less disposable waste and to use alternative forms of waste management.

Landfill taxes are common in the Member States of the European Union (see Table 4-1 as well as Section 2.4.1).

*Table 4-1: Selection of Levied taxes on landfills in different EU-Member States.*

Country	Tax [Euros/tonne]
Austria	29-87
Belgium	4-23
Denmark	45
Finland	15
France	6
UK	3-50

(Source: Hogg, 2002)

One of the most prominent examples of a progressive landfill tax (meaning the tax rate rises each year) is the United Kingdom. The tax rates vary according to the type of waste dumped at the landfill:

- the lower rate - £2 per tonne for inactive waste such as rocks and soil
- the standard rate - £18 per tonne for all other waste from 1 April 2005

The British government has stated that the standard rate of tax will increase by at least £3 per tonne in subsequent years to a rate of £35 per tonne by 2010, which would result in a doubling of the actual price. There are some exemptions to the tax scheme for waste streams used for landfill restoration or that pertain to certain types of waste streams, including waste arising from dredging activities, quarrying and mining, reclamation of contaminated land, etc.

Also, the Netherlands introduced a landfill tax in 1995, the rate of which was raised from 13 Euro per ton to 85 Euro per ton in 2006 (Umweltbundesamt, 2007).

### **Addressees**

The addressees of the various types of waste taxes are first and foremost the municipalities, who decide how the municipal waste will be treated. The municipalities design the waste treatment policy and can set quality standards in their call for tenders by way of public procurement. The citizens then, as waste producers, have influence over waste policy of the respective commune as constituents. Therefore, citizens can exert pressure on their communal representatives.

### **Immediate Objective**

The immediate objective of a landfill tax is to discourage waste management authorities and industry from landfilling.

### **Effectiveness**

A study launched by Ecotec found that the landfill tax in the U.K. has limited effects on the attitudes and behaviour of waste producers and waste management companies (Eco TEC Research and Consulting Ltd.). As the tax rate is not yet very high and the tax figures constitute a very small part of the general financial charges on companies, the effects intended by the landfill tax do not make themselves felt. As a consequence, the study advises to raise the tax rate and to include the landfill tax in a far-reaching strategy for recycling.

However, in some cases, the effects generated by landfill taxes in Europe are perceived to be considerable and contribute to reducing waste disposal. At a workshop “Waste to Energy – A Considerable Contribution to Climate Protection” organised by the German Federal Environmental Agency in November 2006, the Netherlands and Austria especially praised the effects of the landfill tax, i.e. its contribution to recovery rates. The revenues of the Austrian landfill tax are, therefore, declining, and the tax regime has been extended to other modes of waste treatment other than recycling.<sup>58</sup>

It is pointed out that the effectiveness of landfill tax in reducing the amount of municipal waste going to landfill also depends on how the price signal is conveyed to the sources of waste via, for example, unit-based pricing systems for waste disposal services. The fact that

---

<sup>58</sup> In 2006 the focus of the “landfill tax” was extended. Now waste incineration is also subjected to the tax.

landfill tax is often introduced with other instruments such as landfill bans makes it difficult to isolate the effect of landfill tax (Bartelings et al., 2005).

### **Frequency of Application**

The landfill tax is common in many EU Member States, in EU-15, such as. UK, France, Italy, The Netherlands, Austria, Finland, Denmark and Sweden) except Germany.

### **Enforceability**

In those countries where the landfill tax is instituted, the tax is politically accepted. The plans to raise the tax rates are not questioned either. The landfill tax can be enforced rather easily, as it has to be paid for each ton of waste put to the landfill. Of course, illegal dumping of waste cannot be impeded by this tax scheme. Yet, the landfill tax does not necessarily encourage illegal dumping as it might be the case with variable waste management fees (“pay as you throw”), because the landfill tax is included in the general waste fees and the fee raise per inhabitant might thus be minor.

## **4.2.2 Waste disposal tax**

A more sophisticated instrument than the landfill tax, the waste disposal tax introduces different levels of taxation for waste treatment techniques according to their environmental soundness.

One example of this is the Danish waste tax in the field of construction waste, which was introduced in 1987. The disposal of waste in landfills is subject to the highest tax-level, followed by waste incineration, without recovery of energy, followed by waste incineration recovering electricity, and waste incineration recovering electricity and thermal energy. Recycling of these substances is not charged with the tax.

A similar waste disposal tax came into effect in Norway in 1999. In order to reduce methane emissions, a tax on final disposal of waste (landfilling and incineration), with tax rebates for energy utilisation, was introduced. In addition, it prohibited the disposal of wet organic waste in landfills and required that it be used for animal feed, composted or incinerated (International Energy Agency, 2006).

Austria subjected waste incineration to a tax regime in 2006, which contributes to a raise of the waste management fees (Österreichischer Städtebund, 2003). The subsection of waste incineration to the tax system seemed to be due to declining revenues from the landfill tax, which are needed for the fund financing cleanup of abandoned hazardous sites (Altlastenfonds).

### **Addressees**

See above (landfill tax).

### **Immediate Objectives**

The immediate objective of the waste disposal tax is to encourage decision makers to employ the most environmentally sound method of waste recovery. While the landfill tax only discourages the landfilling of waste, the waste disposal tax distinguishes between environmentally sound and less sound methods of waste treatment. The latter are subject to more or less taxation, the difference may at times be considerable. Therefore, this tax scheme

seeks to favour environmentally preferable waste treatment methods, implying the most far-reaching recovery of waste.

Compared with the landfill tax, there is far less consensus with regard to the waste disposal tax than to the landfill tax. On the basis of current EU law and the jurisprudence of the European Court of Justice, waste incineration is generally construed as a disposal method. Only the isolated incineration of highly calorific fractions can be construed as waste recovery (energetic recovery). Still, many waste management experts agree that waste incineration is an environmentally favourable means of waste management provided that the energy produced is put to good use. Therefore, the fiscal “discrimination” of energetically efficient waste incineration is also questionable from an environmental point of view.

However, the fiscal differentiation between waste incineration producing thermal heat and electricity and waste incineration that does not use any energy is environmentally reasonable and can therefore be judged as a positive incentive promoting resource and energy efficiency.

### **Effectiveness**

There are no figures available to show in detail whether such a sophisticated tax scheme fulfils its basic objective to favour the most environmentally sound mode of waste treatment. However, as was already mentioned with the landfill tax, the efficiency of this instrument depends on the level of the tax rate as well as on the local need for energy produced in waste incineration processes and the need for secondary products that result from recycling processes. Only if there is a good chance that these products can be sold on the free market, a tax will be a meaningful strategic element to promote recovery / recycling of waste. Therefore, the economic reasonability for recovery and recycling also depends on other factors than the sole costs of waste disposal.

### **Frequency of application**

A waste disposal tax, as it is found in Denmark and Norway, is not common in other EU Member States. Therefore, experience with it is very limited.

### **Enforceability / political acceptance**

Even though there is limited experience with the instrument, it can be assumed that there are no differences in the enforceability between the landfill and the waste disposal tax. Hence, there is no reason to believe that the tax scheme would not be enforceable once it is introduced. However, one must question whether a taxation of waste incineration, as opposed to recycling (implying the separation of recyclable waste streams and the substance-based recovery) is politically accepted, taking into consideration the debates on the environmental soundness of waste incineration. This is most likely an underlying cause for limited application at this point.

## **4.3 Recycling Credit Scheme**

Recycling credits constitute awards and a financing instrument for recycling<sup>59</sup>. Recycling credits are common in the UK.

---

<sup>59</sup> Waste disposal authorities in Britain have the duty to pay recycling credits to waste collecting authorities that collect waste for recycling (the duty exists only when authorities carry out the collections).

Recycling credits are paid by local waste disposal authorities to waste collection authorities<sup>60</sup> or firms/ charity groups who collect certain waste items from households and transfer them to recycling facilities. Recycling credits play a big role in communes where there is no recycling scheme set up by the waste authorities themselves. The recycling credit scheme was an early initiative introduced through the UK Environmental Protection Act 1990 to promote recycling and composting of household waste by waste collection authorities and by third parties. It makes available to recyclers the savings in disposal and collection costs that result from recycling household waste, where the authority that collects the household waste for recycling is not also responsible for disposing that waste. The credits for recycling also apply if the collected items are re-used (DEFRA, 2005). In the UK the Waste Disposal Authorities have a duty to pay recycling credits to Waste Collection Authorities and have a power to pay them to third parties (firms / charity groups). The scheme was not designed to cover the additional collection and treatment costs associated with recycling but guarantees the authority conducting or facilitating the recycling the amount of money that would have been needed to dispose of the waste (DEFRA, n.d.).

The UK recycling scheme was worked out at a time when no specific legally binding recycling targets existed, so the instrument had to be adapted to the new situation of recycling targets laid down by European and UK law. The duty for Waste Disposal Authorities to pay Recycling Credits to Waste Collection Authorities has been abolished in cases where alternative arrangements are jointly agreed.

In the following, the recycling credit scheme of Exeter City is described as an example. Companies / charity groups who collect waste to be recycled receive a unique registration number. On delivery of this waste to an accredited facility, the companies then receive a receipt (usually in the form of a weight bridge ticket) from the recycling company, which lists the date of delivery, the type of material deposited, and the weights involved. This provides proof that the waste was recycled and represents a necessary condition to be paid the recycling credit. Exeter City Council will then pay the collection credits for the waste recycled and will also claim disposal credits on their behalf from Devon County Council as the waste disposal authority. The collection credits reflect the savings for collection, the disposal credit the savings for disposal (Exeter City Council, 2006).

The following table provides an overview of the amounts of credits:

*Table 4-2: The Environmental Protection (Waste Recycling Payments) (England) Regulations 2006.*

---

<sup>60</sup> So the system applies only to areas where waste disposal and waste collection are managed by two different authorities so called "two tier" areas.

<b>County</b>	<b>Savings (pounds) / tonne</b>
A London waste disposal authority for an area which includes an inner London borough	64,22
The council of an inner London borough	64,22
The Common Council of the City of London	64,22
A London Waste disposal authority which comprises outer London borough	57,20
The council of an outer London borough	57,20
The Greater Manchester Waste Disposal Authority	48,82
The Meseyside Waste Disposal Authority	48,82
The council of a metropolitan district	48,82
Teignbridge	46,46
Any other waste disposal authority where the authority incurs any transport costs in disposing of similar wastes	40,41
in other cases	30,61.

### **Addressees**

The addressees of the recycling credit scheme are primarily waste collection authorities or private charity groups and companies who (intend to) collect and transfer waste to a recycling facility. They are encouraged to maintain or increase their activities, i.e. collecting waste to be recycled.

### **Immediate Objectives**

The immediate objective of the initiative is to promote the collection of – separate – waste streams in order to recycle the waste. Where the waste authorities do not set up waste recycling schemes, they themselves may grant recycling credits to encourage private charity groups or firms to set up a collection/recycling scheme.

### **Effectiveness**

The recycling credit scheme has helped set up separate collections of waste to be recycled. However, as the UK Department for Environment, Food and Rural Affairs (DEFRA) has pointed out, the recycling credit scheme in its current form is no guarantee that the waste authorities choose the most cost-effective and sustainable way of recycling (DEFRA, 2005). As the waste disposal costs are rising due to the landfill tax, the waste collection authorities can earn much money without regard for the concrete soundness of their recycling activities. This is the case, for example, with the recycling of green waste where the recycling is now cheaper than the disposal. Therefore, the amount of the credits will be capped at 2005/ 2006 level, and an average level per waste disposal authority should be calculated.

### **Frequency of application**

The recycling credit scheme has been introduced into British waste law, the relevant legislation being the Environmental Protection Act 1990 Section 52 and later amendments. The UK remains the only major country in the European Union that makes use of these schemes.



## **Enforceability**

There are no hints that the scheme is not enforceable.

## **4.4 Subsidies for secondary Products / Taxation of Quarry Products**

Waste treatment methods aiming at the recovery of valuable waste streams produce various secondary products.

Among these are i.a.:

- Inert material for construction (e.g. resulting from slack treatment);
- Filling material in mines (especially ashes and salty residues from incineration and gas treatment processes);
- Secondary plaster (residues of the gas treatment);
- Secondary hydrochloric acid;
- Methyl alcohol (from certain gasification processes);
- Secondary metals (these materials are common to almost all modes of waste recovery);
- Secondary fuels (especially common in waste treatment concepts that include mechanic-biological treatment);
- Synthetic materials (separated mechanically from municipal waste).

One aspect decisive for the elaboration of a municipal waste management concept that includes waste recovery and recycling is whether secondary materials produced or separated from the municipal waste are of technical use and can be sold on the free market.

The most common materials, such as scrap metals, can currently be sold without problems as prices are reasonable (100 –200 Euro per tonne<sup>61</sup>). Also, some types of synthetic materials can be sold on the world market at very good prices (up to 400 Euro per tonne in China). Most ash residues from waste incineration plants can be utilised as filling materials in salt mines (BMU, 2006). Furthermore, the use of methyl alcohol does not principally constitute a problem, as this product results from a complex chemical reaction which erases the waste origin of the methyl alcohol. For all of those products, the use of additional economic instruments to promote their attractiveness is not necessary.

Industry and private consumers are, however, for aesthetic, hygienic or environmental reasons often reluctant to buy and / or use secondary materials, such as secondary plaster and inert construction material (e.g. slack from waste incineration plants). In order to promote the use of secondary products, public authorities have to develop policy initiatives. In addition to public information campaigns, underlining the equal user value of primary and secondary products public policy might develop financial rewards (financial credits) for the use of secondary materials. One environmental NGO, for example, claims that the amount of secondary plaster produced yearly can well substitute for all primary plaster implicating the quarrying of raw material and ruined landscapes (Bund Naturschutz in Bayern, 2006).

---

<sup>61</sup> See for Germany [www.abendblatt.de/daten/2005/03/01/404758.html](http://www.abendblatt.de/daten/2005/03/01/404758.html) [22 March 2006].

The imposition of taxes on the quarrying of raw materials could motivate industry to take advantage of secondary plaster, which often must be deposited in landfills due to the lack of industrial interest in employing secondary plaster.

The imposition of taxes for quarrying has been repeatedly demanded by environmental NGOs<sup>62</sup>. One example of such a policy is the UK's aggregate tax introduced in 2002 with the aim to promote the use of recycled materials. The tax aims to reduce demand for virgin aggregates, encourage the use of recycled materials, and address the environmental costs associated with quarrying, e.g. noise, dust, visual intrusion. The tax applies to sand, gravel, and crushed rock, and will be charged at £1.60 per tonne. The levy will not apply to coal, clay, metals, gemstones, or industrial minerals (Scottish Environmental Protection Agency, 2006). So the concrete concept of this tax does not include absolutely critical materials, such as coal. If a tax is, however, levied on coal, this might encourage operators of power stations to consider co-incineration of waste (secondary fuels) more seriously.

There are similar taxes in Sweden (Swedish Tax on Natural Gravel) and Denmark (Tax on Raw Materials).<sup>63</sup> The latter tax includes charges on:

- Stones, gravel, and sand;
- Clay, limestone;
- Peat, top soil;
- Similar deposit.

In Eastern Europe taxation of different types of mineral is widespread, but these taxes are almost entirely fiscal, and very few environmental motives lie behind their introduction.<sup>64</sup>

### Addressees

The addressees of the instrument “subsidies for secondary products” are industry, businesses, or private consumers who must decide between buying and using primary products composed of quarry material or recycled (secondary) products. Rather than being granted a subsidy, these actors will not have to pay taxes on the latter products.

### Immediate objectives

The immediate objective of a tax / subsidy is to financially incite consumers to buy and use secondary materials. Raw material is taxed and therefore disadvantaged vis-a-vis secondary materials. In turn, the original “mispricing” of secondary material, which lies in the non-monetarisation of its benefits (conservation of resources, reduced pollution, avoided landfill costs<sup>65</sup>), is to a certain degree corrected by a tax on virgin materials. This is intended to promote the practical use of secondary products and incite the recycling industry to identify elaborate ways of putting recycling products to good use.

---

<sup>62</sup> See for example for Germany [www.grueneliga.de/service/archiv/bund.htm](http://www.grueneliga.de/service/archiv/bund.htm) [22 March 2006].

<sup>63</sup> For further information see [epubl.ltu.se/1404-5508/2004/028/LTU-SHU-EX-04028-SE.pdf](http://epubl.ltu.se/1404-5508/2004/028/LTU-SHU-EX-04028-SE.pdf) [29 March 2006].

<sup>64</sup> See Söderholm (2006, p. 232)

<sup>65</sup> For further information see [www.dep.state.pa.us/dep/deputate/airwaste/wm/recycle/Market/docs/Phase\\_II\\_Principles\\_of\\_Approach.pdf](http://www.dep.state.pa.us/dep/deputate/airwaste/wm/recycle/Market/docs/Phase_II_Principles_of_Approach.pdf) [2 February 2007].

The instrument is thus intended to foster the marketability of secondary materials, which is always seen as an impediment to extensive recycling schemes by municipalities.

### **Effectiveness**

As with the landfill and waste disposal tax, the effectiveness of any quarry tax will depend on the specific rate and concept of the tax. The European experiences of taxing aggregates are rather mixed. Low tax levels combined with low price elasticities of natural resource demand and sectoral exemptions explain why many of the taxes have had only limited impacts on resource use and recycling behaviour (Söderholm, 2006, p.232). The tax might work well in connection with effective information campaigns by waste authorities and recycling associations promoting secondary products. Thus, the tax can only be one part of a mix of instruments aiming at promoting secondary materials.

The combination of a waste disposal tax with a quarry tax could be a decisive step to promote the use of secondary materials/ products. As the addressees of these two instruments are, however, different – the waste disposal tax being addressed at waste producers and the gravel tax addresses at the producing industry – it seems difficult to evaluate the effectiveness of this combination.

### **Frequency of application**

A tax on raw material and resources is currently not widely applied, as such political initiatives often meet resistance with numerous lobby groups, and present therefore potential weakening points for political administrations. As previously mentioned, there are environmental taxes on natural resources in the UK, Sweden and Denmark and a number of taxes on specific raw materials in some new Member States of the EU. The motives for these taxes have, however, been described as merely fiscal (Söderholm, 2006, p.233).

### **Enforceability**

There are no signs that taxes on raw materials would not be enforceable.

## **4.5 Waste Pricing: “Pay-as you-throw approach”**

The pay-as you-throw (PAYT) approach to charging waste collection/ treatment implies a unit-based attribution of waste collection/ treatment costs for waste producers. This is intended to encourage waste producers to produce “fewer units” of waste and save money. The opposite of PAYT is a flat-rate-system, which charges every citizen with the same level of waste management fee regardless of the masses they produce and their respective individual economic situation. A PAYT approach, in turn, makes waste fee calculation sensitive to waste reduction and recycling efforts by citizens and industry, which in turn should motivate citizens and industry to reduce waste and sort out waste streams suited for recycling.<sup>66</sup>

PAYT is thus a lever to integrate elements of the “polluter pays principle” into waste management.

---

<sup>66</sup> Waste fees systems have of course comply with legal requirements and respect fundamental principles (citizens may not be charged with fees for services that they do not use, etc., the fee has to reflect the average costs for a service, etc.). In Germany, there is extensive and complex jurisprudence on the issue of waste fees, which cannot be reflected in this study. Therefore, only some possibilities of designing waste fees based on the polluter-pays principle, policy makers have to make sure if they are compatible with the legal requirements of the respective country.

For public finance reasons, only a part of waste fees should be unit based (variable), because the fix costs for municipal waste management institutions should – at least to a major extent – be paid proportionately by all citizens and industry. Thus, a fixed amount has to be paid for the communal institution of waste management as such (institutional costs, e.g. costs for personal, administration, material, etc.). Often a “fixed” and probable minimum use of the waste management service (residual waste) per inhabitant/ household/ enterprise is laid down in waste fee statutes (Umwelt, 2007a). For example, in a survey of waste management practice of Saxonian communities, 10 communities prescribe “obligatory” disposal of 104 and 320 l per inhabitant per year (Umwelt, 2007b). This translates into fix minimum fees to be paid in any case by citizens and industry.

Such a “basic” fee serves many purposes. On the one hand, an obligatory minimum fee is likely to discourage illegal dumping of waste or misuse of cost-free recycling facilities for waste streams not suitable for recycling. In short, a minimum fee discourages “escapism” from the municipal waste management system. On the other hand, the second important purpose of a minimum fee is the coverage of waste management costs (fix costs). A good mix of fixed and variable parts of waste management fees is essential to provide communities and waste management services with the needed revenues to finance the waste management infrastructure.

As the example of one German (Bavarian) community shows, the relation between the basic fee (fix costs) and the variable fee is 70:30 (Knauer, 2000), in another one it is 56:44 (EVA GmbH, 2007). An Italian study has estimated the share of the basic fee to be 30-50%, the share of the variable fee to be 50-80% (Scuola di Agraria del Parco di Monza, 2006, personal interview). In general, it can be said that the higher the share of the fixed elements of the fee the less effective the PAYT program is.

Principally, the waste managing service in the community has to take into consideration that the PAYT system might decrease the masses of waste (especially residual waste) considerably and, therefore, has to base their financial planning on the projected future waste production. As the residual waste is often the waste stream subject to waste management fee, a sharp decrease might lead to underfunding of the waste management institutions.<sup>67 68</sup> In the past this has been the case for communities that had to finance waste incineration facilities, which usually feature high fix costs and depend on a good capacity utilisation. In case there is a decrease in residual waste masses, the capacities cannot be used and the fees per tonne have to be raised.<sup>69</sup>

The PAYT approach rewards the reduction of waste. Once a “unit” is defined (for example, a typical 32-gallon waste bin), each bin of service costs the same. Throwing out two bins per week costs twice as much as throwing out one bin or even more when a progressive waste fee system is applied, which can be legally problematic. A PAYT system can take various forms such as assigning collection bins to the waste generator given an optional size and/ or optional frequency of collecting them, weighing or other kind of measuring the amount of waste.

---

<sup>67</sup>See for example explanation in the Dresden Waste Management Concept [www.dresden.de/media/pdf/infoblaetter/abfallwirtschaftskonzept.pdf](http://www.dresden.de/media/pdf/infoblaetter/abfallwirtschaftskonzept.pdf), p. 7.

<sup>68</sup> Cases have been recorded where the introduction of PAYT has led to a sharp decline of residual waste production, which was to a huge extent due to “escapism” from the municipal waste management system and which led to rising waste fees per ton, as the waste management infrastructure could otherwise not have been financed, see [www.zeit.de/archiv/1999/24/199924.muellchips\\_.xml](http://www.zeit.de/archiv/1999/24/199924.muellchips_.xml) . [7 February 2007].

<sup>69</sup> [www.zeit.de/archiv/1999/24/199924.muellchips\\_.xml](http://www.zeit.de/archiv/1999/24/199924.muellchips_.xml) [7 February 2007].

Technical specifications depend on the specific situation in the collection area, provisions made in the waste statutes and other settings defined by the local waste policy.<sup>70</sup>

In general, the approach is either volume based or weight based. The weight-based approach calculates costs according to the weight of waste to be disposed of and constitutes a very precise attribution of costs to the waste producers. However, the techniques needed to make this approach work are still developing and the approach is generally more expensive and requires considerable preparatory work from the administrative side. This is why the volume-based approach is currently more often used. The volume-based approach is less precise and bases the cost calculation on the number of bins/bags of waste.

### **Addressees**

The addressees of the PAYT schemes are first and foremost the producers of waste, i.e. households and industry. The producers of waste are financially encouraged to reduce their waste to be disposed of. The key to making PAYT work is to provide opportunities for people to make other use of their waste than to throw it into the residual waste bin. Waste reduction and recycling education programs, reuse facilities, expansion of kerbside collection services, yard and other organic waste composting programs are possibilities to reduce the amount of waste to be disposed of and to promote recycling. Therefore, the PAYT scheme favours primarily the reduction of waste. Secondly, it favours waste recycling. Where the PAYT system is implemented, recyclable waste is usually collected free of charge. Still, it depends on the respective national recycling system and whether this system is extensive enough and works properly if the rate of recycling is indeed increased. The PAYT schemes also oblige the waste authorities and waste management companies to communicate to the public the PAYT system and give advice on how to reduce waste and to profit from recycling options.

### **Objectives**

As already stated above, Pay-As-You-Throw is intended to provide an incentive to reduce waste and increase recycling. Moreover, the PAYT scheme also provides a fairer system with regard to the attribution of costs, as people who generate less waste will no longer subsidise the cost of those who generate larger amounts of waste. Hence the PAYT approach is the most direct way to implement the “Polluter-Pays” principle.

### **Effectiveness**

On average, communities that implement pay-as-you-throw programs report a general reduction of the amount of waste disposed, ranging from 15-50 %.<sup>71</sup> One Czech study showed an average decrease of 22% of mixed waste in a sample of 178 communities in Czech Republic and Germany (Sauer & Pribilová, n.d.).

Consequently, recycling rates often increase dramatically. The increased recycling rates are often due to the provision of multiple programmes to encourage waste recycling (for example: recycling drop-off centres, curb-side recycling pickup, etc.). Most local authorities agree that providing variable rates for waste disposal is a very effective method to reduce landfill waste and increase the recycling rate of the respective community.

---

<sup>70</sup> <http://web.tu-dresden.de/intecuspayt/> [7 February 2007].

<sup>71</sup> Lynn et al., 1996., stating 25-50%; for the average reduction of 15-50 %. see also Radermaker (2006, March 29). State of Rhode Island stating 15-28% (Rhode Island Department of Environmental Management, 2006).

As stated above, there is also a risk that variable (i.e. unit-based) collection / disposal rates encourage households / industry to dump their waste illegally, such as diverting certain waste streams to recycling facilities not suitable for that respective type of waste. Therefore, it must be ensured that the PAYT system penalises those waste producers who are found to illegally divert waste streams to recycling facilities. Most communities charge an individual extra-fee, which are in fact individual fines, if the recycling system is disturbed by too many “mishthrows” of waste streams that belong in the residual waste bin as well as fines for illegal waste dumping.

Generally, it can be said that in order for PAYT to be effective at reducing waste and to discourage illegal dumping it should be accompanied by effective recycling and alternative disposal programs, such as yard waste collection and curb-side recycling. However, the effectiveness of PAYT should not be over-estimated. While people living in detached or semi-detached houses are assigned their own bin and have thus more influence over “their” waste management, people living in multi-storeyed houses often do not feel that they have much influence on how much is thrown away, as many people share the same waste bin.

Even though PAYT is also applicable to huge apartment buildings, the costs for waste management are shared by many. In these cases, the costs for waste management are often not even known to the tenants of the flats, which hampers the effectiveness of any “polluter pays approach”.

### **Frequency of application**

The PAYT approach is currently used to a growing extent in the European Union. In a survey provided by the EU Project “Variable Rate Pricing based on Pay-As-You-Throw as a Tool of Urban Waste Management”<sup>72</sup> in 2002/ 03, a survey for the old EU MS demonstrated that the lead countries for PAYT were Germany (especially the East German communities) and Switzerland. In the past couple of years, PAYT systems have become widespread in Austria, Belgium, Finland, Luxembourg, Sweden and Switzerland (International Herald Tribune, 2005, April 23). Also the UK and Italy report increasing use of PAYT. In the UK, local councils increasingly employ PAYT schemes, using predominantly bucks and scales that measure the weight of the waste mass discarded (BBC, 2006, October 4). The PAYT approach is also used in various communities in the United States; the approach is expressly supported by the US Environmental Protection Agency (USEPA, 2006).

Many German communities have introduced - to a larger or lesser extent - a volume- or weight-based approach to charge waste collection / disposal fees. In Dresden, microchips in dumpsters measure the volume of garbage, which is linked to charges on households. Some cities in Denmark (e.g. the municipality of Tølløse) use readings as a sort of “garbage meter,” following the same principle that gas and electric companies use to calculate bills (International Herald Tribune, 2005, April 23).

In Zurich, the routine collection of waste was reduced to once a week for most of the city’s districts. Waste must be placed into the “Zuri-Sack”, which is the city’s official, and costly, trash bag and must be purchased from the government at about 5 Swiss francs, or 3.2 Euro apiece, depending on size. This has led to a profound reduction of waste for disposal in Zurich.

---

<sup>72</sup> [www.web.tu-dresden.de/intecuspayt](http://www.web.tu-dresden.de/intecuspayt)

### **Enforceability**

There are no hints that PAYT systems would not be enforceable.

## **4.6 Deposit-refund Systems**

Deposit-refund systems are meant to encourage the re-use and recycling of goods. Certain materials are charged with a deposit that is added to the price of the material. This deposit is refunded when the material is returned. The most common deposit systems exist in the field of beverage containers.

### **Addressees**

The addressees of such deposit systems are first and foremost the private households and industry that buy and “use” without consuming the material upon which a deposit has been levied. Private consumers or industry are motivated by the refund to return the material. The producers of the materials, in turn, are encouraged to set up recycling or re-use schemes in order to make good use of the returned material.

### **Immediate Objective**

The immediate objective of deposit-refund systems is to make sure that valuable materials are not disposed of but incorporated in a recycling or re-use scheme. Apart from encouraging reuse or recycling, an often cited aim in the case of beverage deposits is the reduction of litter and the promotion of recyclable products (glass bottles or rechargeable batteries) as well as providing incentives for consumers to sort and return the recyclables. Hence, deposit-refund systems work at the relevant levels of waste prevention and recycling, depending on the charged product.

### **Effectiveness**

If material is charged with a sufficiently pricey deposit, chances are good that the material is separated from the general municipal waste and returned. For example, there is a significant difference in the collection rate of batteries charged and not charged with a deposit. In Germany, only 30 % of general batteries are returned and inserted into a special recycling process. However, nearly all starter batteries are returned which are charged with a deposit of 7,50 Euro when being purchased.<sup>73</sup> Meanwhile, experiences of many deposit-refund systems for beverage containers suggest that the amount of refund does not have to be high, from 0.03 to 0.25 USD (Lindhqvist, 2000).

Apart from expensive deposits, effectiveness will also depend on the extent to which consumers are well informed as well as the convenience provided. For example, consumers must realise that there is a refund on the material.

Studies in the U.S. have shown that “bottle bills” that levy a charge on beverage containers have contributed to a sharp decline of total litter. Data from the Center for Marine Conservation’s (CMC) 1995 International Coastal Cleanup shows that, on average, beverage container debris represents a far greater percentage of beach litter in non-bottle bill states (19 percent) than in bottle bill states (7 percent). Take-back requirements for some packaging (e.g. glasses, PET bottles, aluminium cans) combined with deposit-refund systems in different

---

<sup>73</sup> See, for example, [de.wikipedia.org/wiki/Batterierecycling](http://de.wikipedia.org/wiki/Batterierecycling) [31 March 2006], and [www.akkuzerkeuge.de/Akku%20Recycling%20Umweltrichtlinien.1884.0.html](http://www.akkuzerkeuge.de/Akku%20Recycling%20Umweltrichtlinien.1884.0.html) [31 March 2006],

countries (e.g. Sweden, Germany, the Netherlands, Norway, some provinces in Canada, 10 states in the United States) have achieved very high collection rates, from 70 to close to 100% (Lindhqvist, 2000).

As can be deduced from the table the bottle bills have been largely successful in reducing beverage container litter and raise support for the redemption and recycling rate of beverage containers.

## Frequency

Deposit-refund systems exist for instance for the following goods<sup>74</sup>:

- Lightbulbs (Austria);
- Batteries (Denmark); car batteries (Germany);
- Beverage containers (Austria, Denmark, Finland, Netherlands, Germany, Sweden);
- Cars (Finland, Sweden)<sup>75</sup>.

As a consequence, there are currently numerous deposit-refund systems in place for many of the European Union Member States. However, the range of materials charged with a deposit could be extended, and more goods could be included into a refund system. Hazardous substances should especially under no means be treated the same way as non hazardous waste is and should be charged with a deposit. Reasonable materials would be batteries and electronic waste. This would ensure the separation of this waste stream from general municipal waste.

*Table 4-3: Litter reduction (beverage containers)*

State	Beverage Container Litter Reduction	Total Litter Reduction
New York	70 - 80%	30%
Oregon	83%	47%
Vermont	76%	35%
Maine	69 - 77%	34 - 64%
Michigan	84%	41%
Iowa	76%	39%
Massachusetts	N/A	30 - 35%

*(Source: Container Recycling Institute (CRI). (2004, February 4))*

## Enforceability

Enforceability depends to a large extent on the charged product. Since deposit-refund systems target specific products, there is the risk of strong lobbying on behalf of the respective waste producer groups. Germany provides an excellent example, as in addition to providing a very controversial public debate, there has been excessive lobbying against the introduction of

<sup>74</sup> See Radermaker (2006, March 29).

<sup>75</sup> For cars, however, a cost-free take-back system is prescribed by the End-of-Life-Vehicle Directive (Directive 2000/ 53/ EC). It is legally obligatory for car owners to hand ELV over to recognised take-back points or ELV treatment facilities. Consequently, the presentation of a certificate of destruction is a condition for deregistration of the end-of life vehicle.



deposit-refund systems for beverage containers by producers. On the other hand, the German deposit system for car batteries has never been questioned, since its usefulness has been accepted by the public and the system does not cause any great inconvenience.

## 4.7 Conclusions

In the previous sections several economic instruments aiming at (i) the prevention of waste, (ii) the promotion of waste recycling, and (iii) the overall reduction of waste disposal – have been described, taking account of its principal objectives, its frequency of application, and its presumed effectiveness.

The various instruments are applied with differing frequency in the European Union. A ranking of the instruments according to their effectiveness is difficult to carry out for the following reasons:

- each instrument has different aims (prevention of waste, reduction of waste disposal) and different targeted groups (waste in general or specific products);
- effectiveness of a given instrument is always a combination of its mechanism of action as well as its implementation;
- lack of sufficient experience with some of them;
- different quality of the studies evaluating them;
- different reference systems. The effectiveness of every measure depends largely on the effectiveness of the regional waste management system where it is applied. If several measures to reduce the amount of produced waste were already in place, every additional reduction would be more difficult. Hence, figures illustrating the absolute amount of changes are only a rough indicator of their effectiveness;
- limited transferability of some tailor-made solutions to other settings (e.g. the recycling credit system in England).

Nevertheless our analysis with the use of the different criteria (s. chapter 4.1.4) allows some general conclusions (see. Table 4-4).

*Table 4-4: Overview of the economic instruments including frequency of application*

<b>Instrument</b>	<b>Frequency</b>	<b>Effectiveness/Experience</b>
Landfill tax	Many countries in the European Union.	Easy to implement effectiveness depends on the concrete tax rate per ton waste
Waste Disposal Tax	Two examples.	More elaborated version of the landfill tax, effectiveness depends on the concrete tax rate of the respective waste disposal methods per ton waste; promotion of waste recycling depends on other factors as well (demand for and prices of secondary materials).
Recycling Credit Scheme	Primarily the UK.	High effectiveness, raises profitability for recycling, but limited application (UK) due to special situation (separation of waste disposal and waste collection authorities).
Subsidies for secondary Materials / quarry tax	Only two examples.	Innovative measure but rarely applied so far, effectiveness depends on the tax rate, prone to resistance of lobby groups.
Pay as you throw	Many pilot projects, much experience in Germany.	Easy to implement and effective, but precaution against illegal waste dumping or misuse of recycling facilities (“mishthrows”) should be taken, full financing of waste management infrastructure through waste fees has to be assured, sufficient awareness raising is necessary.
Deposit-refund systems	Many countries in the European Union.	Effective for certain goods, prone to resistance of lobby groups.

Even though this study could not examine the waste policies of all Member States, and hence the enumeration contained in the table above may not be complete, it is clear that instruments such as the landfill/ waste disposal tax, pay-as-you-throw schemes, and deposit-refund systems have gained importance in Europe. The landfill tax has been introduced in an important number of “old” Member States of the European Union and can thus be labelled a common measure to help divert waste into recycling schemes.

The effectiveness of these fiscal measures will depend on the concrete rate of the taxes or deposits levied on the respective goods and material. In addition, the instruments will be more effective if public authorities effectively communicate the existence, reasons for, and also the possibilities to avoid the taxes (quarry tax, waste disposal tax).

In order to attain the objective of promoting recycling, the existence and adequacy of secondary materials to be used by industry must be advertised and fostered by public authorities. Hence, public authorities can raise the effectiveness of their waste policies through catchy information campaigns. If no demand for secondary materials exists, the landfill tax may not be able to bring about a rise in recycling activities for economic reasons. In order to promote the use of secondary materials, the gravel tax is an interesting approach; however, it is prone to diverse lobby resistance by raw materials producers and, therefore, a high rate of such a tax is for now unlikely. Therefore, a combination of a landfill tax (waste disposal tax) and a gravel tax might be an interesting approach to promote recycling and the use of

secondary goods, even though the combined impact is difficult to evaluate due to the different addressees of the two taxes.

Furthermore, it should be emphasised that the employment of the different economic instruments must fit with various regional circumstances. Thus, each country should devise a mix of instruments according to their traditions and waste management systems. For example, a recycling credit scheme like the UK's is not effective in countries where there is no distinction between waste disposal and waste collection authorities, or where a sophisticated recycling scheme has been in place for an extended period. For the latter, private firms need not be incited to set up new collection services to raise recycling rates.

Pay as you throw away systems, in turn, can be applied anywhere; however, the optimal mix of fixed and variable elements of the waste management fees is very important. While PAYT is intended to foster waste reduction and waste recycling, it can in practice lead to "escapism" from the municipal waste management system and favour illegal waste dumping or misuse of recycling facilities. For economic reasons, the fees have to be set at a level that securely finances the work of the waste management institutions. If the variable elements of a waste fee are of only minor importance (for example  $< 20\%$ ), then the effect of PAYT is only very limited and the environmental sense of introducing such a PAYT would become questionable.

All economic instruments can, moreover, be judged on their effectiveness only in the context of concrete regional and local circumstances.



## 5 Informative instruments

This chapter discusses the third type of policy instruments: informative instruments used/ discussed in the area of waste management in Member States. Informative instruments concern the collection and provision of information, and are used with the assumption that, people behave differently when they have better information and understanding.

### 5.1 Informative instruments for waste management

The following instruments which are deemed to be relevant to local governments and the waste streams covered by the HOLIWAST project, are discussed in the chapter:

- Eco-labelling scheme
- Green shopping guide
- Marking of products and components
- Information campaigns to residents
- Information provision to treatment facilities

The criteria against which the instruments are described include the *content*, *objectives* and *addressees* of the instrument, its *effectiveness* and its potential in *introducing at the local level* (see Section 3.1).

### 5.2 Eco-labelling scheme

#### Content

An eco-labelling scheme is a voluntary informative instrument that aims to improve the environmental performance of products and services by providing easy-to-understand information to consumers.<sup>76</sup> Starting from the Blue Angel program in Germany in 1977, in total of 26 countries and regions are the members of the Global Ecolabelling Network as of spring 2006 (Global Ecolabelling Network, 2006). Among them, members from Europe include Croatia, Czech Republic, EU, Germany, Greece, Luxemburg, Nordic five countries, Sweden, Ukraine and the United Kingdom (Global Ecolabelling Network, 2006). There are also regional programs, such as Nordic Swan (for Nordic countries) and EU flower (the EU). The product groups covered by the existing eco-labelling schemes range from kitchen and toilet paper, products whose function is to help reduce environmental impacts (e.g. filter applied in the kitchen sink) to computers, transport service, restaurants and the like.

Although the details vary among the schemes, an eco-labelling scheme has the characteristics of rewarding products that meet environmental criteria set for selected product groups. The scheme is run by an independent organisation. The criteria are set based on life cycle thinking. Various environmental impacts –such as resource efficiency, toxicity, energy use, noise – arisen from different stages of life cycle of products – raw material extraction, production, use, end-of-life, transportation in between – should be taken into account. In order for a producer

---

<sup>76</sup> There are different labels that communicate environmental information to consumers. What is discussed section is a so-called Type I label according to the ISO standard. ISO (International Standard Organisation) distinguishes three types of eco-labels based on the entities that verify the information communicated, the manner of communicating the information and the like.

to put the label on their products, they must first design the products that conform to the criteria. They subsequently apply for the eco-labelling scheme, and receive the verification from an independent body that the characteristics of the products indeed meet the criteria. The application of the symbol typically requires payment of license fees which finances the activities of the organisation that runs the scheme.

Setting criteria related to end-of-life phase of the products and services faced challenges, as producers of products typically do not have control over that phase (Thidell, 2006, personal interview). However, awarding criteria for some of the product groups contain requirements addresses waste, such as recyclability and reusability of products, recycled material content, reduction / elimination of substances that cause harm at the end-of-life and the like.

For instance, the German Blue Angel program established award criteria for:<sup>77</sup>

- Returnable transportation packagings such as returnable transportation packagings admitted to freight traffic, laundry transportation bags, heat preserving containers for food, returnable food crates, etc. (RAL-UZ27);
- Returnable bottles and glasses (RAL-UZ 2);
- Recycled cardboards (except for those used for one-time packaging) and products made from recycled cardboards (e.g. the product line folders, files and registry) (RAL-UZ 56);
- Recycled graphic papers, printing and press papers and finished products made from recycled paper, such as product lines of exercise books, writing pads, drawing books, calendars, envelopes, printing and press products (e.g. telephone directories) etc.(RAL-UZ 14);
- Sanitary paper products (paper towels, toilet papers, facial tissues, etc) made of recycled paper (RAL-UZ 5);
- Products made from recycled plastics that do not contain polyvinyl chloride (PVC), polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE), halogenated organic propellants, production and processing waste, returned defective products (RAL-UZ 30a);
- Products made from waste rubber (excluding production and processing waste) (RAL-UZ 30b);
- Building materials made primarily (containing at least 80%), of waste paper (excluding unprinted mill broke) (RAL-UZ 36);
- Wallpapers containing at minimum 60% of waste paper (RAL-UZ 35b);
- Building materials made primarily of waste glass (RAL-UZ 49); and
- Rechargeable alkaline/manganese batteries (RAL-UZ 92).

The Swedish Good Environmental Choice program includes recyclability as one of its awarding criteria for paper (Swedish Society for Nature Conservation, 1997). A criterion for cleaning agents concerns packaging. The packaging are to be manufactured using polyethylene (PE), polypropylene (PP) or polyethylene terephthalate (PET), and must be adapted as far as possible to the recommendation of the PRO for packaging materials in order to facilitate recycling (Swedish Society for Nature Conservation, 2002).

---

<sup>77</sup> The detailed content of the criteria is available at the homepage of the Blue Angel Program ([www.blauer-engel.de/englisch/navigation/body\\_blauer\\_engel.htm](http://www.blauer-engel.de/englisch/navigation/body_blauer_engel.htm)).

## **Objectives**

The objective of the eco-labels is to enhance the possibility for consumers to select environmentally less burdensome products in their purchasing decision by providing the consumers with easily-understandable information that distinguish the environmentally superior products from the rest. Meanwhile, the eco-labelling schemes encourage manufacturers to improve the environmental performance of their products. The labels can communicate the superiority of their products in terms of environment via use of simple labels awarded from an independent body. In doing so, the eco-labelling schemes ultimately aims to improve the environmental performance of the entire product groups addressed in the scheme.

Eco-labelling schemes address different part of the waste hierarchy in their criteria. Some criteria concern waste prevention and reuse (for example through refillable demand or requirements of the use of less hazardous substances), while others seek to enhance recycling.

## **Addressees**

Consumers (users) and manufacturers of the products are the primary addressee of the eco-labelling schemes.

## **Effectiveness**

A study that reviewed existing studies of eco-labels in 2002 pointed out the lack of comprehensive evaluation of environmental gains of eco-labelling schemes. Some of the observed reasons include the difficulties of establishing the point of comparison and of delineating the effects of eco-labelling schemes in light of other influencing factors (Thidell, 2002).

However, the study recognised the trust of consumers as well as producers in the existing schemes (Thidell, 2002). Concerning the attitude of consumers, a Finnish study showed that Finnish consumers are willing to pay on average 15% more for the eco-labelled products, for instance detergents (Björk, 1997, as cited in Thidell, 2002). Similar conclusion was drawn in Denmark: consumers are willing to pay 10-17 % more for eco-labelled toilet papers and detergents (Bjørner et al., 2002).

Indirect effects of eco-labelling schemes have been also observed when the criteria for label are incorporated in the purchasers' – both private and public – decision making process (Thidell & Leire, 2005). Another indirect effect also includes the enhancement of consumers' awareness on environmental issues.

## **Introduction at the local level**

Introducing an eco-labelling scheme itself specific to local community may be difficult and may confuse consumers. However, local governments can facilitate awareness raising about the eco-labels. The criteria of the eco-label schemes can be integrated into the criteria for public procurement program, a practice already found in various instances (Thidell & Leire, 2005).

## 5.3 Green shopping guidance

### Content

In addition to the eco-labelling schemes discussed in the previous section, information regarding environmentally benign products has been provided in the forms of publication such as handbook or leaflet. The provider of such information varies and includes environmental organisations, consumer organisations and the like. For example, the Swedish Society for Natural Conservation published a handbook for consumers entitled “Handla Miljövänligt” (Buy environmentally friendly) in 1988. They also provide information via newsletters, organising events such as “Miljövänliga veckan” (Environmentally friendly week) and the like.

In relation to waste, the handbook, in the “thirteen tips for better environment” recommend the purchase of returnable bottles and that one should return batteries, broken glasses and paper to the collection points. The tip also recommends that one should discredit products that contain chlorinated hydrocarbons and heavy metal.

The guidance materials of this kind have been utilised by local governments when they try to provide their citizens with information on environment.

Local governments in Sweden can also employ people called “Konsumetvägledare” (a leader for consumers’ way). They provide advice to consumers when they have problems with companies concerning their products and services. As part of their advices, some of them also provide information on environmentally benign products (Thidell, 2006, personal interview).

Books such as “The Green Consumer Guide”<sup>78</sup> also became very popular in the late 1980s.

### Objectives

The objective of the guidance is to influence consumers’ purchasing behaviour. Provision of such guideline also aims to influence the manufacturers’ decisions regarding the design of their products.

### Addressees

Purchasers of products (citizens as well as institutional purchasers) are the primary addressees of the guidance. Intended addressee also includes the manufacturers of the products covered in the guidance.

### Effectiveness

At the moment studies that specifically look at the effectiveness of the guidance of discussed in this section are not available.

### Introduction at the local level

As has been the case, local governments can serve as an effective channel for the provision of guidance materials developed by other organisations.

---

<sup>78</sup> John Elkington & Julia Hailes, *The Green Consumer Guide. From shampoo to champagne – high-street shopping for a better environment*. London: Victor Gollancz Ltd.



## 5.4 Marking of products

### **Content**

Eco-labelling schemes discussed in Section 5.2 help the distinction of environmentally friendly products and services from the rest based on life-cycle perspective. There are other types of labels and marks that aim specifically at facilitating source separation. Marks often indicate the primary reasons for the necessity of source separation, such as enhanced recycling, inclusion of toxic substances, or both. Provision of such labels can be mandatory or voluntary.

Directives on specific waste streams all include mandatory marking on the products covered under the respective directives (See Section 2.5). The content of the marking include source separation (packaging, WEEE, batteries) as well as content of hazardous substances (batteries).

Products covered under the deposit-refund systems are also typically labelled with a clear symbol that suggests that consumers are entitled to receive refund.

A typical example of marking introduced by the market is the so-called green dots that have been introduced by the Duales System Deutschland AG (DSD) system in response to the entry into force of the German Ordinance on the Reduction and Avoidance of Packaging Waste. Producers who have a license agreement with DSD, which include the payment of license fees, are allowed to put the green dot on their products. Consumers are to discard the products with the green dots in separate collection bins. The DSD gradually expanded its activities and have collaborations with PROs in other European countries. Today the green dots are used for separate collection of packaging materials in total of 22 countries (Der Grüne Punkt – Duales System Deutschland AG, n.d.).

Among the packaging materials, markings on plastics include not only indicates that it is recyclable, but also the types of plastics, such as polyethylene (PE), polypropylene (PP) and polyethylene terephthalate (PET). The marking facilitates source separation, as well as recycling activities down the line.

### **Objectives**

The objective of the markings on products discussed in this section is to facilitate source separation. It often indicates the primary reasons for the necessity of source separation, such as enhanced recycling, inclusion of toxic substances, or both.

### **Addressees**

The primary addressees of the instrument are consumers. The entities that actually supply the products with marks are manufacturers.

### **Effectiveness**

The instrument is introduced together with other policy instruments, such as mandate on source separation (Section 3.3), producers' take-back (Section 3.4), collection targets (Section 3.5) and the like. This makes it difficult to see the contribution of the markings alone in achieving the source separation as indicated in the previous sections.

When the DSD system was introduced in Germany, some consumers discarded all the packaging materials in the separate containers regardless of whether the packaging has a green dot or not (OECD, 1998). It was not a problem from the environmental point of view. However, it put the producers who pay the license fees to be a part of the system in an economically disadvantageous position (free rider problem).

### Introduction at the local level

There are examples where marking was required by one region in a country (e.g. states and provinces in Canada) together with the introduction of source separation requirements. However, industry's responses suggest strong preference towards uniform systems (Fishbein, 1997; NEPSI, 2001; Betts, 2002). Just like the eco-labelling schemes and green shopping guidance, local governments can play an important role in channelling the information to their residents.

## 5.5 Information campaign to residents

### Content

In addition to the marking of products, various forms of information campaigns exist. The campaigns range from labelling on the waste containers, provisions of information materials to the private households, posters in the public transports to advertisement on TVs. They may be integrated into something that people can utilise in their daily life, such as calendars.

Information campaigns typically take place when a new source separation system is introduced. They are often accompanied by provision of equipment to implement the system, such as containers or bags. For instance, the Municipality of Torino, Italy, when introducing a door-to-door separate collection system for food waste, packaging materials and residual waste, visited private households one after another. When talking to the people about the new system, the campaigners also provided a starter kit which consists of bags for food waste and containers for packaging materials (Guiseppe, 2006, personal interview).. In Tølløse, Denmark, new residents to the community are provided with the information on source separation and weight-based collection system, together with containers for source separation (Olsen, 2006, personal interview). A waste management company in Katowice, Poland provides a small brochure to all the new customers, together with bags for source separation in four colours (Duda, 2006, personal interview).. When the City of Lund, Sweden introduced compost for food waste in selected parts of the community, they provide a small container for each household together with a sheet of information describing what can be put into the container. It was supplemented by two information meetings followed by a barbeque party.

Some EPR programs mandate informative responsibility to private entities. EPR program for EEE in Norway requires retailers to inform the public of their collection responsibility.<sup>79</sup> The legislation for batteries in Switzerland<sup>80</sup> require retailers to display a “prominent notice”, 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 and 3) the possibility of returning the spent batteries to shops. However, the obligation for retailers, at least in the initial stage, was not complied well. In Norway, where EPR legislation was enforced in July

---

<sup>79</sup> Section 5, Regulations regarding Scrapped Electrical and Electronic Products. 16 March 1998, Norway.

<sup>80</sup> Ordinance relating to Environmentally Hazardous Substances. Amendment of 11 November 1998. Batteries and accumulators. Annex 4.10., Switzerland.

1999, it was found in December 2000 that five major retail chains failed to inform consumers of their collection responsibility (ENDS, 2000, December 20).

In addition to the information provision mandated by law, private actors inform the consumers of the collection and recycling programs voluntarily as well. The PROs for batteries and EEE in Switzerland and the Netherlands are both active in this area, with the aim to fulfilling the collection targets stipulated in the legislation (Tojo, 2004).

Some local governments put some information on the waste management system of the communities (e.g. location of the collection points, which waste streams should be collected how, frequency of collections) in their Internet homepages.

Concerning waste prevention, as a part of waste counselling activities, the authorities in the Helsinki Metropolitan Region provided advices on non-material Christmas gifts, such as baby-sitting, cross-country skiing and the like (Arnold, 2006, personal interview)..

### **Objectives**

The objective of the information campaigns discussed above is to enhance awareness of citizens concerning waste. Most of the existing campaigns address source separation, while some initiatives address waste prevention.

### **Addressees**

Citizens (waste producers) are the primary addressees of the campaigns.

### **Effectiveness**

Information campaigns are often supplementary measure to achieve the goals of other policy instruments such as source separation, collection targets and the like. In most cases they are also accompanied by provision of convenience and/or financial incentives, which are considered as the determining factors to facilitate source separation (See Section 3.3).

However, a battery collection pilot project that took place for 6 months (November 1987 – May 1988) on an island in Denmark, with massive information efforts (after the intensive campaign, 92% of the population were aware of the programme), achieved only low collection results (Lindhqvist, 2000). The case illustrates that even when there is ample information, mere information cannot overcome inconvenience and lack of financial incentives.

### **Introduction at the local level**

As illustrated by a few examples, a variety of possibilities exist for local governments to take initiatives in launching information campaigns.

## **5.6 Information provision to treatment facilities**

### **Content**

A major challenge facing those involved in waste management is that the diversified content of the waste. Unlike production process where materials and components are more or less standardised, waste managers need to deal with ever changing “incoming materials”. The

difficulties increase due to the lack of communication between the upstream (manufacturers of products) and downstream (treatment facilities).

In order to remedy the situation, the EU Directives on waste streams from complex products (cars and EEE) require producers to provide information concerning the reuse and treatment to treatment facilities. In response, the European car industries developed a common manual for dismantlers and scrappers, and provide it to more than 2,200 dismantlers in Europe in the form of a CD-ROM (ENDS, 1999, October 25).

Information provisions are conducted voluntarily as well. For instance, prior to the introduction of the EU Directives, a number of EEE manufacturers in and outside of Europe started to label types of plastics (Tojo, 2004). Battery manufacturers also devised a standardised way of marking mercury-free batteries in order to facilitate the distinction between mercury-free batteries and mercury containing batteries at end-of-life. Labelling of plastics for packaging facilitates the sorting and recycling of plastics as well.

### **Objectives**

The objective of such provision is to facilitate reuse and environmentally sound treatment of the discarded products and components. Obligation to supply information may also provide manufacturers with the opportunities to consider end-of-life features of their products – ease of dismantling, recyclability and the like.

### **Addressees**

People working at the treatment facilities are the main users of the information. The information should enhance the quality, efficiency and safety of their work. Meanwhile, producers should supply the information, which may also give them opportunities to integrate end-of-life consideration in their product design.

### **Effectiveness**

The information regarding the activities at the treatment facilities is in general not easy to find, and the information concrete progress in terms of increased environmental effectiveness is not available. However, communication between the producers and the downstream actors of cars and EEE has been increased since the EPR programs for these products emerged, including the anticipation phase (Tojo, 2004). Meanwhile, the increase of the communication may not be so much to do with the information requirement, but other mandate such as take-back and achievement of recycling rates.

### **Introduction at the local level**

Considering the nature of the products for which information provision mandate has emerged, introducing the instrument at the local level per se may not be most optimal. The streams are supposed to be taken care of by producers in Europe, thus the majority of the waste stream most likely leave the hands of local governments. However, some obsolete products come to reuse facilities. Local governments could encourage these facilities – some of which may be run by them – to obtain such information from producers. Moreover, they can, for instance, utilise the permit provisions and inspections and check if the recycling/dismantling facilities are aware of the existence of the information – or possibility to obtain such information. If the facilities do not know about the information, the public body could direct the facilities to the relevant producers or their associations.

## 5.7 Conclusions

The five informative instruments reviewed in this chapter contain various different characteristics. Concerning the issues addressed in the instruments, two of them (eco-labelling schemes and green shopping guidance) cover environmental impacts arising from various parts of life cycle of products including end-of-life phase. The rest addresses waste as the primary issue. Regarding the level of coerciveness towards the primarily addressees, all the instruments reviewed leave it up to the receivers of the information to utilise it or not. Some of the instruments often mandate the provision of information from the producers (marking requirement, information to treatment facilities), while in the case of, for instance, eco-labelling scheme, it is up to the producers to decide if they would like to participate in the scheme or not.

The informative instruments that primarily address waste (marking, information campaign to residents, information to treatment facilities) are supplementary to other instruments. Eco-labelling schemes and green shopping guidance can be a stand-alone instrument. However, there are many factors that influence the behaviour of the addressees – both the consumers and the producers. Just like other policy instruments, evaluation of the effectiveness of respective instrument alone is difficult, especially regarding attributability. Table 5-1 summarises how local governments can utilise the respective instruments.

*Table 5-1: Selected informative instruments for waste management and issues related to local government*

Instruments	Examples	Issues related to local governments
Eco-labelling scheme	German Blue Angel, Nordic Swan, Swedish Good Environmental Choice, EU Flower (26 countries and regions are members of the Global Ecolabelling Network)	Local governments can help raise awareness of consumers regarding eco-labelling schemes. Criteria in the scheme can be incorporated in the government green procurement program.
Green shopping guidance	Communication of the existence and content of materials (e.g. handbooks, leaflets) assembled by others Provision of information via consumers' advisers	Local governments can be an effective channel in communicating information materials
Marking of products and components	Directives on packaging, WEEE and batteries, voluntary initiatives by manufacturers	Different requirements introduced by different local governments may face resistance and inefficient. Local governments can be an effective channel in communicating information materials
Information campaign to residents	Various initiatives (e.g. labelling on the waste containers, information materials to private households, posters in the public transports, advertisement on TVs) Both by public and private entities	Local governments should take the lead especially for the waste that come into municipal waste streams.
Information to treatment facilities	EU WEEE and ELV directives, voluntary initiatives by manufacturers	Local governments can direct treatment facilities to the source of information.

Local governments can play an essential role in implementing some of the instruments (e.g. information campaigns to residents on source separation). Moreover, they can serve as an important channel to connect the information to the primary users (consumers, treatment facilities) of the information.

## 6 Conclusions

This report aims to highlight the potential of selected existing policy instruments – administrative, economic, informative – in reducing the environmental impacts related to municipal waste generated in Europe. An overview of the EU policies related to municipal solid waste management is presented, with a view to setting the scene. Reflecting upon the aim and scope of the HOLIWAST project and the cases selected for in-depth studies, a focal point for discussion is implications to the local governments

As of spring 2006, the EU policies on waste are in transition. A new framework directive that replaces the existing framework directive has been proposed. In addition to some of the structural changes, some issues governing all waste policies in the EU – such as the distinction between waste and recovered materials, waste for recovery versus waste for disposal – are addressed in the proposal. The outcome will have implications to, among others, the movement of waste/material streams within and across the national boarder.

Some of the EU legislation, especially those governing specific waste streams, contains within them many policy instruments and serves as examples of these policy instruments. Some of them, such as material restriction, set the same standards for all the Member States, while the fulfilment of requirements such as minimum collection/ reuse/ recycling targets is partially left in the hands of Member States. The WEEE Directive and the proposal for the Directive on batteries and accumulators – which will replace the existing one once coming into force – are based on the concept of EPR (extended producer responsibility). Implementation of the packaging directive in the majority of the old-15 Member States has also been based on EPR. Meanwhile, the implementation in practice often retains the collection responsibility in the hands of municipalities. Considering the high cost of collection in relation to the rest of the end-of-life management of specific waste streams, this choice does not make sense. Meanwhile, local governments seem to want to keep control over the municipal waste collection system for various reasons. The optimal solution may differ depending on the socio-economic context. What will remain in the waste stream handled by the municipalities have implication to the technological solutions they should select.

The review of in total of 18 policy instruments – categorised into administrative, economic and informative – reveals that they vary in terms of the parts of waste hierarchy they address, the addressees, level of coerciveness and the like. The characteristics of the individual instruments are highlighted in the concluding section of the previous chapters, thus are not repeated here.

Although some of the instruments can be introduced on its own, the majority of the instruments are introduced together with other instruments. As already mentioned in the introduction, one policy intervention integrates a number of instruments together. Moreover, there could be a number of other factors influencing the behaviour of the addressees. Some of the policy instruments have not been implemented for a long time. Furthermore, instruments are introduced in different context. All these factors pose challenges to evaluate the effectiveness of single policy instrument.

Meanwhile, common to the instruments is that they all seem to have potential in reducing the environmental impacts of waste. Instruments related to source separation – seem to provide range of possibilities for local governments to devise solutions suitable to their own socio-economic context. Concerning waste prevention in terms of quality, the roles of municipalities may be limited to provision of information to their citizens.

In the next step of the Work Package 1 of the HOLIWAST project, the use of instruments presented in this report in the case communities are analysed in depth. The case studies aim to enrich the understanding on the implementation of some of the EU Directives and to provide insights into the use of policy instruments in practice in different context. Based on the findings of the situation of each community, what instruments may supplement the existing ones can be considered.





## Bibliography

### Sources other than legislation

Anderson, M. S., Dengsøe, N., & Pedersen, A. B. (2000). *An evaluation of the impact of green taxes in the Nordic countries*. Copenhagen: Nordic Council of Ministers. (TemaNord 2000:561).

Bartelings, Heleen, van Beukering, Pieter, Kuik, Onno, Vincent, Linderhof, Oosterhuis, Frans, Brander, Luke & Wagtendonk, Alfred.. (2005). Effectiveness of landfill taxation. Amsterdam: Institute for Environmental Studies.

BBC. (2006, October 6). "Many councils 'bug' rubbish bins" [Online]. Available: [news.bbc.co.uk/1/hi/uk/5404730.stm](http://news.bbc.co.uk/1/hi/uk/5404730.stm) [7 February 2007].

Beaurepaire, Emmanuel. (1997). How to Collect Portable Ni-Cd Secondary Batteries Efficiently: A Consumer's Point of View. In *Proceedings of the OECD Workshop on the Effective Collection and Recycling of Nickel-Cadmium Batteries*. Paris: OECD (ENV/JM/MONO(99)17).

Bebat (Belgium Battery). (2001). Collectes et recyclage: evolutions [Collection and recycling: evolution] [Online]. Available: [www.bebat.be/pages/fr/Recyclagef/mnu82cont.html](http://www.bebat.be/pages/fr/Recyclagef/mnu82cont.html) [23 October 2001]

Betts, David. (2002). Presentation by David Betts, Vice Presentation of Operations, ITAC. Presented at *the National EPR Workshop, Winnipeg, Manitoba*. 6 March 2002. Manitoba.

Bjørner, Thomas Bue, Hansen, Lars Gårn, Russell, Clifford S., & Olsen, Tore. (2002). *The Effect of the Nordic Swan Label on Consumers' Choice*. Copenhagen: AKF Forlaget.

BMU. (2006). Abfallwirtschaft. [Online]. Available: [www.bmu.de/abfallwirtschaft/doc/3213.php](http://www.bmu.de/abfallwirtschaft/doc/3213.php) [23 March 2006].

Blauer-Engel. De. (2006). 1. Existing Basic Criteria. [Online]. Available: [www.blauer-engel.de/englisch/navigation/body\\_blauer\\_engel.htm](http://www.blauer-engel.de/englisch/navigation/body_blauer_engel.htm) [19 May 2006]

Bund Naturschutz in Bayern. (2006). BAYERNS SCHÖNHEIT BEWAHREN. [Online]. Available: [www.bund-naturschutz.de/presse/pressemitteilungen/496.html](http://www.bund-naturschutz.de/presse/pressemitteilungen/496.html) . [22 March 2006].

Carlson, C., D. Burtraw, M. Cropper and K. Palmer. (2000) SO<sub>2</sub> Control by Electric Utilities: What are the Gains from Trade?" *Journal of Political Economy*, 108, 6, 1292-1326.

Crowe, Matt, Nolan, Kirsty, Collins, Caitríona, Carty, Gerry, Donlon, Brian & Kristoffersen, Merete. (2002). Biodegradable municipal waste management in Europe. Part 1: Strategies and instruments. Copenhagen: European Environment Agency (Topic report: 15/2001).

Coggan, A. & Whitten, S. (2005). Market Based Instruments (MBIs) in Australia Background paper presented at the *Desert Knowledge CRC Workshop* Alice Springs, 8-10 June, 2005, CSIRO sustainable ecosystems.

Council of the European Union. (2006). *Subject: Proposal for a Directive of the European Parliament and of the Council on batteries and accumulators and waste batteries and accumulators*. 5455/06. Interinstitutional File: 2003/0282 (COD).

Council of the European Union. (2007). *Subject: Proposal for a Directive of the European Parliament and of the Council on waste. – outcome of the European Parliament's first reading (Strasbourg 12 to 15 February 2007)*. 6242/07. Interinstitutional File: 2005/0281 (COD).

COM(2001) 68 final. *Green Paper on the integrated product policy*

COM(2003) 301 final. *Communication from the Commission. Towards a thematic strategy on the prevention and recycling of waste*.

COM (2003) 379 final. *Proposal for a Regulation of the European Parliament and of the Council on Shipments of Waste*.

COM (2003) 723 final. *Proposal for a Directive of the European Parliament and of the Council on batteries and accumulators and spent batteries and accumulators*.

COM (2005) 666 final. *Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions. Taking sustainable use of resources forward: A Thematic Strategy on the prevention and recycling of waste*.

COM (2005) 667 final. *Proposal for a Directive of the European Parliament and of the Council on waste*.

Container Recycling Institute (CRI). (2004, February 4). *Bottle Bill Resource Guide (2004): "Litter."*, Bottle Bill Resource Guide. [Online]. Available: [www.bottlebill.org/impacts/litter.htm](http://www.bottlebill.org/impacts/litter.htm) [4 February 2004]

DEFRA (Department for Environment, Food and Rural Affairs). (2005). *Consultation Paper on Changes to the Recycling Credit Scheme*. [Online]. Available: [www.eden.gov.uk/CIS/PDF/ca\\_res05\\_1dec\\_12a.pdf](http://www.eden.gov.uk/CIS/PDF/ca_res05_1dec_12a.pdf) [2 February 2007].

DEFRA.(n.d.). [Online]. Available: [www.defra.gov.uk/environment/waste/localauth/recycling\\_credits.htm](http://www.defra.gov.uk/environment/waste/localauth/recycling_credits.htm) [23 March 2006].

Der Grüne Punkt – Duales System Deutschland AG. (n.d.) *Europe Goes Green Dot. 2004 2005*. Cologne. Der Grüne Punkt – Duales System Deutschland AG. [Online]. Available: [www.pro-e.org/brochures/europe\\_goes.pdf](http://www.pro-e.org/brochures/europe_goes.pdf) [23 May 2006]

ECOTEC Research and Consulting Ltd. (2000): *Effects of Landfill Tax – Reduced Disposal of Inert Wastes to Landfill*. Birmingham: ECOTEC. [Online]. Available: <http://www.defra.gov.uk/environment/waste/strategy/pdf/report.pdf> [2006, April 25]

EEA (European Environmental Agency). (2006). *Treatment of Packaging Waste*. [Online]. Available: [dataservice.eea.europa.eu/atlas/viewdata/viewpub.asp?id=1375](http://dataservice.eea.europa.eu/atlas/viewdata/viewpub.asp?id=1375) [2006 May 22]

ENDS (Environmental Data Services). (1999, October 25). *EU car industry seeks to increase recycling*. *Ends Environment Daily* [Online]. Available: e-mail: [mailer@ends.co.uk](mailto:mailer@ends.co.uk) [1999, October 25]

- ENDS. (2000, June 6). Swedish waste recycling up in 1999. *ENDS Environment Daily* [Online]. Available: e-mail: mailer@ends.co.uk [2000, June 6]
- ENDS. (2000, August 7). New record for European waste glass collection. *ENDS Environment Daily* [Online]. Available: e-mail: mailer@ends.co.uk [2000, August 7]
- ENDS. (2000, November 22). German refill quota under legal attack. *ENDS Environment Daily* [Online]. Available: e-mail: mailer@ends.co.uk [2000, November 22]
- ENDS. (2000, December 1). Tempers fray over EU NiCad battery study. *ENDS Environment Daily* [Online]. Available: e-mail: mailer@ends.co.uk [2000, December 1]
- ENDS. (2000, December 20). Norway reads the riot act to electronics firms. *ENDS Environment Daily* [Online]. Available: e-mail: mailer@ends.co.uk [2000, December 20]
- ENDS. (2001, January 31). German drinks pack deposits to start in 2002. *ENDS Environment Daily* [Online]. Available: e-mail: mailer@ends.co.uk [2001, January 31]
- ENDS. (2001, May 2). Advance for German drinks pack deposit. *ENDS Environment Daily* [Online]. Available: e-mail: mailer@ends.co.uk [2001, May 2]
- ENDS. (2001, July 2). EU resolve on NiCad ban shows sign of weakening. *ENDS Environment Daily* [Online]. Available: e-mail: mailer@ends.co.uk [2001, July 2]
- ENDS. (2001, July 17). German government defeated over packaging. *ENDS Environment Daily* [Online]. Available: e-mail: mailer@ends.co.uk [2001, July 17]
- ENDS. (2001, September 9). German refillable drinks pack sales fall again. *ENDS Environment Daily* [Online]. Available: e-mail: mailer@ends.co.uk [2001, September 9]
- ENDS. (2002, October 1). Sweden's recycling progress reviewed. *ENDS Environment Daily* [Online]. Available: e-mail: mailer@ends.co.uk [2002, October 1]
- ENDS. (2004, January 20). Industry "implementing EU packaging rules". *ENDS Environment Daily* [Online]. Available: e-mail: mailer@ends.co.uk [2004, January 20]
- ENDS. (2004, April 6). MEPs vote to ban nickel-cadmium batteries. *ENDS Environment Daily* [Online]. Available: e-mail: mailer@ends.co.uk [2004, April 6]
- ENDS. (2004, April 20). EU parliament confirms NiCad battery ban. *ENDS Environment Daily* [Online]. Available: e-mail: mailer@ends.co.uk [2004, April 20]
- ENDS. (2005, February 21). Packaging standards win official EU backing. *ENDS Environment Daily* [Online]. Available: e-mail: mailer@ends.co.uk [2005, February 21]
- ENDS. (2005, April 12). MEPs escalate EU RoHS exemption row. *ENDS Environment Daily* [Online]. Available: e-mail: mailer@ends.co.uk [2005, April 12]

- ENDS. (2006, January 10). Parliament sues to reinstate EU deca-BDE ban. *ENDS Environment Daily* [Online]. Available: e-mail: mailer@ends.co.uk [2006, January 10]
- ENDS. (2006, May 5). MEPs to demand say in waste reclassification. *ENDS Environment Daily* [Online]. Available: e-mail: mailer@ends.co.uk [2006, May 5]
- ENDS. (2006, June 26). Jackson bids for clearer EU waste rules. *ENDS Environment Daily* [Online]. Available: e-mail: mailer@ends.co.uk [2006, June 26]
- ENDS. (2006, October 11). MEPs seek more ambition in waste law revision. *ENDS Environment Daily* [Online]. Available: e-mail: mailer@ends.co.uk [2006, October 11]
- ENDS. (2007, February 13). Parliament votes for stricter EU waste rules. *ENDS Environment Daily* [Online]. Available: e-mail: mailer@ends.co.uk [2007, February 13]
- European packaging waste management systems, Argus, ACRR and Carl Bro a/s, December 2000.
- European Commission. (n.d.). *The Story Behind the Strategy. EU Waste Policy*. Brussels: European Commission.
- European Parliament. (1996). *Resolution on the communication from the Commission on the review of the Community strategy for waste management and the draft Council resolution on waste policy (COM (96) 0399-C4-0453/96)*. OJ C 362 02/12/1996. p. 0241. (A4-0364/96)
- Exeter City Council. (2006). Raising funds by recycling. [Online]. Available: [www.exeter.gov.uk/index.aspx?articleid=2486](http://www.exeter.gov.uk/index.aspx?articleid=2486) [23 March 2006].
- Fishbein, Bette. (1997). Industry Program to Collect and Recycle Nickel-Cadmium (Ni-Cd) Batteries. In Davis, G.A. & Wilt, C.A. *Extended Product Responsibility: A New Principle for Product-Oriented Pollution Prevention*. Knoxville, TN: Center for Clean Products and Clean Technologies, the University of Tennessee.
- Global Ecolabelling Network. (2006). *Members*. [Online]. Available: [www.gen.gr.jp/members.html](http://www.gen.gr.jp/members.html) [2006 April 29].
- Hannequart, J.P. (2002). Instruments for Recycling of Specific Waste Streams, Economic Instruments and Individual Financial Responsibility, June 2002. Report to the 6th European Resources and Waste Management Forum. [Online]. Available: [www.acrr.org/prevention/index.htm](http://www.acrr.org/prevention/index.htm) [2006, April 20 ]
- Hogg D.F. (2002). Financing of municipal waste. report presented at the *Turin Seminar organised by the Association of Cities and Regions for Recycling (ACRR)*. 8 April 2002, Turin.
- International Energy Agency. (2007). Tax on Waste Disposal. [Online]. Available: [www.staedtebund.at/staedtetag/2003/seiten/presseunterlage\\_staedtetag\\_2003.pdf](http://www.staedtebund.at/staedtetag/2003/seiten/presseunterlage_staedtetag_2003.pdf) [2 February 2007].

International Herald Tribune, 23 April 2005, "Thinking twice about garbage" [Online]. Available: [www.ihf.com/articles/2005/04/23/news/trash.php](http://www.ihf.com/articles/2005/04/23/news/trash.php) [2006 March 29].

Kim, Nawon. (2002). Exploring Determinant Factors for Effective End-of-Life Vehicle Policy. Experiences from European end-of-life vehicle systems. IIIIEE Reports 2002:7. Lund: IIIIEE, Lund University.

Kiehne, Heinz-Albert. (1997). Collection and Recycling of Ni-Cd Batteries in Germany. In *Proceedings of the OECD Workshop on the Effective Collection and Recycling of Nickel-Cadmium Batteries*. Paris: OECD (ENV/JM/MONO(99)17).

Knauer, Susanne. (2000). Erfahrungen mit Grund- und Leistungsgebühr, in Seminar Müllgebühren, Bayerisches Landesamt für Umweltschutz, [Online]. Available: [www.abfallratgeber-bayern.de/arba/allglfu.nsf/485E045C7DFF817CC1256EB4002C98C8/\\$file/verurg\\_muellgeb.pdf](http://www.abfallratgeber-bayern.de/arba/allglfu.nsf/485E045C7DFF817CC1256EB4002C98C8/$file/verurg_muellgeb.pdf) [7 February 2007].

Korfmacher, Hans. (2001). Financial Aspects of Collecting & Recycling Batteries in Europe. *Warmer Bulletin* 79. July 2001. North Yorkshire: Residua Limited.

Krämer, Ludwig. (2003). *EC Environmental Law* (5<sup>th</sup> ed.) London: Sweet & Maxwell.

Langrová, Veronika. (2002). *Comparative Analysis of EPR Programmes for Small Consumer Batteries. Case study of the Netherlands, Switzerland and Sweden*. IIIIEE Reports 2002:22. Lund: IIIIEE, Lund University.

Lindhqvist, Thomas (1992). Extended Producer Responsibility. In T. Lindhqvist, *Extended Producer Responsibility as a Strategy to Promote Cleaner Products*. (1-5). Lund: Department of Industrial Environmental Economics, Lund University.

Lindhqvist, Thomas. (2000). *Extended Producer Responsibility in Cleaner Production*. IIIIEE Dissertations 2000:2. Lund: IIIIEE, Lund University.

Lindhqvist, Thomas, & van Rossem, Chris. (2005). *Evaluation Tool for EPR Programs*. Report prepared for Environment Canada and the Recycling Council of Ontario. [Online]. Available: <http://www.rco.on.ca/intro/upcoming/conf05/ThomasLindhqvist.pdf>

Lynn, Miranda, Marie, Bauer, Scott D., Aldy, Joseph. (1996). *Unit Pricing Programs for Residential Municipal Waste: An Assessment of the Literature*. U.S. EPA Cooperative Agreement #CR822-927-010. Report prepared for: U.S. Environmental Protection Agency, Washington, D.C.[Online] <http://www.epa.gov/epaoswer/non-hw/payt/pdf/swlitrep.pdf> [2006, April 15]

Morrow, Hugh & Keating, John. (1997). Overview Paper on effective Recycling of Ni-Cd Batteries. In *Proceedings of the OECD Workshop on the Effective Collection and Recycling of Nickel-Cadmium Batteries*. Paris: OECD (ENV/JM/MONO(99)17).

Naturvårdsverket. (2005). *A Strategy for Sustainable Waste Management. Sweden's Waste Plan*. Stockholm: Naturvårdsverket.

NEPSI (National Electronics Product Stewardship Initiative).(2001). National Electronics Product Stewardship Initiative Draft Meeting Notes. June 21-22, 2001 San Francisco. [Online] Available:<http://eerc.ra.utk.edu/clean/nepsi/pubdocs.htm> [4 November 2002]

OECD. (1998). *Extended Producer Responsibility. Phase 2. Case Study on the German Packaging Ordinance*. Paris: OECD (ENV/EPOC/PPC(97)21/REV2).

OECD. (2007). *Instrument Mixes Addressing Household Waste*. Paris: OECD (ENV/EPOC/WGWP(2005)4/FINAL).

PA Department of Environmental Protection. (2007). Principles of Approach. The Role of State Government in Recycling Market Development. [Online]. Available: [www.dep.state.pa.us/dep/deputate/airwaste/wm/recycle/Market/docs/Phase\\_II\\_Principles\\_of\\_Approach.pdf](http://www.dep.state.pa.us/dep/deputate/airwaste/wm/recycle/Market/docs/Phase_II_Principles_of_Approach.pdf) [2 February 2007].

PIRA International Ltd. & ECOLAS N.V. (2005). *Study on the Implementation of Directive 94/62/EC on Packaging and Packaging Waste and Options to Strengthen Prevention and Re-use of Packaging. Final Report 21 February 2005 03/07884/AL* [Online]. Available: [ec.europa.eu/environment/waste/studies/packaging/050224\\_final\\_report.pdf](http://ec.europa.eu/environment/waste/studies/packaging/050224_final_report.pdf) [2006, May 18]

Radermaker, Francis. (2006, March 29).Waste Management Taxes and Fees in the EU – a comparative Study. [Online]. Available: [itnp.wu-wien.ac.at/archiv\\_doc/b3\\_radermaker\\_english.pdf](http://itnp.wu-wien.ac.at/archiv_doc/b3_radermaker_english.pdf) [2006, March 29]

Raymond Communications Inc. (2001). *Battery Recovery Laws Worldwide. 2001 Update Edition*. College Park, MD: Raymond Communications Inc.

Rohde Island Department of Environmental Management. (2006). [Online]. Available: [www.dem.ri.gov/programs/bpoladm/stratpp/payt/payt.htm](http://www.dem.ri.gov/programs/bpoladm/stratpp/payt/payt.htm) [29 March 2006].

SAEFL (Swiss Agency for the Environment, Forests and Landscape). (2001). Separately Collected Waste for Recycling; Quantities and Rates. Bern: SAEFL.

Sauer, Petr & Pribilová, Luibuse. (n.d.) Pay as you throw: An attempt of quantitative comparison of Czech and German experience, p. 3., [Online]. Available: [web.tu-dresden.de/intecuspayout/results/WP4\\_Quantitative%20analysis%20report\\_D-CZ%20comparison.pdf](http://web.tu-dresden.de/intecuspayout/results/WP4_Quantitative%20analysis%20report_D-CZ%20comparison.pdf) [7 February 2007].

Scottish Environmental Protection Agency. (2006). Legislation: Aggregates Tax. [Online]. Available: [www.sepa.org.uk/wastemin/legis/aggregates.htm](http://www.sepa.org.uk/wastemin/legis/aggregates.htm) [22 March 2006].

Swedish Society for Nature Conservation. (1997). *Environmental criteria for paper*. Stockholm: Swedish Society for Nature Conservation.

Swedish Society for Nature Conservation. (2002). *Cleaning agents 2002*. Stockholm: Swedish Society for Nature Conservation.

STIBAT (Stichting Batterijen). (2002a). *Jaarverslag 2001*. Zoetermeer: STIBAT.

Söderholm, P. (2006). Environmental Taxation in the Natural Resource Extraction Sector: Is it a good idea? in *European Environment*, 2006, p. 232ff.

Thidell, Åke. (2002). Measuring success of eco-labels? Paper presented in *the Labelling For A Sustainable and Just World*, 17-18 October 2002, Washington D.C.

Thidell, Åke & Leire, Charlotte. (2005). Indirect Effects of Eco-Labeling – The Case of Purchasing Tools. Paper presented in *the 2<sup>nd</sup> International Conference on Life Cycle Management*, 5-7 September 2005, Barcelona.

Thunberg, Bo & Holm, Fredrik. (1988). *Handla Miljövänligt! Vardagshandbok för en bättre miljö*. [Shop Environmentally Friendly! Everyday's handbook for a better environment]. Stockholm: Svenska Naturskyddsföreningen.

Tojo, Naoko. (2004). *Extended Producer Responsibility as a Driver for Design Change – Utopia or Reality?* IIIIEE Dissertations 2004:2. Lund: IIIIEE, Lund University.

Tojo, Naoko. (2006). *Recycling, Waste Management and Product Policy outside of Japan*. In Mitsubishi Research Institute, *Recycle Kanren Houseido no Kouryoku Sokutei no tamenno Kisojouhou no Shushu, Seiri. (2) [The collection and organization of Basic Information for the Measurement of Effectiveness of Legislation and Policy related to Recycling]* (3-1 - 3-43). Tokyo: Mitsubishi Research Institute.

Tojo, Naoko, & Hansson, Lars. (2004). Political Economy for Implementing EPR-based Policy Instruments. In OECD, *Economic Aspects of Extended Producer Responsibility* (221-278). Paris: OECD.

Tojo, Naoko, Lindhqvist, Thomas, & Davis, Gary. (2003). EPR Programme Implementation: Institutional and Structural Factors. In OECD, *Proceedings of OECD Seminar on Extended Producer Responsibility: EPR Programme Implementation and Assessment. Part II: Assessing EPR Policies and Programmes*, 13-14 December 2001, OECD (226-275). Paris: OECD (ENV/EPOC/WPNEP(2003)10/PART2/FINAL)

Tucker, Peter & Spiers, David. (2002). *Model Forecasts of Recycling Participation Rates and Material Capture Rates for Possible Future Recycling Scenarios*. Paisley: University of Paisley Environmental Technology Group.

Tyson, Gregory. (2005). *Extended Producer Responsibility and Local Government: Exploring Municipal Roles in Managing Packaging and Paper Waste*. IIIIEE Reports 2005:08. Lund: IIIIEE, Lund University.

Van der Doelen, Frans C.J., (1998). The “Give-and-Take” Packaging of Policy Instruments: Optimizing Legitimacy and Effectiveness. In M.-L. Bemelmans-Videc, R.C. Rist & E. Vedung (eds.), *Carrots, Sticks & Sermons Policy Instruments & Their Evaluation*. (129-146). New Brunswick: Transaction Publishers.

Van Rossem, Chris. (2001). Environmental product information flow: communication of environmental data to facilitate product improvements in the ICT sector. IIIIEE Reports 2001:15. Lund: IIIIEE, Lund University.

Van Rossem, Chris, Tojo, Naoko & Lindhqvist, Thomas. (2006). Lost in Transposition? A study of the Implementation of Individual Producer Responsibility in the WEEE Directive.

Report Commission by Greenpeace International, Friends of the Earth Europe and the European Environmental Bureau (EEB).

UMWELT. (2007a). 4 Schlußfolgerungen/Empfehlungen [Online]. Available: [www.umwelt.sachsen.de/de/wu/umwelt/lfug/lfug-internet/veroeffentlichungen/verzeichnis/Abfall-Altlasten/Materialien/Daten/kap4.html](http://www.umwelt.sachsen.de/de/wu/umwelt/lfug/lfug-internet/veroeffentlichungen/verzeichnis/Abfall-Altlasten/Materialien/Daten/kap4.html) [2 February 2007].

UMWELT. (2007b). Abfallgebührenstudie. [Online]. Available: [www.umwelt.sachsen.de/de/wu/umwelt/lfug/lfug-internet/veroeffentlichungen/verzeichnis/Abfall-Altlasten/Gebuehrenstudie\\_2005\\_Internet02.pdf](http://www.umwelt.sachsen.de/de/wu/umwelt/lfug/lfug-internet/veroeffentlichungen/verzeichnis/Abfall-Altlasten/Gebuehrenstudie_2005_Internet02.pdf) [2 February 2007].

Umweltbundesamt. (2007). Abfall nutzen – Klima schützen. [Online]. Available: [www.umweltbundesamt.de/uba-info-presse/2006/pd06-072.htm](http://www.umweltbundesamt.de/uba-info-presse/2006/pd06-072.htm). [7 February 2007].

Vassart, Alain. (2001). Status of Battery Recycling in Europe. In *Take It Back! 2001*. 18 April 2001. Arlington. VA.

Vedung, Evert. (1997). *Public Policy and program evaluation*. New Brunswick: Transaction Publishers.

Vedung, Evert. (1998). Policy Instruments: Typologies and Theories. In M.-L. Bemelmans-Videc, R.C. Rist & E. Vedung (eds.), *Carrots, Sticks & Sermons Policy Instruments & Their Evaluation*. (21-58). New Brunswick: Transaction Publishers.

VROM (Ministry of Housing, Spatial Planning and the Environment, the Netherlands). (1999). *Guideline: Disposal of White and Brown Goods Decree, information for giving notification*, Den Haag: VROM.

Österreichischer Städtebund. (2003). [Online]. Available: [www.staedtebund.at/staedtetag/2003/seiten/presseunterlage\\_staedettag\\_2003.pdf](http://www.staedtebund.at/staedtetag/2003/seiten/presseunterlage_staedettag_2003.pdf) [2 February 2007].

## Legislation

Commission Decision 96/350/EC of 24 May 1996 adapting Annexes IIA and IIB to Council Directive 75/442/EEC on waste. OJ L 135 , 06/06/1996 P. 0032 – 0034

Commission Decision 2005/ 747/ EC of 21 October 2005 amending for the purposes of adapting to technical progress the Annex to Directive 2002/ 95/ EC of the European Parliament and of the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment. OJ L 280, 25.10.2005, p. 0018–0019

Commission Decision 2006/310/EC of 21 April 2006 amending, for the purposes of adapting to the technical progress, the Annex to Directive 2002/ 95/ EC of the European Parliament and of the Council as regards exemptions for applications of lead. OJ L 115, 28.4.2006, p. 0038–0039



Commission Directive 98/ 101/ EC of 22 December 1998 adapting to technical progress Council Directive 91/ 157/ EEC on batteries and accumulators containing certain dangerous substances. OJ L 1, 5.1.1999, p. 1–2.

Council Directive 75/ 439/ EEC of 16 June 1975 on the disposal of waste oils. OJ L 194, 25/07/1975 P. 0023 – 0025.

Council Directive 75/ 442/ EEC of 15 July 1975 on waste. OJ L 194, 25/ 07/ 1975 P. 0039 – 0041.

Council Directive 91/ 156/ EEC of 18 March 1991 amending Directive 75/ 442/ EEC on waste. OJ L 078 , 26/03/1991 P. 0032 – 0037.

Council Directive 91/ 157/ EEC on batteries and accumulators containing certain dangerous substances. OJ L 078, 26/03/1991 P. 0038-0041.

Council Directive 91/ 689/ EEC of 12 December 1991 on hazardous waste. OJ L 377, 31/12/1991 P. 0020 – 0027.

Council Directive 91/ 692/ EEC of 23 December 1991 standardizing and rationalizing reports on the implementation of certain Directives relating to the environment. OJ L 377, 31/12/1991 P. 0048 – 0054

Council Directive 94/ 62/ EC of 20 December 1994 on packaging and packaging waste. OJ L 365 , 31/12/1994 P. 0010 – 0023.

Council Directive 96/ 61/ EC of 24 September 1996 concerning integrated pollution prevention and control. OJ L 257 , 10/10/1996 P. 0026 – 0040.

Council Directive 1999/ 31/ EC of 26 April 1999 on the landfill of waste. OJ L 182, 16/07/1999 P. 0091 – 0019.

Decree 0 31 January 1995 laying down rules for the collection and processing of spent batteries (Batteries Disposal Decree). Bulletin of Acts and Decrees of the Kingdom of the Netherlands. 1995, 45.

Directive 2000/ 76/ EC of the European Parliament and of the Council of 4 December 2000 on the incineration of waste. OJ L 332, 28/12/2000 P. 0091 – 0111.

Directive 2002/ 95/ EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment. OJ L 37, 13.2.2003, p. 0019–0023

Directive 2002/ 96/ EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE). OJ L 037, 13/ 02/ 2003 P. 0024 – 0039.

Directive 2004/ 12/ EC of the European Parliament and of the Council of 11 February 2004 amending Directive 94/ 62/ EC on packaging and packaging waste. OJ L 47, 18.2.2004, p. 0026–0032

Directive 2005/ 20/ EC of the European Parliament and of the Council of 9 March 2005 amending Directive 94/ 62/ EC on packaging and packaging waste. OJ L 70, 16.3.2005, p. 0017–0018

Directive 2006/ 12/ EC of the European Parliament and of the Council of 5 April 2006 on waste. OJ L 113, 27.4.2006, p. 0009–0021.

Directive 2006/ 66/ EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/ EEC. OJ L 166, 26.9.2006, p. 0001–0014.

No. 883. Government Decision on the Collection and Recovery of Waste Paper. 25 November 1998.

Ordinance on Producers' Responsibility for Packaging, 7 May 1997, Sweden (SFS 1997:185).

Ordinance relating to Environmentally Hazardous Substances. Amendment of 11 November 1998. Batteries and accumulators. Annex 4.10., Switzerland.

Ordinance on the Avoidance and Recovery of Packaging Waste (Verpackungsverordnung – VerpackV) of 27 August 1998 (BGBl I 1998 S. 2379), Germany.

Regulation No 259/ 93/ EEC of 1 February 1993 on the supervision and control of shipments of waste within, into and out of the European Community. OJ L 030, 06/02/1993 P. 0001 - 0028.

Regulation 1882/ 2003/ EC of the European Parliament and of the Council of 29 September 2003 adapting to Council Decision 1999/ 468/ EC the provisions relating to committees which assist the Commission in the exercise of its implementing powers laid down in instruments subject to the procedure referred to in Article 251 of the EC Treaty. OJ L 284 , 31/10/2003 P. 0001 – 0053.

Regulation (EC) No 1013/ 2006 of the European Parliament and of the Council of 14 June 2006 on shipments of waste. OJ L 190 , 12/07/2006. P. 0001 – 0098.

Regulations regarding Scrapped Electrical and Electronic Products. 16 March 1998, Norway.

Waste Act 1072/ 1993. Unofficial translation with amendment up to 1063/ 2004 included. Ministry of the Environment, Finland.

## Personal interviews

Arnold, Mona. (2006). Project Manager, Waste Management, Helsinki Metropolitan Area Council. 2006, March 21. Personal interview.

Back, Eduard (Eduard.Back@buwal.admin.ch). (2004). Substances, Soil and Biotechnology Division, Swiss Agency for the Environment, Forests and Landscape. *RE: EPR programme for batteries and possible deposit refund system*. E-mail to Naoko Tojo ([naoko.tojo@iiiee.lu.se](mailto:naoko.tojo@iiiee.lu.se)). 2004, March 16-18

Broers, Sander. (2003). Operational manager, STIBAT (PRO for batteries in the Netherlands). 2003, April 8. Personal interview.

Bulletti, Marco. (2006). Federal Office for the Environment (FOEN), Waste and Raw Materials Division, Switzerland. 2006, March 29. Telephone interview.

Duda, Tadeusz. (2006). Director of Composting facility, MPGK, waste management company of Katowice Municipality. 2006, April 20. Personal interview.

Guiseppe, Comin. (2006). in charge of information campaign. AMIAT, Waste management company of Torino Municipality. 2006, April 3. Personal interview.

Kloptek, Beata. (2006). Deputy Director, Waste Management Department, Ministry of the Environment of Poland. 2006, April 28. Personal interview.

Krämer, Ludwig. (2005). Former Head of the Unit for Governance in DG Environment, Professor of EC Environmental Law. 2005, December 6. Personal interview.

Lilja, Raimo. (2006). Senior Expert, Expert Services Department, Environmental Management Division, Finnish Environmental Institute (SYKE). 2006, March 21. Personal interview.

Olsen, Anne-Sophie (2006). Personnel in charge of waste management, Tølløsø Municipality, Denmark. 2006, January 30. Personal interview.

Ricci, Marco (2006). Scuola Agraria del Parco di Monza. 2006, April 3. Personal interview.

Salo, Markku. (2006). Managing Director, Finnish Solid Waste Association. 2006, March 20. Personal interview.

Thidell, Åke. (2006). Assistant Professor. International Institute for Industrial Environmental Economics at Lund University. 2006, May 22. Personal interview.

Veerman, Kees. (2003). Deputy Commissioner, VROM (Ministry of Housing, Spatial Planning and the Environment). 2003, April 9. Personal interview

## **Abbreviations**

EEE	Electrical and electronic equipment
ELV	End-of-life vehicles
EPR	Extended producer responsibility
IPPC	Integrated pollution prevention and control
PRO	Producer responsibility organisation
RoHS	Restriction of hazardous substances
WEEE	Waste electrical and electronic equipment